GAYATRI VIDYA PARISHAD
COLLEGE OF ENGINEERING FOR WOMEN

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Science, **T**echnology, **E**ngineering & **M**athematics

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Vision of the Institute

To emerge as an acclaimed centre of learning that provides value-based technical education for the holistic development of students.

Mission of the Institute

- Undertake the activities that provide value-based knowledge in Science, Engineering and Technology
- Provide opportunities for learning through industry-institute interaction on the state-of-the-art technologies
- Create a collaborative environment for research, innovation, and entrepreneurship
- Promote activities that bring in a sense of social responsibility

Message from the Principal's Desk

Dr. K V S RAO
Principal

The Engineering community across India celebrates Engineers Day on 15th September every year as a tribute to the Greatest Indian Engineer Bharat Ratna Sir Mokshagundam Visvesvaraya fondly called as Sir MV.

On this eve, it is my privilege to acknowledge the endeavour of our faculty and students in bringing out the second issue of the student level technical magazine - INGÈNIEUR. The integration of the four cornerstones of technological revolution – **S**cience, **T**echnology, **E**ngineering and **M**athematics – is reflected in the articles presented in this issue.

I sincerely thank the efforts put in by the Vice-Principal and his team of faculty and student coordinators who were instrumental in bring out this issue.

I sincerely hope that this magazine will be known for its rich content.

INDEX

COMPUTER SCIENCE & ENGINEERING

DEPARTMENT ARTICLES

ENGINEERS DAY - 2019

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An IoT based Atmosphere Monitoring System

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***Abstract*— Now-a-days, the air we breathe is also being taken as granted. The burning of fossil fuels, agricultural activities, exhausts from factories and industries, mining operations have polluted the air to a great extent. Air pollution is all around us - indoors, outdoors and the country sides. There can be many adverse effects caused by air pollution. Internet of things (IoT) provides a platform that allows devices to be connected, sensed and be controlled remotely across a network infrastructure. This paper aims at designing an IoT based atmosphere monitoring system. The key feature of this paper is to measure the level of air contaminants, temperature and humidity in the atmosphere using the sensors, store the sensor data into the cloud server (Adafruit). Adafruit is a cloud service which can be connected over the internet. It is primarily used for storing and then retrieving the data.**

***Keywords*— Adafruit IO, NODEMCU, ESP8266, DHT 11, MQ-2**

I. INTRODUCTION

Environmental pollution is one of the most censorious threat that is being faced by our planet in the current day scenario. This is an issue of global concern which is seen commonly in all the countries, including the wealthiest countries in the world irrespective of their developmental status. Environmental pollution is caused when humans introduce contaminants in the environment through their activities which leads to the disruption of the routine processes, causing irrevocable changes in the environment. Pollutants are the substances which occur in the nature or are created because of extraneous human activities. The environmental pollution may be classified into six different types based on the pollutants and the pollution caused in the components of the environment. They are air, water, soil/land, noise, radioactive and thermal pollutions. Out of these air pollution is the most serious problem in the present day scenario all over the world especially in the hi-tech cities because of huge level of industrialization. Now-a-days due to the increase in population, the usage of vehicles also increased gradually , resulting in increase of pollution by harmful gases like carbon monoxide that are released due to the combustion of petrol and diesel. As a result of the air pollution many green house gases are released into the atmosphere leading to global warming. Global warming is defined as an increase in the average temperature of the earth due to air pollutants, which collect sunlight and radiation causing green house effect. As a result of these, many health issues have been arising hence causing severe damage to the human beings and animals. Many respiratory diseases like asthma, chronic obstructive pulmonary disease, pulmonary fibrosis, pneumonia and lung cancer are the ramifications of inhaling these harmful gases.

So, in order to reduce this pollutant level in the atmosphere we have to keep the complete track of the pollutant level. In recent years Internet of Things (IoT) has begun to play a crucial role in our daily lives with the ability to modify the environment around us. IoT platform [5] is a multi-layer technology which offers a platform for sensors and devices to communicate consistently within a smart environment and enables the sharing of information across various platforms in a convenient manner. The adaption of various wireless technologies in the recent times placed IoT as the next revolutionary technology benefiting from all the opportunities offered by the Internet technology. Thus this paper aims to apply Iot for both monitoring and sensing the pollutant level in the atmosphere. In order to display the data in the real time online we use Adafruit IO for visualizing multiple feeds of data.

In such visualization, a Wi-Fi enabled system on chip module ESP8266 is used [1]. It is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. A basic ultra low-cost digital temperature and humidity sensor DHT 11 uses a thermistor and a capacitive humidity sensor and does some analog to digital conversion and finally gives a digital signal on the data pin. It calculates relative humidity by measuring the electrical resistance between two electrodes. The *MQ-2* gas sensor module is useful for detecting the gas leakage. It has the capability of detecting LPG, hydrogen, smoke, I-butane, methane and propane. It measures and indicates the concentration of certain gases in air hence these are employed in numerous industries and also in monitoring the atmosphere for detecting the release of these harmful gases.

In this paper Iot has been applied for connecting various physical devices like DHT 11 and MQ-2 gas sensors which are connected to ESP8266 module and uses Adafruit cloud server for data storage [2-4].

II. EARLIER SYSTEMS

Earlier, systems for determining the amount of contaminants present in the air we have used a large number of sensors for determining the amount of each contaminant. Using large number of sensors gradually increases the cost of implementation by increasing the cost of equipment. Due to the usage of large number of sensors the circuit becomes very difficult to handle. Moreover usage of too many sensors increases the amount of power consumed. In the earlier systems very less number of calculations is performed and the time consumed in performing these calculations is also very high. If the amount of data to be computed is very large, the earlier systems can cause great number of errors. For the air pollution monitoring, earlier systems used Fourier Transform Infrared instruments

(FTIR) which are not user friendly. Continuous monitoring of pollution levels is not observed in the earlier system that is pollution levels are checked only at particular intervals of time. Therefore, small fluctuations in the level of pollution cannot be computed accurately. The gas chromatographs, mass spectrometers and other instruments used are not very accurate. In the earlier systems the space complexity is very high because the cloud storage concept using *Adafruit* was not introduced.

III. PROPOSED SYSTEM

In the proposed system the temperature, humidity and pollution levels are streamed continuously and computations are performed on the data obtained. In the proposed system instead of using a large number of sensors for computing a single contaminant in the air we use a single sensor which does all the work of multiple sensors. This causes reduction in the cost of implementation by reducing the cost of equipment. Usage of a single sensor also reduces the power consumption. Due to the usage of a single sensor the circuit becomes easy to handle. The proposed system is least prone to errors because the huge amount of data obtained is analyzed using big data analytics. Unlike the earlier systems pollution levels are monitored continuously so that small fluctuations in the level of pollution can be computed accurately. In the proposed system noxious gases like benzene can be detected using the sensor.

IV. SYSTEM DESIGN AND IMPLEMENTATION

A. *Experimental setup*

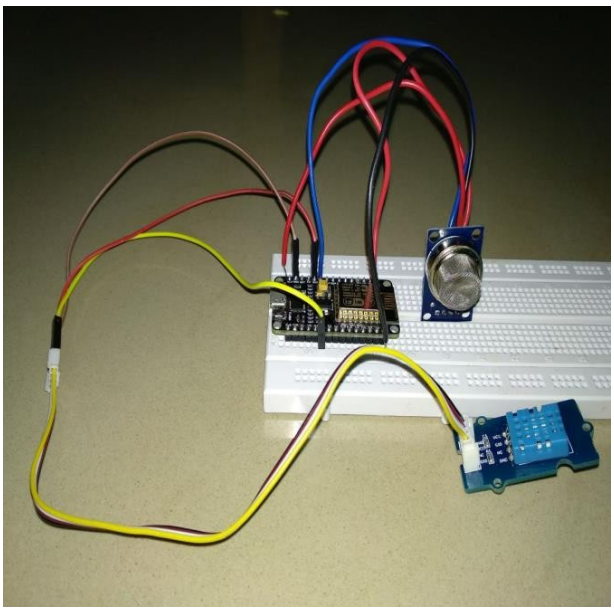


Fig. 1.System architecture and implementation model

B. *Related work*

The DHT 11 sensor is used to add humidity and temperature data to electronic projects. It's perfect for remote weather stations, environmental control systems and farms or garden monitoring systems. The Vcc of the DHT 11 sensor is connected to +5V of the Arduino.The ground (GND) of the DHT 11 is connected to the GND of Arduino. The data pin or signal pin is connected to the pin 2 of the Arduino as shown in the Fig1.

The Grove-Gas sensor (MQ-2) module is useful for gas leakage detection. Gases like H2, LPG, CH4, CO, alcohol, propane are detected using MQ-2 sensor. Measurement can be taken in an efficient way due to its high sensitivity and fast response time. Potentiometer can be used to adjust the sensitivity of the sensor. The Vcc of the MQ-2 is connected to +5V of Arduino. The GND is connected to the GND of the Arduino. The signal pin is connected to the A0 pin of the Arduino as shown in the Fig1.

The core of the Adafruit IO system is feeds. The feed also contains the sensor data values that are pushed from our device to the Adafruit IO.

In Atmosphere monitoring system, we deal with the sensed data sensed by the two sensors that is stored in the cloud server. The following functions are being performed by the proposed system in sequence.

1. The required atmospheric parameters are measured.
2. Transmit the data to the surface location.
3. Process and store the measured data.
4. Reports are created by analyzing the data.

This work mainly aims to design and implement systems with sensors in the atmosphere and data management and storage using the cloud server Adafruit. The extraction of important and useful knowledge from a large data on temperature and humidity, are obtained with IoT. An open-source electronics platform based on easy-to-use hardware and software is Arduino.The Arduino board is connected to the computer using an USB, where it connects with the Arduino Integrated Development Environment (IDE).The Arduino code is written by the user in the IDE and then uploads it to the microcontroller which executes the code, there by interacting with the sensors that are connected to the ESP8266 module.

The algorithm for the arduino code is as follows.

```
#include libraries     //includes all the necessary libraries
#define    macros                    //define the pin numbers to
which the sensors are connected
void setup ()
{
        // initialize all variables, pin modes, start using
libraries etc
         //this function will run only once after each powerup
or reset of arduino board
}
void loop()
{
       //this is repeated continuously because it is called by
the hidden loop that controls the execution of the arduino
program.
}
```

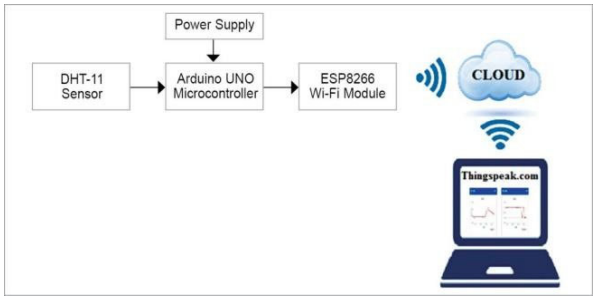


Fig.2. Block diagram of humidity and temperature monitoring using Arduino with ESP8266.

V. RESULT

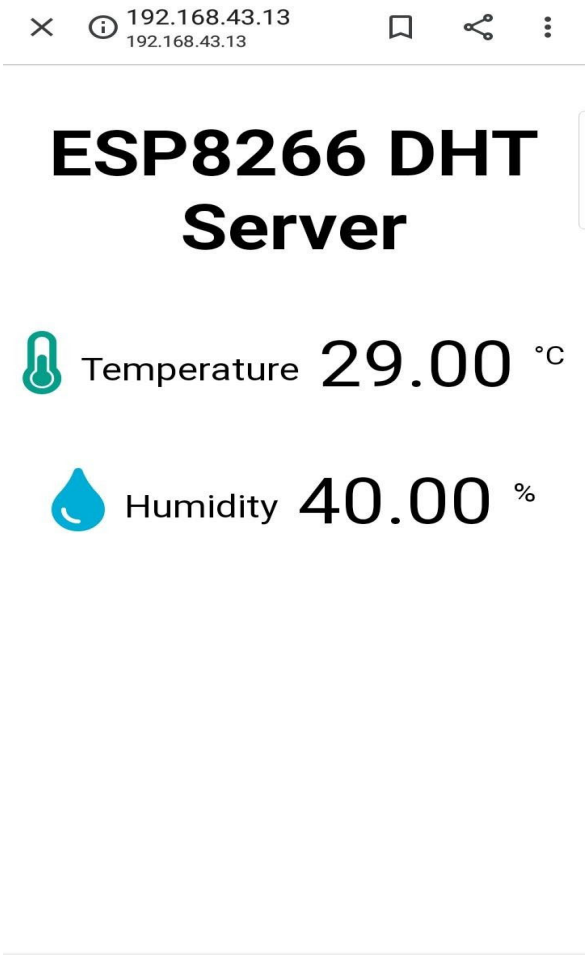


Fig.3. Display of temperature and humidity in mobile phone.

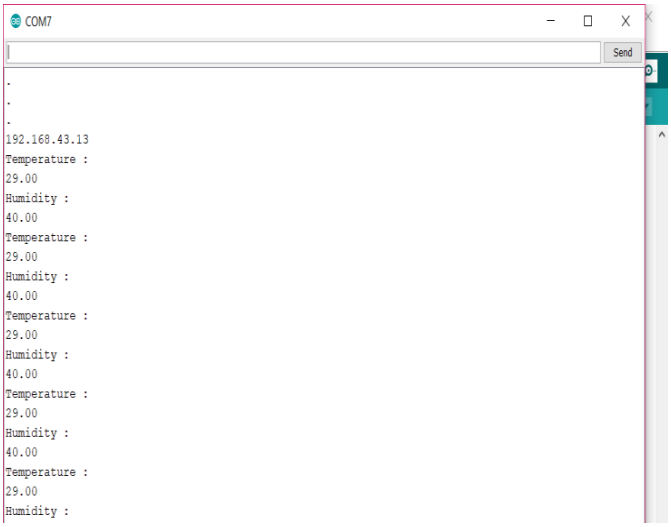


Fig.4. Display of temperature and humidity in serial monitor (COM7)

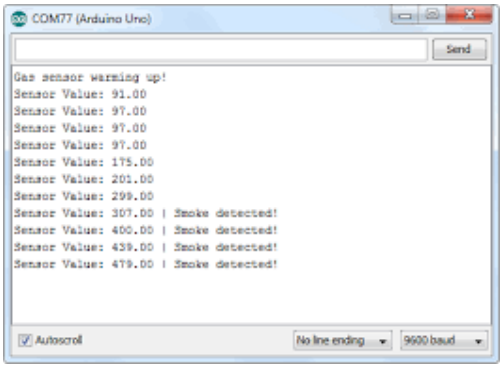


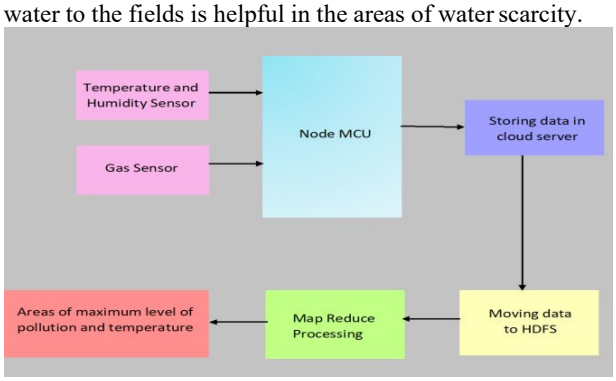
Fig .5 Display of pollution values in serial monitor.

VI. FUTURE SCOPE

Monitoring of the sensors is done by the NODEMCU module. The sensors can be monitored and they can also be programmed to send notifications or alert messages whenever a pre-defined value is exceeded such that these values need not be monitored by us every time. This notification widget can be used in Blynk application with an added advantage that is even if the application is running, we are still informed through a notification message. The data collected regarding the temperature or pollution levels monitored by the respected authorities can be used to take precautions in order to control the pollution in that particular area.

Also, humidity measurement is important in industries as it may affect business cost of the product and the safety and health of the individual. Humidity sensor also plays a major role in the control systems for industrial processes like chemical gas purification, ovens, food processing and so on. In agriculture, measurement of humidity is critical for the

protection of plantations, soil moisture monitoring and so on. With the monitoring of the collected humidity values ,there are few applications developed which determine the amount of water a plant requires to ensure it grows well.
Another advantage with the humidity sensors lies in notifying the farmers about the status of the field. The advantage of using Arduino lies in the fact that it reduces complexity of the architecture and also reduces the maintenance cost of the system. The detected values are transferred through a bluetooth to the motor that serves as a reliable transmission protocol and supports wide area coverage. The database maintained about the supply of water to the fields is helpful in the areas of water scarcity.



VII. CONCLUSION

A small-scale version of IoT has already been implemented by some manufacturers and agencies. The main reason why it has not been widely implemented is because of the impact it may have on the legal, security, social and ethical fields. The benefits of IoT outweigh the drawbacks caused by it. The decision-making habits of decision-makers are improved by IoT. The emergence of related technologies such as cloud computing gives the ability to remove data sources in different domains. It is predicted that the pace with which the technology is going to progress in the next ten years will be three times faster than the past thirty years. This paper surveys *Internet of Things, Adafruit cloud server* and sensor technologies with an aim to find their common operations and combine them, make use of the data collected by them to monitor the pollution levels in the atmosphere. Therefore, we need to put in efforts to update our lives to the Internet of Things technology with respect to both hardware and software.

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Applying Machine Learning Techniques to IoT

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Abstract*— IoT and machine learning have different meanings. IoT in short for internet of things many objects, devices or machines which are interconnected through unique IP address which can transfer data without human interactions. Machine learning is an application of AI that helps create systems that understand, learn and operate in their own. Data collected by IoT sensors are fed into machine learning models and using the resulting information to change how they operate and the products and services they offer. In this paper an in-depth analysis of this emerging topic has been made. Several key issues pertaining projects on machine learning with IoT has been discussed. The terrific results of the projects and a note on the drawbacks have also been made. Future changes with these emerging projects have also been shown.

Keywords*— Firms, Data Scientists, IoT Hub

I. INTRODUCTION

Fig 1: IoT Machine Learning

The IOT contains a framework that in corporate gadgets, correspondence, applications and information. Machine learning has experienced a boost in popularity among industrial companies. Many companies are already designing IOT as a strategically significant area. As a result, every IT vendor is suddenly announcing it platforms and consulting services. The philosophy behind machine learning is to automate the creation of analytical models in order to enable algorithms to learn continuously with data collected by IOT. Smart city projects take advantage of IOT and advanced AI algorithms like machine learning to relieve pressure on their infrastructure and staff while creating more sustainable environments. One could wonder if the two can be successful without each other. One can use machine learning systems to execute tasks on existing data but at the same time the one of the key beauties of IOT is the vast quantity of data that is generated. To effectively turn this data into insights and actions, machine learning is almost always necessary. And this is really when both of them merge together. The most common used cases for machine learning and IOT will be predictive maintenance followed by analysing CCTV surveillance and intelligent transportation systems.

II. ACTIVATING MACHINE LEARNING WITHIOT

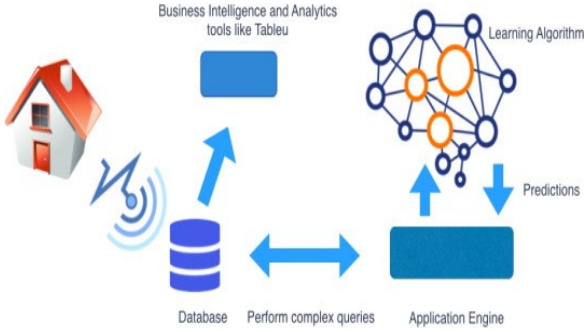

Fig 2: Activating Machine Learning with IoT

To get started with machine learning with IOT we need to approach the major cloud platform providers like Google, Microsoft, Alibaba Cloud, Amazon or IBM. These firms offer a range of services for storing IOT data and preparing it for data analytics, as well as for training and running machine-learning models and for creating dashboards, graphs and other easy-to-grasp layouts for visualizing the information these models generate. An in-house expertise will be required to determine which data should be collected, which patterns should be looked for and why. Working with these needs understanding between data scientists and staff with deep understanding of the company goals. Companies should have a clear goal and predictive maintenance before starting a project. Services available by the major cloud providers for managing IoT devices and the data are largely comparable by their worth. Amazon's AWS IoT Analytics offers a service for collecting, processing and storing data collected by IoT devices, allowing users to query data and run analytics on it, including applying machine learning to that data using hosted Jupyter Notebook. AWS IoT Core offers a cloud service for managing IoT devices that allows devices to securely connect to AWS cloud services for processing and storing their data, while AWS IoT Greengrass is designed to carry out machine learning inference on devices near to the edge of the network.
Similarly, Microsoft offers Azure IoT Edge, a service on its Azure platform for deploying trained machine-learning models to IoT and edge computing devices, alongside its Azure IoT Hub service for managing IoT machines, and Azure Sphere for securing and servicing IoT devices, all of which are packaged under its Azure IoT Central offering.

III. FIRMS USING MACHINE LEARNING WITH IoT

Fig 3: Firms using Machine Learning with IoT

One of the earliest firms to pair IoT sensor data with machine learning models was ThyssenKrupp, which runs 1.1 million elevators worldwide and has been feeding data collected by internet-connected sensors throughout its elevators into trained machine-learning models for several years. These models provide updates on the status of elevators and predict which are likely to fail and when. Reducing elevator outages and saving money on unnecessary servicing. It follows the same for Rolls Royce which predicts when servicing is required. 'Internet of train's project by Siemens Company has made it possible to sell trains and infrastructure and guaranteeing the arrival of trains on time. The company has embedded sensors in trains and tracks in selected locations of Spain, Russia and Thailand and used the data to train machine learning models that tell the arrival time of trains and also show which parts of track or train is likely to fail a point in the service. For agricultural equipment is allowing to experiment with herbicide sprays whose built-in cameras can distinguish between weeds and plants that produce harvesting equipment to operate on fly to maximize crop yields. Machine Learning to IOT is already delivering proven benefits to firms.

IV. INTERESTING PROJECT IDEAS THAT MERGE MACHINE LEARNING WITH IOT

A. Use in Smart Homes

Fig 4: Use in Smart Homes

The basic element is a living room speaker like Amazon Alexa that creates a smart home hub. The IOT part of Amazon Echo includes integration with multiple smart home nodes such as Philips hue bulbs. The machine learning part comes from the voice recognition agent which identifies the message. An echo product such as Belkin uses an internet connected plumbing device that combines IoT data and complex machine learning algorithms that detect and identify critical events such as water leaks and disaggregate the water consumption across different loads.

B. Use in Retail Space

The analog price tags are replaced by LCD screens which are used to modify the pricing of the product by combining machine learning algorithms and IoT equations that determines the right promotional pricing based on a number of parameters such as stock levels, weather forecast and competitive promotional activity. BTLE Beacon is installed in retail space that would identify target visitors to produce highly targeted promotion that has a high chance of driving the consumer.

C. Use in the industrial sector

When important parts of a manufacturing process are interconnected in IoT network, and a central system running a big-data or machine learning system is able to process this data.

V. MAJOR PROJECT- SMART CITY

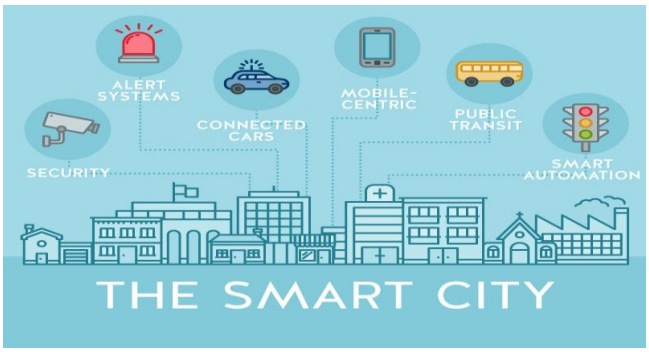

Fig 5: Major Project Smart city

Smart city projects use complex machine learning algorithms and IoT data to create more sustainable environments. Here are some projects that smart cities are taking on to solve major problems:

A. *Smart Lighting* – Smart lighting reduces maintenance needs, decreases energy consumption and lowers utility bills. Old incandescent lighting is replaced with energy efficient LED bulbs. That lower carbon emission and use less energy and decreases cost for cities.

B. Smart Parking –

Fig 6: Smart Parking

This technology is used to solve the problems of traffic congestion and parking infrastructure. The major problem caused by drivers is looking for a place to park which clogs roadways strains infrastructure and clogs roadways. Placing IoT devices locates the empty spaces and directsthe drivers thus reducing traffic congestion and maintains the city infrastructure.

C. Video Analytics - This software flags incidents and remove so relevant footage. The software flags anomalies and incident cities need to respond such as crime and traffic congestion and this reduces storage needs.

D. Smart building energy management - Building energy management systems monitor all energy use within a structure including heating air conditioning, lighting, elevators and fire safety systems Machine Learning and analytics detect energy drifts so building managers can correct areas of high use to save money and utilities.[2]

VI. RISKS OF MERGING IOT AND MACHINE LEARNING

A. Data Privacy - IoT data may present a whole new caliber of granularity for personal data. The devices built up using Machine learning with IoT will know more about you than you do yourself. Steps must be taken to separate any unique personal identifiers from this data.

B. Physical Attacks –

Fig 7: Physical Attacks

The more integrated the world is, the more susceptible we are to physical attacks. For example, your car can be hacked leaving you at the mercy of the one who controls it.

3) Grid collapse - These devices require power in case of power failures, safeguards must be to guarantee that the working condition of these devices continues. For example, self-driving cars get instructions from the smart traffic grid must be able to navigate without it.

VII. CONCLUSION

The future of IoT is virtually unlimited due to advances in technology and consumers desire to integrate devices such as smart phones with household machines. It is optimistic that the pros of Machine Learning with IoT will far overweigh the cons. The predominance of Machine Learning with IoT down the obstruction from genuine world to the internet which leads towards another advanced setting for novel applications and administrations. As per the observation a novel framework can be projected among the future major projects that would minimize energy consumption. A new secure protocol can design for security of the Machine Learning with IoTprojects.

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Honeypot: An Introduction

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Abstract–This article is about honeypot computing. The paper starts with threats of hacking and how honeypot technology can be used to overcome the issue. This paper involves types of honey computing, its applications in phone software and working. At last it also mentions the advantages and disadvantages of this technology.

I. INTRODUCTION

A security hacker is someone who explores methods for breaching defenses and exploiting weaknesses in a computer system or network. Hackers may be motivated by a multitude of reasons, such as profit, protest or information gathering. Depending on their motives they are mainly classified as white hat, black hat, grey hat. A white hat hacker breaks security for non-malicious reasons, either to test their own security system, perform penetration test, or vulnerability assessments for their clients, generally known as an ethical hacker. A black hat is a hacker who violates the computer security for personal gain. They are illegal hackers. They are the epitomes of all that the public fears in a computer criminal. Grey hat hacker lies in between the above two. A grey hat hacker may serve the internet and hack into a computer system for the sole purpose of notifying the administrator that their system has a security defect.

Black hat hackers are an enemy to the internet. It is expected that the cost of data breaches will increase to $2.1 trillion in 2019, and countries like the U.S. spends $14.98 billion for cybersecurity. A honeypot is a decoy computer system for trapping hackers or tracking unconventional or new hacking methods. It is similar to police string operations, colloquially known as “baiting” a suspect.

II. HONEYPOT COMPUTING

Honeypot computing is a mechanism set to defect, deflect or counteract attempts at unauthorized use of information systems. Honeypots are complex to deploy and maintain, capture extensive information, and are used primarily by research, military or government organizations.

Based on deployment, honeypots may be classified as-

- Production honeypots
- Research honeypots

Production honeypots are easy to use, capture only limited information and are primarily used by corporations. They are low interaction honeypots, which are easier to deploy. They give less information about the attacker or attack.

Research honeypots are run to gather information about the motives and tactics of the black hat community targeting different networks.

Based on design criteria, honeypots can be classified as:

- Pure honeypots
- High-interaction honeypots
- Low-interaction honeypots

Pure honeypots are full-pledged production systems. The activities of attacker are monitored by using a bug tap that has been installed on the honeypots link to the network.

High-interaction honeypots imitate the activities of the production systems that host a variety of services and therefore the attack may allow a lot of services to waste their time. They provide more security by being difficult to detect, but they are expensive to maintain.

Low-interaction honeypots stimulate only the services frequently requested by attackers.

A. Honeynets

A honeynet is a network of high interaction honeypots that simulates a production network and configured such that all activity is monitored, recorded and in a degree discreetly regulated. Two or more honeypots on a network form a honey net. Typically, a honey net is used for monitoring a larger and/or more diverse network in which one honeypot may not be sufficient. Honey nets and honeypots are usually implemented as parts of larger network intrusion detection systems. A honey farm is a centralized collection of honeypots and analysis tools.

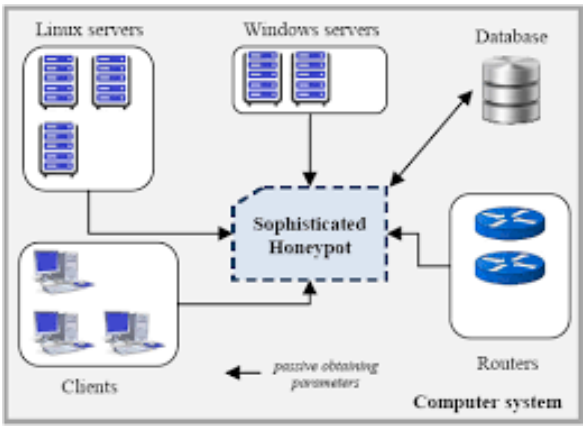

Fig 1. Sophisticated honeypot

B. Working principle

A honeypot works by fooling attackers into believing it is a legitimate system. So, attackers attack the system without knowing that they are being observed completely. Honeypot looks like a really host provided important service, so it has more attraction to hacker. Through its attraction to hackers and being attacked, the related

information of the attackers such as the IP address, motives of the attackers entering the system and attack behavior of the attacker will be collected. This is done generally through the implementation of the background software which monitors and records the network communication data between the attackers and honeypot host, and uses some analytical tools to interpret and analyses these data. Data capture is a difficult section to any honeypot which have the ability to capture everything the attacker is doing. It can also capture the packets and packet payloads involved in the attack. This information can prove important in analyzing the attackers' activities. Honeypot system has generally three modules which are induced, deceived and analysis. The induced module is used to attract the attackers to attack on the Honeypot system. The deceived module calls the simulation information from the database for the deceived host to generate false information which will be sent to the attackers. All the induction and deception events of the system are recorded in the remote log server, and analyzed by the analysis module for adjusting the induction and deception strategy.

The smart phone honeypot system has to perform several complex functions, the basic important three functions are: design and construct the system database, malware detection, and system reactions. During the construction of the system database, various information about the behavior of various well-known malicious applications is captured and saved in database files using the hardware Performance counters.

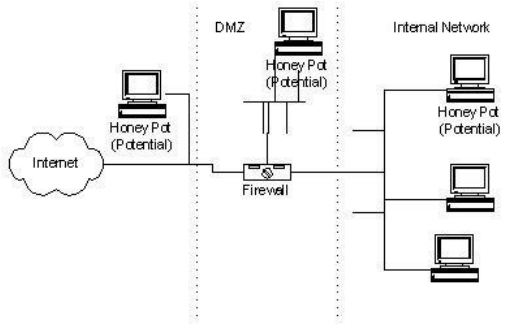

Fig 2. Working

C. *Advantages and disadvantages*

Advantages

- Honeypot creates confusion for attackers by giving them bogus data.
- It can provide forensic evidence that is admissible in a court of law. It can be used as legal evidence as long as it is deployed correctly and is not advertised.
- Honeypots can be used to intrude attacks. Knowing that a system is set up to capture and log all activities may scare away would be intruders.
- The properly designed and configured Honey Pot provides data such as the IP address, motives of the attackers entering the system and attack behavior of the attacker will be collected.
- Honeypots divert intruders from the production system making them use all of their efforts in a harmless manner.
- Honeypots are fairly not expensive. Some simple versions are free to download.
- Honeypots can detect insider attacks by providing valuable information on the patterns used by insiders.

Disadvantages

- Honeypots can only track activity that interacts with it. They have a narrow field of view. They only see what activity is directed against them.
- Honeypots are also at risk because attackers may misuse honeypot to harm other systems.
- Another disadvantage of honeypots is fingerprinting. Fingerprinting is when an attacker can identify the true identity of a honeypot because it has certain expected characteristics or behaviors.
- Another disadvantage is that honeypots must be maintained like any other networking equipment and services.
- Building a honeypot requires that you have at least a whole system dedicated to it and this may be an expensive resource for some corporations.

III. HONEYPOT IN SMARTPHONES

Smartphone users use a lot of applications on internet for various reasons, which makes their devices most vulnerable to attacks by hackers. Even though there are protection software's such as firewalls, intrusion detection systems, and anti-virus applications, the dynamic evolving nature of these attacks makes zero-day attacks difficult to detect for some time. Thus, there is a need for new techniques to recognize malware attacks and deceive them. The honeypot technique is expected to achieve these requirements. One of the ways to identify a potential malware are explained below.

K-means classification algorithm is used to estimate the potential for malware identification. Similarities and dissimilarities between objects are often expressed in terms of a distance measure. Euclidean distance is used to compare the features of the test-case program with the features stored on the malware database files.

$$d(p,q) = \sqrt{((p1-q1)^2} + \sqrt{(p1-q1)}^2 + \sqrt{(p1-q1)}^2)$$

IV. CONCLUSION

Honeypot technology is not a replacement to any current cybersecurity technology, but it can be an effective tool to stop expected threats and with well-designed algorithms, it can also stop unexpected threats. Though honeypot computing was popular in the mid 2000's, it started gaining more popularity after 2017, when researches started to see it as a reliable source to work on controlling cybercrimes. Recent researches include work on virtual honeypot software. Due to the increase in more cybercrime, the development in this technology is rapid.

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Breadth-First Search-Based application to Wireless Sensor Networks

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Abstract*—Data aggregation is one of the most essential operations in wireless sensor networks (WSNs). Since sensor nodes may have limited transmission range, application packets may be transmitted by multi-hop communication. Thus, connectivity is a very important issue. A bridge is a critical edge whose removal breaks the connectivity of the network. In this paper we describe implementation of a simple program and analyze the use of algorithm Breadth-First Search (BFS). We propose energy-efficient and distributed bridge detection algorithm for WSNs. Our algorithm run single phase and is integrated with BFS algorithm. Our algorithm is an extended version of Milic's algorithm, which is designed to reduce the message length.

Keywords – wireless sensor networks; bridge detection; single-phase algorithm; network connectivity; breadth-first search

I. INTRODUCTION

Wireless sensor networks (WSNs) are be defined as a network of devices that can communicate the information gathered from a monitored field through wireless links. The data is forwarded through multiple nodes, and with a gateway, the data is connected to other networks like wireless Ethernet. In recent years an efficient design of a Wireless Sensor Network has become a leading area of research. A Sensor is a device that responds and detects some type of input from both the physical or environmental conditions, such as pressure, heat, light, etc. The output of the sensor is generally an electrical signal that is transmitted to a controller for further processing. WSNs are infrastructure less networks that consist of hundreds, even thousands, of sensor nodes that cooperate to perform sensing and communicating tasks. Many network parameters such as sensing range, transmission range, and node density have to be carefully considered at the network design stage, according to specific applications. To achieve this, it is critical to capture the impacts of network parameters on network performance with respect to application specifications. Intrusion detection (i.e., object tracking) in a WSN can be regarded as a monitoring system for detecting the intruder that is invading the network domain. Since sensor nodes are battery-powered and the transceiver is the dominant energy consumer, transmitted byte counts should be minimized to maximize the network lifetime. Some edges can have a critical role in data delivery operation. If one of these edges fails, the connectivity of the network is broken, and the network is divided into partitions. These types of edges are called bridges (cut edges), which should be detected, and harsh environments has many challenges, such as channel (edge) failures, generally, as a consequence of the direct preventions should be taken. Bridge detection is an important research area for various types of networks [1–7]. After bridge detection is completed, bridge neutralization algorithms can be applied [8].

Breadth First Search (BFS)

BFS is a traversing algorithm where you should start traversing from a selected node (source or starting node) and traverse the graph layer wise thus exploring the neighbour nodes (nodes which are directly connected to source node). You must then move towards the next-level neighbour nodes. As the name BFS suggests, you are required to traverse the graph breadth wise as follows:

1. First move horizontally and visit all the nodes of the current layer
2. Move to the next layer

Consider the following diagram [13].

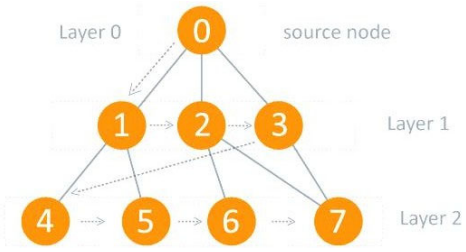

Fig.1 BFS-example

AWSN can be modeled with a graph, G= (V, E), where V is the set of nodes and E is the set of edges. The distance between the nodes in layer 1 is comparatively lesser than the distance between the nodes in layer 2. Therefore, in BFS, you must traverse all the nodes in layer 1 before you move to the nodes in layer 2.

Traversing child nodes

A graph can contain cycles, which may bring you to the same node again while traversing the graph. To avoid

processing of same node again, use a Boolean array which marks the node after it is processed. While visiting the nodes in the layer of a graph, store them in a manner such that you can traverse the corresponding child nodes in a similar order. In the earlier diagram, start traversing from 0 and visit its child nodes 1, 2, and 3. Store them in the order in which they are visited. This will allow you to visit the child nodes of 1 first (i.e. 4 and 5), then of 2 (i.e. 6 and 7), and then of 3 (i.e. 7) etc.

To make this process easy, use a queue to store the node and mark it as 'visited' until all its neighbors (vertices that are directly connected to it) are marked. The queue follows the First in First out (FIFO) queuing method, and therefore, the neighbors of the node will be visited in the order in which they were inserted in the node i.e. the node that was inserted first will be visited first, and so on.

In this study, we proposed bridge detection algorithms that are integrated with BFS and complete their operation within a single BFS execution. The bridge detection algorithms proposed in the literature have some important disadvantages. Some of them should be implemented as a separate service [5,9]. Some of them have multi-phase execution [7,9]. Some of them cause transmission of long messages [6]. Regarding these deficiencies, we propose two energy-efficient bridge detection algorithms. The contributions of this paper are listed below:

We propose an extended version of Milic's algorithm (E-MILIC). We propose two rules as the extension in order to reduce the message length of Milic's algorithm. We show from testbed experiments and extensive simulation results that E-MILIC consumes less resource than Milic's algorithm. Theoretical analysis and performance evaluations show that E-MILIC outperforms other bridge detection algorithms for graphs having a low cross edge count and a high diameter.

II. NETWORK MODEL

In this section, we explain the network model and the bridge detection problem.

A. Network Model

The following assumptions are made about the network, as in [5,7]:

- Each node has a distinct node id.
- The nodes are stationary in the sensing area.
- Links between nodes are symmetric. Thus, if there is a link from u to v, there exists a reverse link from v to u.
- Nodes are not equipped with a position tracker, and they do not execute a localization algorithm; thus, each node does not know its position.
- All nodes have identical capabilities; they are equal in terms of processing capabilities, radio, battery and memory.
- Each node can send radio multi cast messages to its immediate neighbors in its transmission range.
- Nodes are time-synchronized, where this can be achieved by implementing a protocol, such as proposed in [10].

The undirected graph model for the network is depicted in Figure 2, where there are 10 nodes, and the transmission ranges of the nodes are shown with dotted circles.

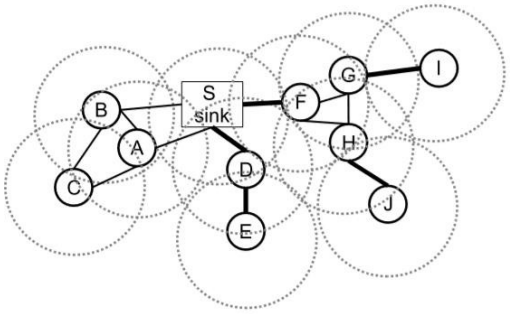

Fig.2 The graph model and the bridge problem

B. The Bridge Detection Problem

A bridge can be a link between a leaf node and its parent or it can be a link between whole components to lower layers. An example sensor network is given in Figure 2. The bridges are shown with the bold lines. The edges, DE, DS, FS, GI and HJ, are bridges. If the edge, DE, fails, then leaf node, E, cannot transmit its packet to its parent. Similarly, node I and node J cannot relay their packets to their parents if the edges, GI and HJ, fail. If the edge, DS, fails, then both node D and node E cannot transmit their data to the sink node. If the edge, FS, fails, then node F, node G, node H, node I and node J cannot send their packets to the sink node, which leads to failure of 50% of the data packet transmissions. Therefore, bridges should be detected, and the preventions should be taken. In this paper, our focus is the detection of the bridges, and our objectives are listed below:

1. The bridge detection algorithm should be efficient in terms of message complexity and message size, since message transmission is the dominant factor of the energy consumption.
2. Routing is crucial for data delivery and data aggregation [11], and it is a fundamental service for sensor networks. If the bridge detection can be integrated with the routing operation, it can introduce a less total cost to the network. Preferably, the bridge detection approach should be a single-phase algorithm in order to consume less energy and time.
3. The bridge detection algorithm should be distributed, since the sink node may initiate the bridge detection algorithm at any time and locally.
4. In order to interface various medium access control (MAC) and physical layer standards [12], the bridge detection algorithm should be independent from the underlying protocols.
5. If location information is already available, a location-based cut detection algorithm can be used. However, for many sensor network setups, accurate localization cannot be afforded, due to the economic costs of GPS receivers, environmental effects (heat, wind, obstacles, etc.) on distance estimations and an insufficient number of anchor nodes. Since our concern is sensors for harsh-environment applications, we believe that if cut vertex detection service is

independent from location information, then it can be integrated into many sensor network setups without the pre configuration of locations.

C. Proposed Algorithm

In this section, we will introduce our proposed E-MILIC [14].

1. Extended MILIC Algorithm

Although the MILIC algorithm completes its operation within a BFS execution session, the transmitted byte count can be high for energy- efficient sensor networks. In order to reduce transmitted byte count, we propose the extended-MILIC(E-ILIC) algorithm by adding two new rules to the MILIC algorithm as listed below:

Rule 1: When the node, n, detects a cross edge, (n, x), it only transmits x instead of (n, x) to its parent, p. After node p receives this message from node n, it can simply decide that x represents the edge, (n, x), since the message is originated from node n. This rule reduces transmitted byte count in two situations. Firstly, since the MAC and physical layer include the source ID field, the routing layer packets of node n do not need to include the ID field for each (n, x) edge; thus, duplicate transmissions of ID fields are prevented. Secondly, if an edge-coloring-based MAC layer is used, then there is no need to transfer the ID field for all layers. The reason is that each node schedules its transmission times and can find the source of a packet by using its schedule.

Rule 2: After the node, n, collects cross edges from its children, it runs a central k-cycle detection algorithm on the undirected graph, G = (V,E), where E is composed of incident cross edges, collected cross edges, the (n, p) edge and (i,pi) edges, where i is a neighbor of n and pi is its parent. The V is the set of incident vertices of the edges in E. These edges can be acquired by the overhearing method. The cycle detection algorithm detects k-cycles, where k ∈ {3,4}and the cycle should have exactly one cross edge.

To explain these rules clearly, we give an example operation in Figure 3. In Figure 3a, an execution of the MILIC algorithm is given. We assume that each edge can be represented with 2log2(N) bits. Firstly, node 2 sends its cross edges (the edge, (2,5), and the edge, (5,6)) to its parent, where the information of two edges are transmitted. Concurrently, node 5 and node 6 send their cross edges to their parent. These operations cause transmission of seven cross edges. When node 3 receives (2,6) and (5,6) from node 6 and (2,5), (5,6) and (5,7) from node5, it matches the (5,6)'s from both lists and deletes them from the lists. Node 3 merges the two lists and adds (3,7) to this list. Node 3 transmits (2,5), (2,6), (3,7) and (5,7) to its parent, node 4. Concurrently, node 7 receives the message of node 2, appends (3,7) and (5,7) to node 2's list and sends it to node 4. Since node 8 has no cross edge, it sends an empty list, which indicates that (4,8) is a bridge. When node 4 receives both node 3 and node 7's messages, it matches (2,5), (2,6), (3,7) and (5,7) and deletes them from both lists. Node4 sends an empty list to node 1, and (1,4) is classified as a bridge. Since 15 cross edge information is transmitted, the transmission overhead of the MILIC algorithm is 30log2(N) bits. Figure 3b shows the transmissions when we apply the proposed rules, where the transmission over head is reduced to the 13 log2(N)bits. Node2, node5 and node 6 use Rule 1 and send only one incident vertex of each edge. Node 5 and node 6 do not transmit the edge, (5,6), by finding a three-cycle, such as (5,6), (3,6) and (3,5), as given in Rule 2. Similarly, node 3 and node 7 do not transmit the edges, (3,7) and (5,7).

The message size of E-MILIC depends on the count of cross edges. In the following section, we will introduce a new algorithm, whose transmitted byte count is independent from cross edge count.

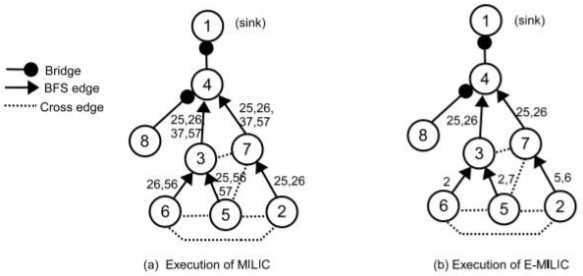

Fig 3. MILIC and extended-MILIC (E-MILIC) examples

III. Conclusion

In this paper, we propose two BFS-based and single-phase bridge detection algorithms for WSNs located on challenged environments. Our proposed algorithm, E-MILIC, is the extended version of the MILIC algorithm. In this algorithm, two rules are added to the MILIC algorithm to reduce the length of the messages. The sent message complexity of E-MILIC is O(N), the received message complexity is O(δN). Our proposed algorithms are significant contributions to the resource-efficient bridge detection problem in sensor networks operating in harsh environments.

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An Introduction to Blockchain Technology

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Abstract*— The Blockchain is the newest and perspective technology in modern economy. It is one of the technologies that have created a disruptive change in many industries. Blockchain (BC), the technology behind the Bitcoin crypto-currency system, is considered to be both alluring and critical for ensuring enhanced security and (in some implementations, non-traceable) privacy for diverse applications in many other domains - including in the Internet of Things (IoT) eco-system. Not only in cryptocurrency has the successful adoption of BC been implemented but also in multifaceted non-monetary systems such as in distributed storage systems, proof-of-location, healthcare, decentralized voting and so forth. Currently blockchain technology is being used in several places and there are many more applications yet to be discovered and implemented. This technology can help to solve different kind of problems in the industrial sphere, such as trust, transparency, security and reliability of data processing. Blockchain is characterized by its decentralized nature, integrity of the data stored in the chain and its openness. This paper describes about blockchain technology, how it works, its advantages and disadvantages, its applications. It then discusses the future work and finally concludes.

Keywords- Blockchain technology, Decentralized

I.INTRODUCTION

Today the world is getting digital in all aspects. Blockchain technology is an upcoming technology and said to be one of the most promising technology which would revolutionize the world. At its most basic level, blockchain is literally just a chain of blocks, but not in the traditional sense of those words. When we say the words "block" and "chain" in this context, we are actually talking about digital information(the "block") stored in a public database (the "chain").The blockchain is essentially a distributed database of records or public ledger of all transactions or digital events that have been executed and shared among participants parties.

Blockchain was invented by a person (or group of people) using the name Satoshi Nakamoto in 2008 to serve as the public transaction ledger of the cryptocurrency bitcoin. The identity of Satoshi Nakamoto is unknown. The invention of the blockchain for bitcoin made it the first digital currency to solve the double-problem without the need of a trusted authority or central server. The Blockchain technology always relates to the cryptocurrency, because this technology is the basis of cryptocurrency's work, but these are different things. The bitcoin design has inspired other applications, and blockchains that are readable by the public are widely use by cryptocurrencies. Blockchain is considered a type of payment rail. Certainly, the Blockchain is the new type of a database. This technology is very interesting for people, because it can solve one of the big problems, which are connecting with finance. The Blockchain technology also is used in other areas, such as the logistics systems or medicine institutions and others. The application of this technology improves the quality of the system's working process.

II. ABOUT BLOCKCHAIN TECHNOLOGY

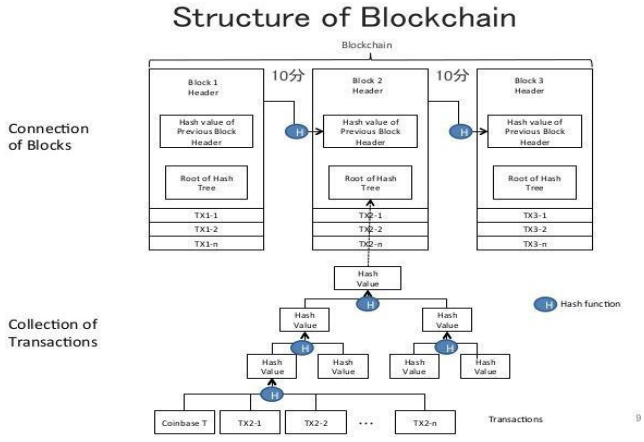
A. The definition of the Blockchain technology

A *blockchain* is a growing list of records, called *blocks* that are linked using cryptography. Each block contains a cryptographic hash of the previous block, a timestamp, and transaction data.

B. The structure of the Blockchain technology

The Blockchain consists of linear sequence blocks, which are added to chain with the regular intervals. The information in the blocks depends on the Blockchain network, but the timestamp, transaction, and hash are existed in all the blockchain variants.

Each block contains the cryptographic hash of the previous block. All hash's information is generated automatically; it means that it is not possible to change any information in the hash. In this case, each next block amplifies the verification of the previous block and the secure of all Blockchain. The more blocks in the chain - the safer and more reliable the Blockchain.



C. Access to the Blockchain data

The Blockchain technology has four varieties, which are classified based on access to the Blockchain data.

Name of the class	Definition
A public Blockchain	Does not have any restrictions on reading of the blocks and on submitting of the transactions for inclusion into the Blockchain
A private Blockchain	Has limited to a predefined list of users of the direct access to the blocks and submitting transactions
A permissionless Blockchain	Does not have any restrictions for the users which are eligible to create the blocks of transactions
A permissioned Blockchain	Has the list of the predefined users which are eligible to performed to process the transactions

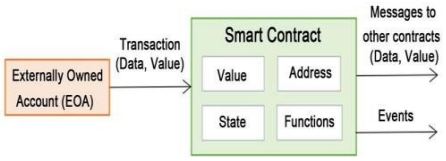
The above table shows the classification and the definitions of the classes.

Access to the data	The processing of the transactions	
	Permissioned	Permissionless
Public	Proprietary colored coins protocols	Existing cryptocurrencies (Bitcoins)
Regulated	The direct access to the reading and creating of the transactions for clients and regulators (limited)	Colored coins protocols (Colored Coins Protocol) which can limit to creating of the transactions
Private	The direct access to the data of the Blockchain is limited and the advantages of the Blockchain are partially lost	It is not possible to apply

Another classification is based on the processing of the transactions and the access of the data. The blockchain can be not only private. The above classification shows that the blockchain has multiple levels of access with different opportunities.

D. Smart Contracts

The smart contract is the script which is stored in the Blockchain. The smart contract has the unique address, set of executable functions and state variables. The user launches the smart contract by addressing the transaction to it. After that, the smart contract is automatically and independently performed in the established order on each node of the chain, depending on the data, which contained in the running transaction.



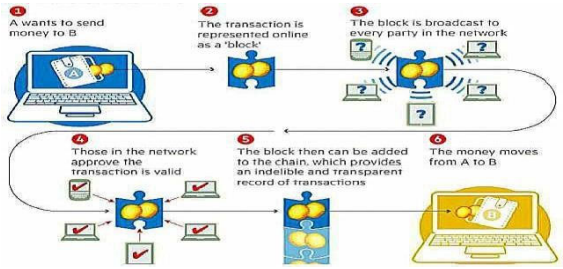
E. Ethereum

The Ethereum is flexible the Blockchain platform which is open to using by everyone. This platform has the high level of the security from different kind of the attacks. The users can create the Smart contracts and the decentralized applications. This platform is based on the Ethereum Virtual Machine (EVM). The Ethereum platform has four processes:

- Block validation
- Network discovery
- Transaction creation
- Mining

III. HOW BLOCKCHAIN WORKS

When a block stores new data it is added to the blockchain. Blockchain, as its name suggests, consists of multiple blocks strung together.



When a new transaction or an edit to an existing transaction comes in to a blockchain, generally a majority of the nodes within a blockchain implementation must execute algorithms to evaluate and verify the history of the individual blockchain block that is proposed. As it is distributed, Blockchain is typically managed by a peer-to-peer network working simultaneously together to solve complex mathematical problems in order to validate new blocks. Once recorded, the data in any given block cannot be updated retroactively without changing all subsequent blocks, which requires the confirmation of the majority in the network. This is the main reason why blockchain technology is secure and not susceptible to hacking.

IV. ADVANTAGES AND DISADVANTAGES OF BLOCKCHAIN

A. Advantages:

It is not necessary to work with the third-party organization or with the central administrator. It means that the system works without intermediary and all participants of this Blockchain make the decisions. Each system has the database and it is important to protect this database, because when system is working with the third-party organizations, there is a hacking risk of the database or the data may turn up in the wrong hands. The process of the database security might take a lot of time and might spend a lot of money. The Blockchain technology can be avoided, because the transactions of the Blockchain has its own proof of validity and authorization to enforce the constraints. The trusty of the Blockchain is based on the belief of two or more participants, who do not know each other. There is the main idea is the real and not worthless transactions between these unknown people. The trust can be increased further, because there can be more shared processes and records.

The immutable is achieved on the transactions are agreed and shared across the Blockchain. When the transaction will be connected to the Blockchain, it won't be possible to change or delete it.

B. Disadvantages:

The main disadvantage of the Blockchain is the high energy consumption. The consumption of power is needed for keeping a real-time ledger. Every time the new node is created and in the same time it communicates with each and other node.

Another downside of blockchain systems is that once data has been added to the blockchain it is very difficult to modify it, while stability is one of blockchain's advantages, it is not always good. Changing blockchain data or code is usually very demanding and often requires a hard fork, where one chain is abandoned and a new one is taken up. Blockchain ledgers can grow very large over time. The bitcoin blockchain currently requires around 200GB of storage. The current growth in blockchain size appears to be outstripping the growth in hard drives and the network risks losing nodes if the ledger becomes too large for individuals to download and store.

V. BLOCKCHAIN APPLICATIONS

The Blockchain technology can be used in the different industrial and technical areas. The biggest IT companies are implementing the Blockchain technology for the systems' quality and working capacity improvement. Some of the using examples of the Blockchain technology are:

A. Payment processing and money transfers: Arguably the most logical use for blockchain is as a means to expedite the transfer of funds from one party to another. As noted, with banks removed from the equation, and validation of transactions ongoing 24 hours a day, seven days a week, most transactions processed over a blockchain can be settled within a matter of seconds.

B. The government management: There are different solutions into the government management. The first decision is Borderless. It is the governance platform which assures the coalition of the legal and economic services. The second solution is the ID2020. This organization is provided proof of the identity for people without documents

C. Monitor supply chains: Blockchain also comes in particularly handy when it comes to monitoring supply chains. By removing paper-based trails, businesses should be able to pinpoint inefficiencies within their supply chains quickly, as well as locate items in real time. Further, blockchain would allow businesses, and possibly even consumers, to view how products performed from a quality-control perspective as they traveled from their place of origin to the retailer.

D. Data sharing: Cryptocurrency IOTA launched a beta version of its Data Marketplace in November, demonstrating that blockchain could be used as a marketplace to share or sell unused data. Since most enterprise data goes unused, blockchain could act as an intermediary to store and move this data to improve a host of industries. While still in its early stages, IOTA has more than 35 brand-name participants (with Microsoft being one) offering it feedback.

E. Medical recordkeeping: The good news is the medical sector has already been moving away from paper for recordkeeping purposes for years. However, blockchain offers even more safety and convenience. In addition to storing patient records, the patient, who possesses the key to access these digital records, would be in control of who gains access to that data. It would be a means of strengthening the HIPAA laws that are designed to protect patient privacy.

F. Securing access to belongings: Smart contracts within blockchain networks also have the ability to be customized to a businesses or consumers needs. As a consumer, you could use blockchain as a means to grant access to your house for service technicians, or allow your mechanic access to your car to perform repairs. But without this digital key, that only you possess, these service technicians wouldn't be able to gain access to your belongings.

VI. THE FUTURE OF BLOCKCHAIN TECHNOLOGY:

The future of blockchain technology will be impacted by new knowledge and skills of employees who will work with those technologies. Block Chain Technology will be the future across the Globe. There are many new job positions that need to be established in organizations and consequently performance evaluation and rewarding system of these employees. Management and leadership are also important determinant of these technologies and their use. Now it is in inception stage only. Developed countries such as US, UK and Europe started implementing this technology in various fields. Emerging economies such as China and India also decided to use this technology in various fields. China is aggressive in adopting this technology. India is far behind in implementing. But banking sector came out with Bank Chain as consortium to implement block chain technology. The Government initiative can be routed through block chains if government is serious. Finally block chain will be the future internet and having bright future. Blockchain possesses a great potential in empowering the citizens of the developing countries if widely adopted by e-governance applications for the identity management, asset ownership transfer of precious commodities and other commercial uses as well as in financial institution.

VII. CONCLUSION:

The Blockchain is the new type of the database which solved some of the problems in the centralized system, such as the transactions without a middleman, the spent time on each transaction, the unintentional or special deletion or modification of data in the Blockchain. The application of the blockchain concept and technology has grown beyond its use for bitcoin generation and

transactions. The properties of it security, privacy, traceability, inherent data provenance and time- stamping has seen its adoption beyond its initial application areas. Its decentralized applications across the already established global internet is also very appealing in terms of ensuring data redundancy and hence survivability. The blockchain has been especially identified to be suitable in developing nations where ensuring trust is a major concern. The Blockchain technology is useful and versatile for our world, because it can facilitate most of the systems in the different industries. Thus, the invention of the blockchain can be seen to be a vital and much needed additional component of the internet that was lacking in security and trust before. The Blockchain technology promises us the bright future without the fraud and deception.

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A Review on Blue Brain Technology

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Abstract - Human brain is the most valuable creation of God. The Man is intelligent because of the brain. "Blue brain" is the name of the world's first virtual brain. That means a machine can Function as human brain. With the advancement in technology, Human, the ultimate source of information and discovery should Also be preserved. In other words, human is does not live for Thousands of years but the information in his mind could be saved and used for several thousands of years. Today scientists are in Research to create an artificial brain that can think, response, take Decision, and keep anything in memory. The main aim is to Upload human brain into machine. So that man can think, take Decision without any effort. After the death of the body, the Virtual brain will act as the man. So, even after the death of a Person we will not lose the knowledge, intelligence, personalities, Feelings and memories of that man that can be used for the Development of the human society.

Keywords: Blue brain, Brain, Neurons, Sensory system.

I.INTRODUCTION

This BLUE BRAIN project was founded in May 2005 by Henry Mark ram at the EPFL in Lausanne, Switzerland. Goals of the Project are to gain a complete understanding of the brain and to Enable better and faster development of brain disease treatments. The research involves studying slices of living brain tissue using Microscopes and patch clamp electrodes. Data is collected about all the many different neuron types this data is used to build biologically realistic models of neurons and networks of neurons in the cerebral cortex. The simulations are carried out on a Blue Gene supercomputer built by IBM, hence the name "Blue Brain". The simulation software is based on Michael Hines's NEURON, together with another custom-built component.

Blue Brain

The IBM is now developing a virtual brain known as the Blue Brain. It would be the world's first virtual brain.

Within 30 years, we will be able to scan ourselves into the computers. We can say It as Virtual Brain i.e. an artificial brain, which is not actually a Natural brain, but can act as a brain. It can think like brain, take Decisions based on the past experience, and respond as a natural Brain. It is possible by using a super computer, with a huge Amount of storage capacity, processing power and an interface Between the human brain and artificial one. Through this interface the data stored in the natural brain can be up loaded into the Computer. So, the brain and the knowledge, intelligence of anyone Can be kept and used for ever, even after the death of the person.

II.WORKING

Sensory Input

When our eyes see something or our hands touch a warm Surface, the sensory cells, also known as Neurons, send a message Straight to your brain. This action of getting information from Your surrounding environment is called sensory input because we Are putting things in your brain by way of your senses.

Integration

Integration is best known as the interpretation of things we have Felt, tasted, and touched with our sensory cells, also known as Neurons, into responses that the body recognizes. This process is All accomplished in the brain

where many, many neurons work Together to understand the environment.

Motor Output

Once our brain has interpreted all that we have learned, either by Touching, tasting, or using any other sense, then our brain sends a Message through neurons to effecter cells, muscle or gland cells, which actually work to perform our requests and act upon our Environment.

III.NEED OF BLUE BRAIN

Human society is always in need of such intelligence and such an Intelligent brain to have with. But the intelligence is lost along with the body after the death. The virtual brain is a solution to it. The brain and intelligence will be alive even after the death. We Often face difficulties in remembering things such as people Names, their birthdays, and the spellings of words, proper Grammar, important dates, history facts, and etcetera. In the busy Life everyone wants to be relaxed. Virtual brain may be a better Solution for it.

Steps for Building A Blue Brain

1. Data collection

2. Data simulation

3. Visualization

A. Data collection

It involves collecting brain portions, taking them under a Microscope, and gauging the shape and electrical behaviour of Neurons individually. This method of studying and cataloguing Neurons is very familiar and worldwide. The neurons are captured by their shape, electrical and physiological activity, site within the cerebral cortex, and their population density. These Observations are translated into precise algorithms which describe the process, function, and positioning methods of neurons. Then, the algorithms are used to generate biologically-real looking Virtual neurons ready for simulation.

B. Data simulation

It concerns with two major aspects: a. Simulation speed b. Simulation workflow Simulation speed Simulations of one Cortical column (more than 10,100 neurons) run about two Hundred times slower than real time. It takes about five minutes to complete one second of stimulated time. The simulations Display unevenly line scaling. Presently the major seek is Biological soundness rather than presentation. After Understanding biologically significant factors for a given effect it might be feasible to crop constituents that don't subsidize in order to advance performance. Simulation overflow making virtual Cells using the algorithms, written to define and describe real Neurons, is the major seek of this step. Algorithms and constraints are adapted according to the age, species, and disease stage of the Animal being simulated. Each one of the proteins is simulated.

BBP-SDK:

The Blue Brain Project – Software Development Kit, a set of Application Programming Interfaces allows the researchers to use and audit prototypes and simulations. The Blue Brain ProjectSDK is a C++ library wrapped in Java and Python. The primary Software used by this for neural simulations is NEURON. Michael Hines of Yale University and John Moore at Duke University developed this in the starting of the 1990s. It uses C, C++, and FORTRAN. It is freely available open source software. The website makes everything available including the code and the binary data freely. Michael Hines in cooperation with BBP Team in 2005 ported the package into the massive and parallel Blue Gene**.**

C. Visualization of results

RT Neuron RT Neuron is the main application that Blue Brain Project uses for visualization of neural simulations. The BBP Team developed this software internally. It is coded using C++ And OpenGL. RT Neuron is ad-hoc software written specifically for neural simulations, i.e. it can't generalize to other kinds of Simulation. RT Neuron takes the output from Hodgkin-Huxley Simulations as input in NEURON and delivers them in 3D. This Allows the programmers and researchers to view as activation Potentials propagate through or between neurons. The animations Can be paused, stopped, started and zoomed, hence allowing the Researchers to interact with the model. The visualizations are Multi-scale (they can render individual neurons or a whole Cortical column).

Advantages of Blue Brain

1. Blue brain is an approach to store and utilize human Intelligence and information present in the mind even after Human demise.
2. It is an important move towards self-decision making by the Computer or machine that holds a Blue brain.
3. Business analysis, attending conferences, reporting, etc. Are Very significant functions that an intelligent machine can do Consistently.
4. It can be used as an interface between human and animal Minds.
5. It a good remedy towards human disability like a deaf can Get the information via direct nerve stimulation.

Disadvantages of Blue Brain

1. It increases the risk of human dependency on Blue Brain Every time.
2. Once a Blue Brain related to a particular person's neural Schema is hacked, the brain could be used against the very Person.
3. Since it an approach to make machines intelligent and Thoughtful it increases the risk of machines conducting war Against human (like we have been watching in the movies Like Terminator, Universal soldier, etc.)

Computer Hardware / Supercomputers

Blue Gene/P The primary machine used by the Blue Brain Project is a Blue Gene supercomputer built by IBM. This is where the name "Blue Brain" originates from. IBM agreed in June 2005 to supply EPFL with a Blue Gene/L as a "technology Demonstrator". The IBM press release did not disclose the terms of the deal. In June 2010 this machine was upgraded to a Blue Gene/P. The machine is installed on the EPFL campus in Lausanne (Google map) and is managed by CADMOS (Centre for Advanced Modeling Science). The computer is used by a Number of different research groups, not exclusively by the Blue Brain Project. In mid-2012 the BBP was consuming about 20% of the compute time. The brain simulations generally run all day, And one day per week (usually Thursdays). The rest of the week Is used to prepare simulations and to analyse the resulting data. The supercomputer usage statistics and job history are publicly Available online – look for the jobs labelled as "C-BPP".

Blue Gene/P technical specifications

1. 4,096 quad-core nodes

2. Each core is a PowerPC 450, 850 MHz

3. Total: 56 teraflops, 16 terabytes of memory

4. 4 racks, one row, wired as a 16x16x16 3D tour

5. 1 PB of disk space, GPFS parallel file system

IV.UPLOADING HUMAN BRAIN

The uploading is possible by the use of small robots known as The Nanobots. These robots are small enough to travel throughout Our circulatory system. Traveling into the spine and brain, they Will be able to monitor the activity and structure of our central Nervous system. They will be able to provide an interface with Computers that is as close as our mind can be while we still reside in our biological form. Nanobots could also carefully scan the Structure of our brain, providing a complete readout of the Connections. This information, when entered into a computer, could then continue to function as us. Thus, the data stored in the Entire brain will be uploaded into the computer.

V.MERITS AND DEMERITS

With the blue brain project the things can be remembered without Any effort, decisions can be made without the presence of a Person. Even after the death of a man his intelligence can be used. The activity of different animals can be understood. That means by interpretation of the electric impulses from the brain of the Animals, their thinking can be understood easily. It would allow the deaf to hear via direct nerve stimulation, and also be helpful for many psychological diseases. Due to blue brain system human Beings will become dependent on the computer systems. Technical knowledge may be misused by hackers; Computer Viruses will pose an increasingly critical threat. The real threat, However, is the fear that people will have of new technologies. That fear may culminate in a large resistance. Clear evidence of This type of fear is found today with respect to human cloning. What can we learn from Blue Brain? Detailed, biologically Accurate brain simulations offer the opportunity to answer some Fundamental questions about the brain that cannot be addressed with any current experimental or theoretical approaches. Understanding complexity at present, detailed, accurate brain Simulations are the only approach that could allow us to explain Why the brain needs to use many different ion channels, neurons and synapses, a spectrum of receptors, and complex dendritic and Axonal arborizations.

Applications:

1. Gathering and Testing 100 Years of Data.

2. Cracking the Neural Code

3. Understanding Neocortical Information Processing

4. A Novel Tool for Drug Discovery for Brain Disorders

5. A Global Facility

6. A Foundation for Whole Brain Simulations

7. A Foundation for Molecular Modeling of Brain Function.

VI.FUTURE PRESPECTIVE

The synthesis era in neuroscience started with the launch of Human brain project and is inevitable phase triggered by a critical Amount of fundamental data. The data set does not need to be Complete before such a phase can begin. Detailed models will Probably become the final form of databases that are used to Organize all knowledge of the brain and allow hypothesis testing, Rapid

diagnoses of brain malfunction as well as development of Treatments for neurological disorders. In short, we can hope to Learn a great deal about brain function and dysfunction from Accurate models of the brain. A model of the entire human brain at the cellular level will probably take the next decade. As with Deep blue, Blue Brain will allow us to challenge the foundations of our understanding of intelligence and generate new theories of Consciousness.

VII.CONCLUSION

In conclusion, we will be able to transfer ourselves into Computers at some point. Most arguments against this outcome Are seemingly easy to circumvent. They are either simple minded, or simply require further time for technology to increase. The Only serious threats raised are also overcome as we note the Combination of biological and digital technologies. While the Road ahead is long, already researches have been gaining great Insights from their model. Using the Blue Gene supercomputers, up to 100 cortical columns, 1 million neurons, and 1 billion Synapses can be simulated at once. This is roughly equivalent to the brain power of a honey bee. Humans, by contrast, have about 2 million columns in their cortices. Despite the sheer complexity of such an endeavour, it is predicted that the project will be Capable of this by the year 2023.

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Emotion Recognition and Brain Mapping for Sentiment Analysis

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Abstract*—the rapid growth of the Internet has caused the increase in the amount of textual information available, such as in blogs, discussion forums and review sites on the web, where the texts surely have the emotion content. Emotion is one appearance of people behavior and it is an important performance in human computer interaction (HCI). Human express the emotion in the form of facial expression, speech and writing text.SA naturally observes the emotion conveyed by a text, and at the same time, distinguishing positive and negative valence. The wide areas of CL research, actually considerable for investigating the emotion dimension detection and searching the approaches and techniques in the term of emotion recognition (ER). The two areas have the same aim for getting the improvement result in sentiment analysis with the mapping of emotion recognition provided. This paper provides the overview of research on emotion detection as well as some approaches, applications, techniques used and shows the link between both SA and ER.

Keywords*—Emotion recognition, brain mapping, sentiment analysis, affective computing.

I. INTRODUCTION

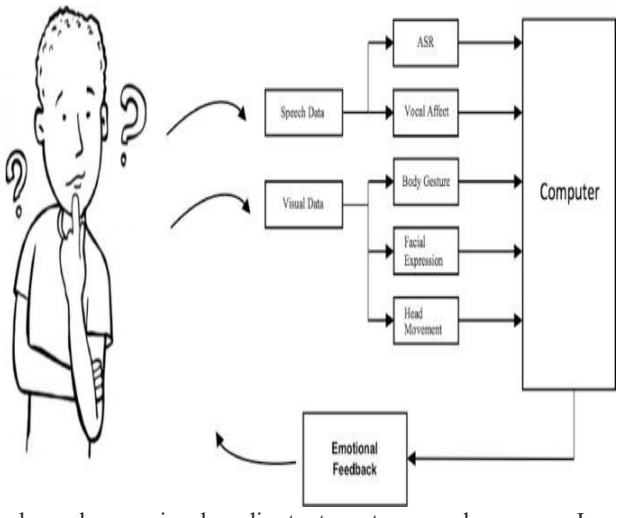
Research has shown that over 90% of our communication can be non-verbal, but technology has struggled to keep up, and traditional code is generally bad at understanding our intonations and intentions. But emotion recognition – also called Affective Computing – is becoming accessible to more types of developers. This post will walk through the ins-and-outs of determining emotion from data, and a few ways you can get some emotion recognition and running yourself. The following are some of the most common application areas of the technique from emotional detection:
1) Sentiment Analysis mainly focuses on information retrieval and knowledge discovery from text; 2) Computer Assisted Creativity; 3) Text to Speech generation; and 4) Improvement of HCI. From past to recent, some emotion mapping for sentiment analysis research interacting with each other such as, the various approaches to emotion detection, developing emotion corpus, affective computing and sentiment analysis, brain signal machines to classify positive and negative emotion, and several methods for text-based emotion recognition.

II. ROLE OF AFFECTIVE COMPUTING

The affective computing is a popular topic. Some computer science applications, indeed, need the emotion recognition. In fact, human computer interaction requires the features available to automatically detect emotion of users. Today, we get a lot of articles that show how to classify which emotion models, methods and approaches are best available to use.

A. Affective Computing and Sentiment Analysis

Affective computing is an emerging interdisciplinary research field bringing together researchers and practitioners from various fields, ranging from artificial intelligence, natural language processing, to cognitive and social sciences. With the proliferation of videos posted online (e.g., on YouTube, Facebook, Twitter) for product reviews, movie reviews, political views, and more, affective computing research has increasingly evolved from conventional unimodal analysis to more complex forms of multimodal analysis. This is the primary motivation behind our first of its kind, comprehensive literature review of the diverse field of affective computing. Furthermore, existing literature surveys lack a detailed discussion of state of the art in multimodal affect analysis frameworks, which this review aims to address. Multimodality is defined by the presence of more than one modality
or



channel, e.g., visual, audio, text, gestures, and eye gage. In this paper, we focus mainly on the use of audio, visual and text information for multimodal affect analysis, since around 90% of the relevant literature appears to cover these three modalities. There are two kinds of SA approach:
1) Machine Learning Approach, to get the weight features of each word. Previously it should do pre-processing first, and then sentiment analysis accuracies using Support Vector Machine.
2) Lexicon Based Approach, The Semantic Orientation calculator (SO-CAL) is one of applied to the polarity classification task which uses the lexicon based.

The process of assigning a positive or negative label to a text that captures the text's opinion towards its primary subject matter. The other ways of this approach are used corpus-based. The summary of architecture of the sentiment analysis based on textual processing is depicted as:

The three main categories of approaches to AC and SA:

1) Knowledge based Techniques such as SentiWordNet, WordNet Affect and do more research of developing corpus.

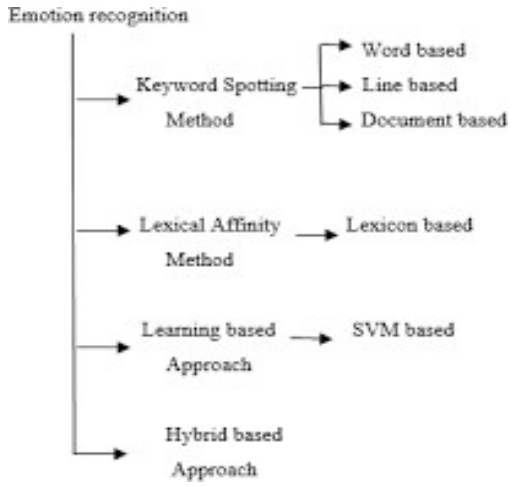
2) Statistical Model,usually uses SVM and deep learning techniques, even though this way also have the weakness, such as do not work well.

3) Hybrid Approach.

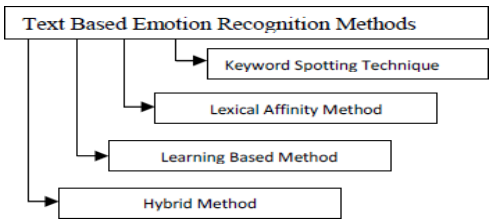
B. Emotion Detection through Text

It is very challenging especially for researchers in the field of psychology to understand emotions.

Emotion Detection and Recognition from text is a recent field of research that is closely related to Sentiment Analysis. Sentiment Analysis aims to detect positive, neutral, or negative feelings from text, whereas Emotion Analysis aims to detect and recognize types of feelings through the expression of texts, such as anger, disgust, fear, happiness, sadness, and surprise. Emotion detection may have useful applications. Ekman distinguished that there are two ways for determining the



em otional model; (a) to describe elements that combine to form larger and more complex emotions and (b) to denote emotions that are presumed to have a biological basis. Several Methods of Emotion Recognition illustrated in figure below:



In addition, some limitations were discovered in those methods which are done by manual analysis approach, such as Subjectivity terms; ambiguity in keyword definitions; Incapability of recognizing sentences without keywords; lack of linguistic information; and difficulties in determining emotion.

C. Brain Mapping and EEG

An EEG uses surface sensors to detect the brain's electrical patterns (known as brainwaves). Common brain imaging techniques such as MRIs, CAT scans and x-rays are built to measure brain structure. An EEG measures brain activity and function; how you are feeling, moment to moment. But even using EEG, it is not possible to get the valence of each word directly from subjects. Generally, at least 5-6 presentations of a stimulus (word) to each subject are needed to get a stable representation of the signal for that stimulus and that subject. At a few seconds per stimulus, at most 80 stimuli can be presented to a subject in one hour—Brain mapping is a means to measure brain function. It has become a primary tool in neuroscience.

QEEGs are used in research centers all over the world to study ADHD, autism spectrum disorder, depression and bipolar disorder, PTSD, anxiety disorders, learning disabilities, and emotional conditions of every sort. It is a recognized diagnostic tool for some medical conditions in Germany and the USA.

III. APPLICATIONS OF SENTIMENT ANALYSIS

The understanding and automatic analysis of emotions, sentiments and affects played an important role in computer science and artificial intelligence in the last decades. It is applied in a variety of studies from which we discuss a selection in the following:

A. Robotics and Artificial Intelligence (AI)

While there is big overlap between the robotics and AI, the former is mostly an engineering field that deals with the design and use of robots, while the latter is more concerned with their actual operation including but not limited to decision making, problem solving, and reasoning (Brady, 1985). This also includes emotional intelligence, as more and more robots that are developed today serve not only pragmatic goals (e.g., cleaning, warehouse operation) but social ones as well (Breazeal,2003). The motivation for affective computing in robotics and AI, therefore, is to build robots and virtual agents that are more human-like in terms of communication and reasoning. Robots and virtual agents that are able to recognize and express emotions have been one of the foci in the field of robotics and artificial intelligence for decades.

Human-computer interaction (HCI) can be considered as sub-field of artificial intelligence. It has also showed an increased interest in emotions. For instance, Cowie et al. (2001) examine basic issues related to the extraction of emotions from the user consolidating psychological and linguistic analyses of emotions. Pantic and Rothkrantz (2003) argue that next-generation HCI designs will need to include the ability to recognize user's affective states in order to become more effective and more humanlike. Both Beale and Creed (2008) and Beale and Creed (2009) provide an overview of the role of emotions in HCI highlighting

important lessons drawn from different research and providing guidelines for future research.

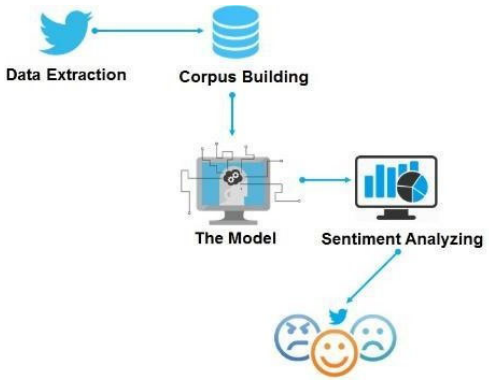
B. Computer Games and Virtual Reality

As video games become more complex and engaging, research in the field of game AI gains more popularity. The foci of the research are different but the ones relevant to our discussion are mining of player data and enhancing non-player character behavior. The main motivation for researchers from this field is to study what makes players enjoy or detest a game and consequently make the gaming experience even more enjoyable. On the one hand, recognition and elicitation of user's emotions through mining of player data (e.g., recognition of facial expressions and keystroke patterns, chat message analysis) has several applications in the field of game development. In contrast to robotics and gaming, the goal of the recognition of emotions from bodily reactions focuses on humans; to identify patterns in acoustic speech signals, facial expressions, body postures, and physiology, and classifying them into different emotions, often with machine learning techniques. Calvo and D'Mello (2010) provide an in-depth survey to which we refer the reader for a comprehensive overview. We will, however, add that since the publication of Calvo's and D'Mello's survey, the methodology has changed in terms of the used equipment. Earlier researchers had to rely on laboratory equipment. Nowadays more and more studies are done with the help of non-invasive wearable devices (wrist bands and smart phone applications) that monitor the subjects' emotional state.

C. Online Commerce

The most general use of sentiment analysis is in ecommerce activities. Websites allows their users to submit their experience about shopping and product qualities. They provide summary for the product and different features of the product by assigning ratings or scores. Customers can easily view opinions and recommendation information on whole product as well as specific product features. Graphical summary of the overall product and its features is presented to users. Popular merchant websites like amazon.com provides review from editors and also from customers with rating information. Tripadvisor is a popular website that provides reviews on hotels, travel destinations. They contain 75 million opinions and reviews worldwide. Sentiment analysis helps such websites by converting dissatisfied customers into promoters by analyzing this huge volume of opinions

D. Twitter Sentiment Analysis using naïve bayes approach



Twitter as social media has a huge implication with rapid and sensitive reaction to political, social, and economic issues. And Foreign exchange rate is the one influenced by those issues. We propose a Naïve Bayes approach to analyzing tweets dataset and making inferences about the polarity into positive and negative tweets based on sentiment analysis and earn advantage from evaluation future or practical implication then predict the foreign exchange market movements IDR Rupiah toward US Dollar.

IV. CONCLUSION

Emotion detection has a promising future. Major approaches towards Emotion Extraction from text have been discussed in this paper. Furthermore, brain mapping based on the polarity of the valence (V) and arousal (A) model into consideration that will be used in this research to analyze the sentiment classification of text. Due to there is still limitation of brain signal tool as EEG is non-stationary in nature and EEG signals changes drastically, then they need resource that could cope that problems. According several articles, resources of emotion dataset, recently, are dominated in English word, therefore, researching built support in other languages are still desperately needed. It is necessary while brain mapping works based on the emotional corpus. This paper related to emotion recognition and EEG signal tool for sentiment analysis has reviewed computing technology which explores looking into the advantages and disadvantages of the current techniques and strategies of sentiment analysis.

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E-Commerce Jewelry Business using 3D Printing

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Abstract*-Jewelry business has a considerable share in the global market and significant growth is expected in fashion jewelry business in the future. The demand for customized and personalized jewelry is slowly increasing and predicted to be the major expectation of the future customers. This future demand can be fulfilled by using the advanced new materials and manufacturing technologies like 3D printing. The 3D printers are now accepted by jewelry manufactures because of many advantages compared with traditional manufacturing methods. Nowadays, 3D printers are capable to handle various materials used for jewelry manufacturing. Major four 3D printing technologies with different materials can be integrated with smart technologies to manufacture customized and personalized jewelry, which could be the considerable solution for the future. The major tasks involved in integration as per the objective of this research work are manufacturing, supply chain management of raw materials and finished products, buyer interface, data mining and machine learning. In order to integrate these tasks, some smart models are developed and discussed in brief.

Keywords—3D printing, E-Commerce, jeweler materials, jewelry manufacturing, supply chain management.

I. INTRODUCTION

Jewelries are the integral part of our society. Common metals used for jewelry are gold, platinum, palladium, titanium, silver, tungsten and stainless steel and non-metals such as wood, glass, pearls, carbon fiber, plastics, stones, resin, lather, etc. Investment casting, die casting and hand fabrication are the three major traditional jewelry manufacturing techniques. The various limitations summarized for these manufacturing processes are durability porosity, cost, complex shape manufacturing ability, skilled labor and low production rate.

The jewelry manufacturing industry is also demanding the use of technological advancements in material science, manufacturing and computer networks and accepting 3D printing technology slowly. The 3D printing technology offers the advantages like manufacturing of complex parts, customized manufacturing, less tooling and environmentally friendly manufacturing [2].

This paper presents an integrated approach for future e-commerce jewelry business using 3D printing assisted by smart technologies. In this paper, future needs of buyers are identified and based on predicted technological advancements, an integrated business model is proposed.[1]

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II.Proposed Smart Models

The major tasks involved in integration as per the objective of this research work are manufacturing, supply chain management of raw materials and finished products, buyer interface data mining and machine learning. In order to integrate these tasks, following models are developed:

- Smart model of jewelry manufacturing unit.
- Smart supply chain model for manufactured jewelry.
- Smart supply chain model for raw materials for jewelry manufacturing.
- Smart integrated e-commerce model for buyers.
- Smart comprehensive model (integrating manufacturing unit, supply chain management of raw materials and manufactures jewelry and buyer interface)

3D Printing or Additive manufacturing is a novel method of manufacturing parts directly from digital model by using layer by layer material build-up approach. This tool-less manufacturing method can produce fully dense metallic parts in short time, with high precision. Features of additive manufacturing like freedom of part design, part complexity, light weighting, part consolidation and design for function are garnering particular interests in metal additive manufacturing for aerospace, oil & gas, marine and automobile applications. Powder bed fusion, in which each powder bed layer is selectively fused by using energy source like laser, is the most promising additive manufacturing technology that can be used for manufacturing small, low volume, complex metallic parts. This review presents overview of 3D Printing technologies, materials, applications, advantages, disadvantages, challenges, economics and applications of 3D metal printing technology.[2]

The printing material, the strength of the manufactured part, the size of the part to be manufactured, speed, accuracy and surface finish obtained are the parameters considered during selection of the 3D printing techniques. As per the order placed by the buyer, the materials and 3D printer will be selected in the manufacturing unit as shown in Figure2.During selection of 3D printer, orders in queue, manufacturing time, delivery schedule, etc. factors will be considered and a decision will be taken using suitable algorithms. Manufactured parts will move to the assembly line for assembly if required. After assembly, the jewelry will be tested, packed and dispatched to the required location. Material storage unit, 3D printers, assembly line, testing and packaging devices are connected to each other through internet. IoT and artificial intelligence system will

take care to make jewelry manufacturing unit smart. All major systems in this unit are connected by the Data Sub-Centre1 and all activities are recorded. Inspection, testing, packaging and dispatch activities are performed using automatic systems. Manufacturing unit may comprise of human interface and few non-IoT devices. This manufacturing unit is connected to smart supply chain model for raw materials and smart supply chain model for manufactured jewelry. For the 3D printer used in this unit, virtual software is available in smart integrated e- commerce model for buyers.

Smart Supply Chain Model Raw Materials for Jewelry Manufacturing

The demand of the material used for jewelry depends on the cost, characteristics of the manufactured parts, machining time, use of the jewelry, etc. The data mining makes it possible to guide the raw material supply chain management through smart computational techniques. The availability of raw materials at various manufacturing units will be continuously recorded and supply will be managed according to it from raw material suppliers. The trend of the cost of raw material will also be recorded and utilized while purchasing the raw materials.

Smart Supply Chain Model for Manufactured Jewelry

The manufacturing units are available across various locations in the country. The selection of manufacturing unit is based on the jewelry design, material, specifications of 3D printers, buyer's location, etc. Hence, it is required to deliver the manufactured jewelry at the desired buyer location. The transport at ion model is decided at the time of placing order. The transportation model and manufacturing unit are interconnected through the data sub- centers 2 and data sub-centers3. The status of the part manufacturing and moving location during the delivery will be continuously tracked by the system administrator and buyer. This model is connected to all the manufacturing units through the internet.

Smart Integrated E-Commerce Model for Buyers

As stated earlier, the customized and personalized jewelry will be the need of the future. The factors considered during jewelry will be the design, material and cost. The smart, integrated-commerce model for the buyer includes unlimited options to purchase the jewelry of various designs and materials and cost depending on selected design and materials. This integrated model jewelry may consist of one or more parts. The buyer has the option to select the jewelry from existing design library1 and material from material library. Jewelry consisting of more than one part can be formulated for online visualization by combining the sub-parts from library2. The photo or video of the buyer. Hence, buyer can visualize the jewelry with user and take further decision. Further, the buyer can fix the jewelry and purchase it by placing the order. Additionally, buyers can take an opinion from the inbuilt artificial intelligence system for matching of jewelry with user considering various factors such as user and jewelry combination, recent trends. If required, an artificial intelligence system can suggest the changes to jewelry. The buyer can repeat the process and take final decisions through a number of iterations about the selection and purchasing of the jewelry. While accepting the order, the manufacturing unit along with transportation management for manufactured jewelry is finalized and intimations are sent to respected units.

This model will also facilitate the creation of customized library3 and library4. Complete designs of jewelry can be added to library3 and sub-component design can be added to library4. These jewelries or subparts can be added in the form of image, CAD file or video. The help of artificial intelligence can be demanded to formulate customized libray5. The jewelry experts can help the buyers formulate libray6.After selecting the jewelry from various design libraries, the buyer can select the material from material library. For the selected combination of jewelry design and material manufacturing, feasibility is checked by virtual 3D printers using artificial intelligence. If it is accepted for manufacturing feasibility, then it will add for comparison, else the issues for selected combination will declare to the buyer for further modifications. The comparison is optional for the buyer. If buyer wishes to know the manufacturing cost of selected jewelry, then it will be available on the screen. The buyer can add number of possible jewelries for comparison and then costs can be displayed. The next process is of online visualization of selected jewelry or jewelries for the person who is going to use the jewelries. The buyer may opt for two-dimensional or a three-dimensional online visualization.

FIGURES AND TABLES

Description	Stats	Year
Retail value of Unbranded jewelry in the global jewelry market	69.5 %	2020
Share of working women highest in Hong Kong	49 %	2017
Share of female population highest in the central Europe and the Baltics	51.7 %	2017
Teen population (14-25) largest in India	229.5 million	2017
Middle class population and spending to be the largest in Asia Pasific	3230 million people spending USD 35.8 Trillion	2030
Time saving and convenient payment push mCommerce sales of fashion jewelry	Mobile transaction account 34% of Fashion and eLuxary Commerce	2018

Fig 1: Facts of Future Jewelry Markets

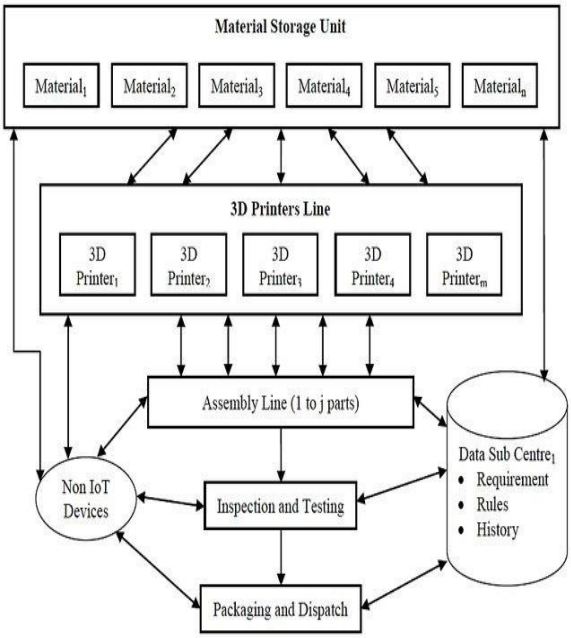

Fig2: Smart Jewelry Manufacturing Unit

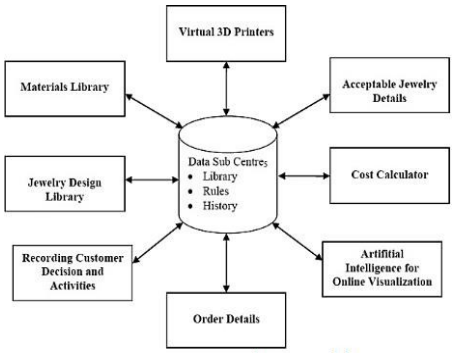

Fig3: Smart Comprehensive model

III.CONCLUSION

This paper presented an integrated approach for future e-commerce jewelry business using 3D printing. The brief models presented in this paper give an overview and will prove useful for the near future jewelry business. These models include all the major process and activities at all stages in a systematic manner. The detailed aspects of smart technologies required can be added to these models.

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A Brief Introduction to Big Data Analytics

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***Abstract* — As the name implies, Big Data literally means large collections of data sets containing abundant information. Big data has the potential to revolutionize the art of management to take appropriate decision on time. Extremely large data sets that may be analyzed computationally to reveal patterns, trends, and association from unstructured data into structured ones to find a solution for a business is the key factor in today's market. Despite the high operational and strategic impacts, there is a scarcity of empirical research to assess the business value of bib data. Big Data Analytics is increasingly becoming a trending practice that many organizations are adopting with the purpose of constructing valuable information from Big Data.**

***Keywords*—Big data, Big data analytics, Predictive analytics, Data acquisition, Prescriptive analytics, in-memory data Fabric, Structured, Semi-Structured, Unstructured**

I. INTRODUCTION

Big Data is also data but with a huge size. Big Data is a term used to describe a collection of data that is huge in size and yet growing exponentially with time. In short, such data is so large and complex that none of the traditional data management tools are able to store it or process it efficiently. [3]

Types of Big Data

Big Data could be found in three forms:

1. **Structured**
2. **Unstructured**
3. **Semi-structured**

Structured

Any data that can be stored, accessed and processed in the form of fixed format is termed as a 'structured, data. Over the period of time, talent in computer science has achieved greater success in developing techniques for working with such kind of data (where the format is well known in advance) and also deriving value out of it. However, nowadays, we are foreseeing issues when a size of such of such data grows to a huge extent, typical sizes are being in the range of multiple zettabytes.

Unstructured

Any data with unknown form or the structure is classified as unstructured data. In addition to the size being huge, un-structured data poses multiple challenges in terms of its processing for deriving value out of it. A typical example of unstructured data is a heterogeneous data source containing a combination of simple text files, images, videos etc. Now day organizations have wealth of data available with them but unfortunately, they don't know how to derive value out of it since this data is in its raw form or unstructured format.

Semi-structured

Semi-structured data can contain both the forms of data. We can see semi-structured data as a structured in form but it is actually not defined with e.g. a table definition in relational DBMS. Example of semi-structured data is a represented in an XML file.

II. CHARACTERISTICS OF BIG DATA

(1) Volume - The name Big Data itself is related to a size which is enormous. Size of data plays a very crucial role in determining value out of data. Also, whether a particular data can actually be considered as a Big Data or not, is dependent upon the volume of data. Hence, **'Volume' is** one characteristic which needs to be considered while with Big Data.

(2) Variety - The next aspect of Big Data is its variety**.**
Variety refers to heterogeneous source and the nature of data, both structured and unstructured. During earlier days, spreadsheets and databases were the only source of data considered by most of the applications. Now a days, data in the form of emails, photos, videos, monitoring devices, PDFs, audio, etc. are also being considered in the analysis applications. This variety of unstructured data poses certain issues for storage, mining and analyzing data.

(3) Velocity - The term '**velocity'** refers to the speed of generation of data. How fast the data is generated and processed to meet the demands, determines real potential in the data.
Bid Data Velocity deals with the speed at which data flows in from sources like business processes, application logs, networks, and social media sites, sensors, Mobile devices, etc. The flow of data is massive and continuous.

(4) Variability - This refers to the inconsistency which can be shown by the data times, thus

hampering the process of being able to handle and manage the data effectively.

Fig 1: Big Data

III. BIG DATA ANALYTICS

Big Data refers to humongous volumes of data that cannot be processed effectively with the traditional applications that exits. The processing of Big Data begins with the raw data that isn't aggregated and is most often impossible to store in the memory of a single computer. A buzzword that is used to describe immense volumes of data, both unstructured and structured, Big Data inundates a business on a day-to-day basis.

Big Data is something that can be used to analyze insights which can lead to better decisions and strategic business moves. The definition of Big Data, given by Gartner is, "Big Data is high-volume, and high velocity and/or high-variety information assets that demand cost-effective, innovation forms of information processing that enable enhanced insight, decision making, and process automation". Big data analytics examines large amounts of data to uncover hidden patterns, correlations and insights. With today's technology, it's possible to analyze your data and get answers from it almost immediately – an effort that's slower and less efficient with more traditional business intelligence solutions.

Big Data analytics can help organizations to better understand the information contained within the data and will also help identify the data that is most important to the business and future business decisions. Analysts working with Big Data typically want the knowledge that comes from analyzing the data. In his report Big Data in Big Companies, IIA Director of Research Tom Davenport interviewed more than 50 businesses to understand how they used big data. Big Data technologies such as Hadoop and cloud-based analytics bring significant cost advantages when it comes to storing large amounts of data, they can identify more efficient ways of doing business and better Decision Making. With the speed of Hadoop and in-memory analytics, combined with the ability to analyze new sources of data, businesses are able to analyze information immediately – and make decisions based on what they've learned new products and services. With the ability to gauge customer needs and satisfaction through analytics comes the power to give customers what they want. Davenport points out that with big data analytics, more companies are creating new products to meet customers' needs. To analyze such a large volume of data, Big Data Analytics is typically performed using specialized software tools and applications for predictive analytics, data mining, text mining, and forecasting and data optimization. Collectively these processes are separate but highly integrated functions of high-performance analytics. Using Big Data tools and software enables an organization to process extremely large volumes of data that a business has collected to determine which data is relevant and can analyzed to drive better business decisions in the future.

1. The big data analytics market is set to reach $103 billion by 2023
2. In 2019, the big data market is expected to grow by 20%
3. By 2020, every person will generate 1.7 megabytes in just a second
4. Internet users generate about 2.5 quintillion bytes of data each day
5. In 2019, there are 2.3 billion active Facebook users, and they generate a lot of data
6. 97.2% of organizations are investing in big data and AI
7. Using big data, Netflix saves $1 billion per year on customer retention
8. Today it would take a person approximately 181 million years to download all the data from the internet.
9. Internet users generate about 2.5 quintillion bytes of data each day.
10. Twitter users send nearly half a million tweets every minute.

IV. BIG DATA ANALYTICS METHODS USED BY DIFFERENT ORGANIZATIONS

To analyze such a large volume of data, Big Data analytics is typically performed using specialized software tools and applications for predictive analytics, data mining, text mining, and forecasting and data optimization. Collectively these processes are separate but highly integrated functions of high-performance analytics.

Using Big Data tools and software enables an organization to process extremely large volumes of data that a business has collected to determine which data is relevant and can be analyzed to drive better business decisions in the future. Data and analytics are at the heart of the digital revolution. They are an imperative across all industries. To survive and thrive in the digital era, now is the time to drive data partner. Scaling the value of data and analytics require a culture of data enablement that extends throughout every facet of your organization.

Here we will explore some of the best Big Data Technologies available:

1. *Predictive Analytics*: Software and/or hardware solutions that allow firms to

discover, evaluate, optimize, and deploy predictive models by analyzing big data sources to improve business performance or mitigate risk. Predictive analytics is concerned with forecasting and statistical modeling to determine the future possibilities. Several factors call for developing new statistical methods for big data. First, conventional statistical methods are rooted in statistical significance: a small sample is obtained from the population and the result is compared with chance to examine the significance of a particular relationship. The conclusion is then generalized to the entire population. In contrast, big data samples are massive and represent the majority of, if not the entire, population. As a result, the notion of statistical significance is not that relevant to big data. Secondly, in terms of computational efficiency, many conventional methods for small samples do not scale up to big data. The third factor corresponds to the distinctive features inherent in big data: heterogeneity, noise accumulation, spurious correlations, and incidental endogeneity.

2. *Data Acquisition*: Data acquisition has two components- identification and collection of big data. Identification of big data is done by analyzing the two natural formats of data— born digital and born analogue. Born Digital Data It is the information which has been captured through a digital medium, e.g. a computer or Smartphone app, etc. This type of data has an ever-expanding range since systems keep on collecting different kinds of information from users. Born digital data is traceable and can provide both personal and demographic business insights. Examples include Cookies, Web Analytics and GPS tracking. Born Analogue Data When information is in the form of pictures, videos and other such formats which relate to physical elements of our world, it is termed as analogue data. This data requires conversion into digital format by using sensors, such as cameras, voice recording, digital assistants, etc. The increasing reach of technology has also raised the rate at which traditionally analogue data is being converted or captured through digital medium.

4. *Prescriptive Analytics*: Prescriptive analytics is about optimization and randomized testing to assess how businesses enhance their service levels while decreasing the expenses. This type of analytics is performed to determine the cause-effect relationship among analytic results and business process optimization policies. Thus, for prescriptive analytics, organizations optimize their business process models based on the feedback provided by predictive analytic models. Although difficult to deploy, prescriptive analytics contribute to handling the information shift and the continuous evolution of business process models. There are very limited examples of good prescriptive analytics in the real world. One of the reasons for this shortage is that most databases are constrained on the number of dimensions that they capture. Therefore, the analysis from such data provides, at best, partial insights into a complex business problem. Few initial studies have applied the simulation optimization methods to the BDA. For instance, Xu, Zhang, Huang, Chen, and Celik (2014) proposed a framework called multi- fidelity optimization with ordinal transformation and optimal sampling (MO2TOS). The framework provides a foundation for descriptive and prescriptive analytics under the BD environment. In the MO2TOS framework, two set of high- and low-resolution models were developed. The authors highlighted that the high-resolution model development can be very slow due to the large amount of data. On the other hand, the low-resolution models were much faster and can be developed using only a sample of data. The proposed MO2TOS framework is able to efficiently integrate the both the resolution models to optimize targeted systems under the BD environment. In general, prescriptive solutions assist business analysts in decision making by determining actions and assessing their impact regarding business objectives, requirements, and constraints. For example, what if simulators have helped provide insights regarding the plausible options that a business could choose to implement in order to maintain or strengthen its current position in the market

5. *In-Memory Data Fabric*: In-memory data fabric provides low-latency access and processing of large quantities of data by distributing data across the dynamic random-access memory

(DRAM), Flash, or SSD of a distributed computer system. These database storage systems are designed to overcome one of the major hurdles in the way of big data processing—the time taken by traditional databases to access and process information. In memory database systems store the data in the RAM of big data servers, therefore, drastically reducing the storage I/O gap. Apache Spark is an example of IMDB systems. VoltDB, NuoDB and IBM solidDB are some more examples of the same.

V. CONCLUSION

In the current scenario Big Data is greatest weapon for the companies to catch in and make their systems talk to each other; access all type of data from different locations around the world in one go with the technology and tools that we have in today's environment. Companies can use the data collected to their advantage; automating processes, gaining insight into their target market and refining overall performance using the feedback that can be readily available. Major concern that is associated with data is ensuring its security and integrity. In this paper we analyzed the basic understanding of big data, its categories, characteristics and methods used by different organizations.

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Mobile Cloud Computing

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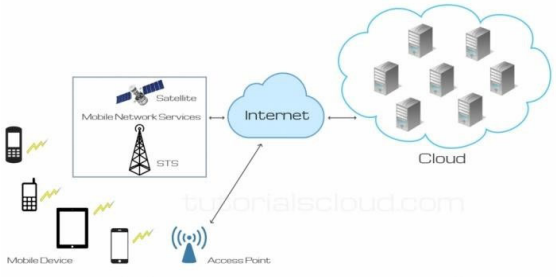
Abstract-With an explosive growth of the mobile applications and emerging of cloud computing concept, the Mobile Cloud Computing (MCC) has become a potential technology for the mobile service users. MCC integrates the technology of cloud computing with mobile environment and has taken part of major discussion thread in the IT world since 2009. Despite of this hype achieved by mobile cloud computing; the growth of mobile cloud computing subscribers is still below expectations. According to the recent survey conducted by the International Data Corporation, most IT Executives and CEOs are not interested in adopting such services due to the drawbacks associated with this (e.g., battery life, storage, and bandwidth), environment (e.g., heterogeneity, scalability, and availability), and security (e.g., reliability and privacy). In spite of various efforts to overcome these, there are a number of loopholes and challenges that still exist in the security policies of mobile cloud computing. This paper will give a review of various challenges in this field and measures to overcome such.

Keywords—Cloud computing; Mobile computing; Virtualization; Offloading.

I.INTRODUCTION

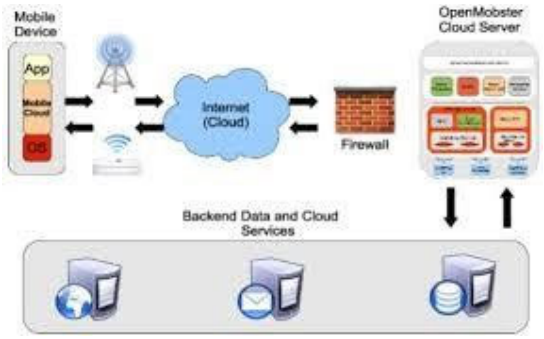
Mobile devices (e.g., Smartphone, tablet pcs, etc) are increasingly becoming an essential part of human life as the most effective and convenient communication tools not bounded by time and place. Mobile users accumulate rich experience of various services from mobile applications, which run on the devices and/or on remote servers via wireless networks. The rapid progress of mobile computing (MC) [1] becomes a powerful trend in the development of IT technology as well as commerce and industry fields. However, the mobile devices are facing many challenges in their resources (e.g., battery life, storage, and bandwidth) and communications (e.g., mobility and security). The limited resources significantly impede the improvement of service qualities. On the other hand, advances in the field of network-based computing and applications on demand have led to an explosive growth of application models such as cloud computing, software as a service, community network, web store, and so on. As a major application model in the era of the Internet, the term, Cloud Computing (CC) has become a significant research topic of the scientific and industrial communities since 2007.Commonly, cloud computing is described as a range of services which are provided by an Internet-based cluster system. Such cluster systems consist of a group of low-cost servers or Personal Computers (PCs), organizing the various resources of the computers according to a certain management strategy, and offering safe, reliable, fast, convenient and transparent services such as data storage, accessing and computing to clients. So, with the explosion of mobile applications and the taking support of CC for a variety of services for mobile users, mobile cloud computing (MCC) is introduced as an integration of cloud computing into the mobile environment. Mobile cloud computing brings new types of services and facilities for mobile users to take full advantages of cloud computing. As the development of cloud computing is going too fast, resources in mobile cloud computing networks are virtualized and assigned in a group of numerous distributed computers rather than in traditional local computers or servers, and are provided to mobile devices such as smartphones, portable terminal, and so on.



II. HOW MOBILE CLOUD COMPUTING WORKS

A. Architecture for Mobile Applications in Cloud Environment:

We start our MCC with an open source project for mobile cloud platform called open mobster. Its architecture is as given in the Figure.



B. Typical services needed by a mobile cloud client:

The most essential services include:
Sync: This service synchronizes all state changes made to the mobile or its applications back with the Cloud Server.

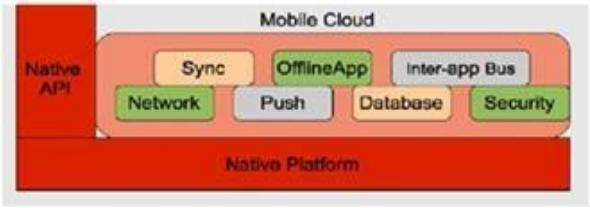
Push: It manages any state updates being sent as a notification from the cloud server. This improves the user's experience as it does not require the user to pro-actively check for new information.

Offline App: It is a service which carries the management capabilities to create smart coordination between low-level services like Sync and Push. It frees the programmer from the burden of writing code to actually perform synchronization as it is this service which decides synchronization management and mechanism which is best for the current state. The moment the data channel for any mobile application is established, all synchronizations and push notifications are automatically handled by Offline App service.

Network: It manages the communication channel needed to receive Push notifications from the server. It carries the ability to establish proper connections automatically. It is a very low-level service and it shields any low-level connection establishment, security protocol details by providing a high-level interfacing framework.

Database: It manages the local data storage for the mobile applications. Depending on the platform it uses the corresponding storage facilities. It must support storage among the various mobile applications and must ensure thread safe concurrent access. Just like Network service it is also a low-level service.

Inter App Bus: This service provides low-level coordination/communication between the suites of applications installed on the device.
Figure shows the client cloud stack.



C. Typical services needed by a mobile cloud server:

These are the essential services that must be provided to the mobile apps by the server.

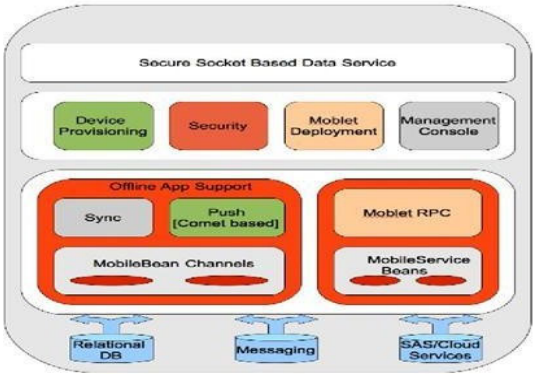
Sync: Server Sync service synchronizes device side App state changes with the backend services where the data actually originates. It also must provide a plug-in framework to mobilize the backend data.

Push: Server Push service monitors data channels (from backend) for updates. The moment updates are detected, corresponding notifications are sent back to the device. If the device is out of coverage or disconnected for some reason, it waits in a queue, and delivers the push the moment the device connects back to the network.

Secure Socket-Based Data Service:
Depending on the security requirements of the Apps this server-side service must provide plain socket server or an SSL-based socket server or both

Security: Security component provides authentication and authorization services to make sure mobile devices connecting the Cloud Server are in fact allowed to access the system. Every device must be first securely provisioned with the system before it can be used. After the device is registered, it is challenged for proper credentials when the device itself needs to be activated. Once the device is activated, all Cloud requests are properly authenticated/authorized going.

Management Console: Every instance of a Cloud Server must have a Command Line application such as the Management Console as it provides user and device provisioning functionalities. In the future, this same component will have more device management features like remote data wipe, remote locking, and remote tracking, etc.



III. ADVANTAGE OF MOBILE CLOUD COMPUTING

Cloud computing is known to be a promising solution for mobile computing due to many reasons (e.g., mobility, communication, and portability [5]). In the following, it describes how the cloud can be used to overcome obstacles in mobile computing, thereby pointing out advantages of MCC.

A. Extending battery lifetime:

Battery is one of the main concerns for mobile devices. Several solutions have been proposed to enhance the CPU performance [6] and to manage the disk an intelligent manner [7] to reduce power consumption. However, these solutions require changes in the structure of mobile devices, or they require a new hardware that results in an increase of cost and may not be feasible for all mobile devices. Computation offloading technique is proposed with the objective to migrate the large computations and complex processing from resource-limited devices (i.e., mobile devices) to resourceful machines (i.e., servers in clouds). This avoids taking a long application execution time on mobile devices which results in large amount of power consumption. [8] evaluates the effectiveness of offloading techniques through several experiments. The results demonstrate that the remote application execution can save energy significantly. In addition, many mobile applications take advantages from task migration and remote processing. For example, using memory arithmetic unit and interface (MAUI) to migrate mobile game components [9] to servers in the cloud can save 27% of energy consumption for computer games and 45% for the chess game.

B. Improving data storage capacity and processing power:

Storage capacity is also a constraint for mobile devices. MCC is developed to enable mobile users to store/access the large data on the cloud through wireless networks. First example is the Amazon Simple Storage Service (Amazon S3) [10] which supports file storage service. Mobile photo sharing service enables mobile users to upload images to the clouds immediately after capturing. Users may access all images from any devices. With cloud, the users can save considerable amount of energy and storage space on their mobile devices since all images are sent and processed on the clouds. Facebook is the most successful social network application today, and it is also a typical example of using cloud in sharing images. Cloud computing can efficiently support various tasks for data warehousing, managing and synchronizing multiple documents online. Mobile applications also are not constrained by storage capacity on the devices because their data now is stored on the cloud).

B. Improving reliability

Storing data or running applications on clouds is an effective way to improve the reliability since the data and application are stored and backed up on a number of computers. This reduces the chance of data and application lost on the mobile devices. In addition, MCC can be designed as a comprehensive data security model for both service providers and users. For example, the cloud can be used to protect copyrighted digital contents (e.g., video, clip, and music) from being abused and unauthorized distribution [11]. Also, the cloud can remotely provide to mobile users with security services such as virus scanning, malicious code detection, and authentication [12]. Also, such cloud-based security services can make efficient use of the collected record from different users to improve the effectiveness of the services. In addition, MCC also inherits some advantages of clouds for mobile services as follows:

a) Dynamic provisioning: Dynamic on- demand provisioning of resources on a fine- grained, self-service basis is a flexible way for service providers and mobile users to run their applications without advanced reservation of resources.

b) Scalability: The deployment of mobile applications can be performed and scaled to meet the unpredictable user demands due to flexible resource provisioning. Service providers can easily add and expand an application and service without or with little constraint on the resource usage.

c) Multi-tenancy: Service providers (e.g., network operator and data centre owner) can share the resources and costs to support a variety of applications and large number of users.

d) Ease of Integration: Multiple services from different service providers can be integrated easily through the cloud and the Internet to meet the user's demands.

IV. CHALLENGES IN MOBILE CLOUD COMPUTING

The main objective of mobile cloud computing is to provide a convenient and rapid method for users to access and receive data from the cloud, such convenient and rapid method means accessing cloud computing resources effectively by using mobile devices. The major challenge of mobile cloud computing comes from the characters of mobile

devices and wireless networks, as well as their own restriction and limitation, and such challenge makes application designing, programming and deploying on mobile and distributed devices more complicated than on the fixed cloud device. In mobile cloud computing environment, the limitations of mobile devices, quality of wireless communication, types of application, and support from cloud computing to mobile are all important factors that affect assessing from cloud computing. Table 1 gives an overview of proposed challenges and some solutions about mobile cloud computing.

A. Limitations of mobile devices

While discussing mobile devices in cloud the first thing is resource-constrain. Though smartphones have been improved obviously in various aspects such as capability of CPU and memory, storage, size of screen, wireless communication, sensing technology, and operation systems, still have serious limitations such as limited computing capability and energy resource, to deploy complicated applications. By contrast with PCs and Laptops in a given condition, these smartphones like iPhone 4S, Android serials, Windows Mobile serials decrease 3 times in processing capacity, 8 times in memory, 5 to 10 times in storage capacity and 10 times in network bandwidth. Normally, smart phone needs to be charged everyday as dialling calls, sending messages, surfing the Internet, community accessing, and other internet applications. According to past development trends, the increased mobile computing ability and rapid development of screen technology will lead to more and more complicated applications deployed in smartphones. If the battery technology cannot be improved in a short time, then how to effectively save battery power in smart phone is a major issue we meet today. The processing capacity, storage, battery time, and communication of those smartphones should be improved consistently with the development of mobile computing. However, such enormous variations will persist as one of major challenges in mobile cloud computing.

Table-1 challenges and solutions of mobile cloud computing

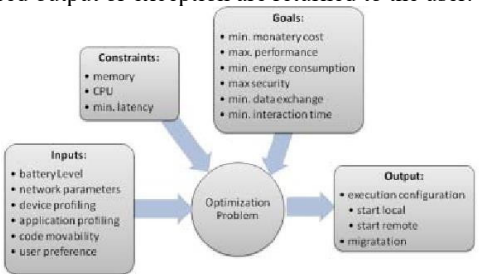
Challenge	Solutions
Device battery lifetime	Cross-layer identification of wireless network interface card (WNIC) sleep intervals
Wireless bandwidth availability	Versatile graphics encoding Downstream data peak reduction Optimization of upstream packetization overhead
Interaction latency	Proximate cloudlet infrastructure Computing display updates in advance Image buffering for virtual environment streaming Scene object caching

B. Quality of communication

In contrast with wired network uses physical connection to ensure bandwidth consistency, the data transfer rate in mobile cloud computing environment is constantly changing and the connection is discontinuous due to the existing clearance in network overlay. Furthermore, data centre in large enterprise and resource in Internet service provider normally is far away to end users, especially to mobile device users. In wireless network, the network latency delay may 200 ms in 'last mile' but only 50 ms in traditional wired network. Some other issues such as dynamic changing of application throughput, mobility of users, and even weather will lead to changes in bandwidth and network overlay. Therefore, the handover delay in mobile network is higher than in wired network.

C. Division of Application Services

In order to dynamically shift the computation between mobile device and cloud, applications needed to be split in loosely coupled modules interacting with each other. The modules are dynamically shifted between mobile devices and cloud depending on the several metric parameters modelled in cost model [15]. These parameters can include the module execution time, resource consumption, battery level, monetary costs, security or network bandwidth. User waiting time, which is a key aspect here i.e. the time a user, waits from invoking some actions on the device's interface until a desired output or exception are returned to the user.



Cost Model: The cost model takes inputs from both device and cloud, and runs optimization algorithms to decide execution configuration of applications (Fig.) Zhang et al. [13] use Na ıve Bayesian Learning classifiers to find the optimal execution configuration from all possible configurations with given CPU, memory and network consumption,
user preferences, and log data from the application. Giurgiu et al. [14] model the application behavior through a resource consumption graph. Every bundle or module composing the application has memory consumption, generated input and output traffic, and code size. Application's distribution between the server and phone is then optimized. The server is assumed to have infinite resources and the client has several resource constraints. The partitioning problem seeks to find an optimal solution in the graph satisfying an objective function and device's constraints. The objective function tries to minimize the interactions between the phone and the server, while taking into account the overhead of acquiring and installing the necessary bundles. However, optimization involving many interrelated parameters in the cost model can be time or computation consuming, and even can override the cost savings. Therefore, approximate and fast optimization techniques involving prediction are needed. The

model could predict costs of different partitioning configurations before running the application and deciding on the best one.

V. CONCLUSION

Mobile cloud computing is one of major mobile technology trends in the future since it combines the advantages of both mobile computing and cloud computing, thereby providing optimal services for mobile users. The concept of cloud computing provides a brand-new opportunity for the development of mobile applications since it allows the mobile devices to maintain a very thin layer for user applications and shift the computation and processing overhead to the virtual environment. This paper covered several representative mobile cloud approaches. Much other related works exists, but the purpose of this paper is to give an overview of the wide spectrum of mobile cloud computing possibilities. None of the existing approaches meets completely the requirements of mobile clouds. Mobile cloud computing will be a source of challenging research problems in information and communication technology for many years to come. Solving these problems will require interdisciplinary research from systems and networks.

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Prediction of Rice Plant Diseases

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***Abstract*— Identification of plant diseases and providing the correct pesticides and the right amount of it is a challenging task, especially that it helps the farmers. This article provides a prototype system for detection and classification of rice plant diseases based on the images of infected rice plants. The diseases taken into consideration are bacterial leaf blight, brown spot and leaf smut. We take three features which are color, shape and texture of the leaf into consideration to classify the diseased leaf images. We use random forest classification method. We also perform 10 fold cross validation on the images.**

Keywords—machine learning, image processing, rice crop diseases

I. INTRODUCTION

Plant diseases are one of the reasons for the reduction of quality and quantity of the crops. The main problem is lack of continuous monitoring of the plants. This article attempts to apply the concepts of machine learning and image processing to solve the problem of detection and classification of diseases of the rice plant which is one of the important plants in India. Diseases are generally caused by bacteria, fungi and virus.

Each disease is unique in its own way that it differs in colour, shape, size and texture of disease symptoms. Some have the same colour but different shapes while some may have different colour but same shape which might be the reason why farmers can get confused and are unable to take proper decision for the selection of pesticides.

Cameras can be employed at a certain distance in the farm to capture images periodically and then sent to a central system for the analysis of diseases so that it can detect and give the proper information about the disease and pesticide selection.

The dataset of diseased leaves are collected firsthand. This dataset consists of images of the diseased rice plant images in three different categories based on their disease. We extract the three features namely colour, shape and texture of the images in the dataset and label them according to the disease and then split the training and testing data in the dataset. We train this data using the random forest classifier to get the maximum possible accuracy.

The process of plant disease detection is divided into two parts, image processing and machine learning. These images are further processed using image processing operations and at the end, machine learning model classifies the disease based on the image features.

Fig 1: Types of Rice Crop Diseases

II. PROPOSED WORK

A Image Acquisition

As rice crop needs a lot of water to grow, many of the farmers grow it in the rainy season. This is the main reason for the spreading of bacterial and fungal diseases for the crop. We have collected the rice crop images in the worst scenario when the dataset is not available.

B Image Pre-processing

During pre-processing of the image, we resize the images to 256x256 pixels to reduce memory requirement and computational power. Then, we remove the background of the image, making it black by applying mask generated on the original image either by using the Hue, Saturation or Value components of the original image.

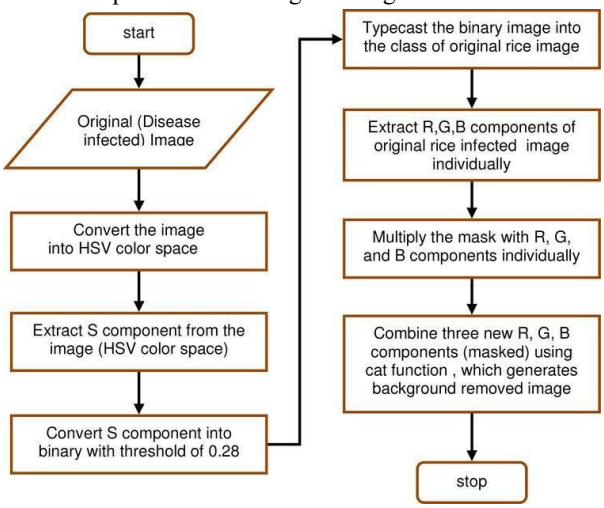

Fig 2: Flowchart of background removal

C Disease Segmentation

By using K-means Clustering, we have divided the leaf into three parts namely the green portion, diseased part and the background. Sometimes we may not obtain the accurate results using K-means algorithm and hence we feed the centroid value from the histogram analysis of hue value of each cluster. We remove the unnecessary green portion in the diseased cluster using thresholding.

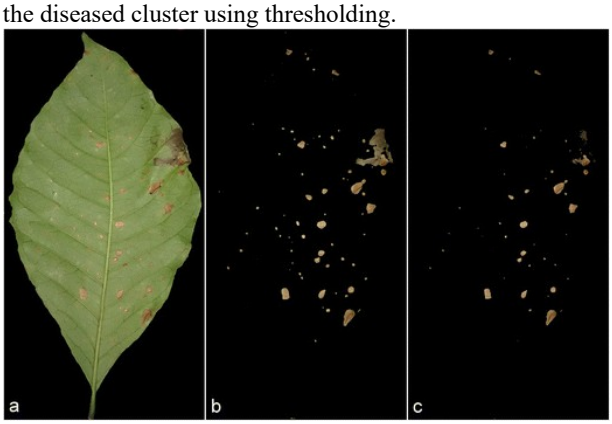

Fig4: Disease segmentation from the leaf

D Feature Extraction

Feature extraction plays a crucial role in differentiating one disease from another. We use various features under three categories: color, shape and texture. For feature extraction for any image, we convert the RGB image to black & white image.

E Classification

Preparation of dataset with known class labels is an essential step for classification of the unknown data points. We can assign labels as numbers or the disease names. We use this prepared dataset for performing disease classification, for which we use random forest machine learning classification model.

Fig3: General approach of plant disease detection using images

III. METHODOLOGY

We have considered the dataset that consists of three diseases which were bacterial leaf blight, leaf smut, and brown spot.

We loaded the images from the dataset and considering the built-in functions in python, we extract the features which are shape, color and texture from the loaded images into arrays. We encoded the target labels and normalized the features. Then we divide the dataset into two parts namely training and testing parts.

Then, we compare the models accuracy by applying the models on the loaded images using 10 fold cross validation. We found that the random forest classifier had the maximum accuracy.

We consider the most accurate model and perform the algorithm. In our test random forest algorithm has given the most reachable accuracy when compared with other algorithms such as SVM, logistic regression, decision trees and so on.

We fit the training data to the model. Now we provide the testing data and predict the label of the testing images. The name of the disease is printed on the top left corner of the image.

IV. CONCLUSION

In this paper we predict the diseases that are caused to the Rice crops. In the future, a more accurate model is to be designed so that there would be an exact differentiation between the smut disease and others. It would be considered better if this model is reachable to the farmers so that it would be easy for them to predict the type of disease that has occurred to the crop and use the appropriate pesticides to control the disease at certain stage without spreading to the whole farm.

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Speech Recognition

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***Abstract*— This paper presents our work on building a large vocabulary continuous speech recognition system. Speech Recognition simply is the process of converting spoken input to text. It is also known as Speech-to-Text and Voice Recognition. Technically Speech recognition is the process of converting an acoustic signal, captured by a microphone or a telephone, to a set of words.**

Keywords*— *Speech recognition, Automatic speech recognition

I. INTRODUCTION

The computer revolution is now well advanced, but we see a starting preparation of computer machines in forms of work people do, the domain of computers is still significantly small because of the specialized training needed to use them and the lack of intelligence in computer systems.

We have passed by five generations of computer science, each adding a new innovative technology that brought computers nearer and nearer to the people. Now we are in the generation whose prime objective is to make computer more intelligent that is to make computer system that can think as humans.

The fifth generation was aimed at using conventional symbolic Artificial Intelligence techniques to achieve machine intelligence. Computer devices with artificial intelligence are still in development, but some of these technologies are beginning to emerge and be used such as voice recognition.

AI is a reality made possible by using parallel processing and superconductors. Leaning to the future, computers will be radically transformed again by quantum computation, molecular and nano technology.

The essence of fifth generation will be using these technologies to ultimately create machines which can process and respond to natural languages, and have capability to learn and organize themselves.

True, but speech recognition seeing and walking don't require "intelligence, but human perceptual ability and motor control. Speech Technology is now one of the major significant scientific research fields under the broad domain of AI; indeed, it is a major co-domain of computer science, apart from the traditional linguistics and other disciplines that study the spoken language.

The days when you had to keep staring at the computer screen and frantically hit the key or click the mouse for the computer to respond to your commands may soon be a thing of past. Today we can stretch out and relax and tell your computer to do your bidding. This has been made possible by the ASR (Automatic Speech Recognition) technology.

The ASR technology would be particularly welcome by automated telephone exchange operators, doctors and lawyers, besides others whose seek freedom from tiresome conventional computer operations using keyboard and the mouse. It is suitable for applications in which computers are used to provide routine information and services. The ASR's direct speech to text dictation offers a significant advantage over traditional transcriptions. With further refinement of the technology in text will become a thing of past. ASR offers a solution to this fatigue-causing procedure by converting speech in to text.

A talking listening computer HAL-9000, had been featured which to date is a called figure in both science fiction and in the world of computing. Even today almost every speech recognition technologist dream of designing a HAL-like computer with a clear voice and the ability to understand normal speech. Though the ASR technology is still not as versatile as the imaginer HAL, it can nevertheless be used to make life easier.

New application specific standard products, interactive error -recovery techniques, and better voice activated user interfaces allow the handicapped, computer-illiterate, and rotary dial phone owners to talk to the computers. ASR by offering a natural human interface to computers, finds applications in telephone-call centers, such as for airline flight information system, learning devices, toys, etc.

II. SPEECH RECOGNITION TECHNIQUES

Speech-enabled applications over wireless networks and the World Wide Web (WWW) employing. Speech recognition are recently attracting more and more attention. At present Google search is based on the words in text mode. ASR can be used to give the input words to Google to be searched, through speech instead of text. Recently this application is also introduced in the Google search. Managing the data of students, like entering the marks, attendance, and preparing progress reports is tedious process. If IWR is used for entering the data, the work load on the teacher will be reduced. Therefore, ASR for IWR based HMM based word models is built for entering data of the students of a class and tested the performance of the system. However, HHMs developed for word models can also used for connected word recognition and it is to spell the connected words as compared isolated words. Therefore, in this chapter the performance of the ASR system for isolated words is given and next chapter will give the performance of

connected word recognition.

Word Recognition is where a word uttered by the user has to be recognized by the speech recognition system. This is possible by the Reference Models stored in the database corresponding to each word intended to be recognized. Thus, while performing the recognition an uttered word is compared to each of these models. Only the words having the Models in the system, can be recognized. If a new word is spelt for recognition, it will recognize as one of the words having model or simply give as a new word. The inputs to the

Word Recognition system are stored MODELS and the MFCC features of the word uttered. The recognition process is simply matching the incoming speech with the stored Models In the recognition process, Forward Algorithm of Dynamic Time Warping, is used for calculating the Cost. All the MODELS (Reference Features) are given as Reference Features to the DTW, one after the other along with the features of the word uttered. The MFCC features of the word uttered for recognition are the test features applied to the DTW algorithm. Thus, the DTW algorithm gives a cost for each model and the test features. The Model with the lowest distance measure (cost) is the recognized word. The word corresponding to the model with lowest cost is the recognized word. Hence the best match (lowest distance measure) is obtained from dynamic programming.

III. APPLICATIONS

In-car Systems
Typically, a manual control input, for example by means of a finger control on the steering-wheel, enables the speech recognition system and this is signaled to the driver by an audio prompt. Following the audio prompt, the system has a "listening window" during which it may accept a speech input for recognition.

Simple voice commands may be used to initiate phone calls, select radio stations or play music from a compatible smart phone, MP3 player or music-loaded flash drive. Voice recognition capabilities vary between car make and model. Some of the most recent car models offer natural-language speech recognition in place of a fixed set of commands, allowing the driver to use full sentences and common phrases. With such systems there is, therefore, no need for the user to memorize a set of fixed command words.

Health care Medical documentation
In the health care sector, speech recognition can be implemented in front-end or back-end of the medical documentation process. Front-end speech recognition is where the provider dictates into a speech-recognition engine, the recognized words are displayed as they are spoken, and the dictator is responsible for editing and signing off on the document. Back-end or deferred speech recognition is where the provider dictates into a digital dictation system, the voice is routed through a speech-recognition machine and the recognized draft document is routed along with the original voice file to the editor, where the draft is edited and report finalized. Deferred speech recognition is widely used in the industry currently.

Helicopters
The problems of achieving high recognition accuracy under stress and noise pertain strongly to the helicopter environment as well as to the jet fighter environment. The acoustic noise problem is actually more severe in the helicopter environment, not only because of the high noise levels but also because the helicopter pilot, in general, does not wear a facemask, which would reduce acoustic noise in the microphone. Substantial test and evaluation programs have been carried out in the past decade in speech recognition systems applications in helicopters, notably by the U.S. Army Avionics Research and Development Activity (AVRADA) and by the Royal Aerospace Establishment (RAE) in the UK. Work in France has included speech recognition in the Puma helicopter. There has also been much useful work in Canada. Results have been encouraging, and voice applications have included: control of communication radios, setting of navigation systems, and control of an automated target handover system.

IV. USAGE IN EDUCATION AND DAILY LIFE

For language learning, speech recognition can be useful for learning a second language. It can teach proper pronunciation, in addition to helping a person develop fluency with their speaking skills.

Students who are blind (see Blindness and education) or have very low vision can benefit from using the technology to convey words and then hear the computer recite them, as well as use a computer by commanding with their voice, instead of having to look at the screen and keyboard.

Students who are physically disabled or suffer from Repetitive strain injury/other injuries to the upper extremities can be relieved from having to worry about handwriting, typing, or working with scribe on school assignments by using speech-to-text programs. They can also utilize speech recognition technology to freely enjoy searching the Internet or using a computer at home without having to physically operate a mouse and keyboard.

Speech recognition can allow students with learning disabilities to become better writers. By saying the words aloud, they can increase the fluidity of their writing, and be alleviated of concerns regarding spelling, punctuation, and other mechanics of writing. Also, see Learning disability.

Use of voice recognition software, in conjunction with a digital audio recorder and a personal computer running word-processing software has proven to be positive for restoring damaged short-term-memory capacity, in stroke and craniotomy individuals.

V. CONCLUSION

Speech recognition has a big potential in becoming an important factor of interaction between human and machine in the near future. The results show reasonably good success in recognizing continuous speech from various speakers, for a large vocabulary

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5G Technology

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Abstract--In the near future, i.e., beyond 4G, some of the prime objectives or demands that need to be addressed are increased capacity, improved data rate, decreased latency, and better quality of service. To meet these demands, drastic improvements need to be made in cellular network architecture. This paper presents the results of a detailed survey on the fifth generation (5G) cellular network architecture and some of the key emerging technologies that are helpful in improving the architecture and meeting the demands of users. In this detailed survey, the prime focus is on the 5G cellular network architecture, massive multiple input multiple output technology, and device-to-device communication (D2D). Along with this, some of the emerging technologies that are addressed in this paper include interference management, spectrum sharing with cognitive radio, ultra-dense networks, multi-radio access technology association, full duplex radios, millimeter wave solutions for 5G cellular networks, and cloud technologies for 5G radio access networks and software defined networks. In this paper, a general probable 5G cellular network architecture is proposed, which shows that D2D, small cell access points, network cloud, and the Internet of Things can be a part of 5G cellular network architecture. A detailed survey is included regarding current research projects being conducted in different
countries by research groups and institutions that are working on 5G technologies.

Keywords-Millimeter waves, Small cells, MIMO, Beam forming.

I. INTRODUCTION

Today and in the recent future, to fulfill the presumptions and challenges of the near future, the wireless based networks of today will have to advance in various ways. Recent technology constituent like high-speed packet access (HSPA) and long-term evolution (LTE) will be launched as a segment of the advancement of current wireless based technologies. Nevertheless, auxiliary components may also constitute future new wireless based technologies, which may adjunct the evolved technologies. Specimen of these new technology components are different ways of accessing spectrum and considerably higher frequency ranges, the instigation of massive antenna configurations, direct device-to-device communication, and ultra-dense deployments.

Since its initiation in the late 1970s, mobile wireless communication has come across from analog voice calls to current modern technologies adept of providing high quality mobile broadband services with end-user data rates of several megabits per second over wide areas and tens, or even hundreds, of megabits per second locally. The extensive improvements in terms of potentiality of mobile communication networks, along with the initiation of new types of mobile devices such as smart phones and tablets, have produced an eruption of new applications which will be used in cases for mobile connectivity and a resultant exponential growth in network traffic. This paper presents our view on the future of wireless communication for 2020 and beyond. In this paper, we describe the key challenges that will be encountered by future wireless communication while enabling the networked society. Along with this, some technology routes that may be taken to fulfill these challenges

II. EVOLUTION OF WIRELESS TECHNOLOGIES

G. Marconi, an Italian inventor, unlocks the path of recent day wireless communications by communicating the letter ‘S’ along a distance of 3Km in the form of three dot Morse code with the help of electromagnetic waves. After this inception, wireless communications have become an important part of present day society. Since satellite communication, television and radio transmission has advanced to pervasive mobile telephone, wireless communications has transformed the style in which society runs. It shows the evolving generations of wireless technologies in terms of data rate, mobility, coverage and spectral efficiency. As the wireless technologies are growing, the data rate, mobility, coverage and spectral efficiency increases. It also shows that the 1G and 2G technologies use circuit switching while 2.5G and 3G uses both circuit and packet switching and the next generations from 3.5G to now i.e. 5G are using packet switching. Along with these factors, it also differentiate between licensed spectrum and unlicensed spectrum. All the evolving generations use the licensed spectrum while the Wi-Fi, Bluetooth and Wi-MAX are using the unlicensed spectrum

A. 1G

The 1st generation was announced in initial 1980’s. It has a data rate up to 2.4kbps. Major subscribers were Advanced Mobile Phone System (AMPS), Nordic Mobile Telephone (NMT), and Total Access Communication System (TACS). It has a lot of

disadvantages like below par capacity, reckless handoff, inferior voice associations, and with no security, since voice calls were stored and played in radio towers due to which vulnerability of these calls from unwanted eavesdropping by third party increases.

B. 2G

The 2nd generation was introduced in late 1990's. Digital technology is used in 2nd generation mobile telephones. Global Systems for Mobile communications (GSM) was the first 2nd generation system, chiefly used for voice communication and having a data rate up to 64kbps. 2G mobile handset battery lasts longer because of the radio signals having low power. It also provides services like Short Message Service (SMS) and e-mail. Vital eminent technologies were GSM, Code Division Multiple Access (CDMA), and IS-95.

C. 3G

The 3rd generation was established in late 2000. It imparts transmission rate up to 2Mbps. Third generation (3G) systems merge high speed mobile access to services based on Internet Protocol (IP). Aside from transmission rate, unconventional improvement was made for maintaining QOS. Additional amenities like global roaming and improved voice quality made 3G as a remarkable generation. The major disadvantage for 3G handsets is that, they require more power than most 2G models. Along with this 3G network plans are more expensive than 2G . Since 3G involves the introduction and utilization of Wideband Code Division Multiple Access (WCDMA), Universal Mobile Telecommunications Systems (UMTS) and Code Division Multiple Access (CDMA) 2000 technologies, the evolving technologies like High Speed Uplink/Downlink Packet Access (HSUPA/HSDPA) and Evolution-Data Optimized (EVDO) has made an intermediate wireless generation between 3G and 4G named as 3.5G with improved data rate of 5-30 Mbps.

D. 4G

4G is generally referred as the descendant of the 3G and 2G standards. 3rd Generation Partnership Project (3GPP) is presently standardizing Long Term Evolution (LTE) Advanced as forthcoming 4G standard along with Mobile Worldwide Interoperability for Microwave Access (WIMAX). A 4G system improves the prevailing communication networks by imparting a complete and reliable solution based on IP. Amenities like voice, data and multimedia will be imparted to subscribers on every time and everywhere basis and at quite higher data rates as related to earlier generations. Applications that are being made to use a 4G network are Multimedia Messaging Service (MMS), Digital Video Broadcasting (DVB), and video chat, High Definition TV content and mobile TV.

E. 5G

With an exponential increase in the demand of the users, 4G will now be easily replaced with 5G with an advanced access technology named Beam Division Multiple Access (BDMA) and Non- and quasi-orthogonal or Filter Bank multi carrier (FBMC) multiple access. The concept behind BDMA technique is explained by considering the case of the base station communicating with the mobile stations. In this communication, an orthogonal beam is allocated to each mobile station and BDMA technique will divide that antenna beam according to locations of the mobile stations for giving multiple accesses to the mobile stations, which correspondingly increase the capacity of the system [8]. An idea to shift towards 5G is based on current drifts, it is commonly assumed that 5G cellular networks must address six challenges that are not effectively addressed by 4G i.e. higher capacity, higher data rate, lower End to End latency, massive device connectivity, reduced cost and consistent Quality of Experience provisioning .Recently introduced IEEE 802.11ac, 802.11ad and 802.11af standards are very helpful and act as a building blocks in the road towards 5G .

III. FEATURES OF 5G TECHNOLOGY

- 5G technology offer high resolution for crazy cell phone user and bi-directional large bandwidth shaping.
- The advanced billing interfaces of 5G technology makes it more attractive and effective.
- 5G technology also providing subscriber supervision tools for fast action.
- The high quality services of 5G technology based on Policy to avoid error.
- 5G technology is providing large broadcasting of data in Gigabit which supporting almost 65,000 connections.
- 5G technology offer transporter class gateway with unparalleled consistency.
- The traffic statistics by 5G technology makes it more accurate.
- Through remote management offered by 5G technology a user can get better and fast solution.
- The remote diagnostics also a great feature of 5G technology.
- The 5G technology is providing up to 25 Mbps connectivity speed.
- The 5G technology also support virtual private network.
- The new 5G technology will take all delivery service out of business prospect
- The uploading and downloading speed of 5G technology touching the peak.
- The 5G technology network offering enhanced and available connectivity just about the world

IV 5G TECHNOLOGY PROMISES FASTER CONNECTIONS, LOWER LATENCY

5G technology is the next generation of wireless communications. It is expected to provide Internet connections that are least 40 times faster than 4G LTE. 5G technology may use a variety of spectrum bands, including millimeter wave (mm Wave) radio spectrum, which can carry very large amounts of data a short distance. The drawback of the higher frequencies is that they are more easily obstructed by the walls of buildings, trees and other foliage, and even inclement weather.

The 5G Technology That Will Make Everything Happen

As the 5G technology market comes into focus, we're seeing a number of technologies emerge as vital to the 5G experience. These include the aforementioned mm Wave technology; small cells; massive multiple input, multiple output (MIMO); full duplex; software defined networking (SDN); and beam forming.

A. *Millimeter wave:* Millimeter waves are broadcast at frequencies between 30 GHz and 300 GHz, compared with the bands below 6 GHz used for 4G LTE. The new 5G networks will be able to transmit very large amounts of data—but only a few blocks at a time. Although the 5G standards will offer the greatest benefits over these higher frequencies, it will also work in low frequencies as well as unlicensed frequencies that Wi-Fi currently uses, without creating conflicts with existing Wi-Fi networks. For this reason, 5G networks will use small cells to complement traditional cellular towers.
B. *Small cells:* Small cells are low-powered portable base stations that can be placed throughout cities. Carriers can install many small cells to form a dense, multifaceted infrastructure. Small cells' low-profile antennas make them unobtrusive, but their sheer numbers make them difficult to set up in rural areas. As 5G technology matures, consumers should expect to see ubiquitous 5G antennas, even in their own homes.
C. *Massive MIMO:* 5G technology enables base stations to support many more antennas than 4G base stations. With MIMO, both the source (transmitter) and the destination (receiver) have multiple antennas, thus maximizing efficiency and speed. MIMO also introduces interference potential, leading to the necessity of beam forming.
D. *Beam forming:* Beam forming is a 5G technology that finds the most efficient data-delivery route to individual users. Higher-frequency antennas enable the steering of narrower transmission beams. This user-specific beam forming allows transmissions both vertically and horizontally. Beam direction can change several times per millisecond. Beam forming can help massive MIMO arrays make more efficient use of the spectrum around them.
E. *Full duplex:* Full duplex communication is a way to potentially double the speed of wireless communication. By employing a 5G full duplex scheme on a single channel, only one channel is needed to transmit data to and from the base station, rather than two. A potential drawback of full duplex is that it can create signal interference.
F. *SDN***:** SDN and network functions virtualization (NFV) are considered the foundation for how 5G will be deployed.

V. CONCLUSION

In this paper, a detailed survey has been done on the performance requirements of 5G wireless cellular communication systems that have been defined in terms of capacity, data rate, spectral efficiency, latency, energy efficiency, and Quality of service.5G wireless network architecture has been explained in this paper with massive MIMO technology, network function virtualization (NFV) cloud and device to device communication. Certain short range communication technologies, like Wi-Fi, Small cell, Visible light communication, and millimeter wave communication technologies, has been explained, which provides a promising future in terms of better quality and increased data rate for inside users and at the equivalent time reduces the pressure from the outside base stations. Some key emerging technologies have also been discussed that can be used in 5G wireless systems to fulfill the probable performance desires, like massive MIMO and Device to Device communication in particular and interference management, spectrum sharing with cognitive radio, ultra dense networks, multi radio access technology, full duplex radios, millimeter wave communication and Cloud Technologies in general with radio access networks and software defined networks. This paper may be giving a good platform to motivate the researchers for better outcome of different types of problems in next generation networks.

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An Introduction to Honeypot Technology

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Abstract - Information security is a rising concern today in this era of the internet. Honeypot is a network-attached system set up as a decoy to lure cyber attackers and to detect, deflect or study hacking attempts in order to gain unauthorized access to information systems .The challenge here is not only to be able to actively monitor large numbers of systems, but also to be able to react quickly to different events. A well designed and developed Honeypot provides data to the research community to study issues in network security. In this paper we present a detailed overview on Honeypot technology. We examine different Types of Honeypots, honeypot concepts and approaches in order to determine how we can intend measures to enhance security using these technologies.

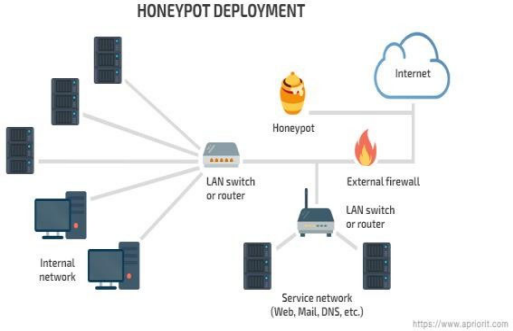
Keywords: Network security, deception, intrusion, hacking, Virus

I. 1.INTRODUCTION

In the last ten years, internet users have been attacked unremittingly by widespread email viruses and internet scanning worms. This is probably not because the internet is more secured but because attackers no longer focus on infecting a large number of computers just to attract media attention, instead their attention has shifted to compromising and controlling the victim. The Honeypot technology is an attempt to conquer these shortcomings of the intrusion detection systems. HoneyPots are fake computer Systems which appears vulnerable to attack though it actually prevents access to valuable sensitive data and administrative controls. A Honeypot is a decoy, put out on a network to attract attackers. They are designed as the emulation of the real machines, creating the appearance of running full services and applications, with open ports that might be found on a typical system or server on a network. This way honeypot mimics the real system, creates confusion for attackers and monitors the intruder without risk to production servers or data. Honeypot technology is not to replace the traditional security mechanisms and defense technologies, but it's supporting and complementary. This technology proactively detects and responds to network intrusion and attacks.

II. BACKGROUND

The idea of honeypots began in 1991 with two publications, "The Cuckoos Egg" and "An Evening with Breferd". "The Cuckoos Egg" by Clifford Stoll was about his experience of catching a computer hacker who was in his corporation searching for secrets. The other, "An Evening with Berferd" by Bill Cheswick is about a computer hacker's moves through traps that he and his colleagues used to catch him. Both of these writings were the beginnings of what became honeypots. The first type of honeypot was released in 1997 called the Deceptive Toolkit. The point of this kit was to use deception to attack back. In 1998 the first commercial honeypot came out. This was called Cybercop Sting. In 2002 the honeyp



III.TECHNOLOGY

Honeypots are generally based on a real server, real operating system, along with data that looks like real but not actual. Honeypot looks like a host provided important service, so it has more attraction to hacker, through its attraction to hackers and being attacked, the related information of the attackers such as the IP address, motives of the attackers entering the system and attack behavior of the attacker will be collected, which is done generally through the implementation of the background software, which monitors and records the network communication data between the attackers and honeypot host, and uses some analytical tools to interpret and analyze these data. Data capture is a difficult section to any honeypot which has the ability to capture everything the attacker is doing. It can also capture the packets and packet payloads involved in the attack. This information can prove important in analyzing the attacker's activities.

Honeypot system has generally three modules which are induced, deceive and analysis.

- *Induced:*
  The induced module is used to attract the attackers to attack on the Honeypot system.
- *Deceived***:**
  The deceived module calls the simulation information from the database for the deceived

host to generate false information which will be sent to the attackers.

- *Analysis*:
  All the induction and deception events of the system are recorded in the remote log server, and analysed by the analysis module for adjusting the induction and deception strategy.

IV. CLASSIFICATION

Based on design and deployment, there are two main types of honeypots. They are:

- *Production Honeypot*:
  These are mainly used for detection and to protect organizations. They are usually deployed inside production networks. A production honeypot is designed to appear real and contain information which attracts the hackers to tie up their time and resources and giving administrators time to access and mitigate any vulnerabilities in their actual system.
- *Research Honeypot*:
  It is used to research and study about the techniques and tactics of the attackers. It is used to know how an attacker works while compromising a system.

Honeypots are also classified as high interaction honeypots and low interaction honeypots:

- *High interaction honeypots:* High level interaction honeypots are the most sophisticated honeypots. They are difficult to design and implement. They are very time consuming and have high risks involved because they involve the real operating system. In these honeypots nothing is restricted or simulated. Some of the examples of honeypots of this kind are Sidecars. The level of risk is increased by many extents because they use the real operating system but in order to capture large amount of information by allowing a hacker to interact with the operating system, it is a kind of trade off.

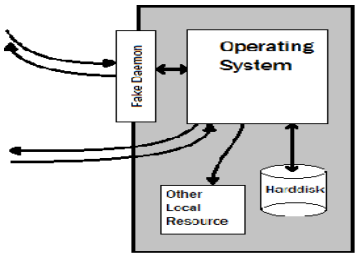


Figure 1. High Interaction Honeypot

- *Low interaction honeypots*: A low level interaction honeypot typically provides only certain fake services like ftp, http, sash etc. In a basic form these services can be implemented by having a listener on a specific port. They play the role of passive IDs where the network traffic is not modified. The well-known example is Honeyed. It is a daemon and an open source tool. It is used to simulate large network on a single host. In low interaction honeypots, real operating systems are not involved and hence risk is minimized significantly because the complexity of an operating system is eliminated. This is also a disadvantage. As real OS is not involved, we cannot watch an attacker interacting with OS which could be really interesting. It is only a one-way connection.

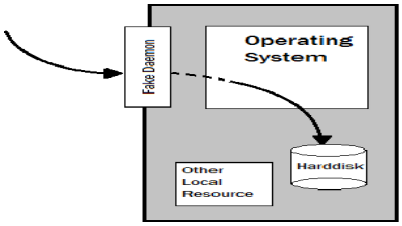


FIGURE 2: LOW INTERACTION HONEYPOTS

V. ADVANTAGES AND DISADVANTAGES

- *Advantages:*

1. Collect real data: Honeypots only collect small amounts of data but all the data collected is of hackers, malicious activities and unauthorized activities providing analysts with a rich source of useful information.

2. Small data sets: Honeypots collect data only when someone or something is interacting with them. Organizations that log Thousands of alerts a day with traditional technologies will only log a few hundred alerts with honeypots. This makes the data they collect of much higher value, easier to manage and simpler to analyze.

3. Reduce false positives: One of the greatest challenges with most detection technologies is the generation of false positives and false alerts. The larger the probability that a security technology produces a false positive the less likely the technologies will be deployed. They dramatically reduce false positives. Any activity with these is by definition unauthorized, making it extremely efficient at detecting attacks.

4. Catching false negatives: Failure in detecting unknown attacks is another challenge of traditional technologies. This causes a critical difference between honeypots and traditional computer security techniques which depend upon only known signatures or statistical detection. The definition of signature-based security technologies implies that “someone is going to be hurt” before the attack is discovered. This type of statistical detection also suffers

from probabilistic failures. On the other hand, honeypots can easily identify new attacks and capture them.

5. Cost effective: They can be good investments because honeypots just interact with malicious activities and does not require high performance resources to process large volumes of network traffic looking for attacks.

6. Encryption: If the activity detected is a malicious activity, then it does not matter if an attacker uses encryption or not. It can be still captured by the honeypots.
This becomes a major issue because more organizations adopt encryption within their environments. Honeypots can do this because the encrypted attacks interact honeypot as a terminal point where the honeypot decrypts the activity.

- *Disadvantages:*

1. *Data:* If the honeypots are not accessed by the attackers, no data can be analyzed. It is because honeypots can collect information only when an attack occurs.

2. *Honeypot network:* All the malicious activities can be captured only when the attackers target theses networks. If the attackers suspect the network, they will not target it and we cannot capture them.

3. *Distinguishable:* Experienced hackers can easily differ between a production system and a honeypot system using system finger printing technologies.

4. *Risk:* Honeypots can introduce risk to our environments which means that a honeypot once attacked can be used to attack or harm other systems or organizations.

VI. ISSUES

- *Security Issues:*

Honeypots don't provide security (i.e. they are not a securing tool) for an organization but if implemented and used correctly they enhance existing security policies and techniques. Honeypots can be said to generate a certain degree of security risk and it is the administrator's responsibility to deal with it. The level of security risk depends on their implementation and deployment. There are two views of how honeypot systems should handle its security risks.

1. *Honeypots that fake or simulate:* There are honeypot tools that simulate or fake services or even fake vulnerabilities. They deceive any attacker to think they are accessing one particular system or service. A properly designed tool can be helpful in gathering more information about a variety of servers and systems. Such systems are easier to deploy and can be used as alerting systems and are less likely to be used for further illegal activities.
2. *Honeypots that are real systems:* This is a viewpoint that states that honeypots should not be anything different from actual systems since the main idea is to secure the systems that are in use. These honeypots don't fake or simulate anything and are implemented using actual systems and servers that are in use in the real world. Such honeypots reduce the chances of the hacker knowing that he is on a honeypot. These honeypots have a high-risk factor and cannot be deployed everywhere.

- *Legal Issues:*

1. *Entrapment:* It means that a criminal is included to do something he was not otherwise supposed to do. Honeypots should be generally used as a defensive detective tool, not an offensive approach to luring intruders.
2. *Privacy:* The second major concern is the information being tracked: operational and transactional data. Operational data contains things like user address, header information net while transactional data includes key strokes, pages visited, information downloaded, chat records, emails etc. Operational data is safe to track without the fear of security concern because IDS system routers and firewalls already track it.

VII. CONCLUSION

Honeypot is not a solution or replacement to network security but a good tool that supplements other security technology to form an alternative active defense system for network security. They are positioned to become a key tool to defend the corporate enterprise from hacker attack; it is a way to spy your enemy. Hackers could be fooled into thinking that they have accessed a corporate network while they have actually accessed a honeypot and hence the real network remains safe. The advantage that they bring to intrusion protection strategies are hard to ignore. In time, as security managers understand the benefits, honeypots will become an essential ingredient in an enterprise level security operation. Although they have legal issues, they do provide beneficial information regarding the security of a network.

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Blue Brain

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Abstract – The human brain is the worthiest creation of God which led to an intelligent mankind. The world's first virtual brain is named as the "Blue Brain" which means that a machine can work like a human brain. Since many years, researchers have been seeking to develop an artificial brain which mimics the human brain with the objective to give machines the capability of human brain for enabling humans to make much more efficient decisions. Now the world is advancing at a rapid pace and it is very important for mankind to preserve the precious history and intelligence for the future. Virtual brain is the solution for preserving the history and wisdom of mankind from ages of experience.

I. INTRODUCTION

Raymond Kurzweil recently furnished a paper on this in which he explains both the invasive and non-invasive techniques. The most assuring technique is the use of tiny robots or nanobots as they are small enough to travel the human circulatory system. By moving into the spine and brain the robots will be able to monitor the activities of the central nervous system. The required thing is the computer with huge storage space and processing power.

Functioning of a Brain

The nervous system is one of the complicatedly organized electron mechanisms and it is like a miracle because we cannot see it but it is working via electric pulses in our body. Even the engineers are not able to make the circuit boards and devices as accurate as the nervous system. The three simple functions of the brain are:

- Sensory input
- Integration
- Motor input

Sensory input: When you keep the things into your brain through senses or from your surrounding environment called as sensory input. For example, if you see anything, touch a warm surface or cold surface then the information or data or message is passed to your brain through your sensory cells also called as neurons.

Integration: Integration is nothing but the interpretation or explanation of all the things that we feel, taste with our sensory cells the so-called neurons into the output that the body recognizes. This process is carried out in the brain where many neurons take part for understanding the current situation environment.

Motor Output: If once our brain has the explanation of all the things that we learned through our sense then it sends a direct message through the neurons to the effector cells, muscle cells or gland cells which work to respond to a request and act upon the environment. The example of this is our hearing, smelling ability.

II. VIRTUAL BRAIN

Blue Brain is the world's first virtual brain. It can think, take decisions and store anything in memory, just as the human brain does.

Blue Brain project is the first comprehensive attempt at reverse engineering the brain of a mammalian, so that through detailed simulations, functions of the brain can be understood. One of the main advantages of the project is brain uploading-even after a person dies, his knowledge will not be lost. Blue Brain can function exactly the same way as a human brain.

This project is also used to understand various brain diseases. The development of this project allows scientists to understand the human brain in more detail. Blue Brain project was founded by prof.Henry Markram from Brain and Mind Institute at EPFL(Ecole Polytechnique Federate de Lausanne) in collaboration with IBM. The simulation does not consist simply of an artificial neural network but involves a biologically-realistic model of neurons. It is expected to shed light on the nature of consciousness. This operation requires a powerful supercomputer. Blue Gene is a supercomputer developed by IBM to handle such situations, hence the name Blue Brain. It could be argued that artificial intelligence, robotics and even the most advanced computational neuroscience approaches that have been used to model brain functions are merely if-then-like conditions in various forms.

III. WORKING OF VIRTUAL BRAIN

In the continuing effort to understand the human brain, the mysteries keep piling up. Consider what scientists are up against. Stretched flat, the human neocortex -- the center of our higher mental functions -- is about the size and thickness of a formal dinner napkin. With 100 billion cells, each with 1,000 to 10,000 synapses, the neocortex makes roughly 100 trillion connections and contains 300 million feet of wiring packed with other tissue into a one-and-a-half-quart volume in the brain. These cells are arranged in six very similar layers, inviting confusion.

Within these layers, different regions carry out vision, hearing, touch, the sense of balance, movement, emotional responses and every other feat of cognition. More mysterious yet, there are 10 times as many feedback connections -- from the neocortex to lower levels of the brain -- as there are feed-forward or bottom-up connections. Added to these mysteries is the lack of a good framework for understanding the brain's connectivity and electrochemistry. Researchers do not know how the six-layered cortical sheet gives rise to the sense of self. They have not been able to disentangle the role of genes and experience in shaping brains.

They do not know how the firing of billions of loosely coupled neurons gives rise to coordinated, goal-directed behaviour.

IV. UPLOADING HUMAN BRAIN

The uploading is possible by the use of small robots known as the Nanobots. These robots are small enough to travel throughout our circulatory system. Traveling into the spine and brain, they will be able to monitor the activity and structure of our central nervous system. They will be able to provide an interface with computers that is as close as our mind can be while we still reside in our biological form. Nanobots could also carefully scan the structure of our brain, providing a complete readout of the connections. This information, when entered into a computer, could then continue to function as us. Thus, the data stored in the entire brain will be uploaded into the computer.

IBM, in partnership with scientists at Switzerland's Ecole Polytechnique Federalede Lausanne's(EPFL)Brain and Mind Institute will begin simulating the brain's biological systems and output the data as a working 3D model that will recreate the high-speed electro-chemical interactions that take place within the brain's interior. These include cognitive functions such as language, leaning, perception and memory in addition to brain malfunction such as psychiatric disorders like depression and autism. From there, the modelling will expand to other regions of the brain and, if successful, shed light on the relationships between genetic, molecular and cognitive functions of the brain. The model brain can accurately echo the song of a South American sparrow. The bird sing by forcing air from their lungs past folds of tissue in the voice box. The electric impulses from the brain that force the lungs had been recorded and when the equivalent impulses were passed to the computer model of the lungs of the bird it begins to sing like the bird.

V. BLUE BRAIN TECHNOLOGY

It is a technology to create a virtual brain that functions similar to a human brain. Currently, IBM is doing a research in this technology. The idea is to reverse engineer the human brain. To recreate it at the cellular level inside a computer simulation using blue gene computer. The design of Blue Gene/P is a technology evolution from Blue Gene/L. Each Blue Gene/P Compute chip contains four PowerPC 450 processor cores, running at 850 MHz

Blue Brain Technology: The Brain Works in up to Eleven-Dimensional Structures

Scientists have discovered that the neurons of the brain connect with each other in very specific geometries, building up to eleven-dimensional structures or cliques.
In 2005, the scientists at Brain Mind Institute at the Ecole Polytechnique Fédérale de Lausanne (EPFL), in Switzerland began what was called the Blue Brain Project to create a working computer simulation of the human brain by starting with an initial simulation of the neocortical column of a rat's brain. This heterogenous structure with its 10,000 neurons and 30 million synaptic connections is the most complex area of the mammalian brain. The virtual neuronal circuits were tested by simulating specific input stimuli and seeing howthe circuits behaved when compared with those in biological experiments. After a process of intensive and continual testing and refining, the simulation reached the point in 2015, where the team was confident that their virtual neocortex behaves like a physical neocortical column.

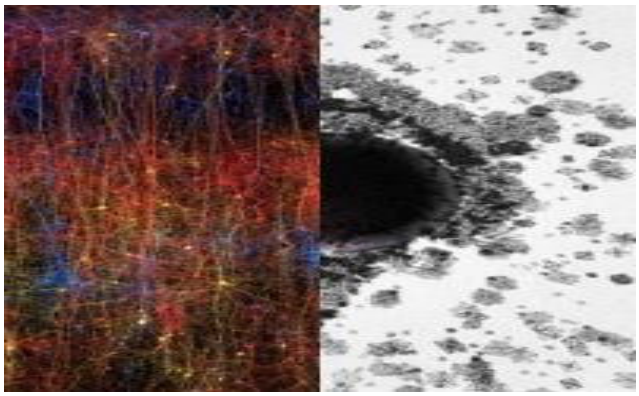
They hope to complete the project of reverse-engineering the entire brain within ten years. Their ground-breaking research used algebraic topology (a sub field of the study of the global properties of spaces that converts topological problems into algebraic problems) for the first time in neuroscience. Through it, they have been able to reconstruct the hidden, constantly changing structures and spaces of the brain's networks. The team described it as being like a telescope and microscope at the same time – like being able to zoom into and study the trees in a forest (structure) and the clearings (empty spaces) between them at the same time. In theirstudy, published in the journal Frontiers in Computational Neuroscience, they have discovered the formation of "multi-dimensional geometric structures and spaces within the networks of the brain".

The complex mathematics showed that while the cells of other organs work in three dimensions – i.e. the three spatial dimensions and one of time – those in the brain work in different dimensions, generally seven but up to eleven, "creating multiverse-like structures that are a world we never imagined." Presented with a stimulus, a set of neurons connect in a specific way to form a clique, which is generally four dimensional. The cliques then connect in ever-increasingly complex geometric structures, up to eleven dimensions, with higher dimensional cavities that appear to be vital to the processing of information, being created within these formations. It thus appears that the brain processes information in an extremely organized and intricate manner as these complex structures are rapidly created and then disappear. Ran Levi of the Blue Brain Project describes it: "as if the brain reacts to a stimulus by building then razing a tower of multi-dimensional blocks, starting with rods (1D), then planks (2D), then cubes (3D) and then more complex geometries with 4D, 5D, and so on." The researchers are considering the possibility that the increasing complexity of the "sandcastles" thus formed may have something to do with the "intricacy of the outcomes", and they further speculate that the cavities formed may provide a clue as to how memories are stored. "They may be "hiding' in high-dimensional cavities," postulates Henry Markram, director of the project. They will also be looking at the involvement of the cliques and cavities in neuroplasticity, the brain's ability at any age,

and even after devastating injury or disease, to re-organize itself by forming new neural connections.

Merits

- Blue brain can cure Parkinson's disease due to loss of brain cells which is a neuro-degenerative disorder.
- This would lead to an evolution of super computers.
- Helps to preserve the knowledge and intelligence of human brain forever.
- Nerve stimulations can make deaf people to hear.



Blue Brain Power

- The human brain has 100 billion, nerve cells that enable us to adapt quickly to an immense array of stimuli.
- Blue brain is a technology that uses "Blue Gene" a supercomputer capable of processing 228 TFLOPS.
- The main aim of blue brain is to build a software replica or template which could reveal many existing aspects of the brain circuits, memory capacity, and how memories are lost.
- The modeling is also able to work out best way to compensate and repair error circuits.
- The blue brain model can be used to detect and test treatment strategies for neurological diseases.

'Blue Brain': An Artificial Brain Comes to Life in Switzerland

- The machine is beautiful as it wakes up – it means it works in a fine way when started. Nerve cells flicker on the screen, along with that electrical charges are produced.
- This piece of hardware consists of about 10,000 computer chips that act like real nerve cells.
- The simulation was created at the Technical University in Lausanne, Switzerland, where 35 researchers participate in maintaining this artificial brain.

Blue Brain Simulation using Microprocessor

The Blue Brain simulation uses one microprocessor for each of the 10,000 neurons in the cortical column of a rat's cerebral cortex. It helps to build a brain microcircuit, in order to scale it in human brain.

Benefits:

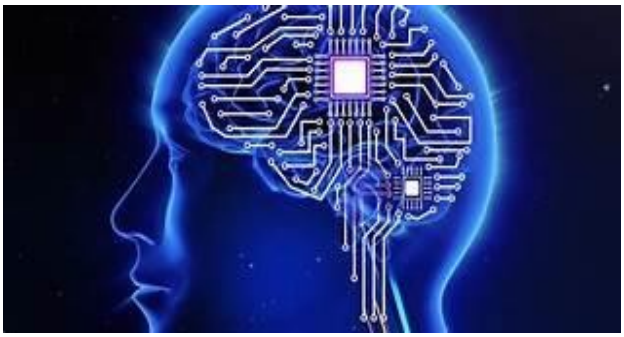
- It acts as a supercomputer and development in processing, speed and memory could simulate the human brain.
- The blue brain can remember the things with less effort.
- The intelligence of the person can be used even after the death of a body.
- The blue brain can make own decisions and permits the deaf to hear through direct nerve stimulation.
- Helps in gathering and testing 100 years of data

Advantages:

- The blue brain is an easy way to store and use human intelligence and data or information present in the mind even after the death of the body.
- It will be a vital step towards self-decision making of a device containing the blue brain.
- Its can-do all-important functions like an intelligent machine.
- It can avail as interference between human beings and animals. The blue brain program was implemented on rat and it was a success, provides a sign of success in future too.

Disadvantages:

- The human kind becomes dependent on machines.
- Another fear is about human cloning and regaining the memory back is an expensive procedure.
- A very costly procedure of regaining the memory back.
- Computer viruses will pose an increasingly critical threat.
- Others may use technical knowledge against us.



VI. BENEFITS OF BLUE BRAIN

- It acts as a supercomputer.
- Improvements in processing, speed and memory could make entire human brain simulated.
- Things could be remembered without any effort.
- Use the intelligence of the person after death.
- It can make decisions entirely of its own.
- Allowing the deaf to hear via direct nerve simulation.

VII. EXAMPLE OF BLUE BRAIN

- A very good example of utilisation of blue brain is the case "short term memory".
- In some movies we might have noticed that a person might be having short term memories.

- Another situation is that when a person gets older, then he starts forgetting or takes a bit more time to recognize to a person.
- For the above reason we need a blue brain. It is a simple chip that can be installed into the human brain for which the short-term memory and volatile memory at the old age can be avoided.

VIII. EXPERIMENTS ON BLUE BRAIN

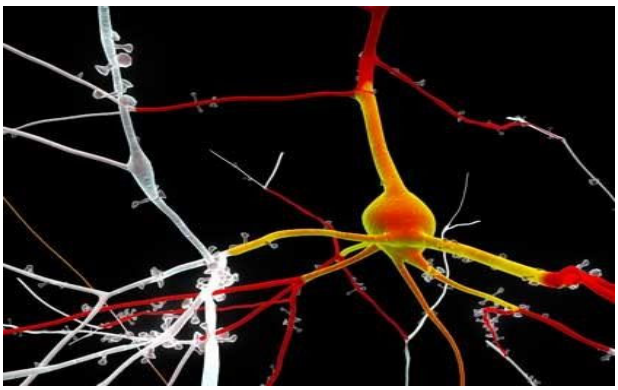
- Scientists rely on computer models to understand the toughest concepts in science.
- A computer model is being designed to take on the human brain.
- A generic template is build which allows us to reconstruct a brain according to any specifications.

IX. FLASHES OF ACTIVITY

Traveling into the spine and brain, they will be able to monitor the activity and structure of our central nervous system. Blue Brain started producing flashes of activity that scientists recognized from measurements of natural brain behaviour on its first day. “It happened entirely on its own”. It starts thinking of its own as how the original brain of a human thinks. It starts its own calculations when it is connected and work similar as human brain.

X. BLUE BRAIN SIMULATOR USING MICRO PROCESSOR

The Blue Brain simulation uses one microprocessor for each of the 10,000 neurons in the cortical column of a rat's cerebral cortex. It helps to build a brain microcircuit, in order to scale it in human brain.



XI. BLUE BRAIN POWER:

- The human brain has 100 billion’s, nerve cells that enable us to adapt quickly to an immense array of stimuli.
- Blue brain is a technology that uses “Blue Gene” a supercomputer capable of processing 228 TFLOPS.
- The main aim of blue brain is to build a software replica or template which could reveal many existing aspects of the brain circuits, memory capacity, and how memories are lost.
- A human brain consists of 100 billion nerve cells. A supercomputer simulating an organ using current technology - would produce a virtual human brain.

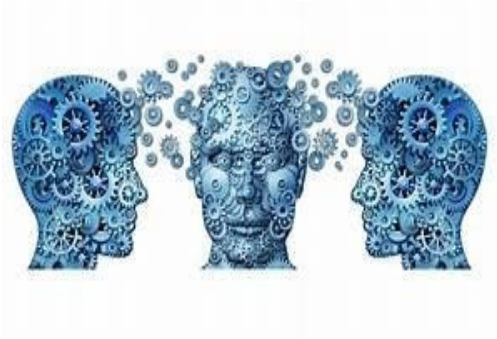


Fig. Riddle Of Consciousness

XII. CONCLUSION

Through the Blue Brain technology, we will be able to transfer ourselves into a computer at some point and eventually aim to apply terrific computer power to the simulation of an entire brain.

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E-Learning using Cloud Computing

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Abstract— Cloud computing is becoming an adoptable technology for many of the organizations with its dynamic scalability and usage of virtualized resources as a service through the Internet. Cloud computing is growing rapidly, with applications in almost any area, including education. Now a day, e-learning is also becoming very popular and powerful trend, which is also broad. E-learning systems usually require many hardware and software resources. This paper presents the benefits of using cloud computing for e-learning. There are many educational institutions that cannot afford such investments, and cloud computing is the best solution, especially in the universities where the use of computers is more intensive and what can be done to increase the benefits of common applications for students and teachers.

Keywords— Architecture, Cloud Computing, E-learning, Information Technology

I. INTRODUCTION

Education or Learning is an important component of life and No human beings are able to survive properly without education. Now a days, there are lots of paradigms for getting knowledge or learn something. One of the most promising paradigms for education is e-learning. E-learning is commonly referred to the intentional use of networked information and communications technology (ICT) in teaching and learning. Some other terms are also used to describe this mode of teaching and learning including online learning, virtual learning, distributed learning, network and web-based learning. The growth of e-learning is directly related to the increasing access to ICT, as well as its decreasing cost. The capacity of ICT to support multimedia resource-based learning and teaching is also relevant to the growing interest in e-learning. Poor or insufficient technology infrastructure can cause more damage than good to teachers, students and the learning experience.

As cloud computing has become a research hotspot among modern technologies, researchers pay more attentions to its applications. As concerned as cloud computing applied in the field of education, a lot of problems had been studied, such as the technology for future distance education cloud [1], teaching information system [2] [3] [4], the integration of teaching resources[5], teaching systems development[6].

Cloud Computing is a new paradigm that provides an appropriate pool of computing resources with its dynamic scalability and usage of virtualized resources as a service through the Internet. The resources can be network servers, applications, platforms, infrastructure segments and services. Cloud computing deliver services autonomously based on demand and provides sufficient network access, data resource environment and effectual flexibility. This technology is used for more efficient and cost-effective computing by centralizing storage, memory, computing capacity of PC's and servers. With the tremendous advantages of cloud computing, we expect this technology to revolutionize the field of e-learning education. Cloud computing applications provide flexibility for all educational universities, schools and institutions. The cloud platform in institutions' campuses provides effective infrastructure and deployment model for their dynamic demands. The benefits of cloud computing can support education institutions to resolve some of the common challenges such as cost reduction, quick and effective communication, security, privacy, flexibility and accessibility. "Cloud computing" is the next accepted action in the evolution of on-demand information technology services and products. Cloud computing allows to move the processing effort from the local devices to the data center facilities.

II. CLOUD COMPUTING

In recent years, cloud computing as a new kind of advanced technology accelerates the innovation for the computer industry. Cloud computing is a computing model based on networks, especially based on the Internet, whose task is to ensure that users can simply use the computing resources on demand and pay money according to their usage by a metering pattern similar to water and electricity consumption. Therefore, it brings a new business model, where the services it provides are becoming computing resources [12].

Cloud computing is highly scalable and creates virtualized resources that can be made available to users. Users do not require any special knowledge about the concept of Cloud computing to connect their computers to the server where applications have been installed and use them. Users can communicate through Internet with remote servers. These servers can exchange their computing slots themselves [13].Cloud computing is one of the new technology trends likely to have a significant impact on the teaching and learning environment [14].

In Cloud computing, resources can be either externally owned (public Cloud – as provided by Google and Amazon) or internally owned (private Cloud). Public Clouds offer access to external users who are typically billed on a pay-as-you-use basis. The private Cloud is built for the access within the enterprise where the users can utilize the facility without any charge [15]. The

methods of meeting challenges such as user interface; task distribution and coordination are explained and evaluated in [16]. Praveena and Betsy [17] have described the application of Cloud in universities. Delic and Riley [18] assessed the current state of enterprise knowledge management and how it would turn into a more global, dependable and efficient infrastructure with Cloud computing.

A. Private Cloud**:** The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g., business units). It may be owned, managed, and operated by the organization, a third party, or some combination of them, and it may exist on or off premises.

B. Public Cloud**:** Public cloud applications, storage, and other resources are made available to the general public by a service provider. These services are free or offered on a pay-per-use model. Generally, public cloud service providers like Amazon AWS, Microsoft and Google own and operate the infrastructure and offer access only via Internet (direct connectivity is not offered).

C. Community Cloud: Community cloud shares infrastructure between several organizations from a specific community with common concerns (security, compliance, jurisdiction, etc.), whether managed internally or by a third-party and hosted internally or externally. The costs are spread over fewer users than a public cloud (but more than a private cloud), so only some of the cost savings potential of cloud computing are realized**.**

D. Hybrid cloud: Hybrid cloud is a composition of two or more clouds (private, community or public) that remain unique entities but are bound together, offering the benefits of multiple deployment models.

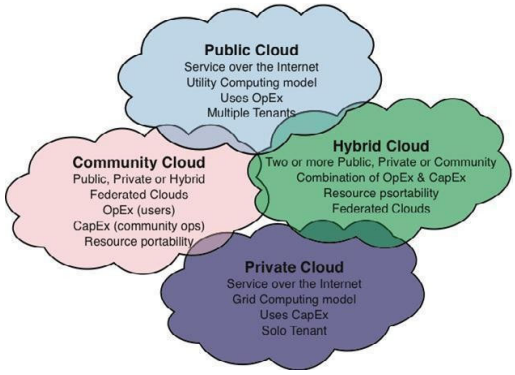

Fig.2: Cloud Model

III. E-LEARNING

E-learning includes all forms of electronically supported learning and teaching.

The information and communication systems, whether networked learning or not, serve as specific media to implement the learning process. This often involves both out-of-classroom and in-classroom educational experiences via technology, even as advances continue in regard to devices and curriculum. Abbreviations like CBT (Computer-Based Training), IBT (Internet-Based Training) or WBT (Web-Based Training) have been used as synonyms to e-learning.

E-learning is the computer and network-enabled transfer of skills and knowledge. E-learning applications and processes include Web-based learning, computer-based learning, virtual education opportunities and digital collaboration. Content is delivered via the Internet, audio or video tape, satellite TV, and CD-ROM. It can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio.

It is commonly thought that new technologies can make a big difference in education. In young ages especially, children can use the huge interactivity of new media, and develop their skills, knowledge, and perception of the world, under their parents' monitoring, of course. Many proponents of e-learning believe that everyone must be equipped with basic knowledge in technology, as well as use it as a medium to reach a particular goal. E-learning is widely used today on different educational levels: continuous education, company trainings, academic courses, etc. There are various e-learning solutions from open source to commercial. There are at least two entities involved in an e-learning system: the students and the trainers. Some benefits of e-learning are discussed below:

Time: One of the key benefits of online study is that one can learn or take a course through e-learning at any time as it is convenient for them. Podcasts and downloadable lectures mean that students are no longer constricted by a conventional timetable of lectures.

Location: Neither are students restricted by their physical location. With an Internet connection, they can attend live online tutorials, participate in dedicated discussion forums or download course material and notes regardless of where they are.

Communication: Another key advantage of online study is that it encourages and enables students to collaborate and communicate with their fellow students as well as their tutors.

Improved training and material costs**:** With e-learning, each time the course is accessed our return on investment improves because users are dividing the fixed production costs by number of uses. We also have savings through decreased travel, reduced material, and hopefully improved (and more efficient) performance.

Increased productivity: Because e-learning is not bound by geography or time, you can control training's impact on production by training people during down times. In addition, with the current economy, you're asking people to do more with less. So, e-learning is a great way to give them the tools and skills needed to enhance their performance.

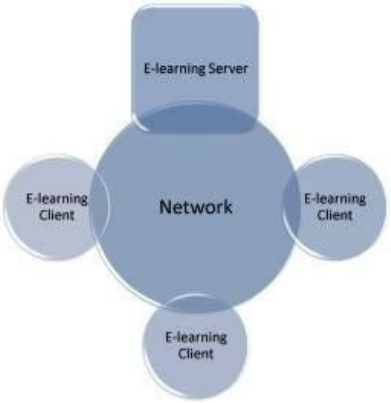

Figure 3— E-learning system

IV. BENEFITS OF USING CLOUD COMPUTING IN E-LEARNING

One of the most interesting applications of cloud computing is educational cloud. The educational cloud computing can focus the power of thousands of computers on one problem, allowing researchers search and find models and make discoveries faster than ever. The universities can also open their technology infrastructures to private, public sectors for research advancements. The efficiencies of cloud computing can help universities keep pace with ever-growing resource requirements and energy costs. Students expect their personal mobile devices to connect to campus services for education. Faculty members are asking for efficient access and flexibility when integrating technology into their classes. Researchers want instant access to high

Performance computing services, without them responsibility of managing a large server and storage farm. The role of cloud computing at university education should not be underestimated as it can provide important gains in offering direct access to a wide range of different academic resources, research applications and educational tools.

Usually, E-learning systems are developed as distributed applications, but not limited to. The architecture of an e-learning system, developed as a distributed application, includes a client application, an application server and a database server beside the hardware to support it (client computer, communication infrastructure and servers).

There are numerous advantages when the e-learning is implemented with the cloud computing technology, they are:

A. Low cost: E-Learning users need not have high end configured computers to run the e-learning applications. They can run the applications from cloud through their PC, mobile phones, tablet PC having minimum configuration with internet connectivity. Since the data is created and accessed in the cloud, the user need not spend more money for large memory for data storage in local machines.

Organizations also need to pay per use, so it's cheaper and need to pay only for the space they need.

B. Improved performance: Since the cloud-based e-learning applications have most of the applications and processes in cloud, client machines do not create problems on performance when they are working.

C. Instant software updates: Since the cloud-based application for e-learning runs with the cloud power, the software's are automatically updated in cloud source. So, always e-learners get updates instantly.

D. Improved document format compatibility*:* Since some file formats and fonts do not open properly in some PCs/mobile phones, the cloud powered e-learning applications do not have to worry about those kinds of problems. As the cloud-based e-learning applications open the file from cloud.

E. Benefits for students*:* Students get more advantages through cloud-based e-learning. They can take online courses, attend the online exams, get feedback about the courses from instructors, and send their projects and assignments through online to their teachers.

F. Benefits for teachers: Teachers also get numerous benefits over cloud-based e-learning. Teachers are able to prepare online tests for students, deal and create better content resources for students through content management, assess the tests, homework, projects taken by students, send the feedback and communicate with students through online forums.

G. Data security: A very big concern is related to the data security because both the software and the data are located on remote servers that can crash or disappear without any additional warnings. Even if it seems not very reasonable, the cloud computing provides some major security benefits for individuals and companies that are using/developing e-learning solutions.

V. CONCLUSION

Cloud computing as an exciting development is a significant alternative today's educational perspective. Students and administrative personnel have the opportunity to quickly and economically access various application platforms and resources through the web pages on-demand. This automatically reduces the cost of organizational expenses and offers more powerful functional capabilities. There will be an online survey to collect the required data for the use of cloud computing in the universities and other governmental or private institutions in the region. This will help us review the current status and probable considerations to adopt the cloud technology. Beginning with the outsourcing of email service seems attractive gradually removal of software license costs, hardware costs and maintenance costs respectively provides great flexibility to the university/corporate management. In this paper we discuss a cloud computing based e-learning. Describe its definition and some benefits. Cloud based education will help the students, staff, Trainers, Institutions and also the learners to a very high extent and mainly students from rural parts of the world will get an opportunity to get the knowledge shared by the professor on other part of the world. Even governments can take initiatives to

implement this system in schools and colleges in future and we believe that this will happen soon.

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ELECTRICAL & ELECTRONICS ENGINEERING

DEPARTMENT ARTICLES

ENGINEERS DAY - 2019

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DC MICRO GRID SYSTEM

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***Abstract*— The use of energy has become a topic of concern, the demand of people for power grows in number of quantity with the development of economy.it is necessary to consider using new forms of power supply micro grid system for distributed power supply. The power supply mode cannot only effectively solve the problem of excessive line loss in large power grid, but also increases the reliability of the power supply, and is economical and environmental friendly .with the increasing of the DC loads, order to improve the utilization efficiency, the DC micro power grid supply problems are began to be researched and integrated with the renewable energy source.**

I. INTRODUCTION

A DC micro grid maintains a DC bus, which feeds DC loads connected to it. Normally, DC loads are low power rating electronic devices such as laptops, cell phones, wireless phones, DVD players, vacuum cleaners etc. In DC micro grid structure, sources with DC output are connected to DC bus directly, whereas sources with AC output are interfaced to DC bus through AC/DC converter. In Addition to the problem of harmonics due to power electronic converter is not present due to DC nature of output power.

A micro grid is a localized group of electricity sources and loads that normally operates connected to and synchronous with the traditional wide area synchronous grid (macro grid) but can also disconnect to" island mode"-which functions autonomously as physical or economical conditions dictate . In this way, a micro grid can effectively integrate various sources of distributed generation (DG), Especially renewable energy sources (RES). As the number of DC generating renewable energy sources is higher as compared to AC generating sources lesser converter units are required. This increases the overall efficiency of DC micro grid

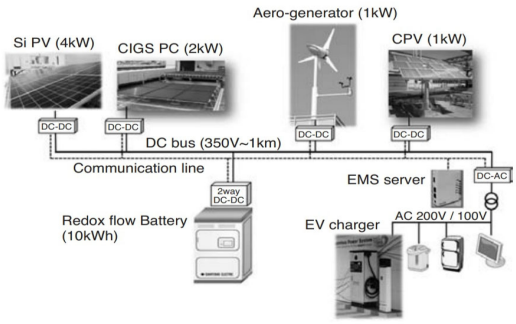
II. PURPOSE AND ARCHITECTURE OF THE DC MICRO GRID SYSTEM

Following three terms are briefly summarized purposes of DC micro grid system

1) Increase the introduction of distributed PV units.
2) Reduce energy dissipation and facility costs resulting from AC/DC conversion by integrating the junction between a commercial grid and DC bus which connects PV units and accumulators.
3) Supply power to loads via regular distribution lines (not exclusive lines for emergency) even during the blackout of commercial grids.

The DC micro grid utilizes a DC bus as its backbone and distributes power to a community that consists of several dozens or a hundred of households in a residential area.

All the PV units in the community are linked with the DC bus through DC/DC converters. These converters always track the maximum power point of the DC power sources which fluctuates depending on the intensity of solar radiation.



DC micro grid modeling consists of diesel generator, DC load, photovoltaic (PV) generation system, and MAIN/SUB ESS.

A. PHOTOVOLTAIC:

The model is represented using perturb and observe method, one of the maximum power point tracking(MPPT) methods, to maximize the power output from the PV module. A risk of voltage problems exist due to the power imbalance in the micro grid generation power of the PV system is larger than the power consumption and the state of charge (SOC) of all ESS is 80% or more.

B. DIESEL GENERATOR:

The diesel generator is composed of a synchronizer. The controller consists of an exciter for adjusting the output voltage and a governor for adjusting the active power output.

C. AC/DC CONVERTERS:

AC/DC converters that convert the AC voltage supplied from the diesel generator to a DC voltage. The two level pulse width modulation AC/DC converters are modeled as a power conversion device. We control the rated output to maximize the efficiency of the diesel generator.

D. ESS:

ESS modeling is composed of a capacitor, voltage source, and insulated gate bipolar transistor (IGBT). The ESS has a structure of interleaved DC-DC buck boost converter, which operates in charge and discharge modes by switching six IGBT devices. The ESS control method uses voltage and output control methods. In case of MAIN ESS, voltage control is performed to maintain a constant voltage of the DC micro grid.

III. OPERATION OF DC MICRO GRID

DC micro grid can be divided into 12 modes. In the operation of DC micro grid, we establish an algorithm based on the connection of MAIN ESS, power consumption of load, amount of power generation of distributed generator, and SOC of MAIN/SUB ESS. The algorithm determines the amount of charge/discharge of each component, control method, and output reference of the diesel generator according to the determined result. The operation mode in the modeled DC micro grid is largely divided into voltages and output control of ESS for DC bus voltage maintenance and power supply. The DC based distribution systems reduces facility costs. The power sources and loads are closely located to each other in a community. The excess and deficiency of power are variable factors which should be compensated for a good balance between supply and demand. The compensated system, which consists of storage battery and a bidirectional power converter .Long term fluctuations are smoothed by the battery system

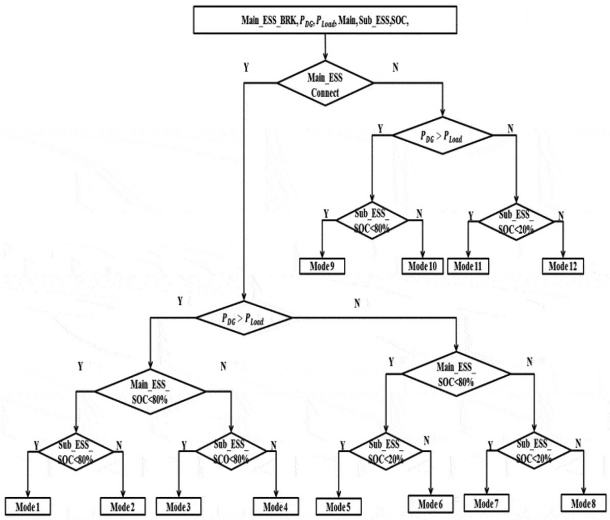


FIG: proposed operation algorithm of DC micro grid.

IV. APPLICATIONS

1) High efficiency household

2) Renewable energy parks

3) Hybrid energy system

4) Electric vehicle fast charging station.

V. ADVANTAGES

DC micro grids have major advantages over AC micro grid.

1) Higher efficiency

2) High reliability

3) Higher stability

4) Reduced size, weight

VI. DISADVANTAGES

Higher initial cost due, in part, to unfamiliarity of the system as well as a general lack of code recognition and efficiency metric recognition leading to the difficult certification and code compliance.

CONCLUSION

The hierarchical control of the DC micro grid aims at managing the balance of the instantaneous power in the micro grid on the basis of energy cost optimization with constraints such as storage limits, public grid power limitations, and energy tariffs, which are variable in time. To summarize, the feasibility of the proposed DC micro grid supervisory control structure, which combines grid interaction and energy management with power balancing, is proved by simulation results. Although micro grid refers only to the building scale and involves only a few sources, the idea of parameterized power balancing and interfacing with optimization, as well as smart grid interaction; thus it can be used as a solution for advanced energy management for other micro grids to optimize local power flow and improve future PV generation.

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Artificial Intelligence In Power Systems

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***Abstract*—the field of artificial intelligence (AI) has shown an upward trend of growth in the 21st century (from 2000 to 2015). The evolution in AI has advanced the development of human society in our own time, with dramatic revolutions shaped by both theories and techniques. Developing an intelligent power and energy system is becoming more and more urgent to promote the power production and consumption revolution and construct a clean, low-carbon, safe, and efficient energy system. Currently, artificial intelligence, as a newly developed scientific technology used to imitate, stretch, and extend the theory, method, technology, and application of human intelligence, is providing a great support for promoting the intelligence revolution of power and energy system.**

Keywords—artificial intelligence, power system

I. INTRODUCTION.

For industrial development with power system expansion; stability, strengthening, reliability, technical advancements, selection and dynamic response of the power system are essential. With the growth of the power system, complexity in the networks is increased tremendously. As a consequence of this power system analysis by conventional techniques and conclusions from the acquired data, the process for the information, management of remote devices and utility became more complicated and time-consuming.

As necessity is the mother of invention, AI is developed with the help of sophisticated computer tools and applied to resolve all aforesaid problems for large power systems.

By using conventional sources we have already developed the systems and collected the big data. Presently with Artificial Intelligence (AI), many constraints can be handled easily such as economic load dispatch, load forecasting, optimization of generation and scheduling, transmission capacity and optimal power flow, real and reactive power limits of generators, bus voltages and transformer taps, load demand in interconnected large power system and their protections etc.

II. NEED OF AI IN POWER SYSTEM

The modern power system operates close to the limits due to the ever increasing energy consumption and the extension of currently existing electrical transmission networks and lines. This situation requires a less conservative power system operation and control operation which is possible only by continuously checking the system states in a much more detail manner than it was necessary. Sophisticated computer tools are now the primary tools in solving the difficult problems that arise in the areas of power system planning, operation, diagnosis and design. Among these computer tools, Artificial Intelligence has grown predominantly in recent years and has been applied to various areas of power systems.

figure1: AI in collaboration with power systems

A. AI TECHNIQUES

Modern AI technologies include the following techniques:

- Artificial Neural Networks (ANNs)
- Expert System Techniques (XPS)
- Fuzzy Logic systems (FL)
- Genetic algorithm (GA)

These are the major families of AI techniques which are considered in the field of modern power system.

III. ARTIFICIAL NEURAL NETWORKS

Artificial Neural Networks are biologically inspired systems which convert a set of inputs into a set of outputs by a network of neurons, where each neuron produces one output as a function of inputs. A fundamental neuron can be considered as a processor which makes a simple non linear operation of its inputs producing a single output. The understanding of the working of neurons and the pattern of their interconnection can be used to construct computers for solving real world problems of classification of patterns and pattern recognition.

They are classified by their architecture: number of layers and topology: connectivity pattern, feed forward or recurrent.

Input Layer: The nodes are input units which do not process the data and information but distribute this data and information to other units.

Hidden Layers: The nodes are hidden units that are not directly evident and visible. They provide the networks the ability to map or classify the nonlinear problems.

Output Layer: The nodes are output units, which encode possible values to be allocated to the case under consideration.

A. ARTIFICIAL NEURAL NETWORK CHARACTERISTICS

ANNs are fast and robust and do not need any appropriate knowledge of the system model. Since they are fault tolerant, they can handle situations of incomplete or corrupt data and information. They have learning and data adaptation ability. On the other hand, ANNs cannot perform a task other than the one for which they are trained. For any other task, they have to be retrained. ANNs always generate the result although the inputs data is unreasonable.

B. APPLICATIONS OF ANN

ANNs can be particularly useful for problems which require quick results, like those in real time operation. ANN techniques can be applied to power system protection

C. METHODOLOGY

Real world problems in generation, transmission, and distribution of electricity can be fed to the ANNs to obtain a solution.

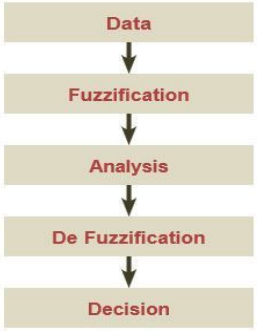

Figure 2: systematic flow of ANN method

IV. FUZZY LOGIC

Fuzzy logic or Fuzzy systems are logical systems for standardisation and formalisation of approximate reasoning. It is similar to human decision making with an ability to produce exact and accurate solutions from certain or even approximate information and data. The reasoning in fuzzy logic is similar to human reasoning. Fuzzy logic is the way like which human brain works, and we can use this technology in machines so that they can perform somewhat like humans. Fuzzification provides superior expressive power, higher generality and an improved capability to model complex problems at low or moderate solution cost. Fuzzy logic allows a particular level of ambiguity throughout an analysis. Because this ambiguity can specify available information and minimise problem complexity, fuzzy logic is useful in many applications. For power systems, fuzzy logic is suitable for applications in many areas where the available information involves uncertainty. For example, a problem might involve logical reasoning, but can be applied to numerical, other than symbolic inputs and outputs. Fuzzy logic provide the conversions from numerical to symbolic inputs, and back again for the outputs.

A. APPLICATIONS OF FUZZY LOGIC

Fuzzy logic has suitable applications in power system, like reactive power and voltage control, system stability analysis and control, fault analysis, security assessment, load forecasting, power system protection, etc. It can be used to increase the efficiency and for designing physical components of power systems from small circuits to large mainframes.

B. FUZZY LOGIC CONTROLLER

Simply put, it is a fuzzy code designed to control something, generally mechanical input. They can be in software or hardware mode and can be used in anything from small circuits to large mainframes. Adaptive fuzzy controllers learn to control complex process much similar to as we do.

C. EXPERT SYSTEM

An expert system obtains the knowledge of a human expert in a narrow specified domain into a machine implementable form. Expert systems are computer programs which have proficiency and competence in a particular field. This knowledge is generally stored separately from the program's procedural part and may be stored in one of the many forms, like rules, decision trees, models, and frames. They are also called as knowledge based systems or rule based systems. Expert systems use the interface mechanism and knowledge to solve problems which cannot be or difficult to be solved by human skill and intellect.

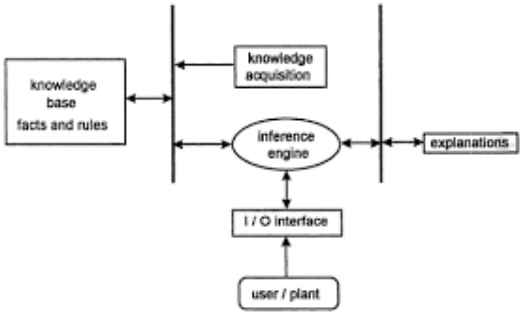

Figure 3: block diagram of ga

D. CHARACTERISTICS

Since expert systems are basically computer programs, it is based on the process of writing codes which is simpler than actually calculating and estimating the value of parameters. Therefore, any modifications even after design can be easily done. These systems are incapable of

accepting new problems or situations other than programmed.

E. APPLICATIONS

Expert systems are especially useful for problems when a large amount of data and information have to be processed in a short time. Many applications in power systems related to Power system designing and analysis match the abilities of expert systems.

F. METHODOLOGY

The methodologies of expert systems can be classified into the categories of rule-based systems, knowledge-based systems, neural networks, object-oriented methodology, case-based reasoning, system architecture, intelligent agent systems, database methodology, modelling, and ontology.

V. GENETIC ALGORITHMS

Genetic algorithm is an optimization technique based on the study of natural selection and natural genetics. Its basic principle is that the fittest individual of a population has the highest probability and possibility for survival. Genetic algorithm gives a global technique based on biological metaphors. The Genetic algorithm can be differentiated from other optimization methods by:

(i) Genetic algorithm works on the coding of the variables set instead of the actual variables.

(ii) Genetic algorithm looks for optimal points through a population of possible solution points, and not a single point.

(iii) Genetic algorithm uses only objective function information.

(iv) Genetic algorithm uses probability transition laws, not the deterministic laws.

- APPLICATIONS

Areas of applications in power systems include:

(i) Planning – Wind turbine positioning, reactive power optimisation, network feeder routing, and capacitor placement.

(ii) Operation – Hydro-thermal plant coordination, maintenance scheduling, loss minimisation, load management, control of FACTS.

(iii) Analysis – Harmonic distortion reduction, filter design, load frequency control, load flow.

VI. CURRENT APPLICATION OF AI IN POWER SYSTEM

Several problems in power systems cannot be solved by conventional techniques are based on several requirements which may not feasible all the time. In these situations, artificial intelligence techniques are the obvious and the only option. Areas of application of AI in power systems are:

(i) Operation of power system like unit commitment, hydro-thermal coordination, economic dispatch, congestion management, maintenance scheduling, state estimation, load and power flow.

(ii) Planning of power system like generation expansion planning, power system reliability, transmission expansion planning, reactive power planning.

(iii) Control of power system like voltage control, stability control, power flow control, load frequency control.

(iv) Control of power plants like fuel cell power plant control, thermal power plant control.

(v) Control of network like location, sizing and control of FACTS devices.

(vi) Electricity markets like strategies for bidding, analysis of electricity markets.

(vii)Automation of power system like restoration, management, fault diagnosis, network security.

(viii) Applications of distribution system like planning and operation of distribution system, demand side response and demand side management, operation and control of smart grids, network reconfiguration.

(ix) Applications of distributed generation like distributed generation planning, solar photovoltaic power plant control, wind turbine plant control and renewable energy resources.

(x) Forecasting application like short term and long term load forecasting, electricity market forecasting, solar power forecasting, wind power forecasting.

VII. CONCLUSION

The main feature of power system design and planning is reliability, which was conventionally evaluated using deterministic methods. Moreover, conventional techniques don't fulfill the probabilistic essence of power systems. This leads to increase in operating and maintenance costs. Plenty of research is performed to utilize the current interest AI for power system applications. A lot of research is yet to be performed to perceive full advantages of this upcoming technology for improving the efficiency of electricity market investment, distributed control and monitoring, efficient system analysis, particularly power systems which use renewable energy resources for operation.

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GENERATION OF ELECTRICITY WITHOUT SPINNING- BLADELESS WIND TURBINE

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***Abstract*—The bladeless windmills uses a radically new approach for capturing both intermittent wind energy pulses and constant wind flow under specified wind velocity and pressure. The windmill utilizes the energy of vorticity, an aerodynamic effect (vortex shedding).As wind strikes a fixed structure, its flow changes and a cyclical pattern of eddies or vortices are formed in the vicinity of the structure. As these forces go strong, the structure starts vibrating. Consequently, these aerodynamic instabilities can be utilized to run a linear alternator or a crankshaft. The natural frequency of the structure should not match with the frequency of vibration, which is one of the design criteria, our design takes care of this major criteria. The design of our windmill is entirely different from a traditional windmill. Instead of the huge tower, nacelle and blades, this device has a conical frustum mast made up of fiber-glass (pivoted at one-third length from bottom), a crankshaft, a crank, a connecting rod and a hinge joint. The hollow and light weight mast makes this device portable and user-friendly. Also, this low cost components opens a way for low cost renewable source of energy.**

I. INTRODUCTION

In the 21 century, secondary (usable) energy resources have become indispensable part of societies' needs. The wide gap between supply and demand for energy resources is required to be met in near future where the paucity of fossil fuels is imminent. In Bladeless windmill, mass of the 'mast' and the elasticity of the 'spring' makes it a vibrating system. This is turbine harnesses vorticity, the spinning motion of air or other fluids. When wind strikes the conical mast, flow of the wind gets sheared off because of the obstruction and thus causing vortex or eddies currents to form. This is vortex then exerts force on the mast, causing it to vibrate. The kinetic energy of the oscillation can be converted to electrical energy via linear alternator.

II. HISTORY OF BLADELESS WIND TURBINE

The idea emerged in 2002 when David Yáñez, the co-founder of a vortex bladeless startup company, saw a video of the Tacoma Narrows Bridge disaster and led him to the idea of a bladeless wind turbine. This is new technology seeks to overcome issues related to traditional wind turbines such as maintenance, amortization, noise, environmental impact, logistics, and visual aspects.

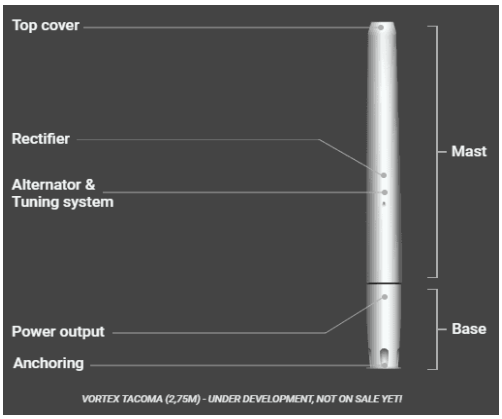

Fig.1. Bladeless wind turbine

The outer cylinder is designed to be largely rigid and has the ability to vibrate, remaining anchored to the bottom rod. The top of the cylinder is unconstrained and has the maximum amplitude of the oscillation. The structure is built using resins reinforced with carbon and/or glass fibre, materials used in conventional wind turbine blades.

The rod's top supports the mast and it's bottom is firmly anchored to the ground. It is built of carbon fibre reinforced polymer, which provides a great fatigue resistance and it has a minimal energy leak when oscillating.

Naturally, the design of such wind turbine is quite different from a traditional turbine. Instead of the usual tower, nacelle and blades, our device has only a mast made of lightweight materials over a base. This reduces the usage of raw materials and the need for a deeper foundation of highly electron conductivity materials (and having zero proton conductivity theoretically) such as porous graphite thin layers. One of the most common catalysts is platinum for low temperature fuel cells and nickel for high temperature fuel cells, and other materials depending on the fuel cell type. The electrolyte is made of such material that it provides high proton conductivity and theoretically zero electron conductivity.

III. WORKING

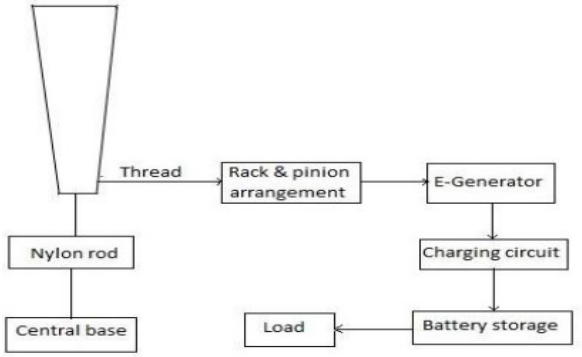

Fig. 1. .block diagram of bladeless wind

The bladeless windmills run on the principle that when wind is allowed to strike the column mast, it tends to vibrate and this vibrational energy is further converted to mechanical (crank shaft) or electrical energy (direct connection to alternator).

When the wind impinges on the projected surface area of the mast from one specified direction, stream lines of the wind tend to depart and get sheared off. Further passage results into the formation of wind currents called vortices or eddies. When they are strong enough to overcome the internal resistance offered by the mechanism (crank shaft or direct linear alternator), the mast vibrates due to spring connected at outside surface of the mast. The then spring is connected to the foundation seat. The connecting rod is bound to transmit this vibration to the crank. The crank shaft can be connected to a generator further. We can also connect the lower end of the mast with the linear alternator directly. Obviously, we can use a rectifier circuit to transform this A.C. current to D.C. current and charge a battery or connect it the load.

A. Calculations and specifications

➢ Mast:

- Larger Radius of the mast, $R_1 = 0.125$ m
- Smaller Radius of the mast, $R_2 = 0.0625$ m
- Height of the mast, L=1 m
- Lateral Surface area of the mast (open), $S=\pi \times (R_1+R_2)\times L$
  $= 3.14\times(0.0625+0.125)\times 1.00$
  $=0.5887\ m^2$
- Density of the Fibre glass, $\rho=1760\ kg/m^3$
- Thickness of the FRP sheet, t=2 mm
- Mass of the mast, $m=\rho\times S\times t$
  $=1760\times 05887\times .002$
  $=2.068$ kg
- Centre of gravity, C.G (from the bottom end)
  $=1-\{ h(R_1^2+2R_1^2 R_2+3R_2)/\{4(R_1^2+R_1^2 R_2+R2)\}$
  $=1- 0.39$
  $=0.61$ m
- Velocity of the wind, v=40 m/s (Gujarat, India)
- Projected area of the mast exposed to wind,
- $A= (R_1+R_2)\times l$
  $= 0.1875\ m^2$
- Force of the wind on the projected area,
  $F_1 = \rho \times A\times v^2$
  $=1.225 \times 0.1875\times 11.12^2$
  $=28.40$ N
- Radius of the mast at the point of pivot, R_3
  Applying theory of proportionality,
  $R_3=R_1\times 0.39$
  $=0.125\times 0.39$
  $=0.048$ m
- Centre of gravity of frustum portion above the pivot,
- $L_1= h - \{ h (R_1^2+2R_1^2R_3+3R_3)\}/\{4(R_1^2+R_1^2R_3+R_3)\}$
  $=0.61-0.22198$
  $L_1=0.388$
- So, Centre of gravity of the frustum above the pivot from the bottom of the whole mast=0.338+0.39=0.778
- Lower end of the mast connected to the hinge = =100 mm
- Point of pivot=1/3×L (from the bottom)
  =333 mm (experimental for maximum deflection)
- Net distance of Point of hinge from point of pivot L_2=233mm
- Mechanical advantage
  $F_1\times L_1 = F_2\times L_2$
  $F_2= 28.40\times 0.388/0.233$
  $F = 47.29$ N

Fig.3.Spanish startup Vortex Bladeless wind turbine.

B. Applications

- Bladeless wind energy can be used in a variety of industries and applications , including marine off -grid systems, industrial applications, remote telemetry and mobile base stations for houses, schools and farms.
- Bladeless energy for agriculture: Remote power systems are needed more and more in the world of farming.
- Whether it's for powering electric fencing, power water pumping, powering lighting in stables and chicken shade or powering

underwater cameras at salmon farms-bladeless energy can be built in small scale as well as large scale to meet the needs.

- Small scale bladeless wind turbine energy for households are designed to bring energy to an off grid locations and matching it with solar panels and supplement it. This is cost effective for houses where solar energy production is intermittent.
- Also, it can be used for residential battery charging and grid connection.
- Bladeless energy for telecoms: with more and more mobile communication and broadband technology being deployed in rural and remote areas, providing power for the transmission equipment can be a problem.

C. *Benefits*

- The bladeless windmill does not have any sliding contact joints which reduces the frictional losses in the system thereby reducing wear and tear.
- The system does loose some electrical conversion capacity, but other pros nullifies this factor.
- The material used in the mast is Fibre glass which exhibits high strengths and low weight. Also, the FRP sheets show high environmental resistance.
- Fire hardness, sound structural integrity and non-corrosive nature makes the device more portable, user friendly and cost effective with durability.
- The space required by these windmills is very small. Consequently, 15windmills can be employed within the same area where one or two conventional windmills are employed.
- It currently takes up 30% of the area of a conventional generator, with maximum deflection at the top end.

D. *Challenges*

- The efficiency of the energy extraction for bladeless windmills from the wind is 40%, while that of conventional windmill is 59.3%.Thus, it cannot substitute thermal and nuclear power plants, traditional windmills and hydroelectric power plants.
- Thus is technology is in development phase and requires huge stakes by investors.
- The Major problem faced by this windmill is that it requires a starting torque.
- The output power depends directly on the height of the mast.

E.The future of bladeless windmill

Tapping newer ways of wind turbine for renewable energy is gaining momentum in the recent years. The purpose of this project is to provide some fundamental results on the analysis of bladeless wind turbine structure and serve as stepping stones for the future development of bladeless wind generating system. The output can be increased by the following techniques,

1. The output of this project can be improved by increasing the height of the mast.
2. By using lighter material for the construction of the mast (fibreglass or carbon fibre) the weight of the mast can be reduced to increase the oscillation. This project can be connected with a feedback control system with magnets in order tune the mast to the natural frequency.
3. The threads can be increased with cable wires in order to withstand the wind forces.
4. The base can be made simple and compact by installing a compact pulley mechanism.
5. By installing efficient generators, output can be increased.
6. By installing efficient transmission system, the output can be improved.
7. The efficiency of the transmission system via the thread mechanism can be improve d by using threads with higher tensile strength
8. A control mechanism can be implemented at the base for the protection of the mast from turbulent wind.

IV. CONCLUSION

The bladeless windmills can offer promising results in near future with respect to efficiency, capacity and productivity. This is topic is a great area for research and so far the results are encouraging. Further, developments can be done in the mechanism which is converting vibrations to electricity. The results above are based on 1 m prototype along with ANSYS analysis software outcomes. The purpose of this paper is to form some basis for the research in the field of renewable resources of energy in near future and be an encouragement for generations to come. The project has five main advantages: Less space requirement, less impact on fauna, less noise, better running, multiple uses due to its portability and use in case of intermittent pulses of wind and its low cost Moreover, some disadvantages such as starting torque requirement, low extraction efficiency can be solved with optimization and changes in design. The use of rack and pinion, direct alternators and slotted link mechanisms can be done instead of crank mechanism.

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MAGNETIC LEVITATION TRAIN

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***Abstract*-This paper reviews and summarizes magnetic levitation train technologies .Many researches, history and developments connecting the maglev train have been accomplished; however, they are not always easy to understand. The purpose of this paper is to make the maglev train technologies clear at glance.**

I. INTRODUCTION

Maglev (derived from magnetic levitation) is a system of train transportation that uses two sets of magnets, one set to repel and push the train up off the track, then another set to move the 'floating train' ahead at great speed taking advantage of the lack of friction. Along certain "medium range" routes (usually 200 to 400 miles (320 to 640 km)) Maglev can compete favorably with high-speed rail and airplanes. With Maglev technology, there are no moving parts. The train is the only moving part. The train travels along a guideway of magnets which control the train's stability and speed. Maglev trains are therefore quieter and smoother than conventional trains, and have the potential for much higher speeds. Maglev vehicles have set several speed records and Maglev trains can accelerate and decelerate much faster than conventional trains; the only practical limitation is the safety and comfort of the passengers. The power needed for levitation is typically not a large percentage of the overall energy consumption of a high speed maglev system. Overcoming drag, which makes all land transport more energy intensive at higher speeds, takes the most energy. Vactrain technology has been proposed as a means to overcome this limitation. Maglev systems have been much more expensive to construct than conventional train systems, although the simpler construction of maglev vehicles makes them cheaper to manufacture and maintain

II. TECHNOLOGY

In the public imagination, "maglev" often evokes the concept of an elevated monorail track with a linear motor. Maglev systems may be monorail or dual rail and not all monorail trains are maglevs. Some railway transport systems incorporate linear motors but use electromagnetism only for propulsion, without levitating the vehicle. Such trains have wheels and are not maglevs. Maglev tracks, monorail or not, can also be constructed at grade or underground in tunnels (i.e. not elevated). Conversely, non-maglev tracks, monorail or not, can be elevated or underground too. Some maglev trains do incorporate wheels and function like linear motor-propelled wheeled vehicles at slower speeds but "take off" and levitate at higher speeds.

The two notable types of maglev technology are:

- Electromagnetic suspensions (EMS), electronically controlled electromagnets in the train attract it to a magnetically conductive (usually steel) track.
- Electrodynamics suspension (EDS) uses superconducting electromagnets or strong permanent magnets that create a magnetic field, which induces currents in nearby metallic conductors when there is relative movement, which pushes and pulls the train towards the designed levitation position on the guide way.

Another technology, which was designed, proven mathematically, peer-reviewed, and patented, but is, as of May 2015, inbuilt, is magneto dynamic suspension (MDS). It uses the attractive magnetic force of a permanent magnet array near a steel track to lift the train and hold it in place. Other technologies such as repulsive permanent magnets and superconducting magnets have seen some research.

III. WORKING

The magnetized coil running along the track, called a guideway,repels the large magnets on the trains undercarraige,allowing the train to levitate between 0.39 and 3.93 inches(1 to 10 cm) above the guideway.Once the train is levitated power is supplied to the coils within the guide way walls to create a unique system of magnetic fields that pull and push the train along the guide way.The electric current supplied to the coils in the guide way walls is constantly alternating to change the polarity of the magnetised coils. This change in polarity cases the magnetic field in front of

the train to pull the vehicle forward, while the magnetic field behind the train adds more forward thrust.

IV. HISTORY

High speed transportation patents would be granted to various inventors throughout the world. Early United States patents for a linear motor propelled train were awarded to the inventor, Alfred Zhen (German). The inventor gained a patent on June 21, 1902 and another on August 21, 1907. In 1907, another early electromagnetic transportation system was developed by F. S. Smith. A series of German patents for magnetic levitation trains propelled by linear motors were awarded to Hermann Kemper between 1937 and 1941.An early modern type of maglev train was described in , Magnetic system of transportation, by G. R. Polygene (Aug 25, 1959).

V.SHANGHAI MAGLEV TRAIN

The Shanghai Maglev Train, also known as the Trans rapid, has a top speed of 430 km/h (270 mph). The line is the fastest and currently the first and only, commercially successful, operational high-speed Maglev train, designed to connect Shanghai Pudding International Airport and the outskirts of central Pudding, Shanghai. It covers a distance of 30.5 km (19.0 mi) in 7 or 8 minutes. For the first time, the launch generated wide public interest & media attention, propelling the popularity of the mode of transportation. Despite over a century of research and development, currently high-speed Maglev is only available in China and Maglev transport systems are now operational in just three countries (Japan, South Korea and China). The incremental benefits of maglev technology have often been hard to justify against cost and risk, especially where there is an existing or proposed conventional high speed train line with spare passenger carrying capacity, as in high-speed rail in Europe, the High Speed 2 in the UK and Shinkansen in Japan.

VI.MAGLEV TRAIN IN INDIA

Moving ahead with the introduction of the high-speed Maglev (magnetic levitation) trains in the country, the Indian Railways has asked Rail India Technical and Economic Service (RITES) to prepare a detailed project report within the next six months. The railways aims to implement the first stretch of the project in less than three years' timeAfter Japan and China, the model of Maglev Train, which is now 600 kilometers per hour, has been developed in India. In fact, the scientists of Raja Ramanna Center for Advanced Technology (RRCAT) of Indore in Madhya Pradesh have succeeded in developing the prototype model of 'maglev' train. The special thing about this train is that it runs floating in the air, not with wheels, and it is called a magnetic system..

VII. ADVANTAGES

- They are less expensive to operate and maintain, because the absence of rolling friction means that parts do not wear out quickly
- Maglev trains produce little to no air pollution during operation, because no fuel is being burned, and the absence of friction makes the trains very quiet and provides a very smooth ride for passengers.
- Due to the lack of physical contact between the track and the vehicle, maglev trains experience no rolling resistance, leaving only air resistance and electromagnetic drag, potentially improving power efficiency.

VIII. DISADVANTAGES

- Maglev systems have been much more expensive to construct than conventional train systems, although the simpler construction of maglev vehicles makes them cheaper to manufacture and maintain.
- Larger train cars are tougher to levitate and require quite a bit more energy, making them less efficient.
- While the Maglev can be safer overall, any infrequent accidents that do occur are likely to be more catastrophic due to the elevated guide ways and incredible speeds.

CONCLUSION

This train is great transportation method. This will run year round and will be great for the economy and will get you where you need to go even faster than ever. It takes less effort and does not produce CO2. Experts are of the opinion that these trains are a lot safe than their conventional counterparts as they are equipped with state-of-the-art safety systems, which can keep things in control even when the train is cruising at a high speed .

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DC-DC CONVERTER FOR ELECTRIC VEHICLES

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***Abstract*—One of the most concerning issues in todays world would be global warming and its effect on our lives and our planet. The matters related to reducing the effects of global warming are taken seriously throughout the globe and this does not exclude the automotive industry .In response to contributing efforts in reducing greenhouse gases, the automobile industry has come up with the Electric Vehicle (EV) and the Hybrid Electric Vehicle (HEV) as an alternative to the conventional combustion engine vehicle. Nowadays, the use of an electric vehicle and the hybrid electric vehicle is seen as a recommended alternative to the conventional combustion engine vehicle. This use of an electric vehicle and hybrid electric vehicle contributes in the effort to reduce greenhouse gases which are mainly consisted of CO2, thus helping in reducing the climate change problems that our generation have been facing in the past few decade. The modelling of DC-DC converter which is used in Electric Vehicle has been described in this paper.**

I. INTRODUCTION

An electric vehicle, also called an EV, uses one or more electric motors or traction motors for propulsion. An electric vehicle may be powered through a collector system by electricity from An electric vehicle, also called an EV, uses one or more electric motors off-vehicle sources, or may be self-contained with a battery, solar panels or an electric generator to convert fuel to electricity. EVs include, but are not limited to, road and rail vehicles, surface and underwater vessels, electric aircraft and electric spacecraft.

EVs first came into the mid-19th century, when electricity was among the preferred methods for motor vehicle propulsion, providing a level of comfort and ease of operation that could not be achieved by the gasoline cars of the time. Modern internal combustion engines have been the dominant propulsion method for motor vehicles for almost 100 years, but electric power has remained commonplace in other vehicle types, such as trains and smaller vehicles of all types.

In the 21st century, EVs saw resurgence due to technological developments, and an increased focus on renewable energy. Government incentives to increase adoptions have been introduced in many countries. Electric vehicles are expected to increase from 2% of global share in 2016 to 22 % in 2030.

II. ELECTRIC VEHICLE TYPES

It is possible to equip any kind of vehicle with an electric powertrain; there are different types of Electric vehicles such as

- Ground vehicles
- Rail borne EVs
- Space rover vehicles
- Airborne EVs
- Seaborne EVs
- Electrically powered spacecraft propulsion

Advantages of Electric Vehicles

There are a number of great benefits to electric vehicles (EVs) over conventional petrol/diesel cars.

- Cheaper to run
- Cheaper to maintain
- Better for the environment
- Health benefits
- Safety improvements

III. MODELLING OF BOOST CONVERTER

A. Converter Basic Circuit

The simple circuit configuration of the boost converter is as shown in the Fig.2 Boost converters consist of a diode, switch, an inductor and a capacitor and give a stepped-up output. This converter has high efficiency while maintaining its simplicity. The voltage source can come from any DC sources. This includes solar panels and batteries. During Continuous Conduction Mode (CCM) operation, the boost converter operation will be as shown in Fig.3 during the ON state of the switch, S whereby, the inductor current will never be zero and the input voltage will appear across the inductor. And during the OFF state of S, the operation will be as in Fig.4 where the inductor current will flow through the load.

B. Modelling

The equations used in modelling the circuit are discussed. The first step of the calculation of the circuit parameters will be to calculate the duty cycle.

The duty cycle of the converter will be:

$$D = 1 - \frac{(V_{OUT} + V_{FWD})}{(V_{IN(min)} + V_{OUT} + V_{FWD})}$$

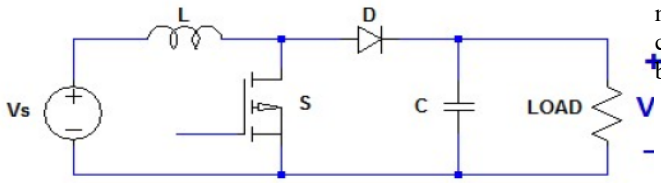

Fig. 2. General configuration of boost converter

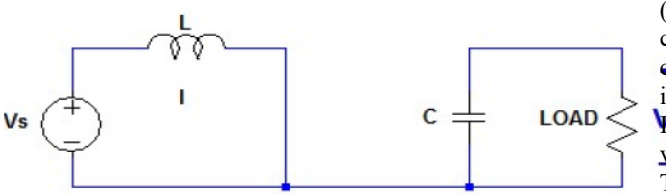

Fig. 3. Operation of boost converter during ON state

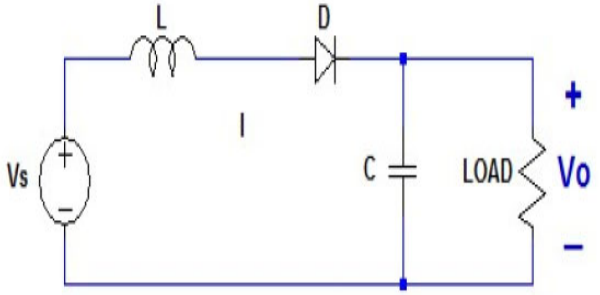

Fig. 4. Operation of boost converter during OFF state

Where, the *VFWD* in Eq. (1) is the forward voltage drop of the diode while the input voltage value is taken at a minimum value as this will give the value of maximum switching current. *VOUT* represents the desired output voltage from the converter. Eq. (1) can also be written as in the form of Eq. (2) where the relation between input and output current with duty cycle will be observed:

$$\frac{D}{1-D} = \frac{V_{OUT} + V_{FWD}}{(V_{IN(min)}) + V_{OUT} + V_{FWD}} = \frac{I_{IN}}{I_{OUT}} \qquad (2)$$

In selecting the passive components, the inductor ripple current needs to be determined first which is usually set between 20-40% of the input current. This can be observed from the equation:

$$\Delta I_L = 30\% \times \frac{I_{IN}}{\eta} = 30\% \times I'_{IN} \qquad (3)$$

The efficiency value, η, is usually taken at 80% which is not an unrealistic value for a boost converter. This can be considered as worst case efficiency. In Eq. (3), the input current is divided by the worst case efficiency and then multiplied by the determined inductor ripple current. The calculations for the minimum inductor value are as shown below:

$$L = \frac{V_{IN(min)} \times D_{(max)}}{\Delta I_L \times f_{SW(min)}} \qquad (4)$$

In (4), the minimum value of input voltage will be multiplied with the maximum duty cycle and the divided by the product of the calculated inductor ripple current in Eq. (3) and the minimum switching frequency. These calculations are based on the power stage of boost converters which comes with an IC that contains an integrated switch. Thus, it is crucial to know if the selected IC for the converter can deliver the expected maximum value of current.

The formula used for this calculation is:

$$I_{OUT(max)} = \left(I_{LIM(min)} - \frac{\Delta I_L}{\eta}\right) \times (1 - D) \qquad (5)$$

In the equation, *ILIM(min)* represents the minimum value of current limit of the IC while the other values such as duty cycle and inductor ripple current values are substituted from the other equations above. The purpose of this is to calculate the maximum output current of the IC and after comparison, determine if the selected IC is suitable for the converter circuit. The maximum switch current can only calculated if the maximum current output of the IC is above the value of maximum current output of the application. The maximum switch current is as shown below:

$$I_{SW(max)} = \frac{I_{OUT(max)}}{1-D} + \frac{\Delta I_L}{2} \qquad (6)$$

From the calculations above, the maximum current value that components such as inductor, switches and diode have to be able to withstand.

The next selection of component is the diode, in which it is the rectifier type. In normal conditions, a Schottky diode should be used as it is known to have minimum losses. The value of forward current threshold needs to be same with the maximum current output of the application. Therefore:

$IF = IOU(max)$ (7)

where *IF* shows the forward current in a rectifying diode.

The other calculation based on diode is the power dissipation of the diode which can be calculated by:

$PD = IF \times VFWD$ (8)

This equation, which comprises of forward current and voltage drop across diode, can also be written as:

$PD = IOUT \times VFWD$ (9)

Usually, the minimum value of input capacitance will be stated in the datasheet of the IC. This value is important to stabilize the input voltage due to peak current requirement of the power supply. The recommended capacitor is that of low equivalent series resistance or better known as ESR ceramic capacitors. The same principle applies for the output capacitor. The ESR, in this case is used to limit the

ripple of the output voltage. The ESR value can be calculated as follows:

$$ESR \leq \frac{\Delta V_{RPL}}{\frac{I_{OUT(max)}}{1-D_{max}} + \frac{\Delta I_L}{2}} \qquad (10)$$

Eq. (10) can be rearranged to:

$$\Delta V_{RPL} = ESR \times \left(\frac{I_{OUT(max)}}{1 - D_{max}} + \frac{\Delta I_L}{2} \right) \qquad (11)$$

Where output ripple voltage can be calculated. The current flowing through an ESR in a capacitor is one of the causes of power dissipation of a capacitor which leads to the increase of internal temperature of the capacitor. This results in the shortened life of a capacitor. The RMS value of this current ripple is based on:

$$I_{C_{OUT}(RMS)} = I_{OUT} \times \sqrt{\frac{D_{(max)}}{1 - D_{(max)}}} \qquad (12)$$

Meanwhile, the power dissipation in the inductor is also caused by the current flowing through it. Power dissipation is also one of the causes of internal temperature increase of the inductor. This ultimately results in the degradation in the insulation winding, which increases core losses in the inductor.

The power loss in the inductor is given by:

$$P_{Inductor} = \left(\frac{I_{OUT}}{1 - D} \right)^2 \times R_{CU} + P_{Core} \qquad (13)$$

In this case, the FETs current rating will also determine the boost design converters maximum output current. The usual type of MOSFET used for boost topology converter is n-channel MOSFET. This is due to the fact that the gate drive is simpler compared to that of p-channel.

The power dissipation of the switch is given by:

$$P_{D\_Q1} = \left[\left(\frac{I_{OUT}}{1 - D} \right)^2 \times r_{DS(on)} \times D_{(max)} \right] + \left[\frac{1}{2} \times V_{OUT} \times \left(\frac{I_{OUT}}{1 - D} \right)^2 \left(t_{rise} + t_{fall} \right) \times f_{sw} \right] + \left[Q_{GATE} \times V_{GS} \times f_{sw} \right] \qquad (14)$$

IV.ELECTRIC VEHICLES ADOPTION

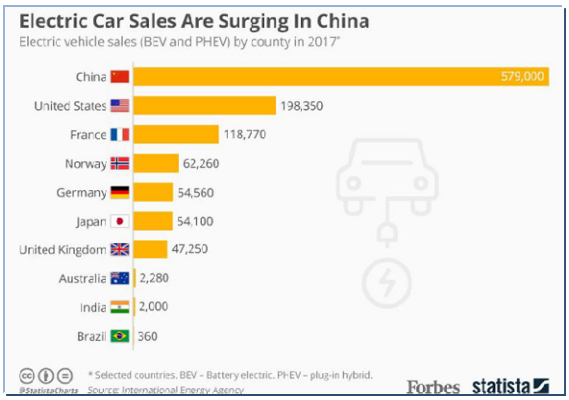

Fig.4 Electric car sales in 2017 in some major countries

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SMART IRRIGATION

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***Abstract*— In the discussed Irrigation system IoT is implemented, in this system all the information that are received from the sensors and the various parameters are given to the arduino uno microcontroller as an analog input. A preset value of soil moisture sensor is fixed in microcontroller and also for fencing. When it goes beyond the particular threshold value water is automatically irrigated to the crops and once the required amount of water is fulfilled it stops. The Microcontroller transmits that information on the internet through a network of IoT in the form of wifi module ESP8266 that is attached to it. This enhances automated irrigation as the water pump can be switched on or off through information given to the controller. This discussed Irrigation system is used to get the chlorophyll content and nitrogen content of the leaf using LDR and Laser.**

I. INTRODUCTION

In India, agriculture plays an important role for development in food production. In conventional Automatic irrigation system based on ARMs and RF module. All the system will be setup using ARM and RF module [1], [2]. The most important factor of this system is RF module which is used to send and receiving the message to the controller. The set up consists of mainly ARM7TDMI core and GSM. GSM operates through SMS and is a link between ARM processor and centralized unit [2]. ARM7TDMI is an advanced microprocessor and forms the heart of the system.

In the design of a model an irrigation system based on wireless sensor network (WSN). The user-controller provided with information from the receiver board (master) that transmits the sensed data (as current parameter of the plant) through the transmitter board. In the prototype design of microcontroller based automatic irrigation system which will allow irrigation to take place in zones where watering is required, while bypassing zones where adequate soil moisture is indicated .Information given by the user through mail by python programming language. Raspberry pi, Xbee used to control the system wirelessly for short distance. The water can be dripped to the roots through tubes and solenoid valves. Raspberry pi serves as a pocket personal computer with Linux operating system.

II. ARCHITECTURE DISCUSSED

Humidity sensor and temperature sensor are directly connected to wifi module. To measure a chlorophyll and nitrogen value of a leaf, a device is connected to wifi module and ultrasonic sensor is also connected to it. The output from Arduino and wifi module is given to driver circuit and server respectively. Based on the information given to the driver circuit the pump gets on when it is required. The ultrasonic is an evolutionary step from the sensor, and has been designed to increase flexibility, increase range, and to reduce costs still further. Range is increased from 3 meters to 4 meters. A new operating mode (tying the mode pin to ground) allows the sensor to use a single pin for both trigger and echo, thereby saving valuable pins on controller. When the mode pin is left unconnected, the sensor operates with separate trigger and echo pins, like the sensor. The sensor includes a small delay before the echo pulse to give slower controllers such as the Basic Stamp and Picaxe time to execute their pulse in commands.

III.MEASUREMENT OF SOIL MOISTURE IN DISCUSSED IRRIGATION SYSTEM

The is designed to measure the soil moisture content in the field so that it gives the accurate value of soil moisture content in terms voltage. It contains two electrodes and a very little quantity of plaster pairs. The gypsum material is used that shows water absorbing property, depending on the water content in the soil the absorbing rate varies. The conduction through electrode varies with content of water absorbed by gypsum and also there is a change in resistance of a conductor depends upon the moisture content. t. This sensor module converts relative humidity (30-90%RH) to voltage. Simply the RH is the amount of water vapor in the air at a specific temperature compared to the maximum water vapor that the air is able to hold without it condensing, at a given temperature.

IV. MEASUREMENT OF HUMIDITY AND TEMPERATURE IN DISCUSSED IRRIGATION SYSTEM

Capacitive sensors are used in the discussed irrigation system which has more linear response. These capacitive relative humidity sensors typically uses an industrial-proven thermoset polymer, three-layer capacitance construction, platinum electrodes, and except for high temperature versions, some have on-chip silicon integrated voltage output signal conditioning.

V. MEASUREMENT OF LIGHT INTENSITY IN DISCUSSED IRRIGATION SYSTEM

In this Irrigation System Laser light source is used and the intensity of light is measured using Light Dependent Resister. This system is used for the development of chlorophyll content. A device that generates an intense beam of coherent monochromatic light (or other electromagnetic radiation) by stimulated emission of photons from excited atoms or molecules. When LDR is subjected to light, its resistance become 10K and hence the droop at the inverting terminal is less than at the non-inverting terminal. Hence the output from comparator is -Vsat indicating normal condition. When the LDR is subjected to darkness, its resistance 100 K and thus the drop at the non-inverting terminal is greater than that at the inverting terminal. Hence the output from this +Vsat

indicating a faulty condition light dependent resistor or cadmium sulfide (CdS) cell is a resistor whose resistance decreases with increasing incident light intensity. Thus the light information is processed in microcontroller then given to Wi-Fi module and then it is transmitted through the IoT network to the user.

VI. Role of Controller In the Irrigation System

In the Discussed Irrigation System the Arduino Uno is used as a microcontroller board based on the ATmega328.The main purpose of the controller circuit is to compare the preset values with measured values and has to produce the proper output. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller, simply connected it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Atmega328 has 32 KB of flash memory for storing code (of which 0.5 KB is used for the boot loader). It has also 2 KB of SRAM and 1 KB of EEPROM for good processing speed of this discussed irrigation system. A watchdog timer (WDT) is a hardware timer that automatically generates a system reset if the main program neglects to periodically service it. It is often used to automatically reset an embedded device that hangs because of a software or hardware fault.

VII. Display system in the irrigation system

The ESP8266 Wi-Fi Module is used in this IoT based irrigation system for transmitting the real time data of the field for irrigation process to the user through the IoT network. The ESP8266 module comes pre-programmed with a default command set firmware, so that it is simply hooked up to the Arduino device and get about as much Wi-Fi-ability as a Wi-Fi Shield.

This module has a powerful enough on-board processing and storage capability of data involved in irrigation process that allows it to be integrated with the sensors which is used in the system and other application specific devices through its GPIO's with minimal development upfront and minimal loading during runtime.

VIII. Controller Interfacing

In the irrigation system the controller is interfaced with the various devices which is used in the system. The Module, interfaced to the system, can be treated as RAM (Memory Mapping), Input/ output, expanded parallel I/O (Input/output Mapping). Since there is no conventional Chip Select signal, developing a strobe signal for the Enable signal (E) and applying appropriate signals to the Register Select (RS) and read/Write strobe. The resultant signal, applied to the LCD's Enable (E) input, clocks in the data. The 'E' Signal must be a positive going digital strobe, which is active while data and control information are stable and true. The failing edge of the Enable signal enables the data/ Instruction Resister of the Controller. All Module timings are referenced to specific edges of the 'E' signal. The 'E' signal is applied only when a specific Module transaction is desired. When the Controller is performing an internal operation the Busy Flag (BF) will set and will not accept any instruction. The user should check the Busy Flag or should provide a delay of approximately 2ms after each instruction. The module presents to difficulties while interfacing slower MPUs.

In the relay section which contains relays and drivers. The microcontroller gives a logic high output has to drive deliver the corresponding load like pump ON /OFF. Relays have unique properties and are replaced with solid state switches that are strong than solid-state devices. High current capacities, capability to stand ESD and drive circuit isolation are the unique properties of relays.

IX. Implementation IoT in irrigation system

The purpose of the IoT in this system is, it has to share the data to the users. Thus the IoT server is connected with the Wi-Fi module. The information of the soil is transmitted to the Wi-Fi network through the signal conditioning circuit of the various sensor. The physical information of the soil such as soil moisture, humidity, temperature are send to the Wi-Fi, then it is shared to the user using IoT,If the moisture content of the soil is lesser than the reference value then the command from the user device is transmitted to the field section through IoT server then the irrigation system is activated and the water is supplied to the field. Whenever it reaches the span value if moisture content of the soil then the irrigation system is deactivated, that information is also transmitted to the user. This is the chain process of this particular discussed irrigation system.

X. Results and conclusion

The discussed irrigation system for agricultural purpose can measure the Soil moisture, temperature of the field and transmits the real time data to the user through the Wi-Fi and IoT server, if there is any deviation from the span of reference value, then the user can send the command through the IoT server to maintain the set point value of field parameter for a proper irrigation and discussed IoT based irrigation system is better than the recently discussed other irrigation systems.

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SUPERCAPACITOR

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I. ABSTRACT-IN TODAY'S WORLD, CLEAN ENERGY STORAGE DEVICES, SUCH AS BATTERIES, FUEL CELLS, AND ELECTROCHEMICAL CAPACITORS, HAVE BEEN RECOGNIZED AS ONE OF THE NEXT-GENERATION TECHNOLOGIES TO ASSISTS IN OVERCOMING THE GLOBAL ENERGY CRISIS. IN RECENT YEARS, THERE HAVE BEEN SIGNIFICANT ADVANCEMENTS IN THE FIELD OF SUPERCAPACITOR TECHNOLOGY WITH REGARDS TO RESEARCH, DESIGN AND IMPLEMENTATION THAT HAVE INFLUENCED INDUSTRIES AROUND THE WORLD. HOWEVER, SOUTH AFRICA INDUSTRY IS DUE TO THE ABSENCE, THIS PAPER AIMS TO CLARIFY THE DIFFERENCES BETWEEN BATTERIES AND SUPERCAPACITORS, AND TO PROVIDE GUIDANCE FOR CHOOSING THE PROPER DEVICE ACCORDING TO THE APPLICATIONS . BATTERIES ARE THE SOLUTION FOR HIGH ENERGY DENSITY APPLICATIONS WHEREAS SUPERCAPACITORS ARE USED IN HIGH POWER DENSITY APPLICATIONS WHERE LONG CYCLE LIFE AND FAST CHARGE-DISCHARGE RATES ARE NEEDED.CURRENTLY,THERE EXISTS A COMPETITION BETWEEN THESE TWO TECHNOLOGIES IN THE MARKET.HOWEVER, THE TWO TECHNOLOGIES CAN BE UTILIZED TO COMPLEMENT EACH OTHER TO ACHIEVE THE BEST RESULTS.

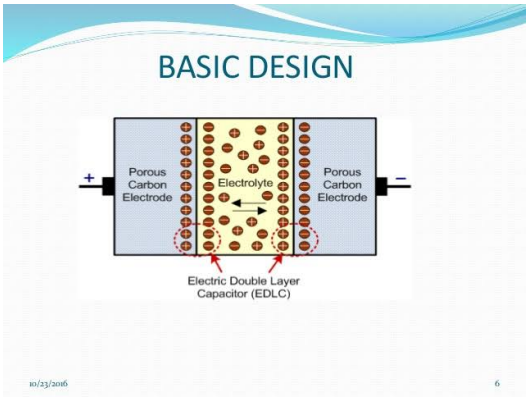
Keywords: supercapacitors , batteries, fuel cells

I. INTRODUCTION

The ever expanding population and rise in the standards of living have resulted in a sharp increase in consumption and demand for energy as a result, energy research has become an important area of focus in scientific communities around the world which has led to advancement s in both energy production and storage technologies.

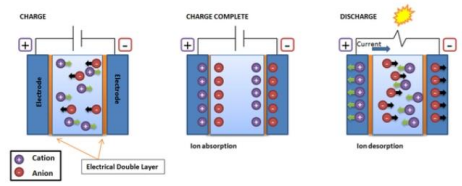
With regards the energy storage, there are two dominant technologies in use today .batteries (such as lithium ion or nickel metal hydride) that have high energy density and supercapacitor that have high power density. In this we are discussing about supercapacitors. In 1950s general electrical engineers started experimenting components using porous carbon electrodes for fuel cells andrechargeble batteries. In 1957 H.Becker developed a "low voltage electrolytic capacitor with porous carbon electrodes". Those capacitors come to known as supercapacitor as it stored very high amount of energy.

Super capacitor is type of capacitor that can store large amount of energy ,typically 10 to 100 times more energy per unit mass or volume compared to electrolytic capacitors.supercapacitors are based oncarbon(nano tube)technology. Supercapacitor is also known as double-layer capacitors or ultracapacitors ,are energy storage device s that store electrical energy without chemical reaction. The capacitor range is from 100 F to 10 kF.

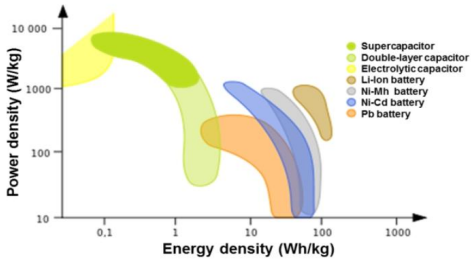


II. SUPERCAPACITOR USE OVER THE NORMAL CAPACITOR

A super capacitor is differ from ordinary capacitor in two important ways :its plates effectively have a much bigger area and the distance between them is much smaller ,because the separator between them works in a different way to conventional dielectric.the voltage of typival capacitor range from a few volts to 1kv .the total energy stored in not so high and the super capacitors made their fame supercapacitors can store more than 100x the energy of a dielectric capacitor (6-8wh/kg). Super capacitors also used foe high surface area. Here is a simple sketch of what a supercapacitor's charge and discharge state might look



Here is a simple comparison chart of storage and performance of the regular and super capacitor (and some batteries):



III. CURRENT RESEARCH AND DEVELOPMENT STATUS

In spite of the rapid progression ,supercapacitor technology still faces the low energy density challenge.in order to overcome this challenge ,governments,industries,and academic organizations around the world are making great efforts to develop novel and high performing electrode and electrolyte materials for supercapacitors .in addition ,some efforts are also putting on the system design and performance optimization for some niche application.for example,many research groups have developed special carbon and polymer materials to fabricate flexible supercapacitors for application in electronic devices.

IV. RESULTS FOR ADVANCED SUPERCAPACITORS

A number of few capacitor devices have been tested in the laboratory at the university of California –davis.these devices includes carbon devices from Estonia and yunasko and hybrid device from Ukraine and japan the carbon device has high power capability eith no sacrifice in energy density .in fact the skeleton technology device has highest energy density (9wh/kg) of any carbon/carbon device tested at uc davis this is due to improved carbon and increase in the rated voltage from 2.7v to 3.4v resulting from the use of improved organic electrolyte

V. APPLICATIONS

- In start up mechanism for automobiles.
- Supercapacitors are suitable for temporary energy storage device.
- Supercapacitors provide backup or emergency shutdown power to low-power equipment e,g.,ups.
- They used in industrial lasers and medical equipment.
- Large supercapacitors are used in wind turbines.
- Super capacitors used in automobiles, buses, trains, cranes and elevators.
- These are used for regenerative braking, short-term energy storage, or burst-mode power delivery.

VI. FUTURE APPLICATIONS

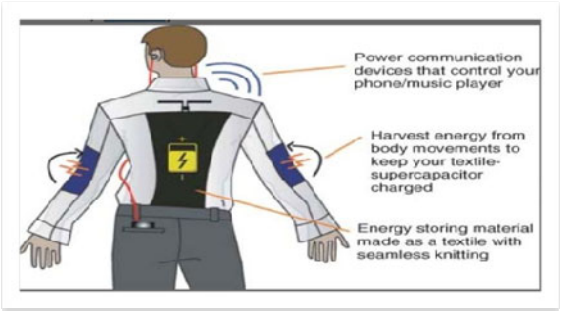
Scientists and entrepreneurs are exerting many efforts into uncovering innovative applications for super capacitors.

Volv o developed lightweight structural energy storage components composed of carbon fibers and polymer resins . The components, behaving like supercapacitors ,are considerably lighter than the conventional batteries already used in electronic vehicles.

In addition, the energy storage components can be easily molded into desired shapes (eg.car chassis)

Another development for electrical vehicles arouse when South Korean scientists synthesized extremely porous graphene.

University of south carolia created a t-shirt that function like a supercapacitor .the surface of the clothing fibers transformed into AC, exhibiting supercapacitor



II.

III. CONCLUSION

- Supercapacitors may be used where high power or energy storage is required that it will replace the batteries for power storage.
- Supercapacitors can be used widely because of their long life and short charging time.
- On the other hand it has limitations due to its high cost, self discharge, packaging problems etc.
- Thus,ultracapacitors may emerge as the solutions for many application-specific power systems
- They are the ideal devices for storing high current transient electrical surges to boost energy efficiency of a system.
- Finally thanks to their environmentally friendly nature and long cycle life,use of supercapacitors can reduce costs associated with maintenance,disposal and global environmental taxes as well as reduction in environmental impact of high powered system.

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Surge Current Protection using Superconductors

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***Abstract*- High inrush current can affect the electrical system by tripping fuses and circuit breakers unnecessarily. If inrush protection is not in place relays and circuit breakers must be rated higher than any possible inrush current. The surge current cause component damage or failure within the equipment itself .Superconductors are extraordinary because they take no energy to make current flow. So no energy is lost to friction to sustain the current.**

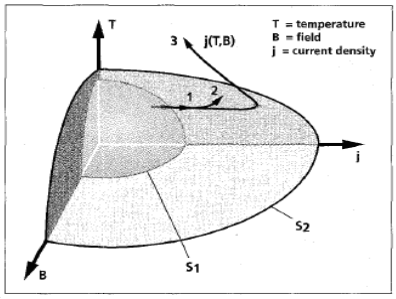
I. INTRODUCTION

Damage from a short circuit is a constant threat to any electric power system. Insulation damaged by aging, an accident, or lightning strike can unloose immense fault currents, practically the only limit on their size being the impedance of the system between their location and power sources. There is obviously a big demand for devices that, under normal operating conditions, would have negligible influence on power system but in case of fault will limit the prospective fault current to a value close to the nominal. A device of this kind is called Fault current limiter.

II. SUPERCONDUCTORS

Superconductors, because of their sharp transition from zero resistance at normal currents to finite resistance at higher current densities are tailor made for use in fault current limiters. Equipped with proper power controlled electronics, a super conducting limiter can rapidly detect a surge and taken and can also immediately recover to normal operation after a fault is cleared.

Superconductors lose their electrical resistance below certain critical values of temperature, magnetic field and current density. A simplified phase diagram of a super conductor defines three regions.



In the innermost, where values for temperature, field, and current density are low enough, the material is in its true superconducting state and has zero resistance. In a region surrounding that area, resistively rises steeply as values for three variables so higher. Outside that area, receptivity is in essence independent of field and current density as with ordinary conductors.

"The maximum instantaneous input current drawn by an electrical device when it is first turned ON" is defined as Surge current and is also known as Inrush current or input surge current or switch on surge. Inrush current can be as high as 100 times the normal steady state current and lasts for less than half a normal 60Hz cycle. SCFCLs may be categorized as resistive or shield core.

III. RESISTIVE LIMITERS

In the resistive SCFCL, the super conductor is directly connected in series with the line to be protected. To keep it superconducting, it is usually immersed in a coolant that is chilled by a refrigerator. Current leads are designed to transfer as little heat as possible from the outside to the coolant. In the case of a fault, the inrush of current and magnetic field take the super conductor into the transition region, between zero resistance and normal resistivity. The fast rising resistance limits the fault current to a value somewhere between the nominal current and whatever fault current otherwise would ensue. After some time, perhaps a tenth of a second, a breaker will interrupt the current.

The behavior of resistive fault current limiter is largely determined by the length of the superconductor and the type of material used for it.

IV. SUPERCONDUCTORS AS VARIABLE RESISTORS AND SWITCHES

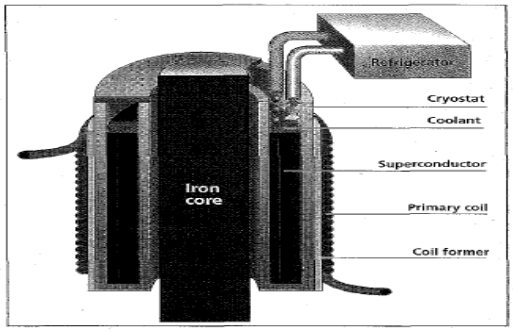
Several anisotropic high temperature superconductor show critical current densities which are strongly dependent on the direction of an applied external magnetic field. The resistance of a sample can change by several orders of magnitude by applying a magnetic field.

The current carrying capability of both low temperature and high temperature super conductors decreases with the application of a magnetic field. Some anisotropic high temperature superconductors, in particular the bismuth and thallium based superconductors, show a resistance that is highly dependent on the amplitude and

direction of the applied field. In general, this feature is undesirable, because the current carrying capability and, therefore the stability margin are lowered even by the self field of the current in the superconductor.

V. THE SHIELDED CORE SCFCL

The shielded-core fault current limiter, basically a shorted transformer, is the other basic category of SCFCLs. Here, the superconductor is connected in the line not galvanic ally but magnetically. The device's primary coil is normal conducting and connected in series to the line to be protected, while the secondary side is superconducting and shorted. (Because of the inductive coupling between the line and superconductor the device is sometimes also called an inductive SCFCL).



Depending on the turn ratio between primary and secondary side, the nominal current and voltage will be transformed to the secondary side as the product of turn-ratio and current and ratio of voltage to turn ratio. The superconductor on the secondary has to be designed for these values. In normal operation the shielding effect of the superconductor prevents the magnetic flux produced by the primary winding from entering the iron core. During a fault, the large increase in induced current, due to primary winding current, exceeds the critical current of the superconductor. The shielding effect is destroyed as flux enters the iron core, resulting in the insertion of a large current impedance into the line to be protected.

VI. COMPARISON

Both the shielded core and resistive types of SCFCL use the same amount of superconductor material to achieve a given limitation behavior. This is because the rated power per volume of conductor is determined by the product of fault induced field and critical current, which is the same for both devices, assuming the same type of superconducting material is employed.

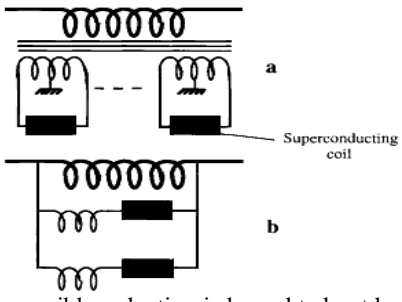
The shielded-core limiter works only with ac currents and is much larger and heavier than the resistive SCFCL. But it needs no current leads, and uses short conductors with high rated current (or several superconductors in parallel). Its independence of current leads is especially attractive where the protection of high-current systems is involved. And avoidance of a very long superconductor with rather low rated current answers a problem that afflicts SCFCLs of the resistive type: hot spots.

It was earlier assumed that while a fault current is being limited, the voltage drop is uniform throughout the conductor. But in practice superconductors tend to develop thermal instabilities, called hot spots, connected with the strong current and temperature dependence of their resistivity in the transition state. If a part of the superconductor sees a greater voltage drop than the rest, as a result of an in homogeneity, this part will heat up faster; leading to an even greater voltage drop at that point and further accelerated heating. Burn-through can result.

The common cure is to attach a normal conducting bypass in close electrical contact to the superconductor, so that the current may bypass the hot spot. Besides its electrical effect, the bypass adds to the thermal mass of the conductor and thus further enhances its stability. But of course such thermal stabilization of the super conductor reduces its total normal resistances, which might have to be lengthened in compensation.

VII. HYBRID CURRENT LIMITER

The advantages of this scheme are the reductions of superconducting weight and current compared to the resistive system. It consists in a series resistive transformer whose primary winding is inserted in series in the line and whose secondary windings are connected to non-inductivity wound conducting coils in two essentially different ways as shown by figure.



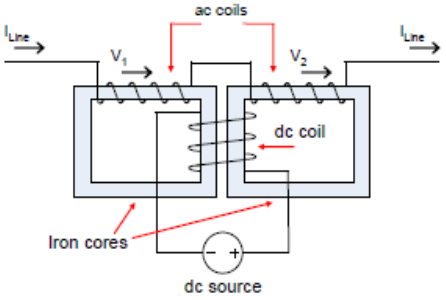
This possible reduction is brought about by the variation of the magnetic coupling between primary and secondary. The variation of magnetic coupling may be performed by a saturable magnetic circuit. In steady state operation, the primary and secondary winding should be magnetically coupled very well in order to reduce the self inductance of the device and hence its voltage drop under rated operation. Under fault operation the coupling is decreased in order to reduce the thermal dissipation

in superconducting coils thanks to lower secondary voltages.

VIII. SATURABLE-CORE SFCL

Unlike resistive and shielded-core SFCLs, which rely on the quenching of superconductors to achieve increased impedance, saturable-core SFCLs utilize the dynamic behavior of the magnetic properties of iron to change the inductive reactance on the AC line. The concept (shown in Figure) utilizes two iron cores and two AC windings for each phase. The AC windings are made of conventional conductors that are wrapped around the core to form an inductance in series with the AC line. The iron core also has a constant-current superconductive winding that provides a magnetic bias.

Under nominal grid conditions (when the AC current does not exceed the maximum rating for the local system), the HTS coil fully saturates the iron so that it has a relative permeability of one. To the AC coils, the iron acts like air, so the AC impedance (inductive reactance) is similar to that of an air-core reactor. Under fault conditions, the negative and positive current peaks force the core out of saturation, resulting in increased line impedance during part of each half cycle. The result is a considerable reduction in peak fault current. During a limiting action, the dynamic action of the core moving instantaneously in and out of saturation produces harmonics in the current waveform. However, under normal conditions, the voltage and current waveforms are basically unaffected by the storable-core SFCL.



Operation of the Saturable-Core SFCL

Essentially, the storable-core SFCL is a variable-inductance iron-core reactor that has the impedance of an air-core reactor under normal grid conditions and a very high impedance during fault events. Unlike resistive SFCLs, which may require time between limiting actions to cool the superconducting components, the storable-core approach can manage several actions in succession because the superconductor does not quench. In fact, the storable-core FCL need not use a superconducting coil; however, the use of an HTS DC field winding reduces operating losses and makes the winding more compact.

A major drawback of storable-core SFCL technology is the volume and weight associated with the heavy iron core; however, manufacturers hope to improve this issue in future prototypes.

IX. ADVANTAGES

- Relatively narrow super conducting wires can be used to carry huge currents.
- Less fuel required to generate electricity which lead to a reduction in costs.
- Superconducting cables will be smaller and can fit into existing conductors for expansion of the power supply.
- Environmental benefits from less pollution and more efficient power production.
- Transforming the Electricity Grid.
- Improving wide line telecommunication
- Aiding Medical Diagnosis.

X. DISADVANTAGES

- Superconducting materials super conduct only when kept below a temperature called transition temperature.
- For presently known practical super conductors the temperature is much below 77K.
- The greatest drawback of superconductors is that they only function as such at temperatures lower than its critical temperature.
- Other drawbacks include price, material handling, maximum current carrying capacity, etc. but the cryogenic limitation must be the biggest.
- This is why the search for the near mythical ‘ room temperature superconductors’ is so important for the future of superconducting applications.

XI. LIMITATIONS

- There is a maximum current that superconducting materials can carry.
- Cost is prohibitive for immediate replacement of existing technologies.
- Developing countries will not be able to afford the technology above a critical current density.
- Superconductivity breaks down limiting current.
- Low critical temperatures are difficult, expensive, and energy intensive to maintain.
- The materials are usually brittle, non-ductile and hard to shape.
- They are also chemically unstable in some environments.

- It cannot function with AC electricity, as the switching in AC destroys copper pairs.
- There is a limit to the current passing through the material before it looses its superconducting properties.

XII. APPLICATIONS

- Fast digital circuits.
- Low loss power cables.
- RF and microwave filters.
- Fast fault current limiters.
- High sensitivity particle detectors including the transition edge sensor.
- The superconducting bolometer, the superconducting tunnel junction detector, the kinetic inductance detector, and the superconducting nana wire single photon detector.
- Rail gun and coil gun magnets.
- Electric motors in generators.

CONCLUSION

The purpose of this presentation is the study of surge current protection using Superconductors. The SCFCL offers efficient advantages to power systems and opens up a major application for superconducting materials.

Surge suppressors should be used as a mailer of habit with all semiconductors based electronic and computer hardware including peripherals such as printers, monitors, external disc drives and other. But it can't be relied upon to provide protection against lightning induced transients. So the safest procedure to ensure that all susceptible hardware is to unplug the suppressors main power cords during lightning.

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Applications of Power Electronics in Renewable Energy System

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Abstract- This paper presents explanation for the usage and importance of Power Electronics converters in the field of the renewable energy. Generation of renewable energy has two important ways to get the Energy, the 1st is the photovoltaic (Solar cells) the other is the wind mills (sometimes called wind turbines). Both of the methods use different type of Power electronics converters. In this paper the types of converters used in both systems are explained which are mainly DC-DC boost choppers, DC-AC inverters, AC-DC rectifiers. The importance of the DC-AC and AC-DC converters is explained through the paper in addition to a full analysis for a DC-DC boost chopper converter. The paper also provides recommendations for future applications.

I.INTRODUCTION

Renewable energy systems are systems of high importance as they produce electrical energy from non fossil sources. The production of such energy independent of fossil became a must as the consuming of fossil resources caused pollution to the environment and exhaustion of fossil sources that are almost completely drained.

The production of renewable energy is based on the idea of converting a type of energy mostly mechanical energy and solar energy into electrical energy. The most appealing two types of renewable energy sources are photovoltaic which transform the solar energy into DC electrical energy and wind turbines which transform mechanical energy resulting from the spinning of the turbine by wind into AC electrical energy. Both of the methods require the usage of Power electronics converters to control Frequency and magnitude of the current resultant from the conversion between energies. Producing renewable energy using wind mills have a growth rate of 30% during the years from 2004 till 2014countries that are highly interested in the usage of wind mills include Germany, Spain, USA, Denmark, India, New Zealand and Ireland. Wind turbines in general have two modes of operation. The 1st one is the fixed speed where the turbine is designed to operate with high efficiency on a certain single speed it is a cheap technology but lacks the ability to work efficiently when speed of wind change. The second type is variable speed where the turbine works with high efficiency on a wide range of speeds. The trade-off of this type is that it's relatively expensive and the design of the turbine is more complex.

Working on variable set of speed in both types produces after conversion between mechanical and electrical energy produces currents with variable and random frequencies as there is a relation between the rate of change of position (angular frequency) of the turbine and the frequency of the AC current so to produce a n AC current with the desired magnitude and frequency a rectifier is used to transform the AC current into DC then a DC boost chopper is used to achieve a higher magnitude and at the end an inverter is used to transform the DC current into AC current with the desired frequency as shown in below fig.1

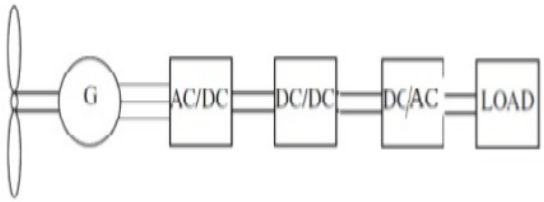

Fig.1

Another source to produce clean energy is the photovoltaic power generation system which produces a DC current by converting heat resultant from the solar Energy. The photovoltaic arrays can be used in wide range of applications like battery charging, water pumping, vehicles, satellite power systems, grid-connected power systems, standalone power systems. The main disadvantage of the photovoltaic arrays is its low conversion efficiency. To overcome this problem of PV arrays DC-DC booster choppers are used to increase the magnitude of the produced electrical DC energy that allows the photovoltaic arrays to extract the maximum possible power for increasing the utilization rate of the photovoltaic arrays. After getting the desired magnitude of the DC current a DC-AC inverter is used to interface the current with the required frequency of the load [4] as shown in below fig.2

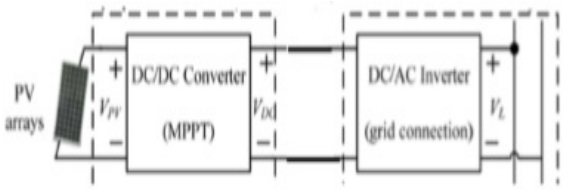

Fig.2

II. ANALYSIS OF DC-DC BOOST CHOPPER

As mentioned before the DC-DC boost chopper is one of the essential keys in an efficient renewable power system. It has the ability to control the DC magnitude of the electrical current resultant from the system. The basic description of the boost chopper that it is a step-up power converter that takes in a low voltage input and provides an output at a much higher voltage by the usage of an inductor that increases the output voltage [4] as shown in fig.3.

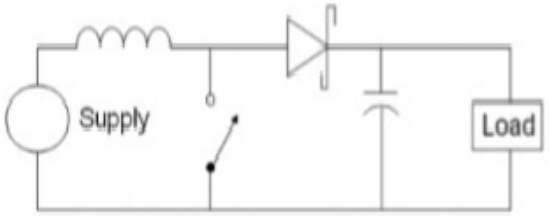

Fig.3

The voltage output relation to the input voltage is expressed as $V_{out}=V_{in}/(1-D)$ where D is the duty cycle of the circuit (time switch is on related to the period). With D according to its definition is a number between 0 and 1 the amplification of the voltage can goof values from 1 till infinity. The duty cycle of the system is controlled using two techniques the 1st is the Pulse Width Modulation in which the variation happens in the time of the circuit in on stage to the period. The 2nd technique is the Frequency Modulation in which the time in which the circuit is on is constant and the period is variable. Both techniques can give similar results however the Pulse Width Modulation is more commonly used as it's easier to control the pulse width without affecting the frequency that the system works on. In this part full analysis and show of detailed equations of CCM boost chopper DC-DC shown in fig.4 will be presented [1].

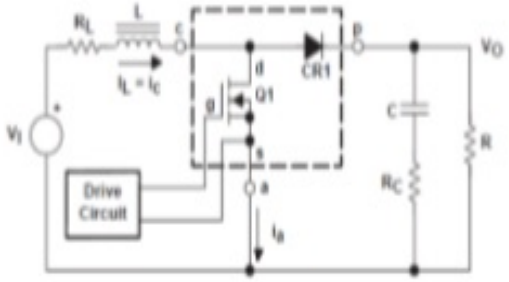

Fig.4

The DC-DC boost chopper work in two different stages the On stage in which the NMOS is conducting and a current flows through it and Off stage in which the NMOS isn't conducting and no current flows through it. The duty cycle "D" of the chopper is based on the time of the On stage relative to the period which is the time of On stage added to the time of the Off stage.

The boost chopper is called continuous conduction mode CCM as the output voltage is can be modeled as a DC output as its variation is always positive and average output component can be obtained. During the On state: Q1 has its gate signal so it will be conducting and can be modeled as a resistance with low value RDS on and CR1 is reverse biased and no current flows through it and can be modeled as a short circuit as shown in fig.5[1].

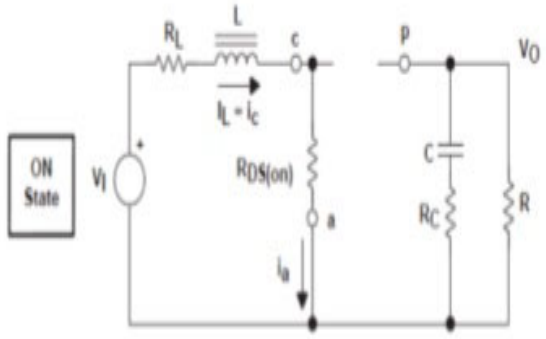

Fig.5

During Off state: Q1 has no gate signal and it will not be conducting and can be modeled as an open circuit and CR1 will be forward biased and current will flow through it and can be modeled as short circuit as shown in fig.6 [1].

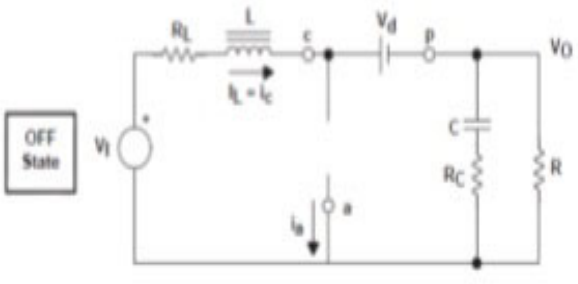

Fig.6

Analysis equations of the CCM Boost Chopper: To understand clearly how the boost chopper obtains a higher magnitude DC from a lower magnitude DC analysis equations had to be retrieved. In this part mathematical equations and explanation are presented. During the on state Q1 will have a low drain-to-source resistance, labeled RDS (on), which has a small voltage drop of VDS. The inductor will also experience a small voltage drop equivalent to IL x RL. Due to this occurrence the input voltage, labeled VI, will be applied across the inductor 'L'. During this time the diode CR1 will be in reverse bias, and as such, switched off. Applied to the right side of inductor 'L' is the MOSFET 'on' voltage, VDS. The inductor current will flow from the input source, VI, through Q1 and then to ground. Using the expression: VI-(VDS+IL x RL), the voltage across the inductor can be found. This voltage will remain constant. Since the voltage remains constant the current in the inductor will increase linearly.

During off stage Q1 is off, there will be high drain-to-source impedance. Since the current inside an inductor cannot change instantaneously the current will shift from Q1 to CR1. As the inductor current decreases the voltage across the inductor reverses polarity. It will stay in this state until the rectifier CR1 becomes forward biased and switches on. The voltage to the left of inductor L remains the same as before. However, the voltage applied to the right side of the inductor now becomes the output voltage; VO. Flowing

from the input voltage source, VI, through CR1 to the output capacitor is the inductor current. The voltage across the inductor will remain constant as in the 'on' state, and will equal to (VO + Vd + IL x RL) - VI. The applied voltage will be negative. The inductor current will decrease when it is in the off state. The current will decrease linearly.

Calculating under steady state conditions the decrease and increase of current in the two different stages are equal and under the assumption that VO is constant as the RC branch is highly capacitive load that can be modeled as a constant voltage source these equations are obtained.

$\Delta I_L(-)=((V_o+V_d+I_L*R_L)-V_i)*T_{off}/L$

$\Delta I_L(+)=(Vi-(V_{DS}+I_L*R_L))*T_{on}/L$

$V_o=(V_i-I_L*R_L)/(1-D)-V_d-V_{DS}*D/(1-D)$

Under assumption that R_L, V_d, V_{DS} have small values $V_o=V_i/(1-D)$

$I_o=(1-D)*I_i$

Fig.7 represents the curves of the currents through each component in the converter and its relation to the duty cycle [1].

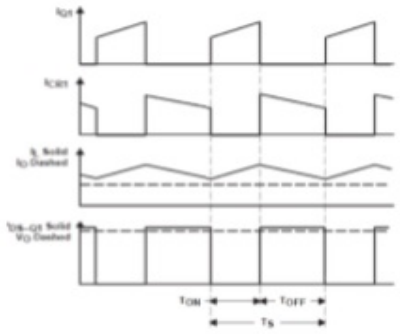

Fig.7

Effect of varying the duty cycle on V_{out}: In this part simulation for the boost chopper was done on Simulink and the duty cycle of the system was varied to verify the mathematical relations obtained in the previous part. The values used for the simulation were as follow: L=10uH RL=10 ohm C=10uF RC=10ohm R=100ohm V=10v F=1kHz.

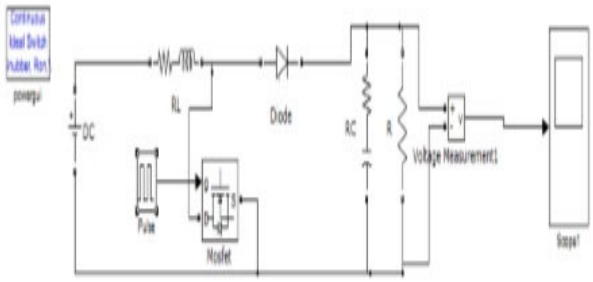

Fig.8 Simulink circuit simulation

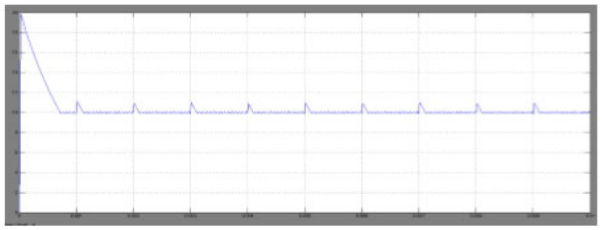

Fig.9 output at D=0.001

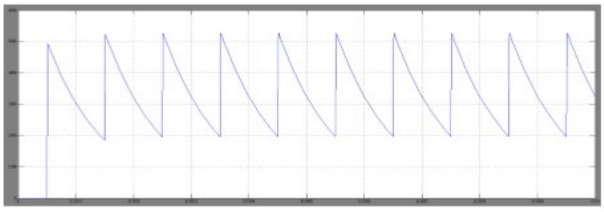

Fig.10 output at D=0.5

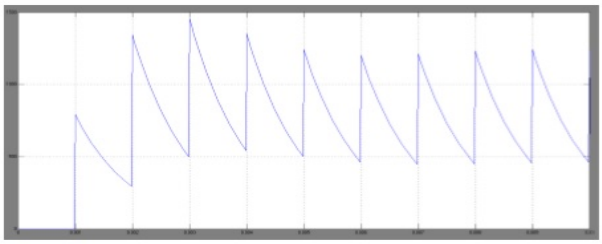

Fig. 11 output at D=0.99

The outputs from the three simulations verify the mathematical equations retrieved as when D=0.1 the output is almost equal to the input voltage, when it was increased the output increased and when it reached 0.99 the output was almost 100 times higher than the input which is also verified by the mathematical equations.

The design of a DC boost chopper should always have low values for RL and RC so the inductive and the capacitive part in each part dominates the behavior of the branch and to have the assumptions used valid in order to have control over the magnitude of the output by only tuning the duty cycle of the NMOS.

The future trend in usage of DC choppers in renewable energy systems s to cascade two choppers one to get a higher magnitude like the boost chopper the other chopper is used to stabilize the output to get the maximum power from the system which is widely needed in both photovoltaic systems and in wind turbines.

CONCLUSION

Renewable energy systems are a crucial ned that develops and will be needed all over the world to replace the Fossil energy. The power electronic converters are the main key to obtain efficient conversion of energy and maximize the output. It's needed to have further researching in the area of maximizing the conversion between the energies, stabilizing the output of the renewable energy systems and in the area of the inverters DC-AC in order to get output with pure sinusoidal wave of desired frequency.

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Wireless Power Transmission via Solar Power Satellite

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***Abstract*-In this paper, we present the concept of Solar Power Satellites -The solar cells in the satellite will convert sunlight to electricity, which will changed to radio frequency energy, then beamed to a receiver site on earth and reconverted to electricity by using transmitting and receiving antenna with the technology of wireless power transmission (i.e., transmitting power as microwaves in order to reduce the transmission and distribution losses). This concept is also known as Microwave Power Transmission. The advantages, disadvantages, biological impacts and applications of WPT are also presented.**

keywords--Wireless transmission, Tesla theory, Microwave power transmission, Rectenna, Transmitting antenna

I. I. INTRODUCTION

The new millennium has introduced increased pressure to finding new renewable energy sources. The exponential increase in population has led to the global crisis such as global warming, environmental pollution and rapid decrease of fossil reservoirs. Also the demand of electric power increase at a much higher pace than other energy demands as the world is industrialized and computerized. Under these circumstances, research has been carried out to look into the possibility of building a power station in space to transmit electricity to Earth by way of radio waves-the Solar Power tellites. Solar Power Satellites(SPS) converts solar energy in to micro waves and sends that microwaves in to a beam to a receiving antenna on the Earth for conversion to ordinary electricity.SPS is a clean, large-scale, stable electric power source. Solar Power Satellites is known by a variety of other names such as Satellite Power System, Space Power Station, Space Power System, Solar Power Station, Space Solar Power Station etc.(1) One of the key technologies needed to enable the future feasibility of SPS is that of Microwave Wireless Power Transmission.WPT is based on the energy transfer capacity of microwave beam i.e., energy can be transmitted by a well focused microwave beam. Advances in Phased array antennas and rectennas have provided the building blocks for a realizable WPT system(2) .

II. II. SOLAR POWER SATELITE

A. why SPS

Increasing global energy demand is likely to continue for many decades. Renewable energy is a compelling approach both philosophically and in engineering terms. However, many renewable energy sources are limited in their ability to affordably provide the base load power required for global industrial development and prosperity, because of inherent land and water requirements. The burning of fossil fuels resulted in an abrupt decrease in their .it also led to the green house effect and many other environmental problems. Nuclear power seems to be an answer for global warming, but concerns about terrorist attacks on Earth bound nuclear power plants have intensified environmentalist opposition to nuclear power. Moreover, switching on to the natural fission reactor, the sun, yields energy with no waste products. Earth based solar panels receives only a part of the solar energy. It will be affected by the day & night effect and other factors such as clouds. So it is desirable to place the solar panel in the space itself, where, the solar energy is collected and converted in to electricity which is then converted to a highly directed microwave beam for transmission. This microwave beam, which can be directed to any desired location on Earth surface, can be collected and then converted back to electricity. This concept is more advantageous than conventional methods. Also the microwave energy, chosen for transmission, can pass unimpeded through clouds and precipitations.

B. Concept

Basic idea of SPS is to collect the solar energy in orbit and send it to ground by microwave, laser beam or some other ways. The concept of the Solar Power Satellite energy system is to place giant satellites, covered with vast arrays of solar cells, in geosynchronous orbit 22,300 miles above the Earth's equator. Each satellite will be illuminated by sunlight 24 hours a day for most of the year. Because of the 23" tilt of the Earth’s axis, the satellites pass either above or below the Earth’s shadow. It is only during the equinox period in the spring and fall that they will pass through the shadow. They will be shadowed for less than 1% of the time during the year. The solar cells will convert sunlight to electricity, which will then be changed to radio-frequency energy by a transmitting antenna on the satellite and beamed to a receiver site on Earth.

It will be reconverted to electricity by the receiving antenna, and the power would then be routed into our normal electric distribution network for use here on the Earth. Figure 1 illustrates the concept. The great advantage of placing the solar cells in space instead of on the ground is that the energy is available 24 hours a day, and the total solar energy available to the satellite is between four and five times more than is available anywhere on Earth and 15 times more than the average location. Testing has demonstrated that wireless energy transmission to the Earth can be accomplished at very high efficiencies. Tests have also shown that the energy density in the radio-frequency beam can be limited to safe levels for all life forms.

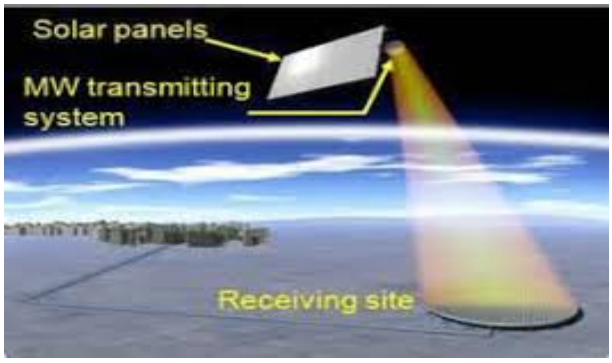


Fig. 1. Components of SPS and basic conversion processes

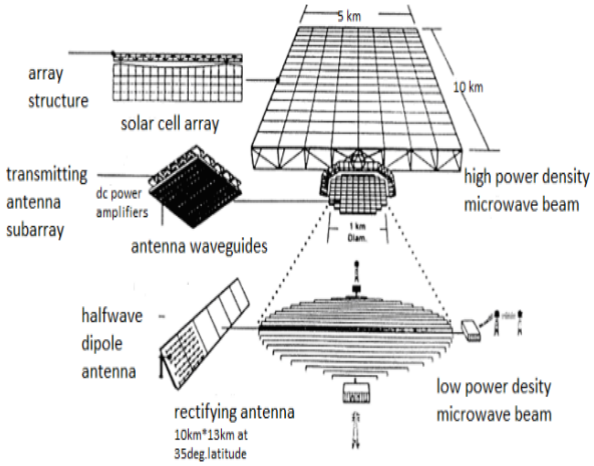
III. WIERELESS POWER TRANSMISSION

In 1893, Nikola Tesla demonstrated the illumination of vacuum bulbs without using wires for power transmission at the World Columbian Exposition in Chicago. William C. Brown, the pioneer in wireless power transmission technology, had designed, developed a unit and demonstrated to show how power can be transferred through free space by microwaves. In 1961, Brown published the first paper proposing microwave energy for power transmission, and in 1964 he demonstrated a microwave-powered model helicopter that received all the power needed for flight from a microwave beam at 2.45 GHz from the range of 2.4GHz - 2.5 GHz frequency band which is reserved for Industrial, Scientific, and Medical (ISM) applications. Typical WPT is a point-to-point power transmission. For the WPT, we had better concentrate power to receiver. It was proved that the power transmission efficiency can approach close to 100% (3). See figure 2 for a typical reference system.

The main components of Wireless Power Transmission are Microwave Generator, Transmitting antenna and Receiving antenna (Rectenna). These essential components are further described in detail (Figure 1)

A. Microwave Generator:

The Microwave generator takes the DC power generated by the solar cells and converts it to radiated RF output. It consists of a DC-RF conversion oscillator, which is typically low-power and followed by a gain stage and finally a power amplifier (PA).Typically the microwave generating devices are classified as microwave tubes (e.g., klystron, magnetron, TWT etc) or semiconductor MW devices.



(A Fresh Look at Space Solar Power: New Architectures, Concepts and Technologies" by Mankins J., 1997, National Aeronautics and Space Administration).

Figure 2. Depicts a reference system

B. Transmitting Antenna

A. The slotted wave guide antenna, microstrip patch antenna, and parabolic dish antenna are the most popular type of transmitting antenna. The slotted waveguide antenna is ideal for power transmission because of its high aperture efficiency (> 95%) and high power handling capability (4). We need higher efficient generator/amplifier for the MPT system than that for the wireless communication system. For highly efficient beam collection on rectenna array, we need higher stabilized and accurate phase and amplitude of microwave when we use phased array system for the MPT.

C. Rectenna

The concept and the name „rectenna" was conceived by W.C. Brown of Raytheon Company in the early of 1960s . A Rectenna is a Rectifying antenna, a special type of antenna that is used to directly convert microwave energy into DC electricity. Its elements are usually arranged in a multi element phased array with a mesh pattern reflector element to make it directional. Rectennas are being developed as the receiving antennas in proposed microwave power transmission schemes, which transmit electric power to distant locations using microwaves. Rectennas are used in RFID tags; the energy to power the computer chip in the tag is received from the querying radio signal by a small rectenna. One possible future application is a receiving antenna for solar Power satellites. A simple rectenna element consists of a dipole antenna with a Schottky diode placed across the dipole

elements. The diode rectifies the AC current induced in the antenna by the microwaves, to produce DC power. Schottky diodes are used because they have the lowest voltage drop and highest speed and therefore waste the least amount of power

due to conduction and switching. Large rectennas consist of an array of many such dipole elements. Rectennas are highly efficient at converting microwave energy to electricity. In laboratory environments, efficiencies of over 85% have been observed (3).

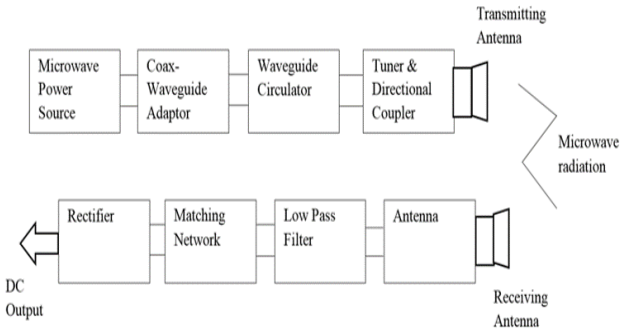


Fig. 3. Functional block diagram of wireless power transmission.

IV. SOLAR ENERGY IS A LIMITLESS SOURCE OF ENERGY

The solar energy that reaches the Earth is about 10,000 times total human energy production today and the energy available in near-Earth space is limitless. A solar panel on an average can deliver 19 to 56 W/m² where as SPS rectenna would deliver about 23mW/cm² (230 W/m²) continuously. Research is being done on many different ways of using solar power economically on Earth, and many of these will be successful. Terrestrial solar energy is going to become a colossal business. However, sunlight is diffuse and not available continuously at the Earth's surface. So one additional possibility is to collect solar energy 24 hours per day in space, and transmit it as microwave beams to receivers on Earth. Hence power can be delivered wherever needed by redirecting its microwave beam, if additional ground-receiving Rectenna arrays are available.

V. ADVANTAGES

The idea collecting solar energy in space and returning it to earth using microwave beam has many attractions.

1. The full solar irradiation would be available at all times expect when the sun is eclipsed by the earth (5). Thus about five times energy could be collected, compared with the best terrestrial sites
2. The power could be directed to any point on the earth's surface.
3. The zero gravity and high vacuum condition in space would allow much lighter, low maintenance structures and collectors (5).
4. The power density would be uninterrupted by darkness, clouds, or precipitation, which are the problems encountered with earth based solar arrays.
5. The realization of the SPS concept holds great promises for solving energy crisis
6. No moving parts.
7. No fuel required.
8. No waste product.

VI. DISADVANTAGES

The concept of generating electricity from solar energy in the space itself has its inherent disadvantages also. Some of the major disadvantages are:

The main drawback of solar energy transfer from orbit is the storage of electricity during off peak demand hours (6).

1. The frequency of beamed radiation is planned to be at 2.45 GHz and this frequency is used by communication satellites also.
2. The entire structure is massive.
3. High cost and require much time for construction
4. Radiation hazards associated with the system
5. Risks involved with malfunction.

CONCLUSION

The SPS will be a central attraction of space and energy technology in coming decades. However, large scale retro directive power transmission has not yet been proven and needs further development. Another important area of technological development will be the reduction of the size and weight of individual elements in the space section of SPS. Large-scale transportation and robotics for the construction of large-scale structures in space include the other major fields of technologies requiring further developments. Technical hurdles will be removed in the coming one or two decades. Finally, we look forward to universal acceptance of the premise the electromagnetic energy is a tool to improve the quality of life for mankind. It is not a pollutant but more aptly, a man made extension of the naturally generated electromagnetic spectrum that provides heat and light for our sustenance. From this view point, the SPS is merely a down frequency converter from the visible spectrum to microwaves.

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Analysis of Wide Area Monitoring System Architectures

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***Abstract*—Wide Area Measurement System (WAMS) is technology to improve situational awareness and visibility within power system of today's and future grids. It uses real time synchro phasor data to measure the state of grid that enables improvement in stability and reliability of power grid. WAMS architecture plays an important role in these real time and data intensive systems. Proper selection of WAMS architecture helps immensely in achieving the benefits of WAMS technology namely increase in stability and reliability of grid. The factors like PMU data acquisition, decision making based on PMU data and the enactment of actions based on decision making determine the architecture details of WAMS. This paper discusses how different combinations of these factors lead to different realizable types of WAMS architectures. In addition, this paper also presents detailed comparison of all WAMS architectures to highlight the advantages and disadvantages of implementing each one of them based on WAMS features like WAMS data communication, data security, data storage, alarm/event management, system availability etc. The paper concludes with summarizing the architecture options and their possible use cases.**

Keywords—Wide Area Monitoring Systems (WAMS) architecture, Phasor Data Concentrators (PDC), Phasor Measurement Unit (PMU), Synchrophasors.

I. INTRODUCTION

Many of today's electrical grids are being operated closer to their stability limits because of ever expanding power demands, aging infrastructure, complex power transfers among regions, and challenging renewable integration. All these trends present an important challenge to the reliability and stability of the electrical grid and under such complexities, carrying out monitoring, protection on real time basis and responding to contingencies are critical for maintaining reliability and stability of the grid.

SCADA/EMS systems are widely used as situational awareness technology however they provide only the steady state view of dynamically changing power system. Wide area measurement systems (WAMS) have come forward as a prominent technology option to improve the visibility and situational awareness in both today's and the future electrical grids. Synchro phasor technology is at the heart of WAMS system that has enabled state measurement in WAMS compared to state estimation in conventional SCADA systems. WAMS measurements are more accurate and faster compared to their SCADA counterparts. The faster and more accurate synchro phasor measurements enable accurate and faster analysis of current grids situation almost in real-time which in turn provides operators with options to carry out preventive measures and time to act through early prediction of dangerous events. WAMS thus addresses not only the immediate reliability concerns but also operational issues by conducting real-time dynamic analysis, identifying and calculating security margins and indices, facilitating early detection and monitoring of system security, predicting emergency states and initiating restorative actions to avoid instability. It is also useful in post mortem analysis of disturbances in power grid.

This paper studies different types of architectures feasible for WAMS deployment considering the location of data collection, analysis, decision making and remedial action execution. The paper also brings out the detailed comparison of all WAMS architectures to highlight the advantages and disadvantages of implementing each one of them.

II. WIDE AREA MONITORING SYSTEMS

In a typical WAMS system, synchronized measurements are obtained from the PMUs and all the data is sent through communication networks, received and concentrated at a decision and control support system called as phasor data concentrators (PDC) that determines appropriate preventive corrective and protective measures. The decisions determined by the support system will then help operators at control centers to take smarter operator control actions. These actions are translated into feedback signals that are sent through communication networks to exploit the controllability and protection resources of the power system. PMU and PDC are thus backbones of any WAMS system. PMU is a function or logical device that provides synchro phasor (angle and magnitude), system frequency and rate of change of frequency measurements based on the data collected from one or more primary sensors like current (CTs) and potential (PTs) transformers. PMUs may optionally provide information such as calculated real (MW) and reactive (MVAr) powers, sampled measurements and Boolean status words [1] [2] [6].

PDC, a function or logical device, works as a node in a communication network where synchro phasor data from a number of PMUs and/or PDCs is collected, time aligned, aggregated and sent out as a single stream to the higher level PDCs and/or applications. PDC optionally has to execute real-time wide-area protection and control applications [3] [4] [6].

With the increasing number of PMUs installed in the WAMS system a need of an efficient architecture of data collection and management grew necessary for the efficient utilization of the data provided by the PMUs.

III. WAMS ARCHITECTURE CLASSIFICATION AND DEFINITION

WAMS architectures can be classified as Centralized, Distributed and Decentralized architectures [5]. The distinguishing factors among these types are information or data flow between the location of data acquisition, the location of decision making and the location where action based on decision is performed. The following sections describe different types of WAMS architecture in detail.

A. Centralized WAMS Architecture

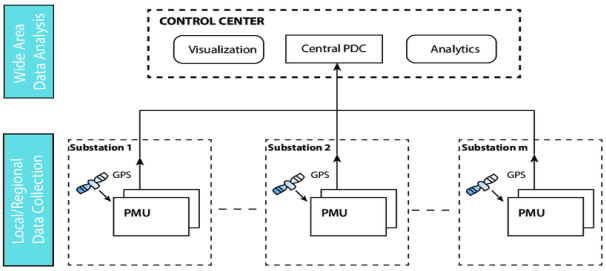
In a centralized WAMS architecture, PMU data acquisition, data analysis and enactment of remedial action is performed at central location. Fig. 1 encapsulates the centralized WAMS architecture. PMUs from various substations send the phasor data to Central PDC where time alignment and data concentration of all received PMU data activity takes place. The concentrated data is used for analytics and visualization. The remedial actions coming out of analysis are passed on to primary devices.

B. Decentralized

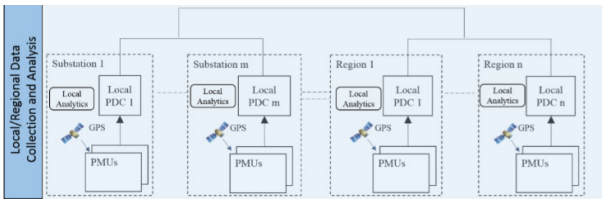
WAMS Architecture In decentralized WAMS architecture, the wide area monitoring is split into multiple small areas and PDCs control the small areas locally using local data. The local controllers are connected to each other if there is a need to solve larger area problem. Fig. 2 encapsulates the decentralized WAMS architecture. PMUs within a local area such as substation or particular region send phasor data to respective local PDC for processing. Local PDCs analyze the data to take any remedial action to protect or control respective local assets. Although all distributed local PDCs are connected to each other for data exchange in order to monitor larger area, this is not efficient solution for monitoring wider area. Coordinated concentrated data acquisition from local PDCs and their analysis for large area monitoring is often challenging and does not meet the goal most of the times.

C. Distributed WAMS Architecture

Distributed WAMS architecture can be mapped between centralized and decentralized architectures. It includes local as well as central controllers. It can be thought of as centralized control with decentralized execution stage. Fig. 3 encapsulates the distributed WAMs architecture. It comprises of local PDC situated at substation or region level and master PDC located at central control station. PMUs within a local area such as substation or particular region send phasor data to respective local PDC. All local PDCs are connected to master PDC at central control station. The difference is in the flow of information as local PDC may process the PMU data locally, supervised and controlled by master PDC.



Centralized Wam Architecture



Decentralized Wam Architecture

IV. CONCLUSION

WAMS architecture plays a key role in real time and data intensive WAMS systems to overcome the present challenges of power grid namely reliability and stability. Based on the location of PMU data collection ,analysis, decision making and remedial action execution, WAMS architectures are classified as centralized, decentralized and distributed architectures. Decentralized WAMS architecture can monitor and control smaller area covered by local PDC. This architecture cannot be used efficiently to monitor larger or wider area. Hence it is not used widely. This architecture finds application where area of monitoring is smaller and neighboring areas do not need coordination among them. Centralized and distributed WAMS architectures are widely used and preferred architectures for WAMS implementation. Centralized WAMS architecture uses the system elements efficiently to monitor wide area using smaller infrastructure however it does have single point failure opportunities leading to lower system availability compared to distributed architecture. One of the biggest advantages of centralized architecture is coordinated alarms and events management. The distributed architecture is advantageous over centralized architecture in terms of lower communication bandwidth, smaller data storage, increased data security and flexibility to implement additional substation functionality. Centralized WAMS architecture requires comparatively lower implementation cost however on costto-benefit ratio, distributed WAMS architecture scores over centralized architecture. Selection of centralized, decentralized or distributed WAMS architecture for WAMS deployment depends on the monitoring, protection, control schemes one wants to implement in a particular area. These schemes decide the data analysis, data required for analysis, the source of data, the location where data analysis needs to done and the location where enactment of action needs to be completed. Once the clarity is obtained on the above decision factors, the selection of WAMS architecture becomes easier. Proper selection of WAMS architecture is stepping stone in achieving the goals of WAMS i.e. increased reliability and stability of power grid.

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UNDERGROUND CABLES MAINTENANCE AND FAULT DISTANCE LOCATOR

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***Abstract*—this paper proposes the maintenance of underground cables and fault location from the base station in kilometers. Fault distance locator uses the ohm's law concept. When a low DC voltage is applied at the feeder end through the series resistor, then the current would vary depending upon the fault location.in case of a short circuit, the voltage across the series resistor would vary accordingly.**

I. INTRODUCTION

This paper is concerned with the maintenance of underground cables and fault location detection. Electric power can be transmitted or distributed either by over head transmission lines or by the underground cables. Till the decades, for transmission, overhead lines are used but currently underground cables are using for the transmission of power. underground cables are superior to the overhead lines. This is due to the underground cables does not affected by the atmospheric conditions like air pollution, snow, heavy rains and cyclones etc. the underground cable system is the common practice in urban areas. When the fault occurs in an underground cable, repairing is very difficult due to the unknown fault location. The fault of the cable occurs due to the reasons: inconsistent, weakness of the cable, insulation failure and breaking of the conductor. For that reason, the underground cables should be maintained properly.

II. UNDERGROUND CABLES

These are the cables which are buried below the ground. These are alternative to the overhead lines for transmission and distribution of power. They have several advantages like less voltage drop, less chances of occurrence of faults, less maintenance cost. They are very expensive to manufacture.

Benefits of underground cables:

1. suitable for highly densed urban areas where the installation of overhead lines is difficult or impossible.

2. No possibility of shortage due to wind, accidents, vibrations.

3. No danger to wildlife or flying aircraft.

4. No chance of illegal connection and sabotage.

III. CLASSIFICATION OF FAULTS

A fault in a cable can be classified as

A. Short Circuit Fault

It is further classified into 2 types, namely symmetrical and unsymmetrical faults. In symmetrical fault, all the three phases are short circuited, hence it is also known as three phase fault. In unsymmetrical fault the phase voltages are not equal in magnitude and displaced by 120^0.

B. Open Circuit Fault

This fault occurs when one or more conductors break. It is better than the short circuit fault because when this fault occurs the current flowing in the underground cable will become zero.

IV. DIFFERENT TYPES OF FAULT LOCATION METHODS

A. Online method

This method uses the sampled currents and voltages for the determination of fault points.

B. Offline method

It is further classified into two types.Tracer method and Terminal method. In Tracer method, the fault of the cable can be determined by walking on the cable lines.Fault location can be by indicated by an electromagnetic signal or audible signal.This method gives the accurate fault point.In terminal method, the fault location can be determined from one end or both the ends without tracking.

a) Time Domain Reflectometry: In this test, low energy signals are used to test the underground cables.TDR results are displayed as a graph and properly functioning cables send a return signal in a known timeframe.

b) High Voltage Radar Methods: These are three types.

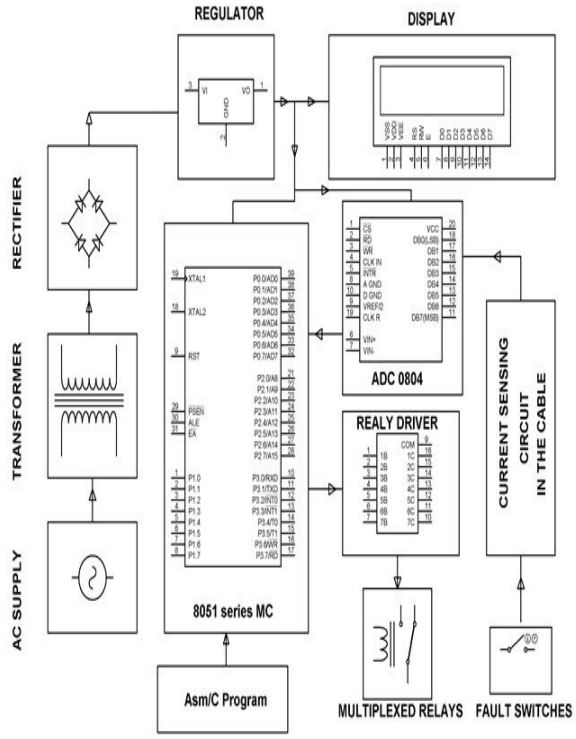
- Arc reflection:a filter,thumper and TDR work together to give approximate results of fault location.
- Sugre Pulse Reflection: a storage oscillator,thumper and current coupler are used to ionize distant fault locations.
- Voltage Pulse Reflection:This method uses a voltage coupler and analyzer to locate the faults at voltages higher than 25kv.

V. OPERATION OF FAULT LOCATOR:

Whenever an AC supply is given to the fault locator, the stepdown transformer will stepdown 230v to 12v. Then the ac supply is converted into DC by using a rectifier. By using the filters AC ripples are filtered out. The DC supply is then given to a voltage regulator from which the output is regulated as 5volts. This 5v are used for the working of microcontrollers and IC's in the circuit. The circuit consists

of a series of resistors to represent the resistance of underground cables for a specific distance. When the low voltage DC is applied to the feeder end through a series resistor, then the current would differ based on the fault location of the cable. Then it is fed to an Analog to Digital converter to develop the exact data. Then the result will be displayed in the 8051 microcontroller which is preprogrammed during the manufacturing.

VI. Fault Distance Locator Circuit



A. Advantages of fault distance locator

- Less complexity
- Low cost
- Long distance applications

B. Applications of fault distance locator

- Industrial applications.
- Underground cable fault location detection
- Electrical cable fault location detection

VII. Methods of Maintenance of Underground Cables

Maintenance can minimize the chances of occurrence of faults.

- Preventive maintenance: it is used to prevent the occurrence of faults due to the negligence of power distribution infrastructure. Maintenance activities fall under this category are:

  1. Checking the ground connections, cable joints and correcting if there are any issues.
  2. Checking the physical condition of transformers and switchgears.
  3. Clearing the contaminant deposits from termination points.
  4. Conducting contact resistance tests on terminations, insulation resistance tests between ground connections and conductors, to assess damage or wear.
  5. defective electrical joints and contacts are tested with thermal scanning.

- Corrective maintenance:

  These are conducted in response to the faults due to the internal failure or externally caused damage and to identify the remedial action. The maintenance activities fall under this category are:

  1. Repairing, re-testing and re-commissioning the faulty cables.
  2. Pinpointing the faulty areas using a cable fault locator.
  3. Checking the routes of electric cables for possible damage after excavation.

- Conditon based maintenance:

  It is used to check the underground cables and joints which are partially damaged or experiences the damage. It is useful to forecast when and what type of repair is needed in the future and what are the parts should be replaced to maintain the better performance. Oscillating wave testing system can be used to identify, evaluate partial discharge conditions in cable joints and terminations.

Conclusion

Underground cables are the ultimate solution of overhead lines. In recent past, the electric transmission system is partially destroyed in thunderstorms, cyclones. Using underground cables this destruction is eliminated. Transmission losses in underground cables are less compared to overhead lines. But the cost of installation is high in underground cables. We can conclude by, with the maintenance methods mentioned above it is possible to increase maintenances with low cost, good safety, security and the most efficient power transfer in the distribution and transmission network.

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Smart protecting device for Power System

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Abstract*— This paper discusses a power-system protection device designed to be integrated in smart environments based on Internet-of-Things technologies. The discussed system enhances electrical safety by fast disconnection of the power supply in case of fault events like leakage current, electrical arc, overcurrent or overvoltage and has been designed with the goal to be integrated in smart environments like smart homes or smart cities for protecting the electrical equipment. The system also enables real-time monitoring and notification events through an advanced communication interface using a data concentrator architecture. This paper provides an extended description of the discussed system's design and implementation, as well as the experimental validation results.

I.INTRODUCTION

The security and reliability of the electrical energy infrastructure is of vital importance today more than ever, given the degree to which electric-powered technology has become embedded in all human activities. Protecting the electrical power supply system against interruptions due to various faults is thus a main research concern .One of the components involved in power-system protection is the circuit breaker, which is responsible for closing the system when a fault or anomaly occurs in order to protect the electrical equipment .In today's world, the technological trend of implementing **"smart"** technologies, fostered by the emergence of Cloud Computing and the Internet of Things (IoT), led to a transfiguration of ordinary devices and environments to "smart" entities . This paper describes the design, implementation and experimental validation of the **ELSA** (Electrical Safety) power-system protection device with built-in support for IoT-based integration in smart environments like a Smart City or a Smart Home.

II.FEATURES OF ELSA

- Advanced fault-detection and protection through high-speed disconnection in the case of: overcurrent, overvoltage, leakage current and electric arc.
- Real-time monitoring by sending recorded events to a Web server where the information is accessible through an online Web-based interface.
- Real-time notifications by e-mail and text messages to designated persons.
- Flexible and scalable communication infrastructure supporting easy integration in smart environments and with other utility service operators through Web-based protocols, services and APIs.

III.BACKGROUND OF ELSA

One of the recent trends is linked to the emergence of micro-grids, which need to operate safely in both islanded and grid-connected modes. Hence, the re-shaping of the traditional power grid (transcending into Smart Grid and micro-grids) will require highly flexible distribution management systems and a re-design of protection strategies. The reliability of micro-grids is an important research direction, given their sensitivity to power outages which can increase the average frequency and duration of interruptions . Thus, existing research focuses on designing reliable protection solution for such systems.

The ELSA power-system protection device described in this paper has been designed with the goal to be integrated in smart environments like smart homes or smart cities for protecting the electrical equipment from faults and anomalies. It not only allows remote monitoring and control of the coupling/decoupling feature, but also supports real-time notifications and provides enhanced protection against a wide range of electrical failures.

The public lighting poles part of the IoT-based intelligent lighting system integrate only a basic circuit breaker offering decoupling in the case of a short circuit. Thus, the ELSA device provides additional protection against a wider range of electrical faults. This is also the case of residential or industrial buildings, most of which are protected only against short-circuit (and only some having differential breakers). In both cases, deploying the ELSA device enables, besides enhanced protection, real time notification of the public energy provider or the building owner about the fault events as they occur.

IV.MATERIALS

The ELSA protection device described in this paper has been implemented based on an original, innovative design, and ensures the protection of electrical consumers connected to the public power supply grid by disconnecting the

electrical supply in the event of several faults: overvoltage, overcurrent, leakage current and electrical arc. In the left subfigure the ELSA device is displayed in its case, with the modules being identified as follows:

1. Power supply (230V AC to 12V DC)
2. Control module containing three stacked PCBs (A, B, C from the right subfigure)
3. Relay (SW2) for neutral switching
4. Casing including the solid state relay (SW1)

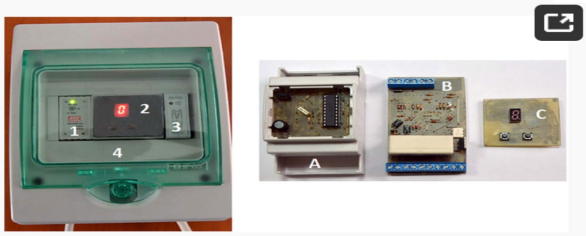

Fig 1. The power system protection device.
doi:10.1371/journal.pone.0208168.g001

The right subfigure shows the microcontroller unit with its three overlayed PCBs:

1. (A) PCB for microcontroller and switched supply sources
2. (B) PCB for sensors
3. (C) PCB for user control (via the buttons) and states display

V. FUNCTIONALITY AND RELIABILITY TESTING IN LABORATORY

The ELSA protection device underwent functional testing with R, L, and C loads in different combinations, measuring the decoupling speed for various faults and also validating the data communication infrastructure. In order to accurately determine the reliability of the device, a dedicated test stand has been designed and developed that continuously generates all types of fault events and measures the decoupling/recoupling timings. This stand also supports accelerated reliability testing, including temperature and humidity variation.

An analysis was also performed in order to proper handle various failure scenarios caused by malfunctions of the ELSA device. In the case of decoupling/recoupling faults a specific error message is shown on the local display together with an error notification message sent to the user via SMS. If the malfunction involves critical system components (e.g. the microcontroller or power supply), the device still offers basic protection against short-circuit until the defects have been remedied. In this case, remote fault detection is performed by the server upon not receiving the status message from the device which is supposed to be sent one each 24 hours.

VI. SUMMARY

To summarize, our approach for transcending a traditional electrical protection system to one that is “IoT-ready” brings the following important features:

- Easy and uniform interaction with other communication and data systems due to the effectiveness of IP-based networking.
- Low-power overall consumption by integrating low-power microcontrollers and communication shields. (Thus enforcing the current trends in IoT communication devices).
- Simplified communication architecture based on HTTP requests, consequently reducing the complexity of the hardware/software implementation.
- Interoperability—achieved by using IP based communication, HTTP requests and JSON-structured messages—that allows a seamless integration with other systems.
- Scalability—the architecture of the entire communication system allows connecting a variable number of devices “on the fly”.
- Easy data exchange with other entities (e.g. utility companies, emergency services).

VII. CONCLUSION AND FUTURE WORK

This paper described the design, implementation and functional validation of an advanced power-system protection device with IoT-based support for integration in smart environments like Smart Homes or Smart Cities.

The protection device ensures the safety of electrical consumers connected to the public power supply grid by disconnecting the electrical supply in the event of several faults: overvoltage, overcurrent, leakage current and electrical arc. The system also provides a Web-based interface for monitoring the network of operating devices and also real-time event notification through e-mail and SMS messages.

Future developments will include integrating the protection device in the smart city infrastructure, more specifically the smart public lighting system with LoRa (Long Range Wide-area network) communication support. Also, we envisage replacing the coupling/decoupling component—which is a SSR (Solid State Relay) and thus has a maximum admissible current of 1KA—with an element capable of supporting higher currents for enhanced protection against short circuits that may generate higher current values that SSR can handle. Last but not least, prospective tests envisage the integration of the ELSA device in power grids with distributed energy generators for identifying and addressing potential technical issues. Hence, we are considering as an important research direction extending the functionality of the ELSA device for ensuring the protection of consumers connected to DC micro-grids.

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Power Scenario in India

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***Abstract*—With a limit to the available conventional sources of energy in India accompanied by a continuous increase in pressure for more energy due to rise in population each year, a shift in the focus from conventional sources to the renewable sources of energy is inevitable. The gap between energy required and energy produced will tend to increase in the coming years if our country depends only upon these limited sources of energy. This paper takes into account India's current energy scenario and forecasts India's energy situation in the year 2020. Furthermore, it clearly depicts the widening gap between the demand and supply and also shows that any attempt to fill this increasing gap with the over use of conventional sources of energy will exhaust them even before their estimated time leaving nothing for the future generations thereby preparing us by predicting a picture of India with its approximate increased demand. Moreover the paper focusses on enhancing the use of renewable sources of energy due to its large untapped potential, concern for the environment, increased demand-supply gap with population increase and pressure on high-emission industry sectors.**

I.INTRODUCTION

Electricity is the most important infrastructural input in the development is growth of economy. The power sector in India is mainly governed by ministry of power there are three major pillars of power sector. Those are stated as
I) Generation II) Transmission III) Distribution

Electricity generation is the process of generating electric power from sources of primary energy. For electric utilities in the electric power industry, it is the first stage in the delivery of electricity to end users, the other stagesbeingtransmission, distribution, energy storage and recovery, using the pumped-storage method.A characteristic of electricity is that it is not freely available in nature in large amounts, so it must be produced. Production is carried out in power stations (also called "power plants"). Electricity is most often generated at a power plant by electromechanical generators, primarily driven by heat engines fueled by combustion or nuclear fission but also by other means such as the kinetic energy of flowing water and wind. Other energy sources include solar photovoltaics and geothermal power.

HISTORY

The fundamental principles of electricity generation were discovered in the 1820s and early 1830s by British scientist Michael Faraday. His method, still used today, is for electricity to be generated by the movement of a loop of wire, or disc of copper between the poles of a magnet. Central power stations became economically practical with the development of alternating current (AC) power transmission, using power transformers to transmit power at high voltage and with low loss. In 1870, commercial electricity production started with the coupling of the dynamo to the hydraulic turbine. In 1870, the mechanical production of electric power began the Second Industrial Revolution and created inventions using the energy, whose major contributorswere Thomas AlvaEdison and Nikola Tesla. Previously the only way to produce electricity was by chemical reactions or usingbattery cells, and the only practical use of electricity was for the telegraph.Electricity generation at central power stations started in 1882, when a steam engine driving a dynamo at Pearl Street Station produced a DC current that powered public lighting on Pearl Street, New York. The new technology was quickly adopted by many cities around the world, which adapted their gas-fueled street lights to electric power, and soon after electric lights would be used in public buildings, in businesses, and to power public transport, such as trams and trains.

The first power plants used water power or coal and today a variety of energy sources are used, such as coal, nuclear, natural gas, hydroelectric, wind, and oil, as well as solar energy, tidal power, and geothermal sources. The use of power-lines and power-poles has been significantly important in the distribution of electricity.

II.POLICY INITIATIVES

Electricity Act 2003 has been enacted and came into force from 15.06.2003. The objective is to introduce competition, protect consumer's interests and provide power for all. The Act provides for National Electricity Policy, Rural Electrification, Open access in transmission, phased open access in distribution, mandatory SERCs, license free generation and distribution, power trading, mandatory metering and stringent penalties for theft of electricity. It is a comprehensive legislation replacing Electricity Act 1910, Electricity Supply Act 1948 and Electricity Regulatory Commission Act 1998.The Electricity Act, 2003 has been amended on two occasions by the Electricity (Amendment) Act, 2003 and the Electricity (Amendment) Act, 2007. The

aim is to push the sector onto a trajectory of sound commercial growth and to enable the States and the Centre to move in harmony and coordination.

III. POWER CONSUMPTION IN INDIA

India is the fourth largest power consumer in the world. India the world's second most populated country ended 2017 with 1160.1 Billion unit of primary energy consumption. India is third largest coal producer and consumer and fourth biggest oil consumer in the world. The country's coal reserves estimated at 60.6 Billion tons as of Dec 2013,stand fifth largest in the world.

IV.POWER GENERATION

Total electricity production stood 1003.52 billion units in India between April 2017 and January 2018.Multiple drivers (like industrial expansion and rising per capita income) are leading to growth in power demand.The country installed power generation capacity of 334.4 giga watts(GW/1000 MW) as of January 2018 is the world's fifth largest.Over the last five years, India put up 99.70 GW of additional capacity.back in 2016,India became the world's largest power consumer too. The country consumption is now set to go upto 1894.7 TWhby 2022.

Sector	MW	% of Total
Central Sector	90,177	25.0%
State Sector	102,818	28.5%
Private Sector	167,462	46.5%
Total	**3,60,456**	

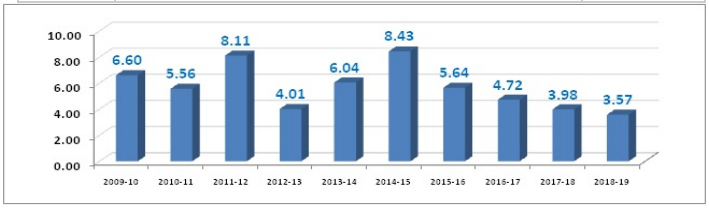
Fig: Installed capacity in respect of RES (MNRE) as on 31.07.2019.

RES (Renewable Energy Sources) include Small Hydro Project, Biomass Gasifier, Biomass Power, Urban & Industrial Waste Power, Solar and Wind Energy.

Performanceof Conventional Generation

The electricity generation target of conventional sources for the year 2019-20 has been fixed as 1330 Billion Unit (BU). i.e. growth of around 6.46% over actual conventional generation of 1249.337 BU for the previous year (2018-19). The conventional generation during 2018-19 was 1249.337 BU as compared to 1206.306 BU generated during 2017-18, representing a growth of about 3.57%.

Year	Energy Generation from Conventional Sources (BU)	% of growth
2009 -10	771.551	6.6
2010 -11	811.143	5.56
2011 -12	876.887	8.11
2012 -13	912.056	4.01
2013 -14	967.150	6.04
2014 -15	1048.673	8.43
2015 -16	1107.822	5.64
2016 -17	1160.141	4.72
2017 -18	1206.306	3.98
2018 -19	1249.337	3.57
2019 -20*	447.627	6.15



OVERVIEW

The Overall generation (Including generation from grid connected renewable sources) in the country has been increased from 1110.458 BU during 2014-15 to 1173.603 BU during the year 2015-16, 1241.689 BU during 2016-17, 1308.146 BU during 2017-18 and 1376.095 BU during 2018-19. The performance of Category wise generation during the year 2018-19 was as follows:

Thermal Increased by	3.39 %
HydroReduced by	6.95 %
NuclearIncreased by	1.39 %
Bhutan Import Increased by	7.78 %
Renewables Increased by	24.47 %

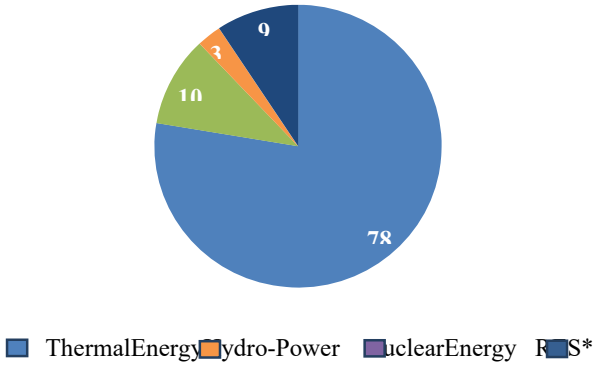
Overall Growth rate recorded by 5.19 %

V.POWER GENRATION BY SOURCES

Total electricity generated in the country clocked 1156.8 BU (billion unit) during April-Jan 19, reporting growth of 5.7% vs 5.3% in previous year. Renewable energy sources contributed 107.2 BU, and recorded a 25.2% growth over production in corresponding period of FY18.

PLF of thermal power plants monitored by CEA stood at 61.1% during 10 month period of FY19, an improvement over 59.3% for the corresponding period in FY18.

Power Generation by Source

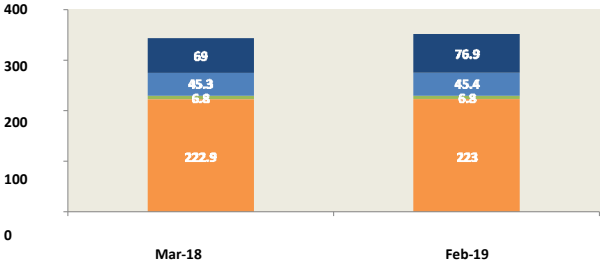


Installed capacity stood at 350.1 GW as of February 2019, recording a net capacity addition of 6.1 GW during the year. Solar and wind power accounted for 95% of capacity addition

and remaining were hydro power projects. Wind energy capacity addition at 1.2 GW, has slowed down considerably post FY17 when it recorded 6 GW of capacity addition.

India is 100% electrified and as per government data, all willing households have been connected to grid-based electricity.

Graph 2 Total Installed Capacity *(Source Wise- Capacity in GW)*



April-Feb 19 witnessed addition of 2.1GW of thermal power capacity, but due to retirement of an equivalent capacity, the net capacity addition was just over 100 MW. Total thermal power capacity stood at 223 GW as of February 2019. Overall capacity utilization of coal-based plants stood at 61.1%.

As of January 31st,2019 68.7 GW of additional thermal power capacity is under construction.

Gas based power plants continued to witness below-par capacity utilization and witnessed PLF remaining stable at 22.2% marking a marginal improvement over 22% in FY18.

During the 11-month period, 100MW of hydro-based plants were commissioned. Hydro power projects over 25 MW have been categorised as renewable power by the Union Government.

A total of 7.8 GW of renewable energy capacity was added during the 11month period of FY19 as per latest data from MNRE and is in addition to the CEA data above.

Solar power witnessed the highest capacity addition (5.4GW), followed by wind power (1.3 GW) and small hydro (~32 MW). Wind power capacity addition was at multi year low. Bio power capacity too recorded 1.2 GW of capacity addition during the year.

SECI has issued fresh tenders totalling 6 GW in March 2019, in order to improve the overall pace of implementation of solar projects over the next 36 months. An average 2 GW of solar capacity has to be completed every month over the next 3 years in order to achieve a 100 GW solar power capacity.

ELECTRICITY DEMAND AND GENERATION

Total energy generated from conventional sources in the country stood at 1051 billion units (BU) during April-January 2019, growth of 4.3% over corresponding period inFY18.

Renewable power generation recorded 25% increase in generation during the first 10 months ofFY19.

Thermal energy which includes coal-gas-diesel based power plants accounted for 78% of the power generated in the country. Nuclear-based, Hydro-power; and Renewable energy accounted for 3%, 10% and 9% respectively of the power generated during theyear.

INSTALLED CAPACITIES

ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS
(As on 31.03.2019)
(UTILITIES)

Region	Ownership/ Sector	Modewise breakup								Grand Total
		Thermal					Nuclear	Hydro	RES * (MNRE)	
		Coal	Lignite	Gas	Diesel	Total				
Northern Region	State	16344.00	250.00	2879.20	0.00	19473.20	0.00	8697.55	699.56	28870.31
	Private	21680.83	1080.00	558.00	0.00	23318.83	0.00	2514.00	13120.46	38953.29
	Central	12335.37	250.00	2344.06	0.00	14929.43	1620.00	8496.22	379.00	25424.65
	Sub Total	**50360.20**	**1580.00**	**5781.26**	**0.00**	**57721.46**	**1620.00**	**19707.77**	**14199.02**	**93248.25**
Western Region	State	21560.00	1040.00	2849.82	0.00	25449.82	0.00	5446.50	547.89	31444.21
	Private	34745.67	500.00	4676.00	0.00	39921.67	0.00	481.00	21864.76	62267.43
	Central	16502.95	0.00	3280.67	0.00	19783.62	1840.00	1620.00	666.30	23909.92
	Sub Total	**72808.62**	**1540.00**	**10806.49**	**0.00**	**85155.11**	**1840.00**	**7547.50**	**23078.94**	**117621.55**
Southern Region	State	19932.50	0.00	791.98	287.88	21012.36	0.00	11774.83	586.88	33374.07
	Private	11874.50	250.00	5322.10	273.70	17720.30	0.00	0.00	37491.40	55211.70
	Central	11235.02	2890.00	359.58	0.00	14484.60	3320.00	0.00	541.90	18346.50
	Sub Total	**43042.02**	**3140.00**	**6473.66**	**561.58**	**53217.26**	**3320.00**	**11774.83**	**38620.18**	**106932.27**
Eastern Region	State	6240.00	0.00	100.00	0.00	6340.00	0.00	3537.92	275.11	10153.03
	Private	6387.00	0.00	0.00	0.00	6387.00	0.00	399.00	1116.37	7902.37
	Central	14836.64	0.00	0.00	0.00	14836.64	0.00	1005.20	10.00	15851.84
	Sub Total	**27463.64**	**0.00**	**100.00**	**0.00**	**27563.64**	**0.00**	**4942.12**	**1401.48**	**33907.24**
North Eastern Region	State	0.00	0.00	497.71	36.00	533.71	0.00	422.00	233.25	1188.95
	Private	0.00	0.00	24.50	0.00	24.50	0.00	0.00	61.04	85.54
	Central	770.02	0.00	1253.60	0.00	2023.62	0.00	1005.00	30.00	3058.62
	Sub Total	**770.02**	**0.00**	**1775.81**	**36.00**	**2581.83**	**0.00**	**1427.00**	**324.29**	**4333.11**
Islands	State	0.00	0.00	0.00	40.05	40.05	0.00	0.00	5.25	45.30
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.38	7.38
	Central	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.10	5.10
	Sub Total	**0.00**	**0.00**	**0.00**	**40.05**	**40.05**	**0.00**	**0.00**	**17.73**	**57.78**
ALL INDIA	State	64076.50	1290.00	7118.71	363.93	72849.13	0.00	29878.80	2347.93	105075.86
	Private	74688.00	1830.00	10580.60	273.70	87372.30	0.00	3394.00	73661.40	164427.70
	Central	55680.00	3140.00	7237.91	0.00	66057.91	6780.00	12126.42	1632.30	86596.63
	Total	**194444.50**	**6260.00**	**24937.22**	**637.63**	**226279.34**	**6780.00**	**45399.22**	**77641.63**	**356100.19**

CONCLUSION

Back in 2016, India became the world's third-largest power consumer, too. The country's consumption is now set to go up to 1,894.7 TWh by 2022, the IBEF said.However, production levels are not enough to meet the rising demand which has outstripped supply by about 7.5%, the report said. So India now plans to tap the $14.94 billion opportunity in the power-transmission market, according to the IBEF. Over the last 17 years, foreign direct investment (FDI) in the sector has reached $12.97 billion, accounting for 3.52% of all FDI inflows into the country. India also intends to add around 100 GW of power capacity between 2017 and 2022, focusing more on hydro, renewable, and gas–based power, besides looking at the adoption of clean coal technology. For instance, India plans to have around 60 GW of wind capacity and around 100 GW of solar by 2022. The government aims to quadruple its nuclear capacity to 20 GW by 2020, the report said. Over the last five years, renewable energy has been the fastest-growing segment, but still contributes only around 14% to the total power capacity in India.

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ELECTRONICS & COMMUNICATION ENGINEERING

DEPARTMENT ARTICLES

ENGINEERS DAY - 2019

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A Brief on "Brain Fingerprinting Technology"

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***Abstract*--Brain Fingerprinting is a new computer-based technology to identify the perpetrator of a crime accurately and scientifically by measuring brain--wave responses to crime-relevant words or pictures on a computer screen. Brain fingerprinting is based on finding that the brain generates a unique brain wave pattern when a person encounters a familiar stimulus.**

Keywords: ***Brain fingerprinting, Unique brain wave pattern, magnetic resonance.***

I. INTRODUCTION

In the field of criminology, a new lie detector has been developed in the United States of America. This is called "brain fingerprinting". This invention is supposed to be the best lie detector available as on date and is said to detect even smooth criminals who pass the polygraph test (the conventional lie detector test) with ease. The new method employs brain waves, which are useful in detecting whether the person subjected to the test, remembers finer details of the crime. Even if the person willingly suppresses the necessary information, the brain wave is sure to trap him, according to the experts, who are very excited about the new kid on the block. Brain Fingerprinting is a controversial proposed investigative technique that measures recognition of familiar stimuli by measuring electrical brain wave responses to words, phrases, or pictures that are presented on computer screen. Brain fingerprinting was invented by Lawrence Farwell.

II. BRAIN FINGERPRINTING

Brain Fingerprinting is based on the principle that the brain is central to all human acts. In a criminal act, there may or may not be many kinds of peripheral evidence, but the brain is always there, planning, executing, and recording the crime. The fundamental difference between a perpetrator and a falsely accused, innocent person is that the perpetrator, having committed the crime, has the details of the crime stored in his brain, and the innocent suspect does not. This is what Brain Fingerprinting detects scientifically. Brain fingerprinting is a controversial technique that is advocated as a way to identify a terrorist or other dangerous person by measuring the "brain print" of that person when shown a particular body of writing or an image that was previously familiar (such as of a training camp or manual). The brain print is based on the P300 complex, a series of well-known brainwave components that can be measured. The technique is said to be more effective than a lie detector test. Brain fingerprinting is based on finding that the brain generates a unique brain wave pattern when a person encounters a familiar stimulus Use of functional magnetic resonance imaging in lie detection derives from studies suggesting that persons asked to lie show different patterns of brain activity than they do when being truthful. Issues related to the use of such evidence in courts are discussed.

III. TECHNIQUE

When a crime is committed, a record is stored in the brain of the perpetrator. Brain Fingerprinting provides a means to objectively and scientifically connect evidence from the crime scene with evidence stored in the brain. (This is similar to the process of connecting DNA samples from the perpetrator with biological evidence found at the scene of the crime; only the evidence evaluated by Brain Fingerprinting is evidence stored in the brain.) Brain Fingerprinting measures electrical brain activity in response to crime-relevant words or pictures presented on a computer screen, and reveals a brain MERMER (memory and encoding related multifaceted electroencephalographic response) when, and only when, the evidence stored in the brain matches the evidence from the crime scene. Thus, the guilty can be identified and the innocent can be cleared in an accurate, scientific, objective, non-invasive, non-stressful, and non-testimonial manner.

IV. Procedure

The person to be tested wears a special headband with electronic sensors that measure the electroencephalography from several locations on the scalp. In order to calibrate the brain fingerprinting system, the test is presented with a series of irrelevant stimuli, words, and pictures, and a series of relevant stimuli, words, and pictures. The test subject's brain response to these two different types of stimuli allow the tester to determine if the measured brain responses to test stimuli, called probes, are more similar to the relevant or irrelevant responses.

The technique uses the well-known fact that an electrical signal known as P300 is emitted from an individual's brain approximately 300 milliseconds after it is confronted with a stimulus of special significance, e.g. a rare vs. a common stimulus or a stimulus the proband is asked to count. The novel interpretation in brain fingerprinting is to look for P300 as response to stimuli related to the crime in question e.g., a murder weapon or a victim's face. Because it is based on EEG signals, the system does not require the taste to issue verbal responses to questions or stimuli. Brain fingerprinting uses cognitive brain responses, brain fingerprinting does not depend on the emotions of the subject, nor is it affected by emotional responses. Brain fingerprinting is fundamentally different from the polygraph (lie-detector), which measures emotion-based physiological signals such as heart rate, sweating, and blood pressure. Also, unlike polygraph testing, it does not attempt to determine whether or not the subject is lying or telling the truth.

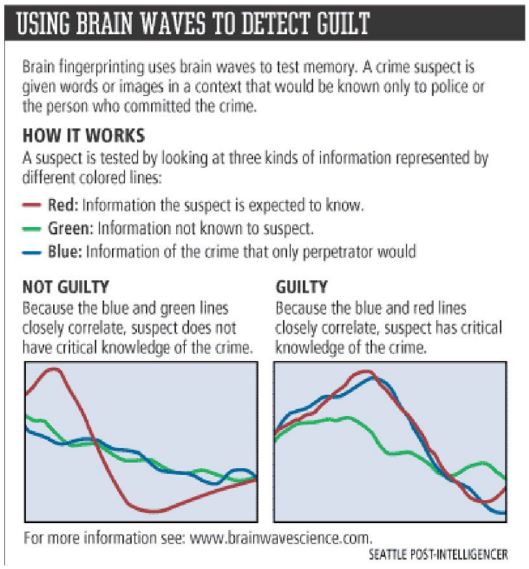
In fingerprinting and DNA fingerprinting, evidence recognized and collected at the crime scene, and preserved properly until a suspect is apprehended, is scientifically compared with evidence on the person of the suspect to detect a match that would place the suspect at the crime scene. Brain Fingerprinting works similarly, except that the evidence collected both at the crime scene and on the person of the suspect (i.e., in the brain as revealed by electrical brain responses) is informational evidence rather than physical evidence. There are four stages to Brain Fingerprinting, which are similar to the steps in fingerprinting and DNA fingerprinting

1. Brain Fingerprinting Crime Scene Evidence Collection;

2. Brain Fingerprinting Brain Evidence Collection;

3. Brain Fingerprinting Computer Evidence Analysis; and

4. Brain Fingerprinting Scientific Result.



In the Crime Scene Evidence Collection, an expert in Brain Fingerprinting examines the crime scene and other evidence connected with the crime to identify details of the crime that would be known only to the perpetrator. The expert then conducts the Brain Evidence Collection in order to determine whether or not the evidence from the crime scene matches evidence stored in the brain of the suspect. In the Computer Evidence Analysis, the Brain

Fingerprinting system makes a mathematical determination as to whether or not this specific evidence is stored in the brain, and computes a statistical confidence for that determination. This determination and statistical confidence constitute the Scientific Result of Brain Fingerprinting: either "information present" ("guilty") – the details of the crime are stored in the brain of the suspect – or "information absent" ("innocent") – the details of the crime are not stored in the brain of the suspect.

V. Scientific Procedure, Research, and Applications

A. Informational Evidence Detection

The detection of concealed information stored in the brains of suspects, witnesses, intelligence sources, and others is of central concern to all phases of law enforcement, government and private investigations, and intelligence operations. Brain Fingerprinting presents a new paradigm in forensic science. This new system detects information directly, on the basis of the electrophysiological manifestations of information-processing brain activity, measured non-invasively from the scalp. Since Brain Fingerprinting depends only on brain information processing, it does not depend on the emotional response of the subject.

b. The Brain MERMER:

Brain Fingerprinting utilizes multifaceted electroencephalographic response analysis (MERA) to detect information stored in the human brain. A memory and encoding related multifaceted electroencephalographic response (MERMER) are elicited when an individual recognizes and processes an incoming stimulus that is significant or noteworthy. When an irrelevant stimulus is seen, it is insignificant and not noteworthy, and the MERMER response is absent. The MERMER occurs within about a second after the stimulus presentation, and can be readily detected using EEG amplifiers and a computerized signal-detection algorithm.

c. Scientific Procedure

Brain Fingerprinting incorporates the following procedure. A sequence of words or pictures is presented on a video monitor under computer control. Each stimulus appears for a fraction of a second. Three types of stimuli are presented: "targets," "irrelevant," and "probes." The targets are made relevant and noteworthy to all subjects: the subject is given a list of the target stimuli and instructed to press a particular button in response to targets, and to press another button in response to all other stimuli. Since the targets are noteworthy for the subject, they elicit a MERMER. Most of the non-target stimuli are irrelevant, having no relation to the crime. These irrelevant do not elicit a MERMER. Some of the non-target stimuli are relevant to the crime or situation under investigation.

VI. The devices used in brain fingerprinting

i) Personal computer
ii) A data acquisition board
iii) A graphics card for driving two monitors from one PC
iv) A four-channel EEG amplifier system
v) Software developed by the Brain Fingerprinting

VII. Applications

A. Counter terrorism

Brain fingerprinting can help address the following critical elements in the fight against terrorism

A: Aid in determining who has participated in terrorist acts, directly or indirectly.

B: Aid in identifying trained terrorists with the potential to commit future terrorist acts, even if they are in a “sleeper” cell and have not been active for years.

C: Help to identify people who have knowledge or training in banking, finance or communications and who are associated with terrorist teams and acts.

D: Help to determine if an individual is in a leadership role within a terrorist organization

B. Criminal justice

A critical task of the criminal justice system is to determine who has committed a crime. The key difference between a guilty party and an innocent suspect is that the perpetrator of the crime has a record of the crime stored in their brain, and the innocent suspect does not. Until the invention of Brain Fingerprinting testing, there was no scientifically valid way to detect this fundamental difference. Brain Fingerprinting testing does not prove guilt or innocence. That is the role of a judge and jury. This exciting technology gives the judge and jury new, scientifically valid evidence to help them arrive at their decision.

C. Medical

Brain Fingerprinting. is the patented technology that can measure objectively, for the first time, how memory and cognitive functioning of Alzheimer sufferers are affected by medications? First generation tests have proven to be more accurate than other routinely used tests, and could be commercially available in 18-24 months. The 30-minute test involves wearing a headband with built-in electrodes; technicians then present words, phrases and images that are both known and unknown to the patient to determine whether information that should be in the brain is still there. When presented with familiar information, the brain responds by producing MERMERs, specific increases in neuron activity. The technician can use this response to measure how quickly information is disappearing from the brain and whether the drugs they are taking are slowing down the process.

CONCLUSION

Brain Fingerprinting is a revolutionary new scientific technology for solving crimes, identifying perpetrators, and exonerating innocent suspects, with a record of 100% accuracy in research with US government agencies, actual criminal cases, and other applications. The technology fulfills an urgent need for governments, law enforcement agencies, corporations, investigators, crime victims, and falsely accused innocent suspects.

• It would be inappropriate to generalize the results of the present research because of the small sample of subjects.

• But the 100% accuracy and high confidence level of the results, however, provide further support for results from previous research using brain MERMER testing.

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A Note on "Sixth Sense Technology"

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***Abstract* -- sixth sense is a wearable gesture interface that augment the physical world with digital world around us. It comprises of hardware components connected wirelessly to the computing device it uses enabling surfaces, walls and physical object as interface. Sixth sense free the information from confine surface. Thus making entire world your computer integrating information into our daily life not only reduce gap between physical and digital world. But also help us to take right decision and improve our power of knowledge. Goal is to bring part of the physical world to digital world. In this paper we explained about sixth sense device its working, component, history, generation of idea, current state, future vision, application, advantages, and introduction to new concept sixth sense glass.**

Keywords: Augmented, Gesture, Sixth Sense Mobile.

I. INTRODUCTION

You all may be wondering what's with the sixth sense. The answer is very simple the sixth sense is a wearable gestural interface device developed by pranav mistry phd student in the fluid interfaces group at the mit media lab . It is similar to telepointer, a neck worn projector/camera system developed by media lab student steve mann (which mann originally referred to as "synthetic synesthesia of the sixth sense")[we've evolved over millions of years to sense the world around us. When we encounter something, someone or some place, we use our five natural senses to perceive information about it; that information helps us make decisions and chose the right actions to take. But arguably the most useful information that can help us make the right decision is not naturally perceivable with our five senses, namely the data, information and knowledge that mankind has accumulated about everything and which is increasingly all available online.

II. HISTORY OF SIXTH SENSE

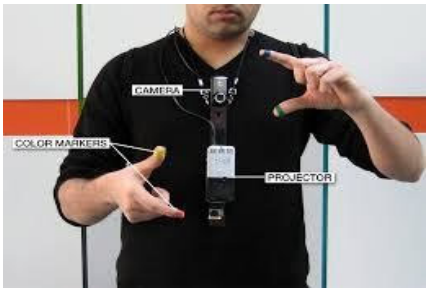
Idea behind this marvelous technology was started late in 1990's by steve mann at mit who actually proposed first wearable computer. First proposed head worn projector and camera in 1994, then he developed it and proposed neck worn projector and camera during 1998 and further in the future developed by pranav mistry who is a phd student in the fluid interfaces group at mit media lab.

III. EARLIER SIXTH SENSE PROTOTYPE:

Maes mit group, which includes seven graduate students, were thinking about how a person could be more integrated into the world around them and access information without having to do something like take out a phone. They initially produced a wristband that would read a radio frequency identification tag to know, for example, which book a user is holding in a store. They also had a ring that used infrared to communicate by beacon to supermarket smart shelves to give you information about products. As we grab a package of macaroni, the ring would glow red or green to tell us if the product was organic or free of peanut traces whatever criteria we program into the system. They wanted to make information more useful to people in real time with minimal effort in a way that

doesn't require any behavior changes. The wristband was getting close, but we still had to take out our cell phone to look at the information. Thats when they struck on the idea of accessing information from the internet and projecting it. So someone wearing the wristband could pick up a paperback in the bookstore and immediately call up reviews about the book, projecting them onto a surface in the store or doing a keyword search through the book by accessing digitized pages on amazon or google books. They started with a larger projector that was mounted on a helmet. But that proved cumbersome if someone was projecting data onto a wall then turned to speak to friend the data would project on the friends face.

IV. RECENT PROTOTYPE



Now they have switched to a smaller projector and created the pendant prototype to be worn around the neck. The sixth sense prototype is composed of a pocket projector, a mirror and a camera. The hardware components are coupled in a pendant-like mobile wearable device. Both the projector and the camera are connected to the mobile computing device in the users pocket. We can very well consider the sixth sense technology as a blend of the computer and the cell phone. It works as the device associated to it is hanged around the neck of a person and thus the projection starts by means of the micro projector attached to the device. Therefore, in course, you turn out to be a moving computer in yourself and the fingers act like a mouse and a keyboard. The prototype was built from an ordinary webcam and a battery-powered 3m projector, with an attached mirror — all connected to an internet-enabled mobile phone. The setup, which costs less than $350, allows the user to project information from the phone onto any surface walls, the body of another person or even your hand. Mistry wore the device on a lanyard around his neck, and colored magic marker caps on four fingers (red, blue, green and yellow) helped the camera distinguish the four fingers and recognize his hand gestures with software that mistry created.

V. COMPONENTS

The devices which are used in sixth sense technology are:

Camera:

It captures the image of the object in view and tracks the users hand gesture. The camera recognizes individuals, images, pictures, gestures thatuser makes with his hand. The camera then sends this data to a smart phone for processing. Basically the camera forms a digital eye which connects to the world of digital information.

Coloured Marker:

There are colour markers placed at the tip of users fingers. Marking the user_s fingers with red, yellow, green and blue coloured tape helps the webcam to recognize the hand gestures. The movements and arrangement of these markers are interpreted into gestures that act as an interaction instruction for the projected application interfaces.

Mobile Component:

The sixth sense device consists of a web enabled smartphone which process the data send by the camera. The smartphone searches the web and interprets the hand gestures with the help of the colored markers placed at the finger tips.

Projector:

The information that is interpreted through the smartphone can be projected into any surface. The projector projects the visual information enabling surfaces and physical objects to be used as interfaces.

The projector itself consists of batteries which have 3 hours of battery life. A tiny led projector displays the data sent from the smartphone on any surface in view object, wall or person. The downward facing projector projects the image on to a mirror.

**mirror:*

The usage of a mirror is important as the projector dangles pointing downward from the neck. The mirror reflects the image on to a desire surface. Thus, finally the digital image is freed from its confines and placed in the physical world.

VI. WORKING

The sixth sense technology works as follows:

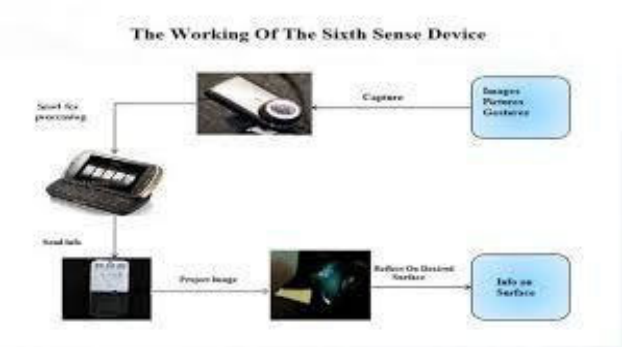
1. It captures the image of the object in view and tracks the users hand gestures.

2. There are colour markers placed at the tip of users fingers. Marking the users fingers with red, yellow, green and blue coloured tape helps the webcam to recognize the hand gestures. The movements and arrangement of these markers are interpreted into gestures that act as an interaction instruction for the projected application interfaces.

3. The smartphone searches the web and interprets the hand gestures with the help of the coloured markers placed at the finger tips.

4. The information that is interpreted through the smartphone can be projected into any surface.

5. The mirror reflects the image on to a desired surface.



VII. APPLICATIONS

The sixth sense prototype implements several applications that demonstrate the usefulness, viability and flexibility of the system. The map application lets the user navigate a map displayed on a nearby surface using hand gestures, similar to gestures supported by multi-touch based systems, letting the user zoom in, zoom out or pan using intuitive hand movements. The drawing application lets the user draw on any surface by tracking the fingertip movements of the user's index finger. Sixth sense also recognizes user's freehand gestures (postures). For example, the sixth sense system implements a gestural camera that takes photos of the scene the user is looking at by detecting the 'framing' gesture. The user can stop by any surface or wall and flick through the photos he/she has taken. Sixth sense also lets the user draw icons or symbols in the air using the movement of the index finger and recognizes those symbols as interaction instructions. For example, drawing a magnifying glass symbol takes the user to the map application or drawing an '@' symbol lets the user check his mail. The sixth sense system also augments physical objects the user is interacting with by projecting more information about these objects projected on them. For example, a newspaper can show live video news or dynamic information can be provided on a regular piece of paper.

VIII. ADVANTAGES

• it is an open source.

• it is portable technology.

• it doesn't make human to understand computer knowledge but it causes machines and computer to adapt to human needs it is cheap to built also connect real world and information.

• can map the idea anywhere on physical objects.

• can be used by anyone without even having any basic knowledge about keyboard and mouse.

• open source code for everyone.

• mind map idea anywhere user wants. • interface does not confines in mobile or pc display. • it is cost effective only 300$.

CONCLUSION

relate with the information via natural hand gestures and enables you the whole world at your fingertips-literally. Transparency between user boundary for accessing information about everything around us and this is classified under wearable computing. Recognize the object and give information about it and give freedom to access.

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Spintronics Technology : A Review

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***Abstract* — Existing semiconductor electronic and photonic devices utilize the charge on electrons and holes in order to perform their specific functionality such as signal processing or light emission. The relatively new field of semiconductor spintronics seeks, in addition, to exploit the spin of charge carriers in new generations of transistors, lasers and integrated magnetic sensors. Spintronics utilizes the electron's spin to create useful sensors, memory and logic devices with properties not possible with charge based devices. This paper reviews the past successes, and the current and future prospects of spintronic materials and devices. Two and three terminal tunnel-junction based sources of highly spin polarized current are described as one component of possible spintronic logic devices, which have the potential for much lower power operation than charge based devices.**

I. INTRODUCTION

Two of the most successful technologies in existence today have created the Si Integrated Circuit industry and the data storage industry. In the case of ICs, the number of transistors on a chip doubles about every 18 months according to Moore's law. For magnetic hard disk drive technology, a typical desk-top computer drive today has a 40GB per disk capacity, whereas in 1995 this capacity was 1GB per disk. Since 1991, the overall bit density on a magnetic head has increased at an annual rate of 60–100%. The integrated circuits operate by controlling the flow of carriers through the semiconductor by applied electric fields. The key parameter therefore is the charge on the electrons or holes. For the case of magnetic data storage, the key parameter is the spin of the electron, as spin can be thought of as the fundamental origin of magnetic moment.

The characteristics of ICs include high speed signal processing and excellent reliability, but the memory elements are volatile (the stored information is lost when the power is switched-off, as data is stored as charge in capacitors, i.e. DRAMs). A key advantage of magnetic memory technologies is that they are non-volatile since they employ ferromagnetic materials.

The emerging fields of semiconductor spin transfer electronics seeks to exploit the spin of charge carriers in semiconductors. Among this new class of devices are spin transistors operating at very low powers for mobile applications that rely on batteries, optical emitters with encoded information through their polarized light output, fast non-volatile semiconductor memory and integrated magnetic / electronic / photonic devices (''electromagnetism-on-a-chip'')

From the first prospect, electron spin currents carry and emit no energy and no heat. This strong advantage resolves heat problems in large-scale integration circuits, personal computers, and also any systems loading them. From the second viewpoint, it is a desirable subject for human life to realize devices beyond CMOS FETs, which are approaching its integration and operation limits. Although many materials and technologies have challenged this, it has not yet been realized. Spintronic devices based on some kinds of ideas must realize this. For instance, operation utilizing spin flipping leads to extremely high switching devices (e.g., in Pico-seconds), which overcomes operation speeds of CMOS FETs and LSIs. There are two approaches for spintronics

A. Metal-based spintronics

After the discovery of giant-magneto resistance (GMR) in magnetic (metal) multilayer's in 1988, which quickly became the standard technology for read-heads of current hard disk drives, a large tunnel-magneto resistance (TMR) between two magnetic metals separated by a thin insulator was demonstrated at room temperature in 1994. This magnetic tunnel junction (MTJ) is currently the preferred device for a magnetic random-access memory (MRAM) cell. There are challenging device level issues to be solved, however, when MRAM technology is to be pushed beyond Gbit in scale; some of them being resolved by the emergence of the MgO-barrier MTJ. Beyond

MRAM, there are schemes to utilize nonvolatility of MRAM not only as a memory but a part of reconfigurable logic-in-memory, which may provide a solution for today's memory bandwidth bottleneck

B. Semiconductor Spintronics

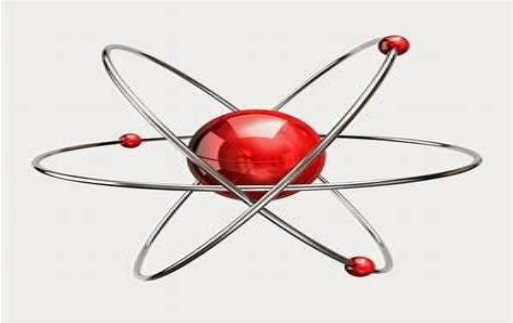
There are several ways to create spin polarization and harness associated spin degree of freedom in semiconductors. One can create spin polarization by the use of circularly polarized light or electrical spin-injection and then utilize it in nonmagnetic semiconductors or when electrons are confined in a quantum dot, the spin-dependent exchange interaction among them becomes important even without magnetic ions. The third approach is to introduce transition metal (magnetic) ions, which gives rise to exchange interaction between band carriers and the electrons localized at the magnetic ions. This has been shown to lead to hole-induced ferromagnetism in the case of InAs and GaAs alloyed with Mn, which made it possible to integrate ferromagnetism with existing nonmagnetic heterostructures, allowing exploration of a new dimension of spin-dependent phenomena in semiconductors. By the use of insulating-gate field-effect transistor structure to modulate carrier concentration, reversible electrical switching of the ferromagnetic phase transition and coercive force has been realized .CIMS has been observed at much lower current density than those in the metallic structures, either in the form of current-induced domain wall motion or in the form of magnetization rotation in nano-pillars. Because CIMS in semiconductors can be seamlessly. integrated into semiconductor structures, ferromagnetic semiconductors may prove to be useful in developing spintronic devices that combine magnetization switching with other spin-related effects, once the transition temperature of these materials reaches well beyond roomtemperature.

II. Material Selection

There are two major criteria for selecting the most promising materials for semiconductor spintronics. First, the ferromagnetism should be retained to practical temperatures (i.e. >300 K). Second, it would be a major advantage if there were already an existing technology base for the material in other applications. Most of the work in the past has focused on (Ga, Mn)As and (In, Mn)As. There are indeed major markets for their host materials in infra-red light-emitting diodes and lasers and high speed digital electronics (GaAs) and magnetic sensors (InAs). In samples carefully grown single-phase by molecular beam epitaxy (MBE), the highest Curie temperatures reported are 110 K for (Ga, Mn)As and 35 K for (In, Mn)As For ternary alloys such as (In0.5Ga0.5)0.93Mn0.07As, the Curie temperature is also low 110 K. A tremendous amount of research on these materials systems has led to some surprising results, such as the very long spin lif One of the most effective methods for investigating spin-polarized transport

is by monitoring the polarized electroluminescence output from a quantum well light-emitting diode into which the spin current is injected. Quantum selection rules relating the initial carrier spin polarization and the subsequent polarized optical output can provide a quantitative measure of the injection efficiency. coherence times in GaAs and the ability to achieve spin transfer through a heterointerface, either of semiconductor semiconductor or metal–semiconductor

There are a number of essential requirements for achieving practical spintronic devices in addition to the efficient electrical injection of spin-polarized carriers. These include the ability to transport the carriers with high transmission efficiency within the host semiconductor or conducting oxide, the ability to detect or collect the spin-polarized carriers and to be able to control the transport through external means such as biasing of a gate contact on a transistor structure. The observation of spin current-induced switching in magnetic heterostructures is an important step in realizing practical devices. Similarly, spin orbit interaction in a semiconductor quantum well could be controlled by applying a gate



voltage. Combined with the expected low power capability of spintronic devices, this should lead to extremely high packing densities for memory elements.

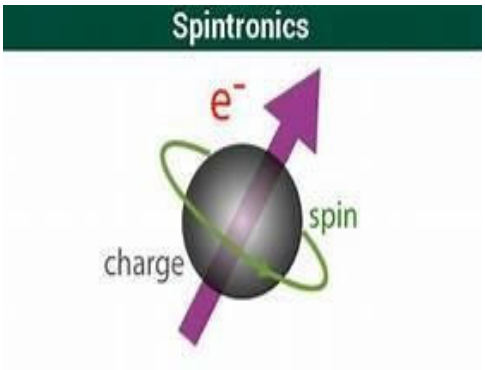
III. FUNDAMENTALS OF SPINTRONICS

The rapid decrease in computational power and increase in speed of integrated circuits is supported by the very fast reduction of semiconductor devices feature size. Due to constantly introduced innovative changes in the technological processes, the miniaturization of MOSFETs by Moore's law successfully continues. Although alternative channel materials with mobility higher than in Si were already investigated, it is believed that Si will still be the main channel material for MOSFETs beyond the 22-nm technology node.

New engineering solutions and innovative techniques are required to improve CMOS device performance. Strain-induced mobility enhancement is one of the most attractive solutions to increase the device speed, which will certainly maintain its key position among possible technological innovations for future technology generations [25]. In addition, new device architectures based on multigate structures with better electrostatic channel control and reduced short channel effects will be developed. A multigate MOSFET architecture is expected to be introduced for the 16-nm technology node. Combined with a high-k dielectric/ metal gate technology and strain engineering, a multigate MOSFET appears to be the ultimate device for high-speed operation with excellent channel control, reduced leakage currents, and low-power budget

A. Physics of spintronics

Spintronics is also called spin-electronics, where the spin of an electron is controlled by an external magnetic field and polarize the electrons. These polarized electrons are used to control the electric current. The goal of Spintronics is to develop a semiconductor that can manipulate the magnetism. Once we add spin degree of freedom to electronics, it will provide significant versatility and functionality to future electronics products. Magnetic spin properties of electrons are used in many applications such as magnetic memories, magnetic recording (read, write).

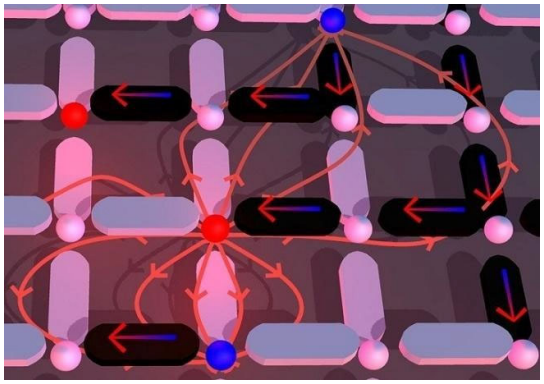


The realization of semiconductor of semiconductors that is ferromagnetic. Above room temperature will potentially lead to a new generation of Spintronics devices with revolutionary electrical and optical properties. The field of Spintronics was born in the late 1980s with the discovery of the "giant magneto resistance effect". The giant magneto resistance (GMR) effect occurs when a magnetic field is used to align the spin of electrons in the material, including a large change in the resistance of a material.

In spintronics, information is stored and transmitted using another property of electron, acts like a compass needle, which points either up or down to represent the spin of an electron. Electrons moving through a nonmagnetic material normally have random spins, so the net effect is zero. External magnetic fields can be applied so that the spins are aligned. The effect was first discovered in a device made of multiple layers of electrically conducting materials: alternating magnetic and nonmagnetic layers. The device was known as "spin valve" because when a magnetic field was applied to the device, spin of its electrons went from all up to all down, changing its resistance so that the device acted like a valve to increase or decrease the flow of electrical current, called Spin Valves.

B. Spin Hall Effect

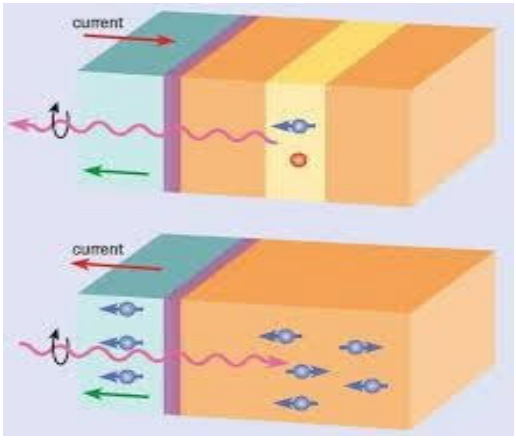
In order to realize spintronics as a fully operational technology, the ability to manipulate spin polarized



electrons with in a conductor is necessary. A phenomenon called the spin Hall effect may be the solution. In the regular Hall effect, in a magnetic field is placed perpendicular to the direction of current. The reason for this is the electrons in the current flow in a conductor; a bias voltage will be created perpendicular to both across the conductor

C. Spin Injection into Semiconductors

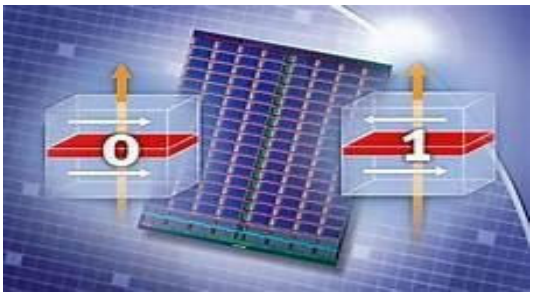
The goal of spintronics research is to eventually relieve present information technology from solely relying on the charge of electrons. This spin degree of freedom of an electron has shown to be a very viable candidate to save the microelectronics industry from the result of "Moor's Law" which describes a trend of electrical components getting increasingly smaller, eventually reaching atomic scales.



Just recently, researchers have successfully injected spin polarized current into Silicon from ferromagnet. Since Si has no nuclear spin, there are no hyperfine interactions, resulting in very spin preservation for electrons inside the semiconductor

IV. Spintronics Devices

Recording devices, such as computer hard disks, already employ the unique properties of the materials. Data are recorded and stored any tiny areas of magnetized iron or chromium oxides. A "read head" can read this information by detecting minute changes in the magnetic field as the disk rotates underneath it. This induces changes in the head's electrical resistance, also known as magnetoresistance. Recent discovery of Tunnelling Magnetoresistance (TMR) has led to the idea of magnetic tunnel junction that has been utilized for the MRAM (Magnetic Random-Access Memory). Here, one has two magnetic layers separated by an insulating metal oxide layer. Electrons are able to tunnel from one layer to other only when magnetizations of the layers than in the standers GMR devices, known as "spin valves". Spintronic devices, combining the advantages of magnetic materials and semiconductors, are expected to be fast, non-volatile and consume less power. They are smaller than s 100 nanometres in size, more versatile and more robust than the conventional ones making



up silicon chips and circuit elements. The potential market is expected to be worth hundreds.

A. Spin Transistor

The basic idea of spin transistor, as proposed by Suprio Datt and Biswajit Das, is to control the spin the spin orientation by applying a gate voltage, as shown in fig.3. A spin –FET, as depicted below, consists of ferromagnetic electrodes and semiconductor channels that contain a layer of electrons and a gate electrode attached to the semiconductor. The source and drain electrodes are ferromagnetic (FM) metals. The spin-polarized electrons are injected from the FM source electrode (FMs), and after entering the semiconductor channels they begin to rotate. The rotation can be controlled by an applied electric field through the gate electrode. If the spin orientation of the electron channels is aligned to FM drain (FMd) electrode, electrons are able to flow into the FM drain electrode. However, if the spin orientation is flipped in the electron layer electrons cannot enter the drain electrode. In this way, with the gate electrode the orientation of the electron spin can becontrolled.

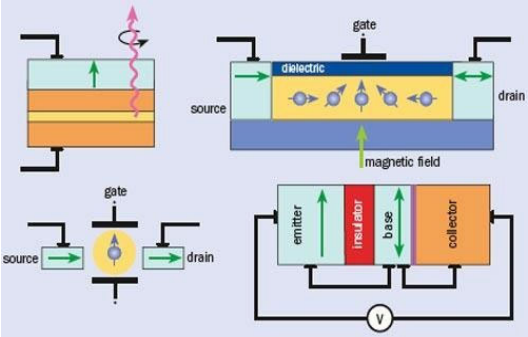
B. Spin (Magnetic) BJT

In a magnetic transistor, magnetized ferromagnetic layers replace the role of n and p-type semiconductors. Much like in a spin-valve, substantial current can flow through parallel magnetized ferromagnetic layers. However, if say, in a three layer structure, the middle layer is antiparallel to the two side layers; the current flow would be quite restricted, resulting in a high overall resistance. If two outside layers are pinned and the middle layer allowed to be switched by an external magnetic field, a magnetic transistor could be made, with on and off configurations depending on the orientation of the middle-magnetized layer. Magnetic (spin) transistors are good candidates for logic (spin logic).

C. Spin LED's.

Recently, efficient spin injection has been successfully demonstrated in all semiconductor tunnel diode structures by using a spin- polarized

DMS as the injector in one case, and using a paramagnetic semiconductor under high magnetic field as a spin filter in the other. In such a case, spin-polarized holes and unpolarised electronics are injected from either side and recombine in a quantum well. The polarization of the injected holes can be left-circularly polarizes light in the electroluminescence spectra.



Among such devices the simplest seems to be the concept of a light emitting diode (LED) with one of the contact layers made ferromagnetic by incorporation of transition metal impurities, a so-called spin LED.

CONCLUSIONS

To continue the rapid pace of discoveries, considerable advances in our basic understanding of spin interactions in the solid state along with developments in materials science, lithography, miniaturization of optoelectronic elements, and device fabrication are necessary. The progress toward understanding and implementing the spin degree of freedom in metallic multilayers and, more recently, in semiconductors is gaining momentum as more researchers begin to address the relevant challenges from markedly different viewpoints.

This paper presents a summary of Spintronics (spin based electronics), is new upcoming technology for next generation of microelectronics/nanoelectronics devices with scaling apparently approaching its fundamental limits; the semiconductor industry is facing critical challenges.

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A Note on "Brain Port Vision Technology"

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***Abstract* – According to the World Health Organization (WHO) there are 285 million people in the world are visually impaired. Out of them 39 million people are completely blind and 246 million people have low vision. In this modern world science has reached to a point where nothing is impossible. Science has made a great progress in the field biotechnology. We have hearing aid for the hearing-impaired person, robotic arm for the paralyzed person. We all know that an eye is the very important part of our body. But unfortunately, blind people cannot see this beautiful world. So, isn't there a device through which blind person can see this world? Yes. Scientist have developed such device and the name of that device is Brain port Vision Device. This device is also known as a tasting device because it can taste and sense objects. This device is based on the idea of electro tactile stimulation for sensory substitution, the process in which if one part of brain is damaged then the part of brain that would normally control the damaged part learns to perform some other function. The device is still in investigation and has not been launched commercially but the results obtained after testing the device on blind people were astonishing and have indicated that there is a huge scope of application for this technology in future.**

Key Words: Brain port Vision Device, Tongue Device, Electro tactile Stimulation for sensory substitution.

I. INTRODUCTION

A blind woman sits in a chair holding a video camera focused on a scientist sitting in front of her shown in figure1. She has a device in her mouth, touching her tongue, and there are wires running from that device to the video camera. The woman has been blind since birth and doesn't really know what a rubber ball looks like, but the scientist is holding one. And when he suddenly rolls it in her direction, she puts out a hand to stop it. The blind woman saw the ball through her tongue. Well, not exactly through her tongue, but the device in her mouth sent visual input through her tongue in much the same way that seeing individuals receive visual input through the eyes. In both cases, the initial sensory input mechanism the tongue or the eyes sends the visual data to the brain, where that data is processed and interpreted to form images. Braille is a typical example of sensory substitution in this case, you're using one sense, touch, to take in information normally intended for another sense, vision. Electro tactile stimulation is a higher-tech method of receiving somewhat similar (although more surprising) results, and it's based on the idea that the brain can interpret sensory information even if it's not provided via the natural channel.

Fig -1: Blind woman with Brain Port Device

An electric lollipop that allows the blind to 'see' using their tongue has been developed by scientists. The machine is called the Brain Port vision device and is manufactured by Wicab, a biomedical engineering company based in Middleton, Wis. It relies on sensory substitution, the process in which if one sense is damaged, the part of the brain that would normally control that sense can learn to perform another function. About two million optic nerves are required to transmit visual signals from the retina (the portion of the eye where light information is decoded or translated into nerve pulses) to the brain's primary visual cortex. With Brain Port, the device being developed by neuroscientists at Middleton, Wisc.–based Wicab, Inc. (a company co-founded by the late Back-y-Rita), and visual data are collected through a small digital video camera about 1.5 centimeters in diameter that sits in the center of a pair of sunglasses worn by the user. Bypassing the eyes, the data are transmitted to a handheld base unit, which is a little larger than a cell phone. This unit houses such features as zoom control, light settings and shock intensity levels as well as a central processing unit (CPU), which converts the digital signal into electrical pulses replacing the function of the retina. "Part of the challenge of Brain Port is to train the brain to interpret the information it receives through the stimulation device and use it like data from a natural sense. Research from prototype devices showed such training is possible, as patients with severe bilateral vestibular loss could, after time, maintain near-normal posture

control while sitting and walking, even on uneven surfaces. Most of us are familiar with the augmentation or substitution of one sense for another. Eyeglasses are a typical example of sensory augmentation. Braille is a typical example of sensory substitution in this case, you're using one sense, touch, to take in information normally intended for another sense, vision. Electro tactile stimulation is a higher-tech method of receiving somewhat similar (although more surprising) results, and it's based on the idea that the brain can interpret sensory information even if it's not provided via the "natural" channel. The multiple channels that carry sensory information to the brain, from the eyes, ears and skin, for instance, are set up in a similar manner to perform similar activities. All sensory information sent to the brain is carried by nerve fibers in the form of patterns of impulses, and the impulses end up in the different sensory centers of the brain for interpretation. To substitute one sensory input channel for another, you need to correctly encode the nerve signals for the sensory event and send them to the brain through the alternate channel. The brain appears to be flexible when it comes to interpreting sensory input. You can train it to read input from, say, the tactile channel, as visual or balance information, and to act on it accordingly. In JS Online's "Device may be new pathway to the brain," University of Wisconsin biomedical engineer and Brain port technology co-inventor Mitch Tyler states, "It's a great mystery as to how that process takes place, but the brain can do it if you give it the right information."

Concepts of electro tactile stimulation

The concepts at work behind electro tactile stimulation for sensory substitution are complex, and the mechanics of implementation are no less so. The idea is to communicate non- tactile information via electrical stimulation of the sense of touch. In practice, this typically means that an array of electrodes receiving input from a non-tactile information source (a camera, for instance) applies small, controlled, painless currents (some subjects report it feeling something like soda bubbles) to the skin at precise locations according to an encoded pattern. The encoding of the electrical pattern essentially attempts to mimic the input that would normally be received by the nonfunctioning sense. So patterns of light picked up by a camera to form an image, replacing the perception of the eyes, are converted into electrical pulses that represent those patterns of light. When the encoded pulses are applied to the skin, the skin is actually receiving image data. According to Dr. Kurt Kaczmarek, Brain Port technology co- inventor and Senior Scientist with the University of Wisconsin Department of Orthopedics and Rehabilitation Medicine, what happens next is that "the electric field thus generated in subcutaneous tissue directly excites the afferent nerve fibers responsible for normal, mechanical touch sensations." Those nerve fibers forward their image-encoded touch signals to the tactile sensory area of the cerebral cortex, the parietal lobe. The structure of brain is shown in figure 2.

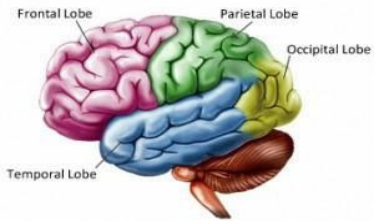


Fig -2: Structure of Brain

Within this system, arrays of electrodes can be used to communicate non-touch information through pathways to the brain normally used for touch-related impulses. It's a fairly popular area of study right now, and researchers are looking at endless ways to utilize the apparent willingness of the brain to adapt to cross-sensory input. Scientists are studying how to use electro tactile stimulation to provide sensory information to the vision impaired, the hearing impaired, the balance impaired and those who have lost the sense of touch in certain skin areas due to nerve damage. One particularly fascinating aspect of the research focuses on how to quantify certain sensory information in terms of electrical parameters -- in other words, how to convey "tactile red" using the characteristics of electricity. This is a field of scientific study that has been around for nearly a century, but it has picked up steam in the last few decades. The miniaturization of electronics and increasingly powerful computers have made this type of system a marketable reality instead of just a really impressive laboratory demonstration. Enter Brain port, a device that uses electro tactile stimulation to transmit non-tactile sensory information to the brain. Brain port uses the tongue as a substitute sensory channel.

II. NEED AND HISTORY

Need

According to the Global data recorded in 2010 by the World Health Organization (WHO), there have been 285 million visually-impaired people, 90% of whom live in developing countries. The Vietnam Institute of Ophthalmology (VNIO) reported that in 2007 up to 380,000 people are blind whereas 1.6 billion persons have vision problems. The number showing a high

percentage of visually impaired people, which results from lack of trained professionals, limited resources and spatial spread of care. Loss of sight is associated with independence loss due to the low perception of the environment. This problem leads to difficulties to take part in daily life and hinders the mobility of the visually-impaired people. For the last few decades, various types of aid devices and systems have been manufactured to provide blind users means of navigation, learning or getting to know the environment. Some of the systems which can detect obstacles on the path are White Cane, Mowat Sensor and Sonic guide while the others can help to globally navigate such as Talking Map, SWAN or GPS System. However, the above systems are not capable of doing both tasks simultaneously. To overcome the drawbacks of the mentioned single-purpose aided devices, applied the mobile robot technology into an assistive system called Guide Robot Dog. However, the system is rather bulky and requires users to act as an operator. So, there is need to develop single autonomous device which is more efficient than the all above devices.

History

Brain Port is a technology sold by Wicab Inc. whereby sensory information can be sent to one's brain via a signal from the Brain Port (and its associated sensor) that terminates in an electrode array which sits atop the tongue. It was initially developed by Paul-Bach-y-Rita as an aid to people's sense of balance, particularly of stroke victims. Bach-y-Rita founded Wicab in 1998. The Brain Port vision device was developed by the late Dr. Paul Bach-y-Rita, a University of Wisconsin-Madison neuroscientist. The technology is covered by patents held by the Wisconsin Alumni Research Foundation ("WARF") and is exclusively licensed to Wicab. The Brain Port vision device is currently an investigational device and is not available for sale. Wicab Inc. is pursuing additional funding to support FDA clearance and commercialization. The machine is called the Brain Port vision device and is manufactured by Wicab; a biomedical engineering company based in Middleton, the device being developed by neuroscientists at Middleton, Wisc.–based Wicab, Inc. (a company co-founded by the late Backy-Rita), and the brain port device will be introduced in 2006. Brain Port collects visual data using a tiny, glasses-mounted video camera, translating images into electrical patterns on the surface of the tongue. After a few hours of training, some users have described the experience as resembling a low-resolution version of the vision they once had. In addition, neuroimaging research suggests that for blind individuals, visual regions of the brain are activated while using the Brain Port vision device. Ultimately, the experience is uniquely individual. However, the resulting perception does not need to "feel" like eye-based vision in order to provide assistive benefit. The Brain Port vision device is an investigational nonsurgical assistive visual prosthetic device that translates information from a digital video camera to your tongue, through gentle electrical stimulation.

Research

The brain is capable of major reorganization of function at all ages, and for many years following brain damage. It is also capable of adapting to substitute sensory information following sensory loss (blindness; tactile loss in Leprosy; damaged vestibular system due to ototoxicity, or general balance deficit as result of stroke or brain trauma), providing a suitable human-machine interface is used (reviewed in Bach-y-Rita, 1995; in press). One such interface is the tongue Brain Port interface (Bach-y-Rita, et al 1998; Tyler, et al, 2003). Sensory substitution allows studies of the mechanisms of late brain plasticity, in addition to offering the possibility of practical solutions for persons with major sensory loss. It also offers the opportunity to study brain imaging correlates of the perceptual learning with the substitute system, such as PET scan studies demonstrating that the visual cortex of congenitally blind persons reveals activity after a few hours of vision substitution training; (Ptito, et al, 2005). In this report tactile vision substitution (TVSS) will be briefly reviewed, followed by a more extensive discussion of electro tactile vestibular substitution. (ETVSS) which will include a personal report by a subject. Some mechanisms related to the therapeutic effects will be presented, followed by a brief presentation of another area of therapeutic applications of late brain plasticity. The Tongue Display Unit (TDU) is the first prototype of the technology that has evolved into today's Brain Port vision device. The current investigational prototype works best for individuals who are blind and have no better than light perception. Since we do not stimulate the eye or optic nerve, our technology has the potential to work across a wide range of visual impairments. We are actively developing device modifications to address the needs for those with low vision such as macular degeneration. The brain is capable of major reorganization even many years after an injury, with appropriate rehabilitation. The highly plastic brain responds best when the therapy is motivating and has a benefit that is recognized by the patient. The major objective of this study was to estimate feasibility and efficacy of an electro tactile vestibular substitution system (ETVSS) in aiding recovery of posture control

in patients with bilateral vestibular loss (BVL) during sitting and standing. Subjects used the Brain Port balance device for a period from3 to 5 days. Other than normal use of tongue for tasting food, eating, talking there are also many other uses. One of them is for sensing of light. It is called as tasting because it can taste the light and sense the objects. It is this property which is used in brain port device.

III. WORKING TECHNOLOGY

System Architecture

As introduced in the Introduction part, the Tongue Display Unit (TDU) which is based on the patent of Professor Bach-y-Rita is the prototype which is applied into our TVSS system. Because the device is stimulated with the tongue, not the eye or optic nerve, it can work with non-disabled people and also those with visual impairments. However, the system will be developed to address the needs for the purpose of small dimension and wireless communication which have never been done. The block diagram of Brain port device is shown in figure 3.

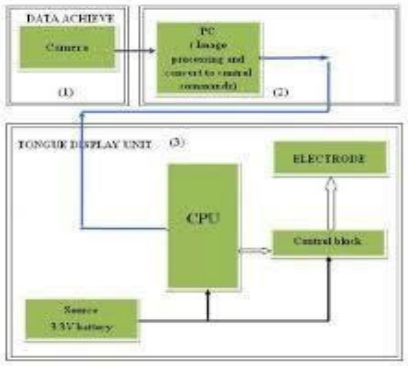


Fig -3: Architecture of Brain Port Device

This system consists of three parts: A. Data acquisition User can wear a pair of sun-glasses which includes a camera capturing images from the environment. The video output is sent to the Host system. B. Host system the computer translates output from camera into a pattern of command and then sending wirelessly to the TDU. C. TDU Central Processing Unit (CPU) converts the command to electronic pulses that will be sent to an array of electrodes placed in contact with the tongue. The TDU contains five functioning blocks: a battery providing energy to all the components, a CPU processing the command signal into an encoded signal, a control block processing the encoded signal to pulse to be sent to the electrodes and the wireless module that receives the wireless signal from the camera. An array of electrodes is around 2.5 meters square that stimulates the receptor cells on the surface of the tongue to the brain, i.e., tactile or touch receptors on the tongue send impulses to the somatosensory cortex in response to stimulation.

Parts of Brain port Device

The Brain Port device consists of an Intra Oral Device (IOD) and a Controller. The IOD contains an embedded accelerometer and an electrode array. The electrode array rests on the anterior surface of the patient's tongue and the accelerometer is used to measure head/body position. Using these measurements, a stimulus pattern is generated on the electrode array reflecting the head/body position. The patient feels the pattern as electro tactile stimulation on the tongue. For example, if a patient leans to the left, the stimulus moves to the left side of the patient's tongue; a forward lean moves the stimulus to the front of the tongue. During training, patients are instructed to focus on the stimulus and to adjust their body position to keep the stimulus centered on their tongue. The Controller provides user controls for power, stimulation intensity, and re-centering the stimulus on the electrode array.

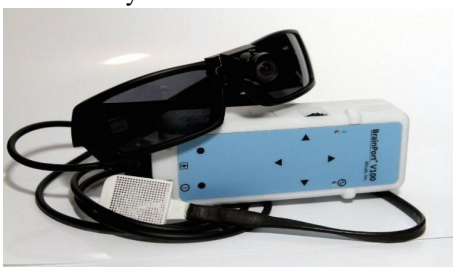


Fig -4: Brain Port Device

Subjects were assessed at baseline and at predetermined points during the study as determined by the individual investigators. Subjects did not use the Brain Port device during the assessments. Each clinical site did not necessarily administer all assessments, resulting in a smaller number of subjects for individual measurements. Various parts of device are as follow:

Electrode Array

The lollipop contains a square grid of 400 electrodes which pulse according to how much light is in that area of the picture. White pixels have a strong pulse while black pixels give no signal. The control unit converts the image into a low-resolution black, white and grey picture, which is then recreated as a square grid of 400 electrodes around the size of a postage stamp on the lollipop. Each of the electrode's pulses according to how much light is in that area of the picture. It converts pictures into electrical pulses and it is placed on tongue.

Stimulation Circuitry

A programming device comprising: a user interface; and a processor that presents a user with an interface for selection of one of a constant current mode or a constant voltage mode via the user interface, receives a selection of one of the modes from the user via the user interface, configures a medical device according to the selected mode, and presents the user with either an interface for selection of a voltage amplitude or an interface for selection of a current amplitude via the user interface based on the selected mode, wherein the processor configures the medical device to measure, using impedance measurement circuitry, an impedance presented to stimulation circuitry of the medical device based on the selected mode, and wherein, when the medical device comprises constant current stimulation circuitry and the user selects the constant voltage mode, the processor configures the medical device to measure, using the impedance measurement circuitry, the presented impedance and adjust a stimulation current amplitude based on the measured impedance to deliver stimulation with a substantially constant voltage amplitude.

Accelerometer

The other side of electrode array is accelerometer. Named Brain Port, and developed by Wicab, Inc, this experimental device uses an accelerometer to provide head and body position information to the brain through electro tactile stimulation of the tongue. Sensitive nerve fibers on the tongue respond to electrodes to enable a rapid transfer of electrical information.

Sunglasses and Camera

The device is made up of a video camera hidden in a pair of sunglasses, which the user wears. Signals from the camera are sent along a cable to a handheld control unit, about the size of a cell phone, and then to a lollipop-shaped stick, which is placed on the tongue. The inventors claim that blind people using the device, that look like sunglasses attached by cable to a plastic lollipop, blind people can make out shapes and read signs with less than 20 hours training. The Brain Port device collects visual data through a small digital video camera about 1.5 centimeters in diameter that sits in the middle of a pair of sunglasses worn by the user.

CPU, Battery

This unit houses such features as zoom control, light settings and shock intensity levels as well as a central processing unit (CPU), which converts the digital signal into electrical pulse replacing the function of the retina. It will be a rechargeable battery.

Power Button

It is used for start and stop the device.

IV. WORKING OF BRAIN PORT DEVICE

Design of the TED Device

In order to verify the performance of a new form of the electrodes as well as the impact of electrical signals from such electrodes, a demonstrator of the TED will be fabricated and verified.

a) Matrix of electrodes

The array of electrodes is composed of 33 electrode pins. In the center of each pin, a hole is made to connect with the bottom layer to plays a role as the negative terminal. Each via has diameter of 0.1mm. Outside the hole of each pin, a copper circle of 2 mm diameter is connected to the positive terminal. These pins are arranged on a round grid with 1mm inter electrode spacing. The total dimension of the grid is a circle of 4 cm diameter.

b) Control circuit for electrodes

To specify and control the stimulus waveform, pattern and trial events, a control circuit needs to be made. In the future, it will be minimized to place inside an orthodontic retainer. This circuit is desired to generate low current (the mean current for tongue subjects was 1.62 mA, the source battery has low voltage in order not cause high leakage current and consume little power. The block diagram of this circuit can be depicted in Figure 5.

In Figure 5, the central element is the microcontroller which produces the stimulation signals to the right electrodes on the dorsal part of the tongue. The whole device is powered by a 3.3V Lithium battery which has small output current. As the purpose is to test the electrode impact on the tongue, only the matrix of electrode is placed inside the mouth, the other parts is fabricated in a separate circuit to prevent severe problem in case of leakage. However, in the future, mounting the whole device within the mouth is the final goal. This can be done by packaging the circuit inside an orthodontic retainer since the groups of Vuillerme has ever made. In the following part, detailed descriptions of each block in the schematic diagram in Figure 5 will be indicated. The names of all electronic components were indicated specifically.

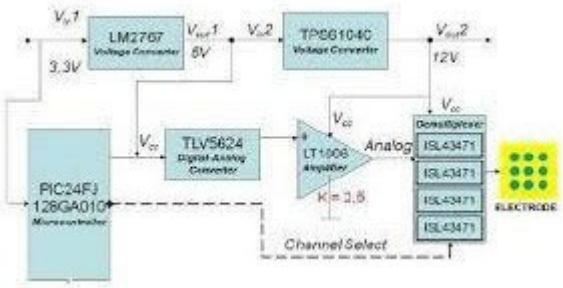


Fig -5: Schematic diagram of the TED device

1. Source (power supply)

A Lithium battery with diameter of 20mm and height of 3.2mm is used, which supplies a voltage of 3.3V and a current of 135 mA.

2. Voltage Converter Circuits

This design is specifically for future use. According to Robineau et al, the range of stimulus voltage is 5-15V. But when we connected directly the electrode to the voltage generator and applied different voltage, the tongue started to have clear feeling at 3V and, at 10V, the tongue started to hurt. Hence, in our circuit, for safety reason, the voltage range was reduced to from 3V to 10V. Since the battery supply 3V power, voltage converters need to be used. In addition, for more flexible voltage modification, a DAC (Digital Analog Converter) was used. Normally the DAC needs 5V power supply. As a result, two voltage converters are necessary for the circuit, one for 5V conversion and the other for 12V conversion. The schematic diagrams of the DAC and amplifier is shown in Figure 6.

The IC (Integrated Circuit) LM2767 of Texas Instruments was to increase the 3V battery to 5V and TPS61040 of Texas Instruments was to rise from 5V to 12V. Both of them are low power IC. The detailed schematic diagram can be easily found in the datasheet of these two ICs. Besides these two converters, in order to modify the voltage, a DAC must be used in combination with an amplifier. The DAC TLV5624 is an 8íbit DAC which has 28 levels of voltage; therefore, there will be 256 voltages in the range from 3V to 12V. It is rather sufficient for choosing a suitable stimulation voltage. The gain of the amplifier is 2.5 because from 12V/5V=2.5. The single amplifier LT1006 consumed small power compared to many other ones.

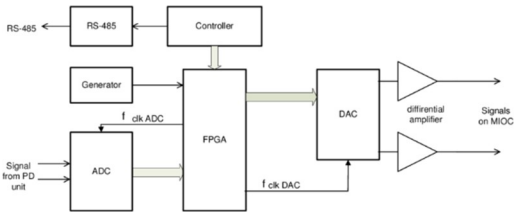
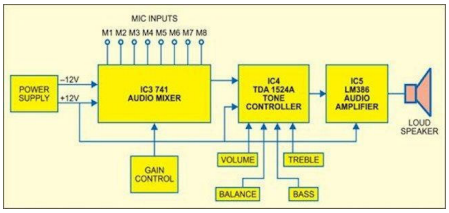


Fig -6: Schematic diagrams of: a) DAC block



b) Amplifier block

3. Signal generation

A low cost PIC24FJ128GA010 microcontroller of Microchip Technology was used for the following three functions: (1) Choosing the stimulation voltage (2) Choosing the electrode to send signal (3) Communicating and receiving the command consequently it connects to the DAC, to the demultiplexers and wireless module. Using the demultiplexer is to connect the microcontroller to the selected electrode because of the limited number of output pin in the microcontroller. Demultiplexer IC named ISL43741 of Intersils which has two blocks of 1:4 demultiplexer, which results in 8 outputs. This IC is used due to the small dimension and low consumption. The program in the microcontroller receives the information from the wireless module to activate one certain electrode at a time. The selection of the right outputs among 8 outputs from 2 inputs is based on the table of truth in the datasheet of ISL43741.

Working

Following figure 7 shows the working of Brain Port device. About two million optic nerves are required to transmit visual signals from the retina (the portion of the eye where light information is decoded or translated into nerve pulses) to the brain's primary visual cortex.

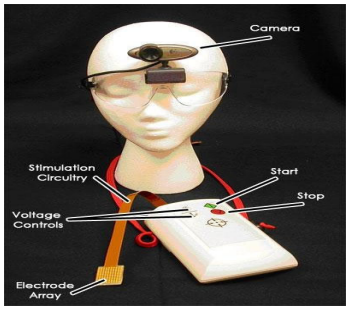


Fig -7: Working of Device

Visual data are collected through a small digital video camera. Bypassing the eyes, the data are transmitted to a handheld base unit, which is a little larger than a cell phone. From the CPU, the signals are sent to the tongue via a "lollipop," an electrode array about nine square centimeters that sits directly on the tongue. Densely packed nerves at the tongue surface receive the incoming electrical signals, which feel a little like Pop Rocks or champagne bubbles to the user. These signals from tactile or touch receptors cells are sent to the somatosensory cortex in response to stimulation in the form of pattern impulses. Although users initially 'feel' the image on their tongue, with practice the signals activate the 'visual' parts of the brain for some people. In any case, within 15 minutes of using the device, blind people can begin interpreting spatial information via the Brain Port. The Brain Port vision system consists of a postage stamp-size electrode array for the top surface of the tongue (the tongue array), a base unit, a digital video camera, and a hand- held controller for zoom and contrast inversion. Visual information is collected from the user adjustable head-mounted camera (FOV range 3–90 degrees) and sent to the Brain Port base unit. The base unit translates the visual information into a stimulation pattern that is displayed on the tongue. The tactile image is created by presenting white pixels from the camera as strong stimulation, black pixels as no stimulation, and grey levels as medium levels of stimulation, with the ability to invert contrast when appropriate. Users often report the sensation as pictures are painted on the tongue with Champagne bubbles. With the current system (arrays containing 100 to 600+ electrodes), study participants have been able to recognize high-contrast objects, their location, movement, and some aspects of perspective and depth. Trained blind participants use information from the tongue display to augment understanding of the environment. Our ongoing research with the Brain Port vision device demonstrates the great potential of tactile vision augmentation and we believe that these findings warrant further exploration. As a result, we are currently working on improvements to the tongue display hardware, software, and usability, and on overall device miniaturization. The system includes the following: A miniature 2-axis accelerometer (Analog Devices ADXL202) was mounted on a low-mass plastic hard hat Anterior-posterior and medial-lateral angular displacement data (derived by double integration of acceleration data) were fed to a previously developed tongue display unit (TDU) that generates a patterned stimulus on a 100 or144-point electro tactile array (10x10 or 12 x 12 matrix of 1.8 mm diameter gold-plated electrodes on 2.3 mm centers) held against the superior, anterior surface of the tongue. Subjects readily perceived both position and motion of a small 'target' stimulus on the tongue display, and interpreted this information to make corrective postural adjustments, causing the target stimulus to become cantered. Thirty-nine research subjects used the Brain Port balance device for a period from 3 to 5 days. The subjects included 19 males and 20 females ranging in age from 25 to 78 years, an average age of 55 years. Etiologies of the balance disorders included, but were not limited, to peripheral vestibular disorders, central vestibular disorders, cerebella disorders and mixed etiology. We found two groups of ETVSS effects on BVL subjects: immediate and residual. After a short (15-40 minutes) training procedure all subjects were capable of maintaining vertical posture with closed eyes, and after additional training (30-160 minutes) some were capable of standing with closed eyes on a 1. Short-term after-effects were observed in sitting subjects after 1-5 minutes of ETVSS Exposure and lasted from 30 sec to 3 minutes, respectively. 2. Long-term after-effects were observed in trained subjects (after an average 5 training sessions) after 20 minutes standing with eyes closed and ETVSS use, with stability lasting from 4 to 12 hours, as measured by standard posture graphic techniques and spectral analysis. Additionally, during that period subjects also experienced dramatic improvement in balance control during walking on uneven or soft surfaces, or even riding a bicycle. 3. Persisting effects were demonstrated in one subject after 40 training sessions and continued for 8 weeks after the last ETVSS session. Evaluation of the results and previous studies suggests that a small amount of surviving vestibular sensory tissue can be reorganized; previous studies suggest that as little as 2 percent of surviving neural tissue in a system can serve as the basis for functional reorganization.

Why device should be placed on Tongue

If we compare tongue with other parts of body well notice that the skin of tongue is more sensitive than any other body part. Large numbers of nerve fibers are

present on the tongue and there is no stratum corneum (outer layer of dead skin cells) on the tongue which would otherwise act as an insulator. To stimulate nerve fibers in tongue we require not if 5-15V which is much less as compared to any other body part. Also, saliva in our mouth which surround our tongue acts as an electrolyte and helps to maintain constant flow of current between the electrode and skin tissue. Moreover, the area of cerebral cortex which helps to interpret the data from tongue is also larger than any other body part. Thus, tongue is the best choice so far.

V. TRAINING AND TESTING OF BRAIN PORT

This device has been tested on several blind people; one among them is Erik Weihenmayer. A genetic eye condition known as retinoschisis caused him to be visually impaired at birth and completely blind by age 13. In retinoschisis, tiny cysts form within the eye's delicate retinal tissue, eventually causing its layers to split apart. Neither medication nor surgery can restore sight. But with the help and practicing this device he was at least able to identify the obstacles, objects around him and can also read the signs. And by use of this device he has climbed mountains around the world—the highest peaks, in fact, on every continent. The figure 8 below demonstrate how information from the video camera is represented on the tongue. Today's prototypes have 400 to 600 points of information on a ~3cm x 3cm tongue display, presented at approximately 30 frames per second, yielding an information rich image stream. Our research suggests that the tongue is capable of resolving much higher resolution information and we are currently working to develop the optimal tongue display hardware and software.

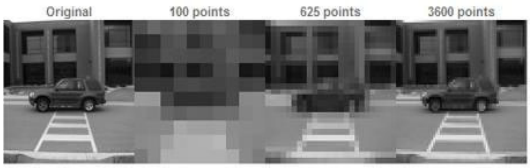


Fig -8: Recovered image from Brain port device

Sonly had between 100- and 1032-point arrays, the low resolution has been sufficient to perform complex perception and "eye"-hand coordination tasks. These have included facial recognition, accurate judgment of speed and direction of a rolling ball with over 95% accuracy in batting a ball as it rolls over a table edge, and complex inspection-assembly tasks. The latter were performed on an electronics company assembly line with a 100-point vibrotactile array clipped to the work-bench against which the blind worker pressed the skin of his abdomen, and through which information from a TV camera substituting for the ocular piece of a dissection microscope was delivered to the human-machine interface (HMI).

Learning Time

Current research studies involve participation between 2-10 hours. Within minutes of introduction, users may understand where in space stimulation arises (up, down, left and right) and the direction of movement. Within an hour of practice, users can generally identify and reach for nearby objects, and point to an estimate the distance of objects out of reach. With additional training, subjects can identify letters and numbers and can recognize landmark information when using the device in a mobile scenario. After a few hours of training, some users have described the experience as resembling a low-resolution version of the vision they once had. In addition, neuroimaging research suggests that for blind individuals, visual regions of the brain are activated while using the Brain Port vision device. Ultimately, the experience is uniquely individual. However, the resulting perception does not need to "feel" like eye-based vision in order to provide assistive benefit. You can adjust the intensity of the stimulation to your comfort level. Participants have reported that the impulses feel like champagne bubbles effervescing on their tongue.

Treatment

Subjects received clinic training for 3-5 consecutive days (2 one-hour sessions each day) with the Brain Port balance device. Each training session included up to 9 short (1-5 minute) training sessions, followed by a 20-minute training session, in progressively challenging positions. Subjects continued training at home for two 20- minute sessions each day for the duration of the study.

VI. APPLICATIONS AND LIMITATIONS

Applications

1. One of the applications which has been commercialized is providing vestibular or balance information for people with balance disorders. This is a simple form of sensory substitution, in which the tongue is used to present information from an artificial balance sensor.

2. Another application is providing directional or navigational information for people who operate under central command and control scenarios, such as military and civilian rescue personnel. Providing

information via the tongue allows them to fully use their vision and hearing to respond to unforeseen threats or hazards. We have shown in the laboratory that it is possible to navigate a virtual maze (like a simple video game) using only information received on the tongue (i.e., buzz on right side of tongue means turn right, etc.

3. A third, more ambitious application would be providing very crude visual information through the tongue for persons who are completely blind. Our colleague Eliana Sampaio at the Louis Pasteur University in Strasbourg, France has used our tongue stimulator with a small video camera and demonstrated an equivalent visual acuity of about 20-to-830, which is very poor vision, but possibly useful for certain limited activities with enough practice. Wicab, Inc. continues to improve this technology with the aim of commercializing it.

4. A fourth application would be providing tactile feedback to the human operators of robots used for various tasks. For example, UW professor Nicola Ferrier is developing a robot controlled by the tongue of persons with quadriplegia which could incorporate touch sensors into its gripper, relaying the touch information back to the user's tongue.

5. Beyond medical applications, scientists have been exploring potential military uses with a grant from the Defense Advanced Research Projects Agency (DARPA). They are looking into underwater applications that could provide the Navy Seals with navigation information and orientation signals in dark, murky water.

6. Brain port may also provide expanded information for military pilots, such as a pulse on the tongue to indicate approaching aircraft or to indicate that they must take immediate action.

7. Race car drivers might use a version of Brain port to train brains for faster reaction times, and gamers might use electro tactile feedback gloves or their controllers to feel what they're doing in a video game.

Limitations

1. This technology can't be adapted to work on senses the brain doesn't already have. So, the research Centre wibac is trying to implement this kind of people also.

2. The Brain Port requires training the brain incrementally using daily practice sessions.

3. When it comes in market its cost is around $10,000 so it cannot be afforded by common people.

4. Occasionally it will produce weak metallic taste sensations, a minor side effect.

CONCLUSIONS

Science has always provided mankind with answers and solutions, and science will continue to do so, while simultaneously supplying us with improvements upon previous technologies or new technologies altogether. Today, humanity owes the majority of our commodities, from prosthetic limbs to iPods, to years of scientific research and collaboration between different scientific disciplines. Unfortunately, however much science may have contributed to improving our lives, there is still plenty of headway to be made. We are always looking for areas in which our interdisciplinary strengths can be leveraged to revolutionize areas of science, engineering and technology, and to improve quality of life for millions of people. To substitute one sensory input channel for another, you need to correctly encode the nerve signals for the sensory event and send them to the brain through the alternate channel. The brain appears to be flexible when it comes to interpreting sensory input. You can train it to read input from, say, the tactile channel, as visual or balance information, and to act on it accordingly. It's a great mystery as to how that process takes place, but the brain can do it if you give it the right information. There is a hope that a balance device that uses nerve fibers on the tongue to transmit information about head and body position to the brain can make a serious difference for patients whose sight cannot be replaced. Thus, we hope that blind people can also see this colorful world by using this brain port device.

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A Note on "Edge Cloud for Internet of Things"

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***Abstract*- Cloud computing has significantly enhanced the growth of Internet of Things (IoT) by ensuring and supporting the Quality of Service (QoS) of IoT applications. However, cloud services are still far from IoT devices. Notably, the transmission of IoT data experiences network issues, such as high latency. In this case, the cloud platforms cannot satisfy the IoT applications that require real-time response. Yet, the location of cloud services is one of the challenges encountered in the evolution of IoT paradigm. Recently, edge cloud has been proposed to bring cloud services closer to the IoT end users, becoming a promising paradigm whose pitfalls and challenges are not yet well understood. This paper aims at presenting the leading-edge concerning the movement of services from centralized cloud platforms to decentralized platforms, and examines the issues and challenges introduced by these highly distributed environments, to support engineers and researchers who might benefit from this transition.**

Keywords*: *Edge cloud, Edge computing, Internet of Things (IoT), Network function virtualization (NFV), Software Defined Networking(SDN)

I. INTRODUCTION

THE INTERNET is evolving rapidly toward the future Internet of Things (IoT), which will potentially network billions or even trillions of devices will connect to internet by the year 2025. Most of these devices will be located at the edge of the Internet and could provide new applications, changing many aspects of both traditional industrial productions and our everyday living. Some devices that already appeared include apple watches, Oculus Rift helmets, Google Nest, Fitbit sports trackers, and Google Glasses. The edge IoT devices actually can be any kind of sensors and chips with various capabilities made by different manufacturers, and many applications can be built to enable smart home, smart health care , smart transportation, smart buildings, and smart cities. For the current cloud computing and application infrastructure, it is very common that these large amounts of edge devices need to work closely with the application servers located at a small numbers of distributed large-size data centers because most of the computation, storage, and networking resources are in these power data centers are owned by the application service providers (ASPs) such as Google, Amazon, Microsoft, Facebook, and apple.

Challenges within Current Cloud Computing Model

The conventionally centralized cloud computing model favours several large-sized distributed data centers. It has proved to be a huge success in the current Internet and was broadly adopted by the aforementioned giant corporations. The success can be attributed to several factors:

1) It provides an on-demand pay-as-you-go service to the users which lowers the owning cost for general customers

2) It provides elasticity of computing, storage, and networking resources which is flexible and scalable.

3) It facilitates big-data analytics using machine learning technologies due to the highly centralized colocation of intensive computation and data. In short, it is through economics of sale in operations and system administration that the conventional cloud computing wins.

However, such a centralized model will face significant challenges toward the IoT world and we briefly discuss some.

a) Volume and velocity of Data Accumulation of IoT Devices: In current model, the new application delivery highly depends on giant companies' proprietary overlays and tools ,and they are generally have to transfer all the data from the edge devices to the remote datacenters, which will not be possible considering the volume and velocity of the data generated by the IoT devices in the future.

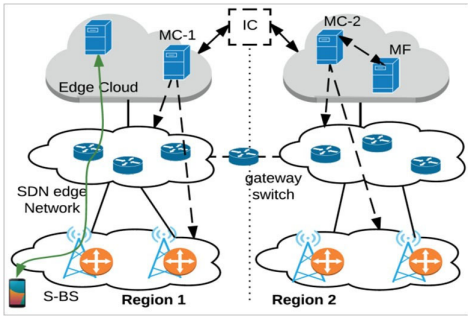
b) Latency Due to the Distance Between Edge IoT Devices and Datacenters : The centralized cloud model also leads to a fact that the edge devices (often mobile) are usually relatively far away from the datacenters.In future, when the number of edge devices experiences exponential increase , it is imaginable that high latency can be a big challenge for quite a number of applications that involve end-to-end communications.

1) Monopoly Versus Open IoT Competition: Current centralized cloud infrastructure is usually expensive to build and is only affordable to those giant companies that tend to define and use proprietary

protocols. Customers are easily stuck to some specific infrastructures as the cost of switching to the others could be dreadful. Such lack of openness could lead to a monopoly, ossification of the Internet, and further inhibit innovations.
In short, we need to address the deficiencies of the traditions cloud computing model. In our opinion, an open edge cloud computing made. In our opinion, an open edge cloud computing infrastructure is inevitable and necessary to embrace the paradigm shift to the future IoT world.

II. ROLE OF EDGE CLOUD

An Edge cloud architecture is used to decentralize (processing) power to the edges (clients/devices) of your networks. Traditionally, the computing power of servers is used to perform tasks such as data minimization or to create advanced distributed systems. Within cloud model, such intelligent tasks are performed by servers so they can be transferred to other devices with less or almost no computing power.



With open edge cloud infrastructures, first, the above challenge:
1) Can be addressed by providing local computing, storage, and networking resources to assist the often resource-poor IoT devices. The data generated by the edge devices at bewildering rates can be stored and pre-processed by the local edge cloud and only a small volume of processed data are required to be sent back to central data centers. The networking load can be reduced
Second, for challenge
2) The IoT devices can be offload their tasks to the edge servers if the loads are beyond their capabilities. Since the edge cloud is closer to the devices, the latency can be well controlled compared to the conventional cloud computing model. Third, for challenge
3) An open edge cloud innovation platform can break the monopoly and accommodate fairer competition among all stakeholders, no matter if they are giant corporation or CLUDE small or medium-sized invertors, vendors or ASPs. Specially, these small or medium-sized stakeholders are usually closer to the common users and are the most active and innovative groups for internet community. Such an open environment would help nurture future innovations.
Edge cloud capabilities include, but are not limited to:

- A consistent operating paradigm across diverse infrastructures.
- The ability to perform in a massively distributed (think thousands of global locations) environment.
- Application integration orchestration and service delivery requirements.
- Hardware limitations and cost constraints.
- Limited or intermittent network connections.
- Methods to address applications with strict low latency requirements (AR/VR, voice and so forth).
- Geofencing and requirements for keeping sensitive private data local.

Edge cloud is similar to data center computing in that:

- It includes compute, storage and networking resources.
- Its resources may be shared by many users and many applications.
- It benefits from virtualization and abstraction of the resource pool.
- It benefits from the ability to leverage commodity hardware.
- It uses APIs to support interoperability.

Edge cloud differs from computing in large data centers in that :

- Edge sites are as close as possible to end users. They improve the experience over high latency and unreliable connections.
- Many require specialized hardware, GPU/FPGA platforms for AR/VR functionality.
- Edge can scale to large number of sites, distributed in distinct locations.
- An edge site's locations and the identity of the access links it terminates are significant. An application that needs to run close to its users, needs to be in the right part of the edge. It is common for the application location to matter in edge cloud.
- The entire pool of sites can be considered to be dynamic because of their physical separation, edge sites will, in some cases, be connected to each other and core with the WAN connections. Edge sites will join and leave the pool of infrastructure over time.
- Edge sites are remote and potentially unmanned, and therefore must be administered

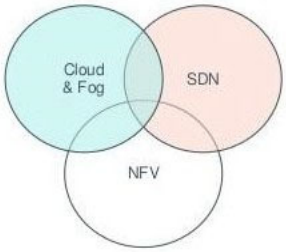
remotely. Tools need to support intermittent network access to the site.

- Edge support large difference in site size and scale, from data center scale down to a single device.
- Edge sites may be resource constrained, adding capacity to an existing site is restricted due to space or power requirements.
- Multi-tenancy on a massive scale is required for some of the use cases.

Isolation of edge cloud form data center clouds may be required to ensure that compromises in the "external cloud" domain cannot impact services.

III. KEY ENABLING TECHNOLOGIES

We will focus on key enabling technologies for IoT applications



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1) *Convergence of NFV and SDN in Edge Cloud:* To push computing storage, and networking resource to the edge and enable future IoT applications, a small-scale cloud computing platform is needed. NFV and SDN seem to be two key synergistic enabling technologies that enable such a vision.

Using NFV at the edge, local computing, storage, and networking resources are available and closer to edge devices for those applications (video monitoring, face recognition, and AR) that generate intensive data or require low latency. In edge clouds, NFV can build on top of affordable industry standard servers, switches and storage, and create VFNs replacing traditional and specialized equipment from proprietary vendors. The VFNs can be launched or terminated dynamically according to demands, and can be placed in much more flexible positions. They can also be chained and scaled up or down for complex functions and applications. All the aforementioned benefits of NFV can be employed by the edge cloud applications if adopting NFV.

SDN, on the other hand, is very suitable to work with NFV in the edge cloud to network, configure, control, and manage the VFNs created by NFV. SDN could greatly reduce the costs and increase the flexibility and programmability of the VFNs in the edge cloud because of the separation of control from the data forwarding and the usage of centralized network control and configuration.

From a technical view, NFV and SDN are highly complementary for edge cloud prospects. The separation of the control and data forwarding in SDN can simplify the compatibility of NFV with existing deployments. NFV can support SDN by providing the infrastructure on top of which SDN can run. The NFV and SDN convergence in edge cloud potentially opens a new door for innovative, fast, and cost-effective new service and application delivery and deployment.

2) Automated Orchestration:

Orchestration is an essential element and a key process for the edge cloud vision. Orchestration is defined as a set of methods and operations that the cloud providers and application owners undertake to either manually or automatically select, deploy, monitor, and control the configuration of hardware and software resources for application delivery. However, the current orchestration approaches from both open-source cloud control platforms and commercial cloud providers (like Microsoft Azure and Amazon EC2), are not for edge cloud IoT applications. They highly depend on either manual or simple conditional check method that is usually complex and error-prone to orchestrate this increasingly sophisticated cloud services. In addition, most of the orchestration methods are application-specific and are highly customized for certain type applications, and using such method for edge cloud orchestration (where it is common that multiple IoT applications are required to be delivered and deployed in a shared edge cloud infrastructure) has significant limitations. Thus, there is a demand for automated tools and appropriate abstractions to turn the application requirements more effectively into orchestration schemes optimizing the resource allocation and provisioning for the IoT applications under deployment.

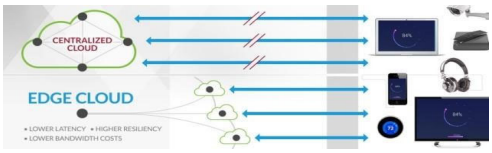
3) Dynamic offloading:

Meanwhile, in edge cloud, the orchestrator needs to work closely with various types of IoT devices to offload their data and computation to the edge cloud, and to dynamically and optimally commit appropriate to carry out these offload tasks matching the demands. There is also lack of systematic configuration and integration method and framework to deliver various IoT applications and manage them efficiently over a unified edge cloud platform. Most of these traditional "program partition partitioning" or "process migration" based offloading methods depend on the programmers and are usually error-prone and hard to manage. As an alternative, an VM based offloading framework is relatively easier to control and manage, and with higher reliability. However, there is a demand to launch, configure, and manage these VMs effectively for a specific IoT application delivered in the edge cloud. To enable such a vision, a typical

method would depend on the NFV and SDN integrated edge cloud platform to orchestrate the resources to fulfil the offloaded tasks from the battery-constrained mobile IoT devices. The edge cloud platform also configures the launched VMs to install and perform application-specific tasks.

IV. Typical IoT Applications Benefiting From Edge Clouds

Edge clouds infrastructure will be important places for future innovations, where potentially there will be many IoT applications. Some examples include smart home/buildings, home robotics, smart cities, smart health, AR or VR, cognitive assistance, autonomous driving, video crowd sourcing, and M2M communications. Instead of all those applications, We will discuss three types of future IoT applications could directly benefit from the edge cloud.



1) Applications Requiring Low Latency:
For such applications, the traditional centralized cloud computing would be vulnerable due to the large data volume generated and the long distance between and the long distance between clients and the backend datacenters. For example, "Foursquare" and "Google Now" applications require fast response to the users. Some wearable camera applications, or industrial monitoring and controlling applications require response time to be as low as 10-50ms. Some multimedia video or gaming applications also have high constraints on delays without significant downgrade of user experience.

2) Applications Requiring High Data Bandwidth:
The number of edge IoT devices is experiencing exponential increase and it is predicted that by year 2020 these devices scale of devices and data will post significant pressure to the Internet. It is necessary that most of the data are processed by the edge cloud first and reduce the volume data sent to the remote data center. This is also an economic and sustainable approach reducing costs and saving energy .The computing and storage resources can also be assigned and utilized more efficiently. Examples include those AR or VR applications using Oculus Rift helmets and Google Glasses.

3) Applications Involving Large Amount of IoT Devices With Limited Capacities:
Comparing with the servers in datacenters, most of the IoT devices or sensors at the edge are somewhat limited in both computing power and battery capacity. Limited by the hardware constraints, complex and intense computation are not suitable for these devices. Instead, most of such computation and data processing tasks can be offloaded to edge cloud, which cloud save energy on IoT devices and get the tasks done faster in the edge cloud. Example IoT applications include structure or agricultural field monitoring, and industrial monitoring, which usually involve a lot of small sized and distributed sensors and IoT devices. In these cases, the sensors and IoT devices mostly generate and send data but with limited capacity in processing and analyzing data.

V. Challenges, Discussions And Perspectives

Having presented a variety of related research projects, we find that there are some key issues worth further discussion. In this section, we present our perspectives and observations. Of course, it does not mean or imply any agreement among researchers.

A) NFV and SDN coherence
While converging NFV and
SDN for applications in the edge cloud context has huge potential, the research is still in an early stage since NFV and SDN technologies individually are still not mature and research on effective synergy between them is just beginning. Some typical example research questions to be answered in this regard include the following.

1) What necessary functional interfaces should be opened to each other between NFV and SDN for coherent interaction.

2) how to enable effective coordination among various VNFs and between mobile IoT devices ("things") and edge cloud (the VNFs).

3) How would the edge cloud orchestrator interact with NFV and SDN modules to create multiple applications through both northbound interfaces and mechanisms.

B) 4G/5G Mobile networks versus internet:
The edge cloud trend and virtualization technologies are transforming networks everywhere. Future IoT applications can be deployed in various networks, including both 4G/5G mobile telecommunication networks and traditional internet. However, there could be significant differences on how and where they implement the edge cloud idea based on their own existing network architecture. For 4G/5G networks, edge cloud implementation can be in the cell towers (Node B) to provide services close to the mobile phone users for better user applications or new applications. For internet the location of the edge servers can be in a C.O. (as a CORD), in a building or community, or

near the access point of a smart home. Due to the network architecture difference, their implementations and corresponding participating vendors may also vary significantly. An open challenge for the 4G/5G carriers is to rearchitect their networks from traditionally closed and proprietary platforms and devices to be open to third party software and hardware vendors for new innovations, since the key technologies, such as NFV and SDN are all open source endeavours.

C) Coordination Between IoT Devices and the Edge
The key motivation of edge computing is to allow the edge servers to get involved to help the IoT devices with computing, storage, and networking. How the things and the edge coordinate with each other to achieve the goals will have significant impacts on the effectiveness of such methods. In traditional offloading and cyber foraging, program/process partitioning technologies had been very broadly studied. However, they generally add complexity in programming and put an extra burden on the application developers. A typical alternative which is also advocated by the Cloudlet project is that instead of programming the applications differently to be adaptive, a whole advocated by the Cloudlet project is that instead of programming the applications differently to be adaptive, a whole VM can be dynamically launched in the edge cloud and the computation tasks can be done in the VM as a whole until the results are sent back to the things. VMs can be launched and deleted dynamically on demand. Such method could simplify the developers' work and further reduce complexity. Understandably, such an implementation may involve extra delay while the NFV platform manages the VMs. However, the good news is that for most of the resource-intensive task involving offloading, the benefits normally out-number the costs. This VM-based method is also facilitated by the VM live migrations technologies that had been relatively well studied.

D) Southbound Interfaces and Northbound Interfaces:
Integrating NFV and SDV in not an easy task as it involves multiple stakeholders that may implement the concepts differently. These stakeholders may not be motivated to work together and may not necessarily provide enough and clear interfaces to interfaces to integrate with other software vendors. Southbound interfaces (SBIs) and northbound interfaces (NBIs)are two important types of interfaces to make everything happen fluently and synergistically. NBIs generally refer the interfaces between the control plane and data plane. While the SBIs have been wells by the protocols such as OpenFlow, the NBIs have not. According to a recent post on the open Networking Foundation(ONF) blog, more than 20 SND controllers and hence preliminary NBIs are currently available for SND in the marketplace. It is unlikely the NBIs will be standardized in the short term, which has the possibility to stifle innovations. To allow deploying over the delivering scalable and portable future applications NBIs are very important and more research efforts are needed .an example ongoing effort is that the developing an "intent-based" NBIs system.

E) SDN Multicloud Scenarios
From the discussions on the three NSF workshops, SDN is evolving to software-defined exchange (SDX). The traditional SDN concept is for inside a network, while SDX refers to applying the concept to interdomain networking. One of SdX's goals is to enable large-scale interconnections of software-defined internet owned and operated by various organizations while gaining similar benefits in flexibility and programmability as in SND for an individual network. Moreover, with SDX, a series of new features (impossible or difficult to achieve in the current interdomain routing system) can be provided, including applications-specific peering, blocking denial-of-service traffic, load balancing, steering through network functions, and inbound traffic engineering. Applying SDN in the interdomain scenario, even at single at Internet exchange point, could benefit tens of hundreds of providers without deploying new equipment. The SDX perspective may affect future edge cloud applications as well. For example, how can SDN in the local edge cloud applications as well. For example, how can SND in the local edge clouds better interact and coordinate with the SNDX in the future Internet for more benefits and features? Many interesting research topics may emerge.

F. Security:
Security remains one of the most important challenges for the future edge cloud infrastructure applications. Due to the fact that the future edge cloud could involve multiple technologies (such as NFV, SDN, and IoT), security concerns will be multifold. First, because of the adoption of virtualisation technology in edge cloud, security concerns with all the traditional cloud computing model (such as the VM security) will also exist for edge clouds. Second, because the edge cloud servers are sparsely located and are close to the users premises, they may be more fragile to physical attacks. Third, security issues for individual technologies, such as NFV, SDN, and IoT will continue exist in the edge clouds. Since the future edge clouds could be a synergistic effort and all of these technologies may play respective roles, additional security issues may also come up from the interfaces could run on the shared infrastructure in edge clouds, so it is important to address the application-level security such as appropriate

application isolation and shared traffic and data access for multiple applications. Lastly, software security can also be a challenge. Since the future edge clouds will enable more programmability and the open platform will allow more third-party software and hardware vendors to weigh in and contribute, it is important to control and manage the potential risks among different stakeholders. Also, appropriate authentication, authorization, and auditing mechanisms may be required to identify and protect the trusted parties and defend from potential malicious attacks and misuses.

VI. AREAS OF APPLICATION

1) Industrial
2) Life style
3) Automotive
4) Healthcare
5) Energy

CONCLUSION

Empowered by the emerging technologies, such as NFV and SDN, edge cloud technologies are promising to address multiple challenges with the cloud computing model facing with the future IoT world. In this paper, we investigated the capabilities, key enabling technologies, applications and possible future use cases for the edge cloud environment.

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An Introduction to "Fractal Antennas"

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***Abstract*—Wireless applications, particularly with multiple Resonances put new demands on antennas pertaining to size, gain, efficiency, bandwidth, and more. One promising approach in this regard is to use fractal geometries to find the best distribution of currents within a volume to meet a particular design goal. In the miniaturization of wire antennas, it has been found that the electromagnetic coupling between wire angles limits the reduction of the resonant frequency with increasing wire length. Unique properties of fractals have been exploited to develop a new class of antenna-element designs that are multi-band and compact in size and have been shown to possess several highly desirable properties, including multi-band performance, low side lobe levels, and its ability to develop rapid beam forming algorithms based on the recursive nature of fractals. Fractal antennas prove worthwhile, high performance, resonant antenna for practical applications. Usually fabricated as or on small circuit boards, they allow new versatile in their use with wireless device. The purpose of this paper is to introduce the concept of the fractals, fractal antenna arrays and applications.**

Index Terms – Fractals, Fractal antenna

I. INTRODUCTION

In the study of antennas, fractal antenna theory is a relatively new area. The term "fractal", means broken or irregular fragments. It was originally coined by Mandelbrot (1983) to describe a family of complex shapes that possess an inherent self-similarity or self-affinity in their geometrical structure. In today world of wireless communication, there has been an increased need for more compact and portable communication systems. As solution to minimizing the antenna size while keeping high radiation efficiency, fractal antenna can be implemented. Fractal antenna can take on various shapes and forms. Example, a quarter wavelength monopole can be transformed into a similarly shorted antenna by the Koch fractal.

With the advance of wireless communication systems and their increasing importance, wideband and low-profile antennas are in great demand for both commercial and Military applications. Multiband and wideband antennas are desirable in personal communication systems, small satellite communication terminals, and other wireless applications. Traditionally, a wideband antenna in the low frequency wireless bands can only be achieved with heavily loaded wire antennas, which usually means that different antennas are needed for different frequency bands. Fractal antennas suggests some attractive solutions for using a single small antenna operating in several frequency bands. The self-similar properties of certain fractals result in a multiband behavior of the antennas while, the highly convoluted shape of these fractals makes possible the reduction in size, and consequently in mass and volume, of certain antennas as investigated by Puente *et al.* (1998). These reductions can make possible to combine multimedia, communication and Tele-detection functionalities in a reduced space like a handy phone, a wristwatch or a credit card e.g. a fractal antenna can provide GPS (Global Positioning System) services within a conventional mobile cellular phone. Since Hertz times, the design of electrically small antennas has always been a topic of great interest, related first to the development of radiotelegraphy and radio broadcasting. In the last few years, the fast-growing development of mobile communication brought the need for devices that require their components to be ever smaller and lighter, capable of adjusting its frequency of operation and to operate in a multiband mode. Some recent results by Puente (1998) and Puente (2001) showed that fractal antennas have excellent multiband properties and low resonant frequencies. Radiation efficiency and impedance bandwidth decrease with the size of the antenna, making small antennas inefficient by nature.

II. FRACTAL CONCEPTS

'Fractal' was first defined by Benoit Mandelbrot (1983) as a way of classifying structures whose dimensions were not whole numbers. These geometries have been used previously to characterize unique occurrences in nature that were difficult to define with Euclidean geometries, including the length of coastlines, the density of clouds, and branching of trees. Most fractal objects have self-similar shapes although there some fractal objects exist that are hardly self-similar at all and also have infinite complexity and detail, that is, the complexity and detail of the fractals remain no matter how far you "zoom-in," as long as you are zooming in on the right location. Fractals can model nature very well. Fractals can be divided into many types; Fig. 1 show some examples. Many theories and innovative applications for fractals are being developed. Fractals have been applied in image compression, in the creation of music from pink noise, and in the analysis of high-altitude lightning phenomena.

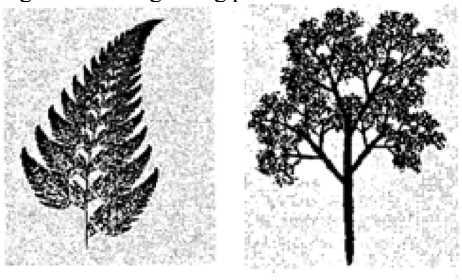


Fig1 Shows The Fractal Modelling (A)Plant (B)Tree

III. THE GEOMETRY OF FRACTALS

The geometry of fractals is important because the effective length of the fractal antennas can be increased while keeping at total area same. The shape of the fractal antenna can be formed by an iterative mathematical process, called as Iterative function systems (IFS). IFS represent an extremely versatile method for conveniently generating a wide variety of useful fractal structures. These iterated function systems

are based on the application of a series of affine transformations, w defined by:

W (x ,y) = (a*x +b*y +e ,c*x=d*y +f)

Where *a ,b ,c ,d ,e* and *f* are real numbers. Hence the affine transformation, w is represented by six parameters with *a, b, c, d, e* as control rotation and scaling while *e* and *f* as control linear translation. Now suppose we consider w1, w2- - -,wn as a set of affine linear transformations, A be the initial geometry, then a new geometry, produced by applying the set of transformations to the original geometry, *A,* and collecting the results from w1 (A),w2(A)**,- - -** wn(A) this can be represented by W(A) where W is known as the Hutchinson operator. A fractal geometry can be obtained by repeatedly applying W to the previous geometry. For example, if the set represents A0 as the initial geometry, then A1=W (A0), A2=W (A1) - - . An iterated function system generates a sequence that converges to a final image, Am in such a way that W (Am) = Am. This image is called the attracter of the iterated function system and represents a fixed point of W, Fig. 2 shows a Koch curve, Fig. 3 shows a Sierpinski fractal and Fig. 4 shows Koch Island. It should be noted that applying several of these transformations in a recursive way, the self-similar fractal is obtained. In fact, self-similarity can also be understood as the property by which the fractal is found inside the fractal itself but at smaller scale. Fractal structures can be analyzed using the integral equation methods (IE), in conjunction with the well-known methods of moments (MOM), which splits the fractal geometry in the basic functions. Iterated function systems have proven to be a very powerful design tool for fractal antenna engineers.

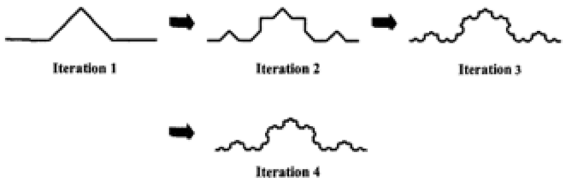


Fig 2 a four iteration Koch fractal

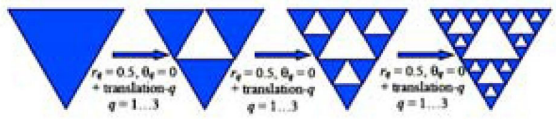


Fig 3 a three iteration sirepinski fractal

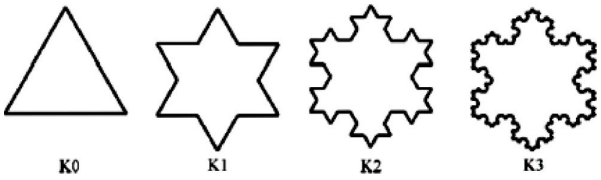


Fig 4 a three iteration Koch island

IV. MINIATURIZATION OF ANTENNAS

Wire antennas miniaturization is usually based in packing a long wire inside a small volume with the aim to achieve the smallest antenna having a given resonant frequency or, equivalently, achieving the lowest resonant frequency of an antenna having a fixed size. In principle, it is expected that the longer the wire length, the lower the resonant frequency. This can be explained by the fact that the degree of coupling between parallel wire segments with opposite current vectors causes a significant reduction in the effective length of the total wire, and therefore an increase in the resonant frequency. The effect can be explained with the help of Koch fractal curve is taken to understand the behavior of the resonant frequency of fractal antennas as a function of the antenna geometry and wire length. With an increase of the wire length of a Koch fractal there is an increase in the resonant frequency which results due to the coupling between sharp angles at curve segment junctions. These angles radiate a spherical wave with phase center at the vertex as shown in Fig. 5.

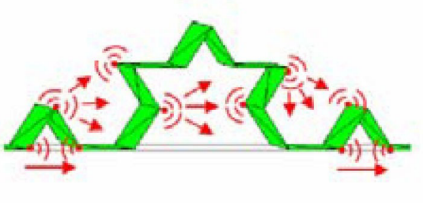


Figure5. Signal coupling at angles in koch curve fractal

Each angle not only radiates, but also receives the signal radiated by other angles. As a consequence, part of the signal does not follow the wire path, but takes “shortcuts” that start at a radiating angle. The length of the path traveled by the signal is, therefore, shorter than the total wire length.

V. FRACTAL ANTENNA ELEMENTS

A. Koch monopole and dipole:

The expected benefit of using a fractal as a dipole antenna is to miniaturize the total height of the antenna at resonance, where resonance means having no imaginary component in the input impedance. The geometry of how this antenna could be used as dipole in shown Fig 2.

A couch curve is generated by replacing the middle third of each straight section with a bent section of wire that spans the original third. Each iteration adds length to the total curve which results in a total length that is 4/3 the original geometry:

$$\text{Length}_{koch} = h.(4/3)$$

The miniaturization of the fractal antenna is exhibited by scaling each iteration to be resonant at the same frequency. The miniaturization of the antennas shows a greater degree of effectiveness for the first several iterations. The amount of scaling that is required for each iteration diminishes as the number of iteration increase. The total length of the fractals at resonance is increasing, while the height reduction is reaching as asymptote. Therefore, it can be concluded that is increased complexity of the higher iterations are not advantageous.

The miniaturization of the antennas shows a greater degree of effectiveness for the first several iterations. Properties of the Koch fractal monopole were later considered in Puente (1998) and it was shown that the electrical performance of Koch fractal monopoles is superior to that of conventional straight wire monopoles, especially when operated in the small-antenna frequency regime. In this paper, the results for Koch monopole of length 6cm are found to be in accordance

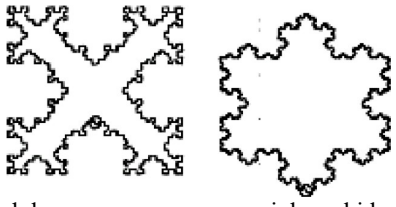
with Puente (2001). The corresponding results for different lengths 8cm and 12cm with first two iterations are listed in Table 1. It can be observed that as the number of iterations of the fractal iterations increases, the resonant frequency decreases.

TABLE I Effective length of Koch monopole

Antenna	Effective length (6cm)	Effective length (8cm)	Effective length(12cm)
K0	6	8	12
K1	8	10.67	16
K2	10.67	14.22	21.33
K3	14.22	18.96	28.44

B. Koch loop and Minkowski loop

Loop antennas, Fig. 6 can be well understood using a variety of Euclidean geometries. Resonant loop antennas require a large amount of space and small loops have very low input resistance a fractal island can be used as a loop antenna to overcome these drawbacks. Minkowski loops were originally investigated by Cohen (1995) and Cohen (1996). Both types of fractal loops have the same characteristic that the perimeter increases to infinity while maintaining the volume occupied. This increase in length decreases the required volume occupied for the antenna at resonance, for a small loop this increase in length improves the input resistance. By raising the input resistance, the antenna can be more easily matched to a feeding transmission line.



Koch loop minkowski loop

C. Sierpinski monopole and dipole

The Sierpinski gasket is named after the Polish mathematician Sierpinski who described some of the main properties of this fractal shape in 1916. The original gasket is constructed by subtracting a central inverted triangle from a main triangle shape, Fig. 7. The self-similarity properties of the fractal shape are translated into its electromagnetic behavior and results in a multiband antenna. A multiband fractal monopole antenna, based on the Sierpinski gasket, was first introduced by Puente *et al.* (1996)

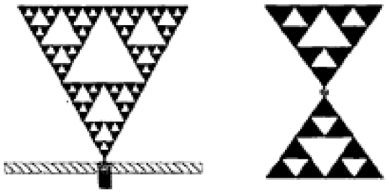


Figure7.Sierpinski monopole and dipole

A scheme for modifying the spacing between the hands of the Sierpinski monopole was subsequently presented by Puente *et al.* in (1996).

D. Fractal Tree

Various fractal tree structures have been explored as antenna Elements and can achieve multiple wideband performance and re duce antenna size,

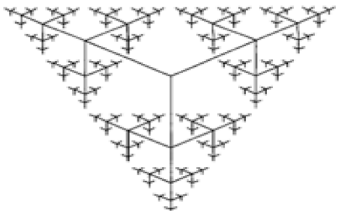


Fig. 9 Show a stage 4 ternary fractal tree. The multiband characteristics of a deterministic fractal tree structure were considered by Xu (1999). It was found that these fractal tree antennas have a multiband behavior with a denser hand distribution than the Sierpinski antenna. The multiband and wideband properties of printed fractal branched antennas were studied by Sindoy (1999).

Figure9. A stage 4 Fractal tree

E. Fractal patch antennas

Borja(2000) proposed a design methodology for a multiband Sierpinski micro-strip patch antenna. A technique was introduced to improve the multiband behavior of the radiation patterns by suppressing the effects of high order modes. High-directivity modes in a Koch-island fractal patch antenna were studied by Romeu (2001). It was shown that a patch antenna with a Koch fractal boundary exhibits localized modes at a certain frequency above the fundamental mode, which can lead to broadside directive patterns. Also, the localized modes were also observed in a waveguide having Koch fractal boundaries. Some additional applications of fractal concepts to the design of micro-strip patch antennas were considered and studied by Yeo (2001) and Gianvittorio (2001). The Cantor slot patch is another example of multiband fractal structure. This type of patch has been applied in multiband micro-strip antennas.

VI. FRACTAL ANTENNA ARRAYS

The concept of the fractal can be applied in design and analysis of arrays by either analyzing the array using fractal theory, or placing elements in fractal arrangement, or both. Fractal arrangement of array elements can produce a thinned array and achieve multiband performance. Properties of random fractals were used by Jaggard (1986) to develop a design methodology for quasi-random arrays. Random fractals were also used to generate array configurations that Were somewhere between completely ordered and completely disordered (i.e., random). The main advantage of this technique is that it yields sparse arrays that possess relatively low side-lobes and which are also robust (a feature associated with random arrays, but not periodic arrays). A family of non-uniform arrays, known as Weierstrass arrays have the property that their element spacing and current distributions are self-scalable and can be generated in a recursive fashion. Synthesis techniques for fractal radiation patterns were developed by Werner (1996), based on the self-scalability property.

A. Multi-Band Fractal Arrays

A design methodology for multi-band Weierstrass fractal arrays was introduced by Wemer (1997). The application of fractal concepts to the design of multiband Koch arrays, as well as multiband and low-side lobe Cantor arrays were discussed by Puente (1996). A simplified Koch multiband array, using windowing and quantization techniques, was presented by El-Khamy (2000). It was recently shown by Werner (2000) that the Weierstrass-type and the Koch type of multiband arrays are actually special cases of a more general unified family of self-scalable multi-band arrays.

B. Cantor, Sierpinski Carpet, and Related Arrays

The radiation characteristics of planar concentric ring Cantor arrays were investigated by Wemer (1997). Cantor linear array is based on a Cantor set with a number of design variables. When thinned, these arrays have a performance that is superior to their periodic counterparts and appear similar to or better than their random counterparts for a moderate number of elements. Planar fractal array configurations, based on Sierpinski carpets, were also studied by Baldacci (2001). The fact that Sierpinski carpet and related arrays can be generated recursively has been exploited in order to develop rapid algorithms for use in
efficient radiation-pattern computations and adaptive beam forming, especially for arrays with multiple stages of growth that contain a relatively large number of elements, Fig. 10 shows the first four stages of a linear Cantor array with dark gray dipoles represent physical elements while the light gray representing the virtual elements.

Figure10. A four stage linear Cantor array

VII. Applications Of Fractal Antennas

There are many applications that can be benefit from fractal antenna. The sudden growth in wireless communication area has sprung a need for compact integrated antennas. The space saving abilities of fractals to efficiently fill a limited amount of space create distinct advantage of using integrated fractal antennas over Euclidean geometry. Examples of these applications include personal hand-held wireless devices such as cellphones and other wireless mobile devices such as and wireless LANs and networkable PDAs.

Fractal antennas can enrich applications that include multiband transmissions. This area has many possibilities ranging from dual-mode phones to devices integrating communication and location services such as GPS, the global positioning satellites. Fractal antennas also decrease the area of resonant antenna, which could lower the radar cross-section(RCS). The benefit can be exploited in military applications where the RCS of the antenna is a crucial parameter.

VIII. Advantages And Disadvantages

Advantages of fractal antenna technology are:

- Miniturazization
- Better input impedance matching
- Wideband/multiband(use one antenna instead of many)
- Frequency independent(consistent performance over huge frequency range)
- Reduced mutual coupling in fractal array antennas

Disadvantages of fractal antenna technology are:

- Gain loss
- Complexity
- Numerical limitations
- The benefits begin to diminish after first few iterations.

Conclusions

Through characterizing the fractal geometries and the performance of the antennas, it can be summarized that increasing the fractal dimension of the antenna leads to a higher degree of miniaturization. Also it is possible to use fractal structure to design small size, low profile, and low weight antennas. Applications of fractal geometry are becoming increasingly widespread in the fields of science and engineering. This paper presented a comprehensive overview of fractal antenna engineering. The analysis of a Koch monopole is also done and the results showed that as the number of iterations is increased, there is an increase in the effective length and decrease in resonant frequency. In the future, one area of development in fractal antenna is to implement fractal antennas into current technologies in practical situations, another area of interest worth pursuing is to analyze the mathematical aspects of fractals to correlate their improved characteristics as antennas with their unique geometrical properties. The field of fractal antenna engineering is still in the relatively early stages of development, with the anticipation of much more innovative advancement to come over the months and years ahead.

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An Overview on "NOMA: A 5G technology"

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***Abstract*— The consistent development of mobile Internet and Internet of things (IoT) will foresee explosive increase in data traffic in 5G communications. To address the challenges in future wireless communications, Non-orthogonal multiple access (NOMA) is an essential enabling technology to improve the parameters such as higher spectral efficiency and lower latency. NOMA includes several schemes to improve the aforementioned parameters. In this article, the basic principles of NOMA and key features of NOMA schemes i.e., Sparse Code Multiple Access and Patter Division Multiple Access are presented.**

Keywords— ***IoT, NOMA, PDMA, SCMA*.**

I. INTRODUCTION

From analog phone calls to Internet Protocol services, including voice and messaging, each transition has been encouraged by the need to meet the requirements of the new generation of mobile technology. With enormous potential for both consumers and industry, 5G is expected to roll out by 2020. From the next-generation radio access technology viewpoint, a step change in data speed and a significant reduction in end-to-end latency is a major concern for 5G, since the rapid development of the mobile Internet and the Internet of Things (IoT) exponentially accelerates the demand for high data–rate applications. In particular, many of the industry initiatives that have progressed with work on 5G declare that the network-level data rate in 5G should be 10-20 Gbps (10-20 times the peak data rate in 4G), and the user-experienced data rate should be 1 Gbps (100 times the user-experienced data rate in 4G). They also set the latency (end-to-end round-trip delay) at 1 millisecond (one-fifth of the latency in 4G).

Future generations of cellular networks are expected to guarantee high quality of service (QoS) and provide better services for multiple users. To address the challenges in the smart world, it is necessary to design and develop advanced technologies that are capable of providing huge user-connections and using the available spectrum efficiently. Non-orthogonal multiple access (NOMA) is an emerging technology for the fifth generation (5G) wireless networks which can address aforementioned challenges in 5G[1]. The key idea behind NOMA is to serve multiple users in the same resource block, such as a time slot, subcarrier, or spreading code. Non orthogonal multiple access can address the challenges in 5G. SCMA and PDMA are typical schemes in NOMA which are recently proposed in wireless communications. In SCMA, bit streams are directly mapped to sparse code words, and thus it is available to use near-optimal multi-user detection (MUD) based on message passing algorithm (MPA) with acceptable complexity. In PDMA, non-orthogonal patterns are designed to maximize the diversity and minimize the overlaps of multiple users. As the resource allocation is non-orthogonal, these schemes can improve spectral efficiency and accommodate much more users.

II. KEY TECHNOLOGIES IN NOMA

The key enabling technologies for NOMA is based on two principles namely, Superposition coding and Successive Interference Cancellation. In conventional MA schemes, one of the popular power allocation method is water filling algorithm.

However, In NOMA, user with poor channel conditions are supposed to allocate more power. By doing so, it can ensure that the users with poor channel condition can decode the message of themselves by treating other users' messages as noise. For those users which are in good channel conditions, SIC technologies can be applied to enable subtract the interference from other users with poorer channel conditions.

A. Superposition coding:

As first proposed by Cover as early as in 1972 [2], the elegant idea of SC is regarded as one of the fundamental building blocks of coding schemes to achieve the capacity on broadcast channel . More particularly, it was theoretically demonstrated that SC is capable of achieving the capacities of channel by Bergmans [3] and of achieving the capacities of the general degraded broadcast channel capacity by Gallager [4]. The fundamental concept of SC is regarded as one of the fundamental building blocks of coding schemes to achieve the capacity on broadcast channel. Superposition Coding is able to encode a user with poor channel condition at a lower rate and then superimpose the signal of a user with better channel condition on it.

B. Successive Interference cancellation

Aiming to improve the network capacity with efficient managing interference SIC is regarded as a promising technology for performing interference cancelation in wireless networks. SIC technique achieves interference cancelation with the following procedure: it enables the user with stronger link to decode the user with weaker link first. Then, it regenerates the signal of weaker user at the stronger user side and subtracts the interference. At last the stronger user decodes its information without suffering the interference from the weaker user. SIC has been widely studied and various version was been employed in practical systems such as CDMA . Another important development on SIC is that it has been implemented in some commercial systems, e.g., IEEE 802.15.4.

III. POTENTIAL NOMA SCHEMES

NOMA achieves a favorable trade-off between system performance and complexity. Thus, various practical forms of NOMA have been proposed for the 5G standard. In this section, basic principles and key features of NOMA schemes i.e., SCMA and PDMA, will be discussed separately.

A. SCMA

SCMA scheme exploits sparse spreading sequences to realize overloading. In SCMA, bit-to-constellation mapping and spreading with low-density signatures are combined together and the bit streams are directly mapped to different sparse codewords. Particularly, different users' codewords are taken from different codebooks, which are generated by multidimensional constellation. By making full use of the sparsity of code words, at the receiver, MUD based on MPA can be used to separate symbols with acceptable complexity.

SCMA is based on the idea that one user's information is spread over multiple subcarriers. However, the number of subcarriers assigned to each user is smaller than the total number of subcarriers, and this low spreading (sparse) feature ensures that the number of users utilizing the same subcarrier is not too large, such that the system complexity remains optimal.

Consider an SCMA system with 6 users and 4 subcarriers, as shown in Fig. 1. The key step to implement SCMA is to design the factor graph matrix, which specifies which user's encoded messages are allocated to which subcarriers. A typical factor graph matrix for SCMA with 6 users and 4 subcarriers is the following

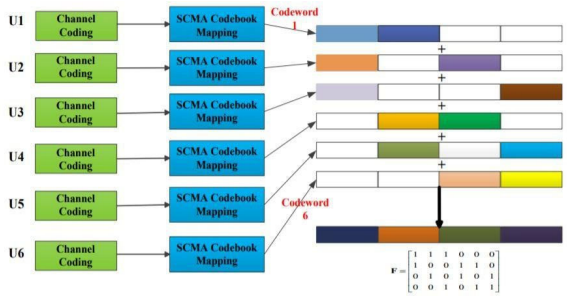

Fig. 1. Example of an SCMA system with six users and four subcarriers.

SCMA requires joint decoding at the receiver, where the MPA is used to ensure low complexity. This is an important feature of SCMA, which distinguishes it from power-domain NOMA, as joint decoding instead of SIC is employed.

$$\mathbf{F} = \begin{bmatrix} 1 & 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix},$$

where $[F]_{ij}$= 1 means that the j-th user can use the i-th subcarrier, and $[F]_{ij}$ = 0 means that this user cannot use the subcarrier. The sparse feature of SCMA is reflected in the fact that there are only two non-zero entries in each column of F, i.e., each user employs only two subcarriers. Since one user can use multiple subcarriers, SCMA employs multi-dimensional coding in order to ensure that the user's information is effectively spread over the subcarriers. Because one user's messages at different subcarriers are jointly encoded.

B. PDMA

PDMA is a novel non-orthogonal multiple access technology based on the total optimization of multiple user communication system. Through the joint design of the sender and the receiver, the users are distinguished by non-orthogonal design at the receiver and are detected with SIC at the receiver. PDMA has many technical advantages. The design of pattern has very strong ability by the signal design framework based on unified power temporal, spatial and coding domains. As a new multiple access, PDMA can effectively suppress co-channel interference, achieve low power consumption, and has high spectral efficiency. Also PDMA has flexible adaptation for diversity scenarios in 5G system. PDMA can promote 1-2 times of the system spectrum efficiency, while in case of high capacity burst traffic scenario, PDMA can decrease data transmission delay and enhance Qos of user access

PDMA can be realized in multiple domains. At the transmitter, PDMA uses non orthogonal patterns which are designed to maximize the diversity and minimize the overlaps of multiple users. Then, multiplexing can be realized in code domain, space domain, power domain, or their combinations. Multiplexing in code domain is similar to that in SCMA, but the number of subcarriers connected to the same symbols in the factor graph can be different. At the receiver, MPA is performed to realize interference cancellation. In the case of multiplexing in power domain, power allocation needs to be carefully considered under the total power constraint. SIC can be also used at the receiver according to SINR difference among multiplexed users. Multiplexing in space domain, i.e., spatial PDMA can be combined with the multi-antenna technique. The advantage of spatial PDMA compared with MIMO is that PDMA doesn't require joint precoding to realize spatial orthogonality, which significantly reduces system complexity. In addition, multiple domains can be combined in PDMA to make full use of various available wireless resources.

The purpose of the spreading matrices in code domain PDMA is to facilitate interference cancellation. In PDMA, the number of subcarriers occupied by one user is not necessarily much smaller than the total number of subcarriers. Similar to the factor graph matrix for SCMA, the performance of PDMA is largely determined by the design of the subcarrier allocation matrix, referred to as the PDMA pattern matrix. According to the pattern, multi-user signals are superimposed and then transmitted. The key feature of the design is that based on the differences of channel quality between cell center and edge users, a reasonable power allocation mechanism is proposed to ensure that the non-linear receiver has better detection performance.

IV. CONCLUSION

In this article, key features of NOMA are presented. In addition, potential NOMA schemes are compared. It is found that SCMA has the better performance due to the near-optimal design of sparse code words while PDMA have

reasonable power allocation in the system. This comparison study reveals that to obtain better system performance for NOMA, the design of sparse codebooks in SCMA and non-orthogonal patterns in PDMA is important. Additionally, robust receiver with low complexity is also expected for NOMA.

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A Brief on "Polymer Memory"

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Abstract—

The Polymer memory technology promises to store more data at a lesser cost as compared to the expensive silicon chips used by popular consumer gadgets including smartphones, digital cameras, and other electronic products. The magical ingredient is not smaller transistors or an exotic material cooked up by the semiconductor industry. It is a plastic. This new memory does not use transistors to store information. Instead, bits are written when a strong current pass through a polymer fuse, causing it to blow and change its conductivity

I. INTRODUCTION

While experimenting with a polymer material known as PEDOT, Princeton University researcher Sven Moller determined that although the plastic conducts electricity at low voltages, it permanently loses its conductivity when exposed to higher voltages. Together with colleagues from Hewlett-Packard Laboratories, he developed a method to take advantage of this property to store digital information, which can be stored as collections of ones and zeros. The PEDOT-based memory card consists of a grid of circuits comprising polymer fuses. A large applied current causes specific fuses to "blow," leaving a mix of functioning and non-functioning connections. When a lower current is later used to read the data, a blown fuse blocks current flow and is read as a zero, whereas a working fuse is interpreted as a one. Because the storage method involves a physical change to the device, it is a so-called WORM–write once, read many times technology.

Features of Polymer Memory

1. Data stored by changing the polarization of the polymer between metal lines.
2. Zero transistors per bit of storage.
3. Memory is Non-volatile.
4. Microsecond initial reads. Write speed faster than NAND and NOR Flash.
5. Simple processing, easy to integrate with another CMOS.
6. No cell standby power or refresh required.
7. Operational temperature between – 40 and 110°C

II. PLASTIC MEMORY BEING DEVELOPED

Researchers at Princeton University working with Hewlett-Packard have invented a new form of permanent computer memory that uses plastic and may be much cheaper and faster than existing silicon circuits. By utilizing a previously unknown property of a cheap, transparent plastic called PEDOT (short name for polyethylene-dioxythiophene); the inventors say that data densities as high as a megabit per square millimetre should be possible. By stacking layers of memory, a cubic centimetre device could hold as much as a gigabyte and be cheap enough to compete with CDs and DVD.

PEDOT is an unusual plastic because it conducts electricity, a property that's led to it being used for anti-static coatings. However, a sufficiently large pulse of current changes it permanently to a nonconducting state, just like a fuse. By putting microscopic pellets of the stuff between two grids of wires, data can be stored by blowing patterns of bits. The memory cannot be rewritten but can be read very fast and with low power consumption. The biggest challenge is developing production techniques. We are hybridizing said the leader of the research group, Princeton professor of electrical engineering Stephen Forrest. We are making a device that is organic the plastic polymer and inorganic thin film silicon at the same time.

III. HOW DOES POLYMER MEMORY WORK?

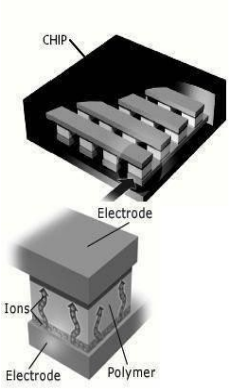
Polymer memory stores information in an entirely different manner than silicon devices. Rather than encoding zeroes and ones as the amount of charge stored in a cell, Coatues chips (Fig. 2a) store data based on the polymer's electrical resistance. Using technology licensed from the University of California, Los Angeles, and the Russian Academy of Sciences in Novosibirsk, Coatue fabricates each memory cell (Fig. 2b) as a polymer sandwiched between two electrodes. To activate this cell structure, a voltage is applied between the top and bottom electrodes, modifying the organic material. Different voltage polarities are used to write and read the cells. Application of an electric field to a cell lowers the polymer's resistance, thus increasing its ability to conduct current; the polymer maintains its state until a field of opposite polarity is applied to raise its resistance back to its original level. The different conductivity States represent bits of information.

A polymer retains space charges near a metal interface when there is a bias, or electrical current, running across the surface. These charges come either from electrons, which are negatively charged, or the positively-charged holes actuated by electrons. We can store space charges in a polymer layer, and conveniently check the presence of the space charges to know the state of the polymer layer. Space charges are essentially differences in electrical charge in a given region. They can be read using an electrical pulse because they change the way the device conducts electricity. The basic principle of Polymer-based memory is the dipole moment possessed by polymer chains. It is the reason by which polymers show the difference in electrical conductivity. As explained earlier implementing a digital memory means setting up a way to represent logic one and logic zero. Here polarizations of polymers are changed up or down to represent logic one and zero.

Advantages of Polymer memory

1. Plastic memory is fast. Lab built devices with a 1GB storage capacity have yielded read/write cycle times that are 10 times faster than CompactFlash, which are typically 2- 10MB/s read, 1-4MB/s write.

2. Memory is Non-volatile
3. Fast read and write speeds
4. It requires far fewer transistors, typically only 0.5M (million) for 1GB of storage compared to silicon's 1.5-6.5B (billion).
5. It can be stacked vertically in a product, yielding 3D space usage; silicon chips can only be set beside each other.
6. Very low cost/bit, high capacity per dollar
7. Low power consumption
8. Easy to manufacture: use ink-jet printers to spray liquid-polymer circuits onto a surface
9. Thin Film system requires about 0.5 million transistors per gigabit of memory. The traditional silicon-based system would require between 1.5 to 6.5 billion transistors for that same gigabit.



IV. Expanding Memory Capability By Using Stacked Memory

Expanding memory capability is simply a matter of coating a new layer on top of an existing one. The footprint remains the same even after expansion because each new layer adds the same capacity as the first one. This stacking is a fundamental strength of the Thin Film technology. A layer may include a self-contained active memory structure with on-layer TFT circuitry or share circuitry with all other layers. Both approaches offer true 3D memory architecture. This means that the new technology is not just for saving space, but also the option of using different, and optimized software architectures.

The driver circuitry, comprising column and row decoders, sense amplifiers, charge pumps and control logic, is located entirely outside the memory matrix, leaving this area completely clear of circuitry, or be 100% built underneath the memory array. This is the fundamental factor which enabled the stacking option. With no circuitry in the memory plane, it is possible to build the polymer memory on top of other chip structures, e.g. processors or memory.

If you want to add more memory with silicon-based technology, you move in a two-dimensional space. Put simply, the area taken, 128 MB RAM, is more than the area occupied by 64 MB RAM. With the new polymer-based technology, you will move in a three-dimensional space.

That is, you move from talking about the area to talking about volume. Put simply, a 128 MB RAM module will have the same footprint as a 64 MB module, but slightly thicker (or higher). This difference in thickness or height will be so small, that we may not even be able to tell the difference by just looking at it. If a 64 MB silicon-based module takes up 20mmx10mmx6mm (1200 cubic mm of space), then 124 MB occupies approximately double that volume. However, with polymer-based memory, the footprint (length x breadth) will remain the same (200 sq mm) but the height would increase only by about 1/10000th of a millimeter, which adds practically nothing to the volume. Polymer memory layers are just 1/10,000 of a millimeter or less in thickness, autonomous and easy to deposit. Layer upon layer may be coated on a substrate. A layer may include a self-contained active memory structure with on-layer circuitry and TFT, or share circuitry (as in hybrid polymer over- silicon chips). In the latter case, stacked layers may be individually addressed from the bottom circuitry, giving three-dimensional storage capacities. The Thin Film memory system is expandable by the addition of new layers manufacturers will be able to gain previously unattainable storage capacity within a given footprint.

Examples: The equivalent of 400,000 CDs, or 60,000 DVDs, or 126 years of MPG music may be stored on a polymer memory chip the size of a credit card.

Limitations of Polymer memory

Turning polymer memory into a commercial product is not an easy process. Memory technologies compete not only on storage capacity but on speed, energy consumption, and reliability. The difficulty is in meeting all the requirements of current silicon memory chips. Until new memory materials are able to compete with the high performance of silicon, their notes, they are likely to be limited to niche applications. One likely use is in disposable electronics, where cost, rather than performance, is the deciding factor.

Researchers at Lucent Technologies Bell Laboratories are working on polymer memory devices for use in identification tags. The polymer memory made at Bell Labs is still relatively slow by silicon standards, and anticipated capacity is only on the order of a kilobit. But, says Bell Labs chemist Howard Katz, the flexible and low-cost polymer memory devices could be very attractive for, say, identification tags meant to be thrown away after a few uses.

Conclusion

Plastic memory is considerably cheap and fast as compared to the silicon memory. This memory can be easily developed as the material required is easily available and the process of manufacturing is also simple. No huge investment is required as compared to its counterpart. The power consumption is very less and the memory device is highly dense which can accumulate a large amount of data in small space. The data is maintained in memory even when the power is off. As the technology is still in development phase it does not enjoy large business in the market. It needs a lot of efforts by researchers and the marketing section to make this particular concept of memory popular and enjoy it is really worth.

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A Brief on "Steganography"

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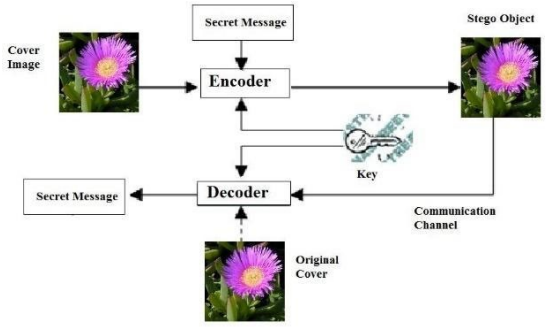
ABSTRACT:

Steganography is the art and science of communicating in a way which hides the existence of the secret message communication. It aims to hide information /covered writing. Information to be protected is hidden in another data known as cover or carrier. Data containing hidden message are called as Steganos or Stegos. Steganos look like cover data and it is difficult to differentiate between them.

I. INTRODUCTION

Steganography based communication over easily accessible platforms to prevent leakage of information Steganography, from the Greek, means covered, or secret writing, and is a long-practised form of hiding information. Although related to cryptography, they are not the same.



Steganography's intent is to hide the existence of the message, while cryptography scrambles a message so

that it cannot be understood. More precisely.

II. EVOLUTION OF STEGANOGRAPHY

Code breakers: David Kahn's The Code breakers and Bruce Norman's Secret.

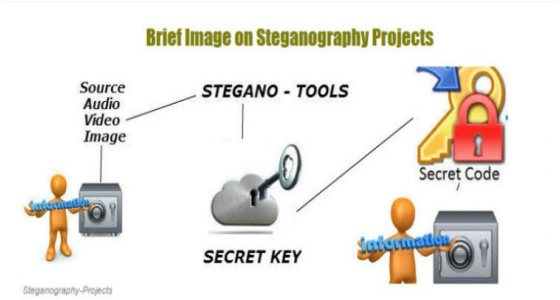
Warfare: The Battle of Codes and Ciphers recounts numerous tales of steganography .

INVISIBLE INK: An innocent letter may contain a very different message written between the lines with invisible ink.Any invisible ink can be made visible by someone who is sufficiently determined,
But the limitation is generally time available and the fact that one cannot apply hours of effort to every single piece of paper. The types of invisible inks are:

- Inks developed by heat
- Inks developed by chemical reaction
- Inks visible under ultraviolet light
- Inks which alter the suface of paper
- Disappearing inks.

MICRODOTS: The Germans developed microdot technology. The message was not hidden, nor encrypted. It was just so small as to not draw attention to itself (for a while). Besides being so small, microdots permitted the transmission of large amounts of data including drawings and photographs.

Image Steganography –
As the name suggests, Image Steganography refers to the process of hiding data within an image file. The image selected for this purpose is called the **cover-image** and the image obtained after steganography is called the **stego-image**.



Cryptography is the study of hiding information, while Steganography deals with composing hidden messages so that only the sender and the receiver know that the message even exists whereas in cryptography the existence of the encrypted message is visible to the world.

Digital image

We can describe a **digital image** as a finite set of digital values, called pixels. Pixels are the smallest individual element of an image, holding values that represent the brightness of a given color at any specific point. So we can think of an image as a matrix (or a two-dimensional array) of pixels which contains a fixed number of rows and columns.

III. CHARACTERISTICS OF STEGANOGRAPHY:

- The Message that is retrieved should be same as the original message.
- More amount of data should be hidden.
- One to one communication.
- Detection level should be tough.
-

IV. PROS & CONS

Steganography is essentially achieved through 2 subparts :

- 1.Encryption part
- 2.decryption part.

1. If the size of the original file is already known or estimated then that could be a potential threat to the excess of the memory that it would show in its properties

2. If the decrypting JavaScript has been exploited or destroyed or meddled with then the information that had been sent could be safely considered as lost or irrevocable

3. It can be done faster with the large

V. APPLICATIONS:

- Confidential communication and secret data storing.
- Protection of data alteration.
- Access control system for digital content distribution
- Media database systems.

Hiding data from human eye.
Secure e-marketing using steganography emergence of cryptography.

Steganography is beneficial for securely storing sensitive data, such as hiding system passwords or keys within other files.

Cryptography: Cryptography means Secret writing. In cryptography, Sender does not send message directly to the receiver, before sending information to the receiver information or plain text is converted into cipher text by using some encryption algorithm then send to the receiver and receiver decrypt the cipher text into plain text to read the original information. It is of two types:

1. Symmetric key cryptography
2. Asymmetric key cryptography

Modern cryptography concerns itself with the following four objectives:
Confidentiality: the information cannot be understood by anyone for whom it was unintended
Integrity: the information cannot be altered in storage or transit between sender and intended receiver without the alteration being detected
Non-repudiation: the creator/sender of the information cannot deny at a later stage his or her intentions in the creation or transmission of the information
Authentication: the sender and receiver can confirm each other's identity and the origin/destination of the information.

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A Review on "The Future of Artificial Intelligence"

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Abstract—**In this we have to know what is the future of Artificial Intelligence in our technology. Artificial Intelligence is recognized as one of the most innovative and polishing fields of study for engineering. For the end users it is a fascinating technology. Some of the tech giants like Amazon, Google, Microsoft, quoted Artificial Intelligence is the future of the technology. But likewise, technology is a double-edged sword. Artificial Intelligence also have both pros and cons. Great scientist Stephen Hawkins also said the same as be careful with AI and he also told that AI can destroy human's race. A man has biological limitations to grasp knowledge and to do work but machines doesn't have any limitations to grasp knowledge and to do work. A human being will become tired after doing some work but a machine doesn't tired. Unemployment will be created which is challenging to cope up with in this inflating economy. Even we consider the reliability of AI.**

Keywords-artificial intelligence,machine learning,internet of things,deep learning,natural language processing,neural networks.

I. INTRODUCTION OF A.I

Artificial Intelligence (AI) is the simulation of human intelligence by machines. In other words it is an ability to design smart machines and robots or to develop self-learning software applications that imitate the traits of the human mind like reasoning, problem solving, optimal decision making, sensory perceptions etc. AI involves machine learning, deep learning, neural networks, internet of things, natural language processing and many other programmable capabilities. In this atricle we will know what is AI, history of AI, what is the need of AI, what are the types of AI, Programming languages for AI, what are the advantages and disadvantages of AI, applications of AI, future of AI.

II. EASE OF USE

A. What is AI?

The ability of computer program or a machine to think and learn as same as humans. It is a simulation of human intelligence in machines that are programmed to think like humans and mimic their actions.

B. History of Artificial Intelligence.

In 1950, Alan Turing published a land mark paper in which he speculated about the possibility of creating machines that think. In 1951, Christopher Strachey wrote a checker program and Dietrich Prinz wrote one for chess. The birth of AI was in the year of 1956. John MC Carthy first coined the term Artificial Intelligence in 1956 at the Dartmouth conference. In 1959 the first AI laboratory was constructed.
In 1960, first robot was introduced to general motors assembly line. In 1961, first AI chat bot called Eliza was introduced. In 1997, IBM'S deep blue beats world champion Garry Kasparov in the game of chess. In 2005, Stanford racing team's autonomous robotic car, Stanley wins the DARPA grand challenge. In 2011, IBM'S question answering system, Watson defeated the two greatest Jeopardy! Champions, Brod Rutter and Ken Jennings. In 2016, Google's deep mind invented Alphago AI that defeat top master in go game which was very famous in china. In 2017, face book created two AI robots-Bob and Alice, they create some secret conversations between themselves which humans can't understand after knowing this face book shut down these AI robots. Recently, Hand son company created a humanoid AI robot named Sophia.

C. What is the need of AI?

There are numerous benefits of understanding and replicating the brand of AI. Apart from treating the brain injuries, diseases, advancements in communication technology, computer's simulations, understandings the brain will help to design machines that have a more powerful impact towards the technology. Generally, the goal of AI is to create robots that can be adaptive like humans and perform multiple tasks.

D. What are the types of AI?

1. Artificial general intelligence-Artificial narrow intelligence is also known as strong AI, involves machines that possess the ability to perform any intellectual tasks that a human being can.
2. Artificial narrow intelligence-Artificial narrow intelligence is also known as weak AI involves applying AI only to specific tasks. Most of the things are in narrow AI. Now we are in artificial narrow intelligence.
Example: Alexa- it is limited.
3. Artificial super intelligence- Artificial super intelligence is a term referring to the time when the capability of computers will surpass humans.

E. Programming languages for AI

Python, R, JAVA, LISP, SWI Prolog, C++, JAVA Script, MAT Lab.

F. Applications of AI

Spam detection, misspelling in the Google, predictive typing and spell checking, sentimental analysis, chat bot, speech recognition, NLP (Alexa, Siri, cortana, Google assistance, machine translation, Google translator), information extraction, advertisement matching, keyword search, etc.

G. Future Scope of AI

Breakthrough in science, Cyber security, Face recognition, Data analysis, Transport, Robotic process automation jobs, Emotion bots, Marketing & Advertising, Employments will decrease.

III. COMPONENTS OF AI

A. Machine learning

Machine learning is a part of AI which provides machines the ability to learn automatically and improve from experiences without being explicitly programmed.

Arthur Samuel first coined the word Machine learning in 1959.

A computer program is said to learn from experience with respect to some class of tasks T and performance P measure if its performance as tasks in T ,as measured by P, improves with experience E.

Need for Machine learning- cloud data, social media.

1. Increase in data generation
2. Improve decision making
3. Uncover patterns or trends in data
4. Solve complex problems

The Machine learning process involves building a predictive mode that can be used to find, a solution for a problem statement.

Steps-

1) Define objective
2) Data gathering
3) Preparing data
4) Data exploration
5) Building a model
6) Model evaluation
7) Predictions

Types of Machine learning -

a) Unsupervised learning -Unsupervised learning is the training of machine using information that is unlabeled and allowing the algorithm to act on that information without guidance.

b) Supervised learning - Supervised learning is a technique in which we teach or train the machine using data which is well labeled.

c) Reinforcement learning - Reinforcement is a part of machine learning where an agent is put in an environment and it learns to behave in this environment by performing certain actions and observing the rewards which it gets from those actions.

Limitations of AI:

1. High dimensional data
2. Image recognition
3. One of the big challenges with traditional machine learning models is a process called feature extraction. For complex problems such as object recognition or hand writing recognition, this was a huge challenge.

B. Neural networks

The Neural networks are also a subset of AI. It undergoes mainly in the field of deep learning. It is also called as Artificial neural network (ANN). It is a sort of computer software, inspired by biological neurons. Neural networks are examples of machine learning, where a program can change as it learns to solve a problem

Applications:

- Today, neural networks are used for solving many business problems such as sales forecasting, customer research, data validation and risk management.
- Example- at statsbot we apply neural networks for time-series predictions, anomaly detection in data,.

C. Internet of things

- The IOT is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer-interaction.
- Advantages-
  1. Communications
  2. Automation and control
  3. Information
  4. Monitor
  5. Money saving
  6. Efficient and saves time

7. Automation of daily task leads to better monitoring of devices
8. Better quality of life

- Disadvantages-

1. Complexity
2. Unsafe
3. Lesser employment of menial staff.

D. Deep learning

Deep learning models are capable to focus on the right features by themselves, requiring little guidance from the programmer. These models are partially solve the dimensionality problem. The idea behind deep learning is to build learning algorithms that mimic brain. Deep learning is a form of machine learning that uses a model of computing that's very much inspired by the structure of brain.

Example:- Image recognition using deep networks

1. Pass the high dimensional data to input layers.
2. Output received from the input layer contains patterns which are extracted.
3. Output is fed to the hidden layer1.
4. Hidden layer2 will able to form the entire faces.
5. The output layer performs classification.

E. Natural language processing

NLP is a part of AI which deals with human language.

➢ Need for NLP:

The overall goal of NLP is to turn text into data for analysis.

Applications-

1. Spam detection
2. Misspelling in the Google
3. Predictive typing and spell checking
4. Sentimental analysis
5. Chat bot
6. Speech recognition
7. Google translator

IV. FUTURE WITH AI

- In medical field, some operations will be done by robots with the help of AI which can't done by humans.
- AI will able to solve problems will can't be solved by humans.
- AI will predict the weather predictions.
- By doing analysis on AI we can said that by the 2030, 800 million jobs (80,00,00,000 jobs) will be automated by AI.By the recent research of Oxford university, it concludes that 700 types of jobs will become automated in future by AI.
- Examples:
  i. By self-driving vehicles (tesla vehicles), driver jobs.
  ii. By automated ATM'S banking jobs.
  iii. By robots, manufacturing jobs.
  iv. By predicting crimes, police jobs. (IN California, a lot of crimes are going on in some places. Then police men of California decides to take help of Predpol AI robot- it predicts crime in real time. It observed all crime records of California and by using old data, it matches it to present conditions it predict where and when the crime will occur and it marked the place where crime will occur on that particular day. By taking information from this AI robot police men catch a lot of crimes, by this 50% arrests are increased in California and 20% crime rate decreased)
- To increase it's intelligence AI can rewrite and modifies it's code by itself.
- AI can access information all over the with in few seconds, by using this information it can process itself with in few seconds.
- Generally, if a human has IQ=85 means he/she will be average person, if a human have IQ=120 means he/she will be smart.
- Great scientist, Albert Einstein have IQ=160, but an AI can be estimated to have IQ=12952.
- On the control of human AI can be beneficial to human beings, while it may cross control it may have chances to destroy human race.
- If AI reaches singularity, we can't control it. It may become final invention of humans.

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Night Vision For Human Eye

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***Abstract*—Night vision connotes the capacity to find in dull (night). This capacity is typically controlled by owls and felines, however with the advancement of science and innovation gadgets has been created which empowers individual(human) to find in dull also and in antagonistic barometrical conditions, for example, haze, rain, tidy etc., But these are bulky and inconvenient instruments like thermal imaging cameras. To overcome this, a nano particle technology has now increased the possibility of built-in night vision in humans.**

Keywords—up conversion of nano particles (UCNPs), near infrared region

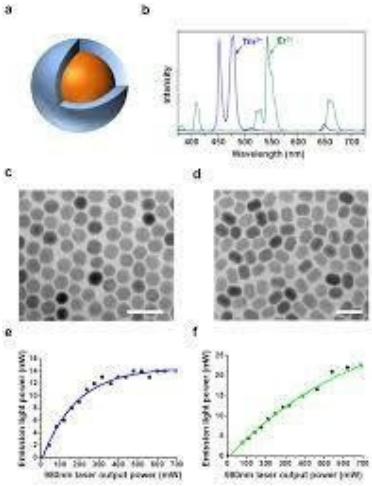
I. INTRODUCTION

In poor light we can't see the articles in light of the fact that the picture can't be framed on the retina plainly. The capacity to recognize and distinguish focuses during the evening and under poor comprehensible conditions has been a basic military prerequisite. The advanced armed forces have to work around evening time and under states of to a great degree poor comprehensible, Since the troopers need to regularly battle oblivious during the evening, they need to confront a serious worry the extent that the area of target is concerned. Likewise, different natural life spectator need to confront issues of low light on the grounds that numerous wild creatures are more dynamic amid evening time than day, along these lines to see their way of life and study it night vision is vital. In this manner to make individual unfit to find in dim by innovative means, night vision innovation has been produced. This paper depicts the need to improve the brightness of the nano particles for human use.

II. HUMAN EYE'S VISION

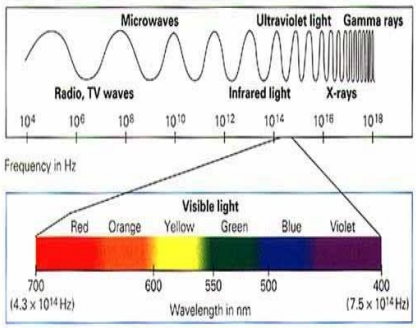
The eyes of human and other mammals can detect light between the wavelengths of 400 and 700 nanometers (nm). On the other hand, near-infrared (NIR) light has longer wavelengths: 750 nm to 1.4 micrometers. To see NIR radiations emitted by organisms in the dark, nanoparticle technology can be used. It converts near-infrared (NIR) light into the visible light which increases the possibility of built-in night vision in humans. Firstly, up conversion nanoparticles, UCNPs were designed by Gang Han and its team which has the ability of "up conversion" of NIR into visible light. This is done by converting the low energy photons into high energy photons emitting green light, making the human eye capable to see in the dark.

III. UPCONVERTING NANOPARTICLES



Upconverting nanoparticles (UCNPs) are nanoscale particles (diameter 1–100 nm) that exhibit photon upconversion. In photon upconversion, two or more incident photons of relatively low energy are absorbed and converted into one emitted photon with higher energy. Generally, absorption occurs in the infrared, while emission occurs in the visible or ultraviolet regions of the electromagnetic spectrum. UCNPs are usually composed of lanthanide- or actinide-doped transition metals and are of particular interest for their applications in bio-imaging and bio-sensing at the deep tissue level. They also have potential applications in photo voltaics and security, such as infrared detection of hazardous materials.

IV. INFRARED REGION



It is vital to comprehend something about light. The measure of vitality in a light wave is identified with its wavelength: Shorter wavelengths have higher vitality. Of obvious light, violet has the most vitality, and red has the minimum. Only by the obvious light range is the infrared range.
Infrared light can be part into three classifications:

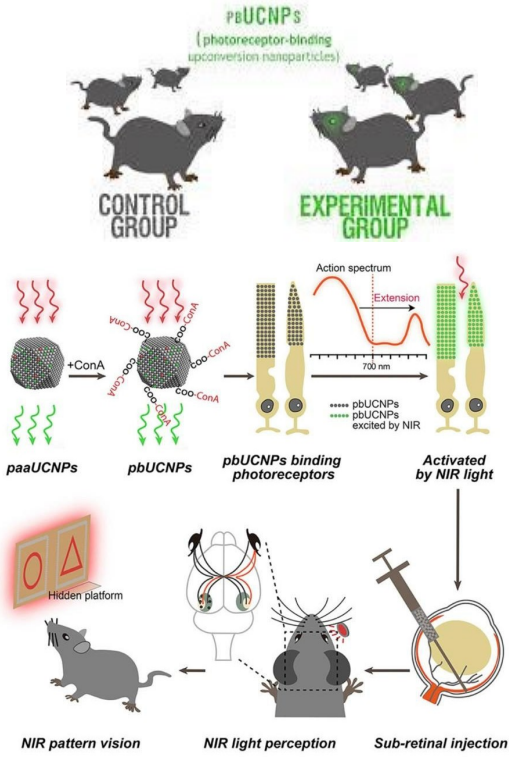
1. Near-infrared (close IR) - Closest to unmistakable light, close IR has wavelengths that range from 0.7 to 1.3 microns, or 700 billionths to 1,300 billionths of a meter.

2. Mid-infrared (mid-IR) - Mid-IR has wavelengths extending from 1.3 to 3 microns. Both close IR and midIR are utilized by an assortment of electronic gadgets, including remote controls.

3. Warm infrared (warm IR) - Occupying the biggest piece of the infrared range, warm IR has wavelength going from 3 microns to more than 30 microns.

V. Experiments On Mice

As the rats are remarkably similar to humans, Han and their team also performed experiments on mice. UCNPs composed by rare-earth elements erbium and ytterbium are injected into the mice of eyes. Several behavioral and psychological tests are performed to find out whether mice can process the NIR light to see in the dark.



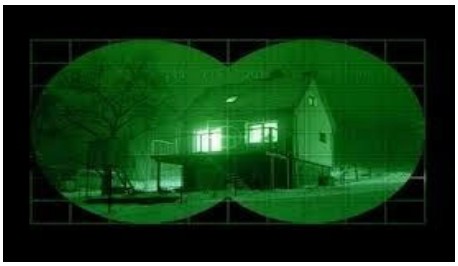
The mice trained to swim in a Y-shaped tank towards visible light having triangular shape by researches. A shallow platform there made the mice easily climb on to get out of the water. Similarly, a lit circle denoted a branch without a platform. The researchers then replaced the visible light with NIR light. Han observed: "The mice with the particle injection could see the triangle clearly and swim to it each time, but the mice without the particle injection could not see the difference between the two shapes".

VI. Nanotechnology And Super Dogs

In addition to the experiments on mice, Han and their team making the next plan to test this technology on dogs if we had a super dog that could see near-infrared light, we could project a pattern onto a law breakers's body from a distance, and the dog could catch them without disturbing other people.

VII. Progressive Efforts for Human Application

Although, after the experiment on mice no negative effects were reported even UNCPs endured in mice's eyes for about 10 weeks. But the UCNPs used are inorganic and there are some drawbacks. So to make them safe for human application, Rare-earth elements should be replaced by organic dyes. Moreover organic dyes have improved properties and fewer side effects.



Night vision for human eyes after nanoparticle breakthrough

VIII. Advantages

1. By inserting nanoparticles into the eye, human can see in the dark without using bulky equipment.
2. Night -vision goggles are used by the military to see clearly in the dark,but nanoparticles could alter our eyes to make the devices unnecessary.

IX. Disadvantages

The biocompatibility is not completely clear and it has fewer side effects.

Conclusion

"when we look at the universe, we see only visible light". if we had infrared vision, we could see the universe in a whole new way. We might be able to do infrared astronomy with the naked eye or have night vision after nanoparticle breakthrough without bulky equipment.

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INFORMATION TECHNOLOGY

DEPARTMENT ARTICLES

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Integration of IoT For Efficient Automatic Plant Watering System

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ABSTRACT

This paper provides an overview of Internet of Things (IOT) with emphasis on enabling technologies, protocols and application issues. This iot is enabled by the latest developments, smart sensors, computing and communication technologies. The basic aim is to have a smart sensors that directly collaborate without human involvement to deliver a set of information. However, processing a large amount of sensor data has been a major challenge. So, this paper provides a brief outline on the role of IOT in developing an application.

Keywords: IOT, sensor, arduino, cloud

I. INTROUDCTION

A. Internet of Things

Typically, IOT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine to machine (M2M) communications and covers a variety of protocols, domains, and applications. The interconnection of these embedded devices (including smart objects), is expected to usher in automation in nearly all fields, while also enabling advanced applications like a smart grid, and expanding to areas such as smart cities.

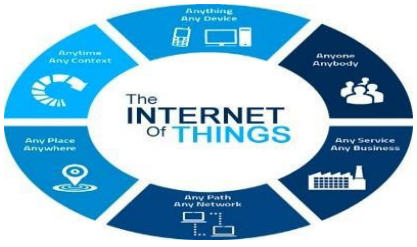

FIG 1 INTERNET OF THINGS

B. Defining IOT

The Internet of Things (IOT) refers to the ever- growing network of physical objects that feature an IP address for Internet connectivity, and the communication that occurs between these objects and other Internet-enabled devices and systems.

If we had computers that knew everything there was to know about things—using data they gathered without any help from us -- we would be able to track and count everything, and greatly reduce waste, loss and cost [1]. We would know when things needed replacing, repairing or recalling, and whether they were fresh or past their best. We need to empower computers with their own means of gathering information, so they can see, hear and smell the world for themselves, in all its random glory. Sensor technology enable computers to observe, identify and understand the world without the limitations of human entered data.

C. Phases of IOT Lifecycle

Five phases of IOT lifecycle:

Firstly, **create** phase, where devices or sensors collect information from the physical environment around them. The data from smart connected devices can be used to generate insights that can help businesses, customers and partners.

Secondly, **communicate** phase, where the data and events generated are sent through the network to the desired destination

Thirdly, **aggregate** phase is where the data collected is integrated by the device itself.

Fourthly, **analyze** phase, where, upon further sophisticated analytics the aggregated data can be used to generate basic patterns, control and optimize processes.

Finally, **act** phase, where suitable actions are performed based on the information created.

FIG 2: THE OVERALL PICTURE OF IOT EMPHASIZING THE VERTICAL MARKETS AND THE HORIZONTAL INTEGRATION BETWEEN THEM.

The IOT is expected to have an significant home in business application, to contribute to the quality of life and worlds economic growth for example , smart homes will provide their residents to automatically open their garage when reaching home , prepare coffee, control TV and other appliances.

D. Scope Of IOT

Internet of Things can connect devices embedded in various systems to the Internet. When devices/objects can represent themselves digitally, they can be controlled from anywhere. The connectivity then helps us capture more data from more places, ensuring more ways of increasing efficiency and improving safety and IOT security.

E. IOT ARCHITECTURE

The IOT is capable of interconnecting billions or trillions of heterogeneous objects via internet, so there is a critical need for significant flexible layered architecture. Fig.3 illustrates some common architectures among them is a five layered model [2].

(a) Three-layer model
(b) Middle- ware based model
(c) SOA based model
(d) Five-layer model

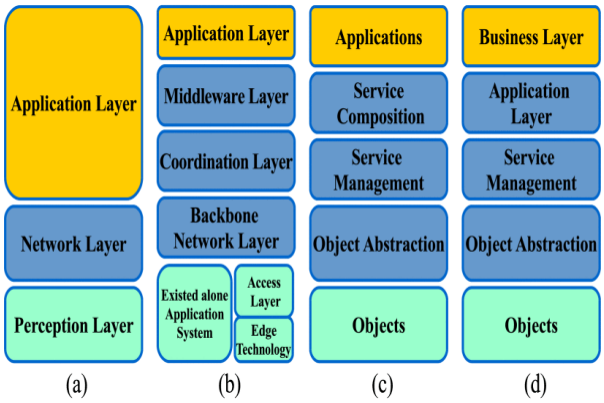

FIG 3: IOT ARCHITECTURE

Object layer:

This is the first layer; the objects are perception layer usually represents the physical sensors of the IOT. This layer aim is to collect and process the information[4]. This includes sensors, actuators to perform different functionalities and tasks such as temperature, weight, acceleration, humidity, querying location, etc.

Object Abstraction Layer:

This layer transforms data produced by the object layer to the service management layer through secure channels. This layer generally acts as a middle layer by interconnecting objects object layer and service management layer.

Service Management Layer:

Service management or middle ware layer pairs up a service with a requester based on address and names. Usually this layer enables the IOT applications programmers to work with heterogeneous objects without considering a specific hardware platform. Also, this layer processes received data and make decisions finally delivers the required services.

Application Layer:

This layer provides services that are requested by the customer. For example, the application layer can provide measurements of temperature and humidity to the customers [5]. The importance of this layer is it provides the ability of high-quality smart services to meet the customer needs.

Business Layer:

The business layer manages the overall IOT system activity and services. The major responsibility of the layer is to build a business model, graph, flow charts, etc. based on the received data from the application layer.

II.SENSOR NETWORK

Sensor network benefited the IOT a lot. These networks allow the user to measure, infer, and understand delicate indicators from the environment. The IOT sensing means gathering of required data from related objects within a specific network and sending the retrieved information back to the data warehouse or cloud. [3]. Some examples of IOT sensors can be smart sensors, actuators or any wearable sensing devices. However, processing a large amount of data using sensing devices has been a major challenge. To avoid this cloud provides a new opportunity in aggregating sensor data.

III.APPLICATION USING IOT

A. Existing system and its drawback:

- Can only be accessible within the range
- Frequentpower failures lead to complexities.
- Not so secure.
- Has to be monitored frequently.
- It can't be controlled once the user is out of range.

Proposed System:

In the world of advance electronics, life of human beings should be simpler hence to make life simpler and more convenient, we have made "**Automatic plant watering system using IOT".**

A model of controlling plant watering facilities to help people. This model uses sensor technology with microcontroller to make a smart switching device.

The model shows the basic switching mechanism of water motor using sensors from any part of the plant by sensing the moisture present in the soil. Fig.3 illustrates the solution for the drawbacks of existing system, it gives a brief view of the automatic water planting.

C. Proposed System Solution:

The system setup and connections of project intelligent automatic plant watering system.

FIG 4: OVERVIEW OF THE PROPOSEDSYSTEM

After setting the system the nodemcu keeps the overall control by monitoring sensors and android application. Sensor senses the plants status and repeatedly report it to nodemcu so as to take the proper decision of whether to supply the water or not by ON/OFF ing of the motor.

D. Methodology:

Initially the moisture sensor is connected to arduino board. Power supply is given to the kit. LAN is connected (Wi-Fi is acceptable) to the arduino. Once the internet is available, embed the code and run the code in the terminal window. If the code runs successfully without any errors, the application will work accordingly. This methodology can be implemented using software arduino, raspberry pi and nodemcu.

ABOUT ARDUINO:

Arduino, is an open-source prototyping platform based on easy-to-use hardware and software.

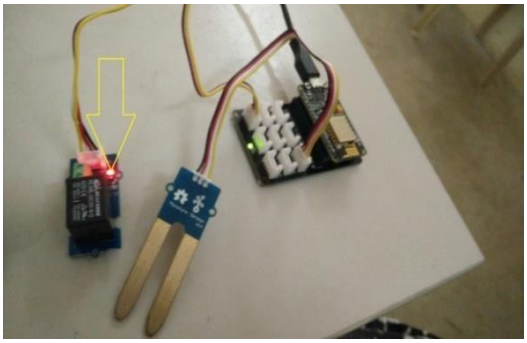

FIG 5: WORKING OF IOT

E. Future Enhancement Using Cloud Computing In IOT:

Our proposed system checks the level of the moisture and waters the plant by turning the motor ON when the moisture level is low and by turning it OFF when the moisture level is high. The system works for certain distance. This can be employed in the system by including additional sensors in the vast area and configuring them to continuously send real time signals to the automated software system.

This enhancement can be included in the large areas like fields where the status of water level is of higher importance. The security of the automatic plant watering system can be enhanced further by deploying it in a cloud environment. Allowing only authorized personnel to access the automatic plant watering system.

IV. HOW IOT AND CLOUD COMPLEMENT EACH OTHER

IOT as well as cloud computing work together towards increasing the efficiency of everyday tasks and both of them have a complementary relationship with each other. On one hand IOT generates a lot of data while in the other hand, the cloud computing shows a way for the data to travel. In addition to this, cloud computing also enables better collaboration for developers by providing the developers to store and access the data remotely. Also, the cloud allows data to store, the IOT companies can access a huge amount of BIG DATA.

V. CONCLUSION:

IOT technology introduces several opportunities and new application. In this paper we have proposed a system to "AUTOMATIC PLANTWATERING SYSTEM". It has been developed by integrated features of all the hardware components used in future the security of the automatic plant watering system can be enhanced further by deploying it in a cloud environment.

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EXPANDING THE BOUNDARIES OF HUMAN KNOWLEDGE CHANDRAYAAN-2

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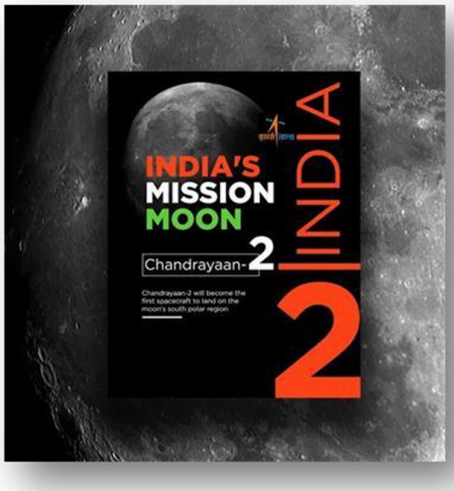
ABSTRACT

Chandrayaan-2 is an Indian lunar mission to explore the unchartered south pole of the celestial body by landing a rover. On September 7, India attempted to make a soft landing on to the lunar surface. However, lander Vikram missed the primary landing site and went for the second. The visuals went missing henceforth.

I. INTRODUCTION

Inching towards the edge of discovery Chandrayaan 2 is an Indian lunar mission that will boldly go where no country has ever gone before — the Moon's south polar region. Through this effort, the aim is to improve our understanding of the Moon — discoveries that will benefit India and humanity as a whole. These insights and experiences aim at a paradigm shift in how lunar expeditions are approached for years to come — propelling further voyages into the farthest frontier [2], [3].



II. WHY ARE WE GOING TO THE MOON?

The Moon is the closest cosmic body at which space discovery can be attempted and documented. It is also a promising test bed to demonstrate technologies required for deep-space missions. Chandrayaan 2 attempts to foster a new age of discovery, increase our understanding of space, stimulate the advancement of technology, promote global alliances, and inspire a future generation of explorers and scientists [3].

III. WHAT ARE THE SCIENTIFIC OBJECTIVES OF CHANDRAYAAN 2? WHY EXPLORE THE LUNAR SOUTH POLE?

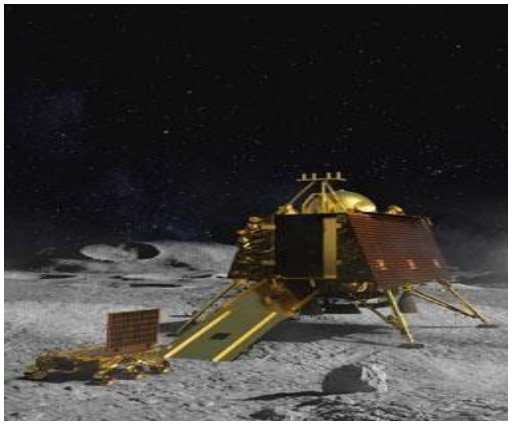
Moon provides the best linkage to Earth's early history. It offers an undisturbed historical record of the inner Solar system environment. Though there are a few mature models, the origin of Moon still needs furtherexplanations. Extensive mapping of lunar surface to study variations in lunar surface composition is essential to trace back the origin and evolution of the Moon. Evidence for water molecules discovered by Chandrayaan-1, requires further studies on the extent of water molecule distribution on the surface, below the surface and in the tenuous lunar exosphere to address the origin of water on Moon [3], [4].

The lunar South Pole is especially interesting because of the lunar surface area here that remains in shadow is much larger than that at the North Pole [5]. There is a possibility of the presence of water in permanently shadowed areas around it. In addition, South Pole region has craters that are cold traps and contain a fossil record of the early Solar System.Chandrayaan-2 will attempt to soft land the lander -Vikram and rover- Pragyan in a high plain between two craters, Manzinus C and Simpelius N [3], [4].

At a latitude of about 70° south.From a country with a great legacy and history, ISRO has again created a benchmark by sending Chandrayaan 2 onto the south pole of the moon. These facts will make you even more surprised which were told by ISRO scientists [3], [4].

1st Indian expedition to attempt a soft landing on the lunar surface with home-grown technology.

1st Indian mission to explore the lunar terrain with homegrown technology.



4th country ever to soft land on the lunar surface.

In brief the parts of the chandrayaan-2 are mentioned Below [1].

Spacecraft and Subsystems

The Chandrayaan 2 orbiter is a box-shaped craft with an orbital mass of 2379 kg and solar arrays capable of generating 1000 W power. The orbiter communicates with the Indian Deep Space Network and the lander. The orbiter will have a scientific payload comprising a visible terrain mapping camera, a neutral mass spectrometer, a synthetic aperture radar, a near infrared spectrometer, a radio occultation experiment, a soft X-ray spectrometer and solar X-ray monitor [1].

The lander, named Vikram, has a mass of 1471 kg (including the rover), and can generate 650 W of solar power. The lander can communicate directly to the Indian Deep Space Network, the orbiter, and the rover. The lander will carry a camera, seismometer, thermal profiler, Langmuir probe, and a NASA-supplied laser retroreflector. The rover, Pragyan (also Pragyaan), is a 6-wheeled vehicle with a mass of 27 kg that runs on 50 W of solar power and can travel up to 500 m at a speed of 1 cm per second. The rover communicates directly with the lander. the rover will hold cameras, alpha-proton X-ray spectrometer, and a laser-induced ablation spectroscopy experiment. **Mission Profile**

Chandrayaan 2 was launched on 22 July 2019 at 9:13 UT (2:43 p.m. Indian Standard Time) from Satish Dhawan Space Center on Sriharikota Island on an ISRO Geosynchronous Satellite Launch Vehicle (GSLV) Mark III. The lander-orbiter pair went into an initial elliptical (170 x 40400 km altitude) Earth parking orbit, followed by a trans-lunar injection on 14 August. The pair entered lunar polar orbit on 20 August. The lander and orbiter separated on September 2 [2]. The orbiter evolves into a 100 km altitude circular polar orbit and the Vikram lander maneuvered into a 30 x 100 km orbit with a plan to land on the surface in the high latitude areas near the south pole, between two craters, Manzinus C and Simpelius N, on 7 September between about 1:30 and 2:30 a.m. Indian local time (Sept. 6, 20:00-21:00 UT). contact was lost during the descent at an altitude of about 2.1 km, the data are being analyzed. The orbiter portion of the mission is planned to last 1 year. The rover was to be deployed using a ramp shortly after landing. The lander and rover portions of the mission were planned for 14-15 days, one period of lunar daylight.

According to the recent update the **observations** made September 10, 2019

Vikram lander has been located by the orbiter of Chandrayaan-2, but no communication with it yet. All possible efforts are being made to establish communication with lander. The never ending spirit and strong determination will always keep Chandrayaan in hearts of all Indians.

IV. CONCLUSIONS

We would like to conclude by congratulating and appreciating the tireless efforts of the entire team Key scientists and in the development of Chandrayaan-2 include:

- Mylswamy Annadurai – Project Director, Chandrayaan-2
- Ritu Karidhal – Mission Director, Chandrayaan-2
- Muthayya Vanitha – Project Director, Chandrayaan-2
- Chandrakanta Kumar – Deputy Project Director (Radio frequency systems), Chandrayaan-2
- Amitabh Singh – Deputy Project Director (Optical Payload Data Processing, SAC), Chandrayaan-2 [1]

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A Study on Mobile Edge computing with 5G Networks prospect: Challenges and future methodologies

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ABSTRACT

Mobile Edge Computing (MEC) is a promising paradigm which aims for the storage and telecommunications. This paper consists of mobile edge computing and we demonstrate the promising benefits of purposed approaches in facilitating the evolution of 5G Networks. Next we have given the advantages and applications related to this. Finally, we are going to discuss about the open research issues that need to be addressed in order to make an efficient integration of MEC into 5G ecosystem.

KEY WORDS-5G networks, aggregation, local connectivity

I. INTRODUCTION

Edge computing is a distributed computing paradigm which brings computation and data storage closer to the location where it is needed, to improve response times and save bandwidth. Mobile **Edge Computing** (MEC) is a new technology which is currently being standardized in an ETSI. Industry Specification Group (ISG) of the same name. Mobile Edge Computing provides an IT service environment and cloud-computing capabilities at the edge of the mobile network, within the Radio Access Network (RAN) and in close proximity to mobile subscribers. The aim is to reduce latency, ensure highly efficient network operation and service delivery, and offer an improved user experience [1]. 5G is the next generation of mobile networks that promises to have estimated network speeds as fast as 10 Gb/s. The emergence of 5G networking capabilities will increase the number of connected devices on a network, which spurs the need for edge computing to help distribute networking demands [2].[3].

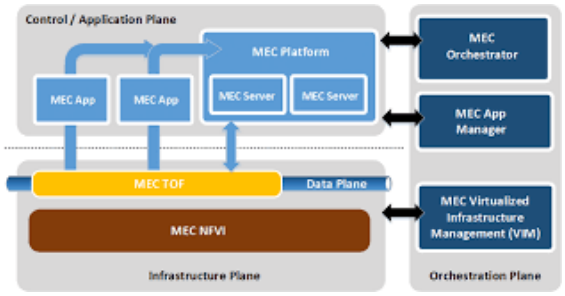

Figure 1: Architecture of edge computing

II. OVERVIEW ON 5G NETWORKING

5G networks are digital cellular networks, in which the service area covered by providers is divided into small geographical areas called cells.[4]. Analog signals representing sounds and images are digitized in the phone, converted by an analog to digital converter and transmitted as a stream of bits. All the 5G wireless devices in a cell communicate by radio waves with a local antenna array and low power automated transceiver (transmitter and receiver) in the cell, over frequency channels assigned by the transceiver from a common pool of frequencies, which are reused in geographically separated cells. The local antennas are connected with the telephone network and the Internet by a high bandwidth optical fiber or wireless backhaul connection. Like existing cell phones, when a user crosses from one cell to another, their mobile device is automatically "handed off" seamlessly to the antenna in the new cell.

III. STRENGTH OF 5G IN EDGE COMPUTING (VICE-VERSA)

By improving communication between edge and cloud components, 5G will provide a foundation for countless IoT innovations. Despite the massive hype 5G surrounding, it's getting highlighted in only few markets. Here edge computing provide the ways or means to store, process and even filter which in turn provides ways for improving 5G networks. The enhanced value of the edge computing/5G combination includes reduced costs of cloud storage and processing, the ability to run more applications at the edge, and the ability to remotely control and manage edge assets. [5]. The major thing is that while 5G is in the early stages of being deployed, edge computing providers are already incorporating data protection and cyber security capabilities in edge devices, so as 5G networking development accelerates; these features will increase edge users' confidence in new networking capabilities.

IV. APPLICATIONS OF EDGE COMPUTING

From the given FIGURE 2 we can see different types of applications, classifications and their uses

4.1. Offloading: Even today, many mobile applications delegate resource- or power- intense tasks to remote services due to limited hardware capabilities. MEC servers offer additional capacities for hosting such services at the mobile edge. The concept is expected to increase limited computing, storage, bandwidth, or battery capacities of mobile devices by referring to external, resource-rich systems. Compute-intense tasks are offloaded either because they cannot be executed in-time by the UEs due to limited hardware capabilities or they are offloaded in order to reduce power consumption of mobile devices in cases where the power consumption needed for computation exceeds the power consumption needed for wireless transmission. If no MEC server is available, mobile devices can degrade gracefully to a more distant MEC server, Internet cloud servers, or fallback to their own hardware resources [6], [7]. For example, calculating GPS positions is a power-intense task which can gainfully be offloaded to remote servers. Also, asymmetric encryption requires much more battery power than symmetric approaches.

4.2. **Aggregation:** Instead of routing all UE data to core routers separately, MEC servers are capable of aggregating similar or related traffic and, thus, reduce network traffic. As an example, many Big Data applications like Car2Car solutions generate a lot of similar and region-related event notifications which can be aggregated. This also applies in the context of monitoring applications where many devices measure similar data that can be aggregated at the edge. Due to the fact that the quantity of data received by ASPs would decreases, aggregation has a positive effect in terms of ASPs' band width utilization, power consumption, and scalability.

However, delay increases since data need to be processed by MEC servers. Since core network traffic decreases, the same applies for bandwidth utilization, power consumption, and scalability of the MInP. Operating MEC servers comes with additional power consumption cost. However, total power consumption is expected to decrease as a result of lower core utilization.

4.3. Local Connectivity: With traffic being routed through MEC servers, servers are capable of separating traffic flows and redirecting traffic to other destinations. An application of this class is connecting enterprise users directly via base stations deployed on enterprises' rooftops to the enterprise network. As an example, this applies on sports/music events where cameras catching additional viewpoints broadcast their content among users in the cell. [7]. Furthermore, Local Breaking allows for local redistribution of data fed into the cell, for example, advertisements and information related to the geographical location of the base station. Thus, MEC servers broadcast locally generated and locally relevant content within the cell. Traffic is routed by circumventing Internet routers, leading to lower communication delay for UEs and ASPs.

Furthermore, MInP's bandwidth utilization and power consumption is reduced, since traffic is not routed through the core network. Reduced network utilization has a positive impact with respect to MInP's communication delay.

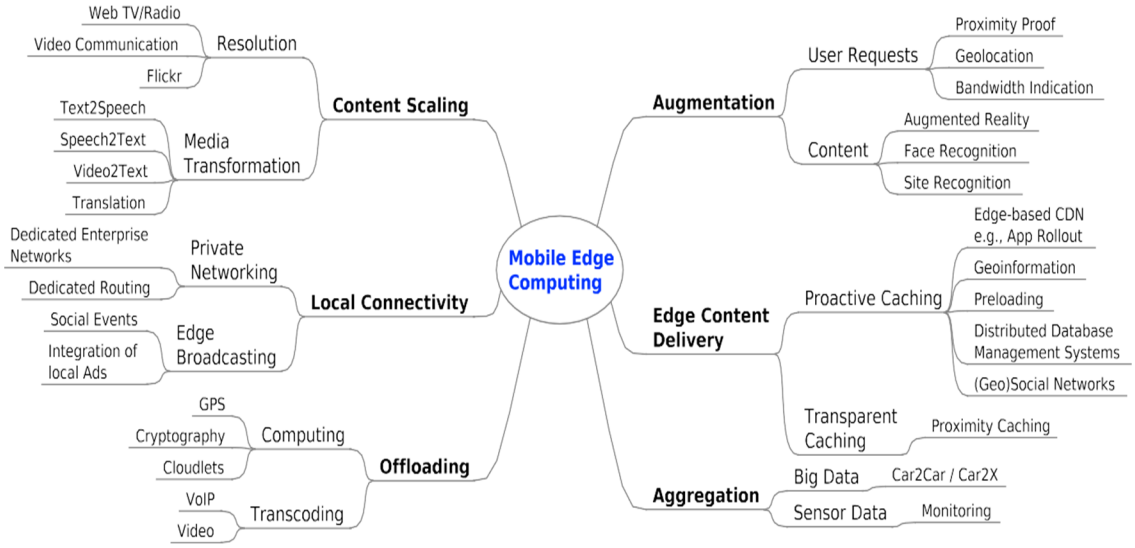

Figure2: Applications and use cases 1

V. CHALLENGES AND FUTURE SCOPE

We have described five potential applications of edge computing in the last section. To realize the vision of edge computing, we argue that the systems and network community need to work together. In this section, we will further summarize these challenges in detail and bring forward some potential solutions and opportunities worth further research, including programmability, naming, data abstraction, service management, privacy and security and optimization metrics.[8]

A. Programmability: In cloud computing, users program their code and deploy them on the cloud. The cloud provider is in charge to decide where the computing is conducted in a cloud. Users have zero or partial knowledge of how the application runs. This is one of the benefits of cloud computing that the infrastructure is transparent to the user. Usually, the program is written in one programming language and compiled for a certain target platform, since the program only runs in the cloud. However, in the edge computing, computation is offloaded from the cloud, and the edge nodes are most likely heterogeneous platforms. In this case, the runtime of these nodes differ from each other, and the programmer faces huge difficulties to write an application that may be deployed in the edge computing paradigm. To address the programmability of edge computing, we propose the concept of computing stream that is defined as a serial of functions/computing applied on the data along the data

The functions/computing could be entire or partial functionalities of an application, and the computing can occur anywhere on the path as long as the application defines where the computing should be conducted. The computing stream is software defined computing flow such that data can be processed in distributed and efficient fashion on data generating devices, edge nodes, and the cloud environment. As defined in edge computing, a lot of computing can be done at the edge instead of the centric cloud.

B. Naming: In edge computing, one important assumption is that the number of things is tremendously large. At the top of the edge nodes, there are a lot of applications running, and each application has its own structure about how the service is provided. Similar to all computer systems, the naming scheme in edge computing is very important for programming, addressing, things identification, and data communication. However, an efficient naming mechanism for the edge computing paradigm has not been built and standardized yet. Edge practitioners usually need to learn various communication and network protocols in order to communicate with the heterogeneous things in their system. The naming scheme for edge computing needs to handle the mobility of things, highly dynamic network topology, privacy and security protection, as well as the scalability targeting the tremendously large number of unreliable things.

VI. CONCLUSION

In this paper, its pointed to edge computing and how mobile edge computing is being used in 5G networks. It is also discusses about the various applications used in the field of networking topology and how 5G is related to edge and its vice-versa. This paper is given with 3 major applications namely offloading, aggregation and local connectivity with a detailed description.

Finally, pointed some on-going research and future opportunities to enhance them.

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A Pragmatic study on Modelling and Prediction of Bitcoin using Machine Learning Based on Blockchain

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ABSTRACT

Bitcoin has recently emerged and gathered attention in the fields of economics, cryptography, and computer science due to its inherent nature of combining encryption technology and monetary units. This paper deals with the effect of Bayesian neural networks (BNNs) by analyzing the time series of Bitcoin process. This paper explains the features from Blockchain information that is deeply involved in Bitcoin's supply and use them to train models to improve the predictive performance of the latest Bitcoin pricing process. Compares the Bayesian neural network with other linear and non- linear benchmark models.

INDEX TERMS: Bitcoin, blockchain, predictive model, Bayesian neural network, time-series modelling.

I. INTRODUCTION

Bitcoin is a successful cipher currency introduced into the financial market based on its unique protocol and Nakamoto's systematic structural specification [1]. Unlike existing fiat currencies with central banks, Bitcoin aims to achieve complete decentralization. Participants in the Bitcoin market build trust relationships through the formation of Blockchain based on cryptography techniques using hash functions. Inherent characteristics of Bitcoin derived from Blockchain technologies have led to diverse research interests not only in the field of economics but also in cryptography and machine learning. Cryptography is mostly used to design security networks like blockchain.

Blockchain was first introduced in the year of 2008 and got started in the year of 2009. A blockchain, originally block chain is a growing list of records called blocks that are linked using cryptography. Where each block contains a cryptographic hash of the previous block, a timestamp, and transaction data. It is "an open, distributed ledger that can record transactions between two parties efficiently in a verifiable and permanent way". A blockchain is typically said to be managed by a peer-to-peer network collectively adhering to a protocol for internode communication and validating new blocks.

Number of studies have been conducted recently on modelling the time series of Bitcoin prices as a new market variable with specific technical rules. Generalized Autoregressive Conditional Heteroskedasticity (GARCH) volatility analysis is performed to explore the time series of Bitcoin price [2], [3].

Predicts the Bitcoin pricing process using machine learning techniques, such as recurrent neural networks (RNNs) and long short-term memory (LSTM), and compare results with those obtained using autoregressive integrated moving average (ARIMA) models. On the analysis of the time series Bitcoin, there are some practical and systematic empirical studies.

In this study we are conducting practical analysis on modelling and predicting of the Bitcoin process by employing a Bayesian neural network (BNN), which can deal with the increasing number of relevant features in the evaluation. A BNN includes

a regularization term into the objective function to prevent the over fitting problem that can be crucial to our framework. When the machine considers a lot of input variables, a trained machine can be complex and suffer from the over fitting problem. BNN models showed their effect to the financial derivative securities analysis. The current study systematically evaluates and characterizes the process of Bitcoin price by modelling and predicting Bitcoin prices using Blockchain information and macroeconomic factors. We also try to account for the remarkable recent fluctuation, which is shown in Figure1 and has not been considered in previous studies.

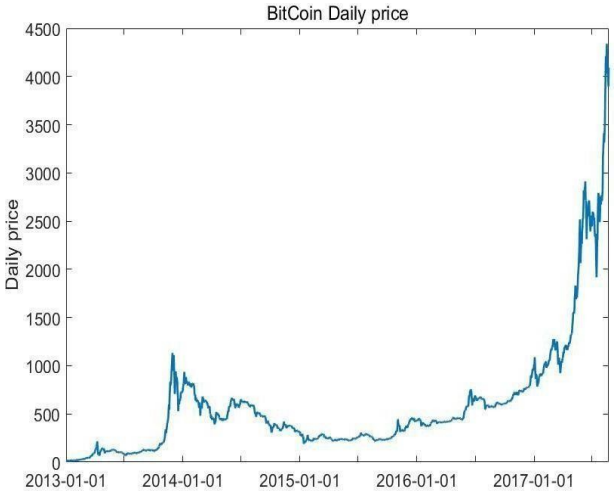

FIGURE 1. Bitcoin daily price (USD), from Sep-11 2011 to Aug-22 2017

II. ECONOMICS OF BITCOIN

Barro's model provides a simple Bitcoin pricing model under perfect market conditions as in [4] evaluates Bitcoin price formation based on a linear model by considering related information that is categorized into several factors of market forces, attractiveness for investors, and global macro-financial factors. In this model, Bitcoin is assumed to possess currency value and is exchange able with traditional currencies, which are under central bank control and can be used for purchasing goods and services. The total Bitcoin supply, SB, is represented by

$$S_B = P_B B$$

Where PB denotes the exchange rate between Bitcoin and dollar (i.e. dollar per unit of Bitcoin), and B is the total capacity of Bitcoins in circulation.

The total Bitcoin demand depends on the general price level of goods or services, P; the economy size of Bitcoin, E; and the velocity of Bitcoin, V, which is the frequency at which a unit of Bitcoin is used for purchasing goods or services. The total demand of Bitcoin, DB, is described as followed by:

$$D_B = PE/V$$

The market equilibrium with the perfect market assumption is acquired when the supply and the demand of Bitcoin is the same amount. The equilibrium is therefore achieved at

$$P_B = PE/VB$$

This equilibrium equation implies that in the perfect market, the Bitcoin price in dollars is affected proportionally by the general price level of goods or services multiplied by the economy size of Bitcoin, and inversely by the velocity of Bitcoin multiplied by the capacity of the Bitcoin market. The general price level of goods or services, P, can be determined indirectly from the global macroeconomic indexes in actual markets. Bitcoin is a ''virtual currency based on Blockchain technologies''. Therefore, economic size, E; the velocity, V; and the capacity of the Bitcoin market, B, are closely related with several measurable market variables extracted from the Blockchain platform and, which will be reviewed in the next subsection.

III. CONCEPTS OF BLOCKCHAIN

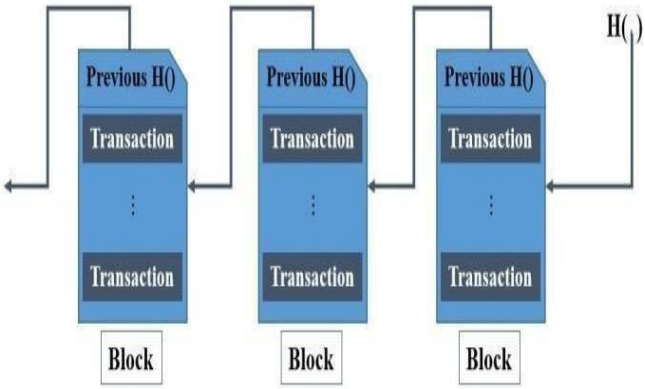

FIGURE 2. The formation of the Blockchain.

Decentralization is the value pursued by all cryptocurrencies as opposed to general fiat currencies being valued by central banks. The blockchain is the only available technology that can simultaneously achieve these three goals. Generation of blocks in the Blockchain, which is directly involved in the creation and trading of Bitcoins, directly influence the supply and demand of Bitcoins. Combination of Blockchain technologies and the Bitcoin market is a real-world example of a combination of high-level cryptography and market economies.

All trading history is recorded in the Blockchain and shared by the network, and all past transaction history is verified by all network participants. The unit called ‘‘block’’, which includes recent transactions and a hash value from the previous ‘‘block’’, creates irreversible data by a hash function, and is pointed out from the next block. Figure 2 shows the general structure of Blockchain. It takes more than a certain amount of time to generate the block to make impossible to forge all or part of the Blockchain. This algorithm is called proof of work (PoW), and the difficulty is automatically set to ensure that the problem can be solved within approximately 10 minutes. PoW also provides incentives to motivate participants to maintain the value of Bitcoin by paying Bitcoin for the participant who created the block.

IV. BAYESIAN NEURAL NETWORKS

A Bayesian neural network (BNN) is a transformed Multilayer perception (MLP) which is a general term for ANNs in the fields of machine learning. The networks have been successful in many application such as image recognition, pattern recognition, natural language processing, and financial time series [5]. It becomes known that much effective to represent the complex time series than the conventional linear models, i.e. autoregressive and moving average, etc. The structure of a BNN is constructed with a number of processing unit’s classified into three categories: an input layer, an output layer, and one or more hidden layers.

V. TIME SERIES MODELING

For time series analysis, nonlinear methods, such as kernel regression model, exponential autoregressive models, artificial neural network (ANN), BNN, and support vector regression have attracted research interest and exhibited improved predictive performance for various time series data [6]. For pricing and hedging derivatives can be improved by the Bayesian regularization techniques and verified empirically for S&P500 index daily call options from January1988 to December 1993. Unlike other widely studied time series researches, there are few related papers analyzing the Bitcoin processes in terms of prediction performance. In this work, we have employed Bayesian neural networks since the predicted model with a large number of input variables need to be regularized for the weights. We have compared a prediction performance of BNN methods with linear regression methods and SVRs.

VI. PREDICTION OF BITCOIN USING MACHING LEARNING

We next perform time series analysis of Bitcoin prices using a BNN model and compare with the benchmark models, which are the linear regression and the SVR model. A total of 25 explanatory variables belonging to three categories are employed as inputs for BNN learning. We also address another input set that comprises 16 input variables by eliminating several unimportant variables as mentioned in the previous subsection. We consider two response variables, log price of Bitcoin and

volatility of Bitcoin price, because extremely high volatility is an important feature of Bitcoin. In general, volatility is a significant variable assessed equally to the value of an option in economic analysis. We use logs called values of both output response variables to account for the large difference between Bitcoin value in the early period and its most recent value.

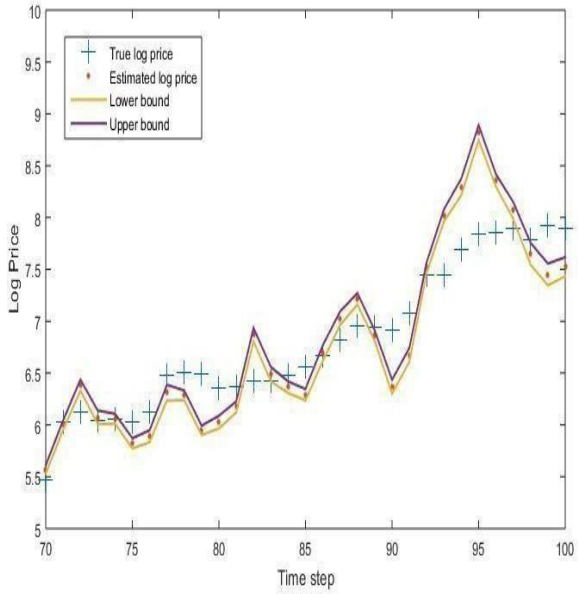

Figure3. the log volatility of the Bitcoin price.

VII. CONCLUSION

Bitcoin is a successful cryptocurrency, and it has been extensively studied in fields of economics and computer science. In this study, we analyze the time series of Bitcoin price with a BNN using Blockchain information in addition to macro economic variables and address the recent highly volatile Bitcoin prices. Given the data of the entire time range, experimental results show that the BNN model learned with the selected features effectively describes processes of Bitcoin log price and log volatility. Adoption of rollover framework experimentally demonstrates the predictive performance of BNN is better than other benchmark methods on log price and volatility processes of Bitcoin. Through the empirical analysis, we have confirmed that the BNN model describes the fluctuation of Bitcoin up to August 2017, which is relatively recent. Unlike other bench- mark models that fail directional prediction, the BNN model succeeded in relatively accurate direction prediction. From these experimental results, the BNN model is expected to have similar performance in more recent data. As the vari- ation of Bitcoin process gets attention, it is expected that the expansion and application of the BNN model would be effective for the analysis and prediction of the Bitcoin process. Variability of Bitcoin must be modelled and predicted more appropriately.

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Zero Trust Security Model: An Emerging Model of Security

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ABSTRACT

Organizations transmit sensitive data across networks and to other devices in the course of doing businesses, and cyber security describes the discipline dedicated to protecting that information and the systems used to process or store it. As the volume and sophistication of cyber-attacks grow, companies and organizations, especially those that are tasked with safeguarding information relating to national security, health, or financial records, need to take steps to protect their sensitive business and personnel information.In this article we mainly focused on one of the famous cyber security technique used by many prestigious companies to rescue their data.

I. INTRODUCTION

1.1 Cyber-Attack

Cyber attack is deliberate exploitation of computer systems,technology –dependent enterprises and networks.Cyber attacks use malicious code to alter computer code ,logic or data,resulting in disruptive consequences that can compromise data and lead to cyber crimes ,such as information and identity theft.Cyber attack is also known as computer network attack. A company acquisition or divestiture can increase the cost of cybercrime by 20% while the launch of a significant new application increased the cost by 18%.24% of breaches affected financial organizations, followed by healthcare and the public sector.The cost to finance firms are the highest of all industries ,losing an average of $16.5 million in 2013.[1]

1.2 Operation Aurora

Operation Aurora was a series of cyber-attacks conducted by advanced persistent threats .First publicly disclosed by Google on January 12,2010.The belligerents involved are Google in United States and PLA Unit 61398 in China.The Casualties of this operation is Google intellectual property got stolen.Technical evidence including IP addresses,domain names,malware signatures,and other factors show Elderwood was behind the Operation Aurora attack.The vulnerability affects InterernetExplorer versions 6,7,8 on Windows 7,Vista,Windows XP,Server 2003,Server 2008 R2,as well as IE 6 Service Pack 1 on Windows 2000 Service Pack 4.

The attack was named “Operation Aurora” by Dmitri Alperovitch,Vice President of Threat Research at Cyber Security Company McAfee.Research by McAfee Labs discovered that “Aurora” was part of the file path on the attacker’s machine that was included in two of the malware binaries.

According to McAfee,the primary goal of the attack was to gain access to and potentially modify source code repositories at these high tech security and defense contractor companies.No one ever thought about securing them,yet these were the crown jewels of most of these companies in many ways-much more valuable than any financial or personally identifiable data that they may have and spend so much time and effort protecting.[2][3]

II.ZERO TRUST SECURITY MODEL

Zero Trust is a security concept centered on the belief that organizations should not automatically trust anything inside or outside its perimeters and instead must verify anything and everything trying to connect to its systems before granting access. The strategy around Zero Trust boils down to don’t trust

anyone,cut off all access until the network knows who you are. Don't allow access to IP addresses, machines, etc. until you know who that user is and whether they're authorized. That perspective drives a new strategy for network security architecture. The 2017 Annual Cybercrime Report from Cybersecurity Ventures predicts that cybercrime will cost the world $6 trillion annually by 2021, up from $3 trillion in 2015.

The Zero Trust Network or Zero Trust Architecture, model was created in 2010 by John Kindervag, who at the time was a principal analyst at Forrester Research Inc. Gero agrees, saying "If you want to stop breaches, zero trust is the best way ." As is the case with IT in general these days, Zero Trust "is not just technology; it's about process and mindset as well," Mann adds.

The Zero Trust approach relies on various existing technologies and governance processes to accomplish its mission of securing the enterprise IT environment. It calls for enterprises to leverage micro-segmentation and granular perimeter enforcement based on users, their locations and other data to determine whether to trust a user, machine or application seeking access to a particular part of the enterprise. To do this, Zero Trust draws on technologies such as multifactor authentication, IAM, orchestration, analytics, encryption, scoring and file system permissions. Zero Trust also calls for governance policies such as giving users the least amount of access they need to accomplish a specific task.

Yet developing a Zero Trust environment isn't just about implementing these individual technologies. Instead, Cunningham, Gero and Mann say, it's about using these and other technologies to enforce the idea that no one and nothing has access until they've proven they should be trusted. Many companies are moving to cloud and, thus, green field environments. Those are the perfect places to go to Zero Trust. There's where you start your Zero Trust journey,"Organizations should pursue the Zero Trust model as part of their overall digital transformation strategy, implementing the technologies that can help them achieve Zero Trust as they move more to the cloud and thus retire old legacy systems.This premise that IT environments can be protected from malicious activity simply by making the perimeter bigger, stronger and more resilient. Zero trust is not a technology, nor is it a product. It is a strategic,architectural approach to network security enabled by technology. . An adage commonly ascribed to zero-trust security is "never trust, always verify," an evolution from the old "trust but verify" approach to security." for example.Policies and governance also play an important role in a zero-trust architecture, since users should have the least amount of access required to fulfill their duties. Granular control over who, what, where and when resources are accessed is paramount to a zero-trust network. n terms of technology, many familiar elements are in zero-trust security's toolbox: automation, encryption, identity access management, mobile device management and multifactor authentication, to name a few. a successful transition to zero-trust security starts with a comprehensive auditof all devices, endpoints and other assets, because everything connected to the network is a potential risk. While the zero-trust security model gained popularity once implemented by Google, it is by no means just for large enterprises. In fact, it can be easier for smaller organizations, as their environments are often less bogged down by interconnected layers of legacy systems. Implementing zero-trust security can be significantly harder for enterprises with legacy environments, often making their networks more brittle.

Zero-trust security also requires ongoing work. Teams must regularly monitor, maintain, optimize and update micro-perimeters and governance policies to ensure systems continue to function properly, while not preventing users from being productive.

2.1 Do Zero-Trust Organizations Really Trust No One?

Micro-segmentation and related solutions go the distance to secure networks and data from everyone and everything. web browsing is a primary area of risk not covered by micro-segmentation or other related zero-trust solutions. Many zero-trust experts suggest whitelisting trusted sites as the answer, while rejecting access to all other sites. However, this method of limiting access to all but known sites has been known to hamper productivity and frustrate employees. Limiting access creates obstacles for users and burdensome busywork for IT staff. Users must constantly request access and wait, while IT staff must shift their attention from more important tasks to manage, investigate and respond to such requests. located in a DMZ or in the cloud. Users One increasingly talked-about way to do this is remote browser isolation (RBI) — an idea that operates under the assumption that nothing from the web is to be trusted. Every website, item of content and download is suspect. But to avoid the issue with impacting the

user experience, all browsing takes place remotely, on a virtual browser. The virtual browser can be housed in a disposable container interact naturally with all websites and applications in real time via a safe media stream that is sent from the remote browser to the endpoint browser of their choice, so no content touches the user device. When the user is finished browsing, the container and all its contents are destroyed.[4][5][6]

III.CONCLUSION

One of the inherent problems we have in IT is we let too many things run way too openly with too many default connections. We essentially trust way too much," Cunningham says. "That's why the internet took off – because everyone could share everything all the time. But it's also a key fail point: If you trust everything, then you don't have a chance of changing anythingsecurity wise."This zero trust security model had given back support for many companies to secure their data from intruders,hackers.These include the prestigious Google company.This step took by Google had made many other companies to trust on this security model.The techniques used in this model will surely make this one of the best security models that can be used in the coming years. Bad guys out, good guys in.

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PREDICTION OF BREAST CANCER USING MACHINE LEARNING

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ABSTRACT

Breast cancer became the major source of mortality between women. The accessibility of healthcare datasets and data analysis promote the researchers to apply study in extracting unknown pattern from healthcare datasets. The intention of this study is to design a prediction system that can predict the incidence of the breast cancer at early stage by analyzing smallest set of attributes that has been selected from the clinical dataset. Wisconsin breast cancer dataset (WBCD) have been used to conduct the proposed experiment. The potential of the proposed method is obtained using classification accuracy which was obtained by comparing actual to predicted values. The outcome confirms that the maximum classification accuracy (99.28%) is achieved for this study.

Keywords— WCBD, classification, knowledge mining, prediction system.

I. INTRODUCTION

Most common type of medical hazard found in middle aged women is, breast cancer. Mortality rate of women due to breast cancer can be reduced if can be detected at a relatively early stage. With the help of latest, efficient and advanced screening methods, the majority of such cancers are diagnosed when the disease is still at a localized stage . The utility of machine learning techniques in healthcare analysis is growing progressively. Certainly analysis of patient's clinical data and physician's judgment are the most considerable features in diagnosis. Most of the possible medical flaws can be avoided by the using classification systems, and also offer healthcare data to be analyse in lesser time and in more exhaustive manner. Accurate and timely prediction of breast cancer allows physicians and healthcare providers to make most favorable decision about the patient treatment. This paper is organized into various sections which mainly focus only on predicting breast cancer.

II. PREVIOUS RESEARCH

Lots of breast cancer research has been reported in the literature of medical data analysis, and most of them turn up with good classification accuracies. Polat et al , proposed LS-SVM classifier algorithm for the diagnosis of breast cancer and achieved the classification accuracy of 98.53% using 10-fold cross validation. Akay, Proposed a new method for the breast cancer diagnosis using support vector classification algorithm on the most predictive features and obtain the classification accuracies of 99.02% without cross-validation . Yeh et al. present a innovative technique for breast cancer detection, by using statistical methods in combination with swarm optimization and reported the accuracy of 98.71%. All of the above listed works are just a small representative of the existing huge number of research in utilizing machine learning and data mining techniques to a range of healthcare domains[1] for forecasting and pattern recognition purposes.

III. PROPOSED FRAMEWORK

In vision of the problem statement described in the introduction section, a classification model is proposed with boosted accuracy to predict the breast cancer patient. The framework is composed of the following important phases:
Regression and KNN.
.

IV. TECHNIQUES

3.1 EXPECTATION MAXIMIZATION (EM):

The EM algorithm is a method for efficient estimation from incomplete data. In any incomplete dataset, there is indirect evidence about the likely values of the unobserved values. This evidence, when combined with some assumptions, comprises a predictive probability distribution for the missing values that should be averaged in the statistical analysis. The EM algorithm is a common technique for matching models to incomplete data.[2]

EM is important on the relationship between missing data and unknown parameters of a model. When the parameters are known, then it is possible to obtain impartial predictions for the missing values

3.2 DATA MINING TECHNIQUES:

In this paper, we used DT, SVM,and ANN machine learning algorithms to predict the recurrence of breast cancer to find which method performs better. For DT, C4.5 algorithm which is based on the ID3 algorithm was used. Each tree node is either a leaf node or decision node. All decision nodes have splits, testing the values of some functions of data attributes.

Each branch from the decision node corresponds to a different outcome of the test. Each leaf node has a class label attached to it. Weka software was implemented to analyze the data with C4.5. It is an open source data mining tool and offers many data mining algorithms including AdaBoost, Bagging, C4.5 and SVM. It is a collection of tools for data classification, regression, clustering, association rules, and visualization.[3]

V. MEASURE FOR PERFORMANCE EVALUATION

Performance of the proposed system is evaluated by considering the actual and predicted classification. Accuracy of the system is calculated by using the confusion matrix obtained for the classifier used. Table 2 shows the confusion matrix for a two class classifier. Classification accuracy, sensitivity, specificity, positive predictive value and negative can be defined by using the elements of the confusion matrix as. Classification accuracy: Accuracy of the classification is obtained by using the given equation:

$$Accuracy = \frac{TP+TN}{TP+TN+FP+FN} \times 100$$

Where TP: Correctly classified as having breast cancer

TN: Correctly classified as not having breast cancer.

FP: Classified as having breast cancer but actually they don't have (Error of type I)

FN: Classified as not having breast cancer but actually they have cancer. (Error of type II)[4]

Actual	Predicted	
	Positive	Negative
Positive	True Positive(TP)	False Negative(FN)
Negative	False Positive(FN)	False Positive(FP)

FIG: Confusion Matrix Representation [5]

VI. METHODOLOGY

We obtained the breast cancer dataset from UCI repository and used spyder as the platform for the purpose of coding. Our methodology involves use of classification techniques like Support Vector Machine (SVM), K-Nearest Neighbor (K-NN), Logistic Regression,with Dimensionality Reduction technique i.e. Principal Component Analysis (PCA)

.

A. Dimensionality Reduction: Dimensionality Reduction is a process in which the number of independent variables is
reduced to a set of principle variables by removing those which are less significant in predicting the outcome.

B. Feature Selection: Feature selection is finding the subset of original features by different approaches based on the information they provide, accuracy, prediction errors.

C. Feature Projection: Feature projection is transformation of high-dimensional space data to a lower dimensional space (with few attributes). Both linear and nonlinear reduction techniques can be used in accordance with the type of relationships among the features in the dataset.

D. Principal Component Analysis (PCA): PCA is an unsupervised linear dimensionality reduction algorithm used to find the strongest features based on the covariance matrix of the dataset. It flattens large number of dimensions to 2 or 3 dimensions. It is used when we need to tackle the curse of dimensionality among data with linear relationships.

E. Model Selection: The most exciting phase in building any machine learning model is selection of algorithm. We can use more than one kind of data mining techniques to large datasets. But, at high

level all those different algorithms can be classified in two groups: supervised learning and unsupervised learning. Supervised learning is the method in which the machine is trained on the data which the input and output are well labelled. The model can learn on the training data and can process the future data to predict outcome.

1. Logistic Regression
2. Nearest Neighbour
3. Support vector Machines

VII. SURVEY OF MACHINE LEARNING APPLICATIONS IN CANCER PREDICTION

Table 1. Summary of benefits, assumptions and limitations of different machine learning algorithms

Machine Learning Algorithm	Benefits	Assumptions and/or Limitations
Decision Tree (Quinlan 1986)	• easy to understand and efficient training algorithm • order of training instances has no effect on training • pruning can deal with the problem of overfitting	• classes must be mutually exclusive • final decision tree dependent upon order of attribute selection • errors in training set can result in overly complex decision trees • missing values for an attribute make it unclear about which branch to take when that attribute is tested
Naïve Bayes (Langley et al 1992)	• foundation based on statistical modelling • easy to understand and efficient training algorithm • order of training instances has no effect on training • useful across multiple domains	• assumes attributes are statistically independent* • assumes normal distribution on numeric attributes • classes must be mutually exclusive • redundant attributes mislead classification • attribute and class frequencies affect accuracy
k-Nearest Neighbour (Patrick & Fischer 1970, Aha 1992)	• fast classification of instances • useful for non-linear classification problems • robust with respect to irrelevant or novel attributes • tolerant of noisy instances or instances with missing attribute values • can be used for both regression and classification	• slower to update concept description • assumes that instances with similar attributes will have similar classifications • assumes that attributes will be equally relevant • too computationally complex as number of attributes increases
Neural Network (Rummelhart et al 1986)	• can be used for classification or regression • able to represent Boolean functions (AND, OR, NOT) • tolerant of noisy inputs • instances can be classified by more than one output	• difficult to understand structure of algorithm • too many attributes can result in overfitting • optimal network structure can only be determined by experimentation
Support Vector Machine (Vapnik 1982; Russell and Norvig, p 749-52)	• models nonlinear class boundaries • overfitting is unlikely to occur • computational complexity reduced to quadratic optimization problem • easy to control complexity of decision rule and frequency of error	• training is slow compared to Bayes and Decision Trees • difficult to determine optimal parameters when training data is not linearly separable • difficult to understand structure of algorithm
Genetic Algorithm (Holland 1975)	• simple algorithm, easy to implement • can be used in feature classification and feature selection • primarily used in optimization • always finds a "good" solution (not always the best solution)	• computation or development of scoring function is non trivial • not the most efficient method to find some optima, tends to find local optima rather than global • complications involved in the representation of training/output data

VIII. CONCLUSION AND FUTURE WORK

A decision support system for predicting breast cancer helps and assist physician in making optimum, accurate and timely decision, and reduce the overall cost of treatment. Different classifiers have been used to conduct experiments on the standard WBCD. It is been observed KNN classifier yields the highest classification accuracies when used with most predictive variables. The proposed system greatly reduces the cost of treatment and improves the quality of life by predicting breast cancer at early stage of development. The future work will focus on exploring more of the dataset values and yielding more interesting outcomes. This study can help in making more effective and reliable disease prediction and diagnostic system which will contribute towards developing better healthcare system by reducing overall cost, time and mortality.

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Introduction to Blue Brain Technology

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ABSTRACT

Human brain is the most precious and typical creation of god. The man responds to the things just because of the brain. To preserve this typical thing a project named 'Blue Brain' which is also called the first virtual brain started in 2005. Scientists are in research to develop an artificial brain that can work, respond, contemplate and take decisions without any effort. The effort is to upload a human brain into machine. The aim is to preserve the human brain after death so that the data, intelligence, personalities, feelings, memories of that person should not be lost. This paper includes the complete research work explaining the functioning module of blue brain and the recent developments which are going through it.

Figure1.Blue brain,the first virtual brain

I. INTRODUCTION

The blue brain project (BPP) makes use of the Blue Gene supercomputer developed by IBM to carry out simulations. Hence the project is named the "**Blue Brain**". The project was founded by Henry Markram at the ÉcolePolytechniqueFédéralede Lausanne (EPFL) in Lausanne, Switzerland way back in May 2005. EPFL is a research institute that specializes in natural sciences and engineering.
Today scientists are carrying out research to create an artificial brain that can think, respond, take decisions and store information. The main aim is to upload a human brain into the computer, so that it can think, and make decisions without the presence of a human body. After death, this virtual brain can act as the man. So, even after the death of a person, we will not lose the knowledge, intelligence, emotions, and memories of a person and this can be used for various situations like to continue the pending work, to decide on something based on his/her area of expertise etc.
The human brain is a complex system consisting of recursive connectors. It is more complex than any circuitry in the world. The human brain is a multi-level system with 100 billion neurons (nerve cells) and 100 trillion synapses. A neuron is a cell designed to transmit information to other nerve cells, muscle, or gland cells whereas synapses help neurons to communicate with each other. So, the question may arise, is it really possible to create a human brain? The answer is yes. Today it is possible because of advancement in technology.
The world of technology has expanded in areas like humanoid robots, virtual reality, wearable devices, artificial intelligence, and so much more at a rapid rate. A full human brain simulation (100 billion neurons) is planned to be completed by 2023 if everything goes well. If so, this would be the first virtual brain of the world.[1]

II. WHAT IS BLUE BRAIN?

Blue Brain is the name of the super computer developed by IBM. If possible, it would be the world's first virtual brain. Within years we would be able to scan our intelligence and knowledge into the computer. By this we can use this knowledge for the development of mankind even after the death of the person. It takes decisions based on the past experiences of the person and apply it to the similar situation occurring in the present. With the help of blue brain we can upload our brain into a computer. Different activities and structure of our central nervous system can also be studied.[3]

III. NEED OF BLUE BRAIN

Intelligence is the quality through which all of us are different from each other. It is the inborn

quality. There are some people having a very high level of intelligence. Sometimes they think up to such extent that others cannot reach. Examples are Newton etc. But after the death the intelligence is lost. The solution to this is the Virtual Brain.
Through this it can be preserved even after death. We all suffer from a problem of remembering history and important days etc. This all can be done by virtual brain.[5]

IV. HOW DOES THE NATURAL BRAIN WORK?

The human ability to feel, interpret and even see is controlled, in computer-like calculations, by the magical nervous system. Yes, the nervous system is quite like a magic because we can't see it, but it is working through electric impulses through your body.
The human brain is a multi-level complex system with 100 billion neurons and 100 trillion synapses. Not even engineers have come close to making circuit boards and computers as delicate and precise as the nervous system. To understand this system, one has to know following three simple functions.

Sensory input:

When our eyes see something or when our hands touch a warm surface, the sensory cells, also known as Neurons, send a message straight to our brain. This is called sensory input because we are putting things into our brain by way of senses.

Integration:

Integration is best known as the interpretation of things like taste, touch, and sense which is possible because of our sensory cells, known as neurons. Billions of neurons work together to understand the change around us.

Motor Output:

Once our brain understands the change, either by touching, tasting or via any other medium, then our brain sends a message through neurons to effecter cells, muscles or gland cells, which actually work to perform our requests and act upon our environment. The word motor output is easily remembered if one should think that our putting something out into the environment through the use of a motor, like a muscle which does the work for our body.[4]

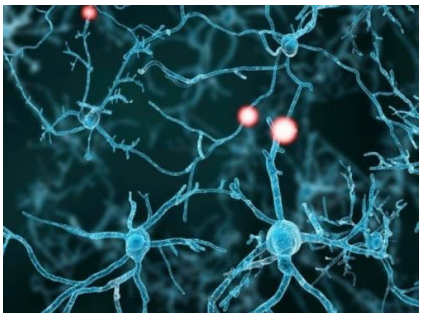

Figure2. Working of natural brain

V. BRAIN SIMULATION

Henry Markram at TED conference said that, "It is not impossible to make the human brain and we will do it in 10 year". He said that if we would be able to implement it correctly, then it would be able to speak and have the intelligence similar to man. In many areas of science and engineering, simulation has proven an invaluable tool for turning mathematical principles, theory and data into new insights.
HBP seeks to bring the bring vital software tools to neuroscience to:

- reduce the need for animal experiments
- Study diseases in unprecedented in-silica experiments.
- improve the validation of data and experiments with computational validation

VI. UPLOADING HUMAN BRAIN

The uploading is possible by the use of small robots known as the Nanobots. These robots are small enough to travel through our circulatory system. Travelling into spine and brain, they will be able to monitor the activity and structure of our central nervous system. They will be able to provide an interface with computers that is as close as our mind can be while we still reside in our biological form. Nanobots can also carefully scan the structure of our brain, providing a complete read out of the connections. This information, when entered into a computer, could then continue to function as us. Thus, the data stored in the enter brain will be uploaded into the computer.

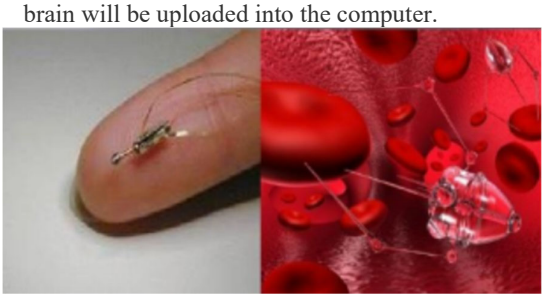

Figure3.Nanobots

VII. BLUE BRAIN OBJECTIVES

1. The project will search for insights into how human beings think and remember.
2. Scientists think that blue brain could also help to cure the Parkinson's disease.
3. The brain curity is in a complex state of flux, the
4. Brain rewiring itself every moment of its existence. If the scientists can crack open the secret of how and why the brain does it, the knowledge could lead to new breed of super computer.[6]

VIII. ADVANTAGES

1. Even after the death of a person his intelligence can be used.
2. This could boost study of animal behaviour. That means by interpretation of the electric impulses from the brain of the animals, their thought process can be understood easily.
3. It would allow the deaf to hear via direct nerve stimulation, and also be helpful for many psychological diseases.
4. We could make use of the information of the brain that was uploaded into the computer to mental disorder.

IX. DISADVANTAGES

There could be new types of threats, this technology would bring.

1. Increases the dependency on computer systems.
2. Computer viruses will pose an increasingly critical threat. Data could be manipulated and used in wrong way.
3. They may lead to human cloning and we cannot imagine how big this threat would be against nature.

X. Applications

1. Data of 100 years can be tested.
2. Neural Code can be cracked.
3. Information Processing of Neocortical can be understood.
4. Whole brain simulation can be studied.
5. A drug for the Brain Disorder.[2]

XI. CONCLUSION

The blue brain project, if implemented successfully, would indeed change many things around us and it will boost the area of research and technology. Certain research and development take decades or even centuries to complete, so the knowledge and efforts of a scientist can be preserved and used further in his absence. At the same time, it is not an easy task to replicate the convoluted brain system into a computer. It may take several years to decades to accomplish this.

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Survey on DBSCAN Clustering Algorithm

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ABSTRACT

Data mining refers to the process of retrieving data by discovering the relative patterns from database. Clustering is a distinct phase in data mining that work to provide an established, proven structure from a collection of databases. Density Based Spatial Clustering of Applications with Noise is a well-known clustering algorithm which has the advantages for finding out the clusters of different shapes and size from a large amount of data, which contains noise and outliers. In this paper we have discussed different DBSCAN classifications that perform different tasks to make cluster more dynamic and effective.

Keywords— Clustering, Density-based clustering, DBSCAN algorithm.

I. INTRODUCTION

Clustering is a popular data analysis technique. Clustering algorithms can be widely applied in many fields including: pattern recognition, machine learning, image processing, information retrieval and so on. It also plays an important role in data mining. All the existing clustering algorithms have their own characteristics. As a kind of other clustering, density-based algorithm is simple and high efficiency algorithm [1]. Density-based clustering algorithms, which are designed to discover clusters of arbitrary shape in databases with noise, a cluster is defined as a high-density region partitioned by low density regions in data space. Density Based Spatial Clustering of Applications with Noise (DBSCAN) is a typical density-based clustering algorithm. DBSCAN can discover clusters of arbitrary shape. But it is sensitive to the input parameters, especially when the density of data is non uniform [1].

The DBSCAN clustering algorithms usually can be classified into the following different categories: (a) partitioning based DBSCAN clustering; (b) grid-based DBSCAN clustering; (c) hierarchical DBSCAN clustering; (d) Detection Based DBSCAN clustering, (e) Incremental DBSCAN clustering (f) spatial–temporal DBSCAN clustering.

II. LITERATURE ON DBSCAN CLUSTERING ALGORITHM

There are number of clustering techniques but this paper mainly focuses on the widely used DBSCAN clustering technique. Number of application areas and techniques are highlighted in Density-based clustering. One approach developed the incremental clustering for mining large database environment. This approach presents the first incremental clustering algorithm based on DBSCAN clustering which is applicable to any database containing data from a metric space. Due to the density-based nature of DBSCAN, the insertion or deletion of an object affects the current clustering only in the neighborhood of this object. Thus, efficient algorithm scan be given for incremental insertions and deletions to an existing clustering. Incremental DBSCAN yields significant speed-up factors over DBSCAN even for large numbers of daily updates in a data warehouse. In this paper, sets of updates are processed one at a time without considering the relationships between the single updates [2]. Many clustering algorithms have been proposed so far, seldom was focused on high dimensional and incremental databases.

An incremental approach on Grid Density-Based Clustering Algorithm (GDCA) discovers clusters with arbitrary shape in spatial databases. It first partitions the data space into a number of units, and then deals with units instead of points. Only those units with the density no less than a given minimum density threshold are useful in extending clusters. An incremental clustering algorithm--IGDCA is also presented in this paper, applicable in periodically incremental environment [2].

An innovative approach presents a new density-based clustering algorithm, ST-DBSCAN, which is based on DBSCAN. It proposes three marginal extensions to DBSCAN related with the identification of (i) core objects,
(ii) noise objects, and (iii) adjacent clusters. In contrast to the existing density-based clustering algorithms, this algorithm has the ability of discovering clusters according to non-spatial, spatial and temporal values of the objects. In this paper, it also presents a spatial–temporal data warehouse system designed for storing and clustering a wide range of spatial–temporal data [3].

One of the new concepts is presented on clustering technique which provides an effective method for Clustering Incremental Gene Expression data. It is designed based on density-based approach where the efficiency of Gen Clus in detecting quality clusters over gene expression data. This work presents a density-based clustering approach which finds useful subgroups of highly coherent genes within a cluster and obtains a hierarchical structure of the dataset where the sub clusters give the finer clustering of the dataset.

A famous concept which discovers distributed clustering environment using DBSCAN algorithm. This approach ultimately forms a distributed clustering algorithm. This approach helps to cluster the data locally and independently from each other and transmitted only aggregated information about the local data to a central server [3]. Therefore, incremental DBSCAN clustering algorithm requires less space and less time than the actual one [4].

III. CLASSIFICATIONS OF DBSCAN CLUSTERING ALGORITHM

A. BASIC DBSCAN CLUSTERING ALGORITHM

DBSCAN requires two parameters: (eps) and the minimum

number of points required to form a cluster (minpts). It starts with an arbitrary starting point that has not been visited. This point's neighborhood is retrieved, and if it contains sufficiently many points, a cluster is started. Otherwise, the point is labeled as noise. Note that this point might later be found in a sufficiently sized environment of a different point and hence be made part of a cluster.

If a point is found to be a dense part of a cluster, its neighborhood is also part of that cluster. Hence, all points that are found within the neighborhood are added, as is their own -neighborhood when they are also dense. This process continues until the density-connected cluster is completely found. Then, a new unvisited point is retrieved and processed, leading to the discovery of a further cluster or noise

PSEUDO CODE*:*

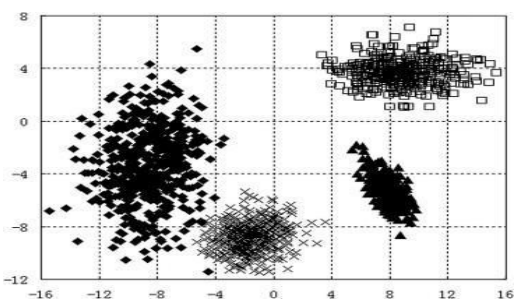
```
DBSCAN (D, eps, MinPts)
C = 0
for each unvisited point P in dataset D
mark P as visited
NeighborPts = regionQuery (P, eps)
if sizeof(NeighborPts) < MinPts
mark P as NOISE
else
C = next cluster
expandCluster (P, NeighborPts, C, eps, MinPts)

expandCluster (P, NeighborPts, C, eps, MinPts)
add P to cluster C
for each point P' in NeighborPts
if P' is not visited
mark P' as visited

  NeighborPts' = regionQuery (P', eps)
  if sizeof (NeighborPts') >= MinPts
    NeighborPts = NeighborPts joined with NeighborPts'
  if P' is not yet member of any cluster
```

B. PARTITION BASED DBSCAN CLUSTERING ALGORITHM

Because of the memory problem, the researches begin to partition large data set into some small partitions. In 2000 partitioning technique was first used in DBSCAN algorithm. It run DBSCAN algorithm on each partition which is partitioned by special rules. DBSCAN requires to specify two global parameters Eps and MinPts. In order to reduce the computational complexity, MinPts is fixed to 4 usually. Then the k-dist. graph must be plotted to decide the value of Eps. K-dist. graph needs to calculate the distance of an object and its kth nearest neighbors for all the objects. Next, sort all the objects on the basis of the previous distances. Finally, plot the k-dist. graph according to all the sorted objects and distances.



Considering that building the R⁄-tree and plotting the k-dist. graph have to cost much time especially for a large database, the initial database is partitioned into N partitions to reduce the time cost. Partitioning database can also alleviate the burden of memory and find more precise parameter Eps for every partition.

The steps of PDBSCAN are as follow:

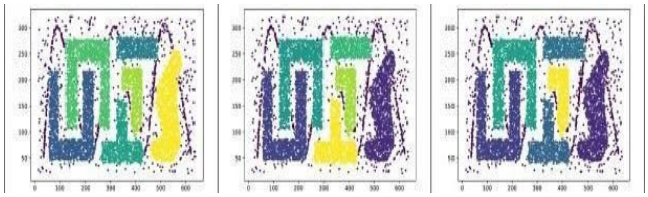
(1) Partitioning the initial database into N partitions.

(2) For each partition, building local R⁄-tree, analyzing and selecting local Eps and MinPts, and then clustering it with DBSCAN.

(3)Merging the partial clusters [4].

C. GRID BASED DBSCAN CLUSTERING ALGORITHM

As we all known, during the algorithm of clustering, especially for large data, the exist of border of data and noise may discard the cluster's border, degrade the precision of cluster, what's more, the value of Eps may affect the final answer of cluster at some extent. So, it is necessary to improve the useful of the algorithm according to choosing parameters automatically in dynamic testing data. As grid based clustering algorithm is mainly for massive data, building a unified grid size to divide data space, and then storing its internal data statistics in each grid, all the clustering operations are targeted to the grid cell to cluster in the integral structure of grid, the clustering answer is nothing to do with the order of data inputted, it is beneficial to achieve the algorithm's Incremental processing; For the density-based clustering algorithm (DBSCAN), the cluster's each data object, whose Eps-Neighbor' objects must smaller than a Minpts . The algorithm defines these data objects as core objects, defines the maximum density of a collection of objects connected as cluster. DBSCAN looks for the object density arriving that start with P about Eps and Minpts from the core object P which never visited form data set D, generate a cluster that contains p and its objects density arriving. The algorithm ends with unvisited objects in the data set D. If it can deal with the parameters Eps,



Grid-based DBSCAN Algorithm with Referential Parameters in order to deal with massive data "mutation" and noise. The algorithm can find clusters of arbitrary shape and remove noise, and then carry out the parameters of DBSCAN automatically.

D. HIERARCHICAL DBSCAN CLUSTERING ALGORITHM

First divide the spatial area into rectangle cells (e.g., using latitude and longitude) and employ a hierarchical structure. Let the root of the hierarchy be at level 1; its children at level 2, etc. A cell in level i corresponds to the union of the areas of its children at level i + 1. In this paper each cell (except the leaves) has 4 children and each child corresponds to one quadrant of the parent cell. The root cell at level 1 corresponds to the whole spatial area (which assume as rectangular for simplicity). The size of the leaf level cells is dependent on the density of objects. As a rule of thumb, choose a size such that the average number of objects in each cell is in the range from several dozens to several thousands. In addition, a desirable number of layers could be obtained by changing the number of cells that form a higher-level cell. This algorithm will use 4 as the default value unless

otherwise specified. This algorithm assume space is of two dimensions although it is very easy to generalize this hierarchy structure to higher dimensional models.

For each cell, algorithm have attribute-dependent and attribute-independent parameters. The attribute independent parameter is: n --number of objects (points) in this cell as for the attribute-dependent parameters, assume that for each object, its attributes have numerical values. For each numerical attribute, algorithm have the following five parameters for each cell: m ---mean of all values in this cell s --standard deviation of all values of the attribute in this cell min -- the minimum value of the attribute in this cell max -- the maximum value of the attribute in this cell distribution -- the type of distribution that the attribute value in this cell follows the parameter distribution is of enumeration type. Potential distribution types are: normal, uniform, exponential, and so on. The value NONE is assigned if the distribution type is unknown.

E. DETECTION BASED DBSCAN CLUSTERING ALGORITHM

a. FINDING SHAPES

In perceptual grouping, image elements are grouped according to some perceptual criteria. This algorithm examine what shapes may be contributed to by each pair of edges. At a high level this can be composed as recovering a graph of relational arrangement. A common approach is spectral graph theory. Probabilistic approaches in this area include Byes nets and combining evidence from raw edge attributes. More recent approaches have used EM. One of the basic algorithmic approaches here is examining pair wise relations

This approach is inherently robust, as gaps, noise, and partial occlusion are ignored, but decrease the support for the feature. These methods have been generalized to detect arbitrary shapes, where the detection space has one dimension for each parameter of the shape. In high dimensional spaces this becomes computationally intensive.

b. SIGN DETECTION

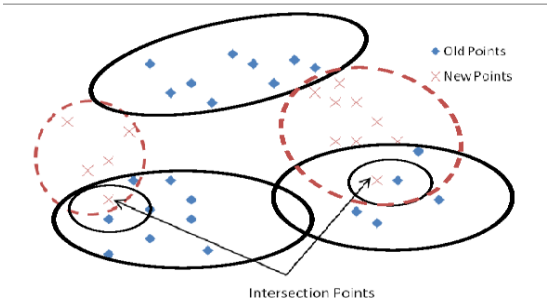
Road sign recognition research has been around since the mid-1980s. Frequently systems apply a low computational cost detection stage: aiming to detect most signs with a limited number of false positives, massively reducing the input stream. A sign must be reliably detected over the period it is visible, rather than every frame. Color based methods are sometimes based on the assumption that only the intensity of lighting changes in outdoor environments; often with statements such as that HSV or HSI spaces are invariant to lighting conditions. However, these methods break down under variation in lighting chrominance. Road scenes are generally well-structured, so some approaches search only part of the image by combining assumptions about structure with color segmentation. Such assumptions often break down on hills and sharp corners, remove large uniform regions corresponding to road and sky. However, this will fail with overhead branches and road shadows.

F. INCREMENTAL DBSCAN CLUSTERING ALGORITHM

The term incremental means "% of δ change in the original database" i.e. insertion of some new data items into the already existing clusters. Such as,

% δ change in DB = (new data – old data)/old data *100[5]

Sometimes DBSCAN may be applied on dynamic database which is frequently updated by insertion or deletion of data. After insertions and deletions to the database, the clustering discovered by DBSCAN has to be updated. Incremental clustering could improve the chances of finding the global optimum. In this approach, it forms clusters based on the initial objects and a given radius(eps) and minimum

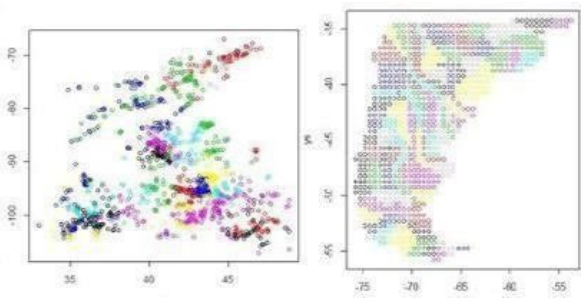


number of points (Minpts). Thus, algorithm finally get some clusters fulfilling the conditions and some outliers. Now, when new data are inserting into the existing database, have to update our clusters using DBSCAN. At first algorithm compute the means between every core object of clusters and the new coming data and insert the new data into a particular cluster based on the minimum mean distance. The new data which are not inserted into any clusters, they are treated as noise or outliers. Sometimes which fulfil the Minpts & eps criteria, combinedly can form clusters using DBSCAN [5].

G. SPATIAL TEMPORAL DBSCAN CLUSTERING ALGORITHM

ST-DBSCAN requires four parameters Eps1, Eps2, MinPts, and D_ because of the extensions. Eps1 is the distance parameter for spatial attributes (latitude and longitude). Eps2 is the distance parameter for non-spatial attributes. A distance metric such as Euclidean, Manhattan or Minkowski Distance Metric can be used for Eps1 and Eps2. MinPts is the minimum number of points within Eps1 and Eps2 distance of a point. If a region is dense, then it should contain more points than MinPts value. Simple heuristic is presented which is effective in many cases to determine the parameters Eps and MinPts. The heuristic suggests MinPts _ ln(n) where n is the size of the database and Eps must be picked depending on the value of MinPts. The first step of the heuristic method is to determine the distances to the k-nearest neighbors for each object, where k is equal to MinPts. Then these k-distance values should be sorted in descending order. Then algorithm should determine the threshold point which is the first ''valley'' of the sorted graph. User should select Eps to less than the distance defined by the first valley.

The last parameter D_ is used to prevent the discovering of combined clusters because of the little differences in nonspatial values of the neighboring locations. The algorithm starts with the first point p in database D and retrieves all points density-reachable from p with respect to Eps1 and Eps2. If p is a core object, a cluster is formed. If p is a border object, no points are density-reachable from p and the algorithm visits the next point of the database.



The process is repeated until all of the points have been processed. The algorithm starts with the first point in database D. After processing this point, it selects the next point in D. If the selected object does not belong to any cluster, Retrieve Neighbors function is called. A call of Retrieve Neighbors (object, Eps1, Eps2) returns the objects that have a distance less than Eps1 and Eps2 parameters to the selected object.

The result set forms the Eps-Neighborhood of the selected object. Retrieve_Neighbours (object, Eps1, Eps2) equals to the intersection of Retrieve_Neighbours(object, Eps1) and Retrieve_Neighbours (object,Eps2). If the total number of returned points in Eps-Neighborhood is smaller than MinPtsinput, the object is assigned as noise. This means that the selected point has not enough neighbors to be clustered. The points which have been marked to be noise may be changed later, if they are not directly density-reachable but they are density-reachable from some other point of the database. This happens for border points of a cluster. If the selected point has enough neighbors within Eps1 and Eps2 distances—if it is a core object—then a new cluster is constructed. Then all directly density-reachable neighbors of this core object are also marked as new cluster label. Then the algorithm iteratively collects density-reachable objects from this core object by using a stack. The stack is necessary to find density-reachable objects from directly density-reachable objects. If the object is not marked as noise or it is not in a cluster, and the difference between the average value of the cluster and the new coming value is smaller than D_, it is placed into the current cluster. After processing the selected point, the algorithm selects the next point in D and algorithm continues iteratively until all of the points have been processed.
Consideration both spatial and temporal neighborhoods. The non-spatial value of an object such as a temperature value is compared with the non-spatial values of spatial neighbors and also with the values of temporal neighbors (previous day in the same year, next day in the same year, and the same day in other years). By this way, non-spatial, spatial and temporal characteristics of data are used in clustering when the algorithm is applied on the table which contains temporal values, beside spatial and non-spatial values. If two clusters C1 and C2 are very close to each other, a point p may belong to both, C1 and C2. In this case, the point p must be a border point in both C1 and C2. The algorithm assigns point p to the cluster discovered first [7].

IV. CONCLUSIONS

This paper gives an idea about basic Density Based Spatial Clustering of Applications with Noise (DBSCAN) clustering algorithm and a detailed description of six density-based clustering algorithm like partitioning based DBSCAN clustering, grid based DBSCAN clustering, hierarchical DBSCAN clustering, Detection Based DBSCAN clustering, Incremental DBSCAN clustering, Spatial Temporal DBCAN clustering Based on the essential requirements required for any clustering algorithm in spatial data. Each algorithm is unique with its own features.

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The Evolution of Industry 4.0: From Punch Cards to Server Farms and Monolithic Programming to Machine Learning

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ABSTRACT

The sophisticated world we live today is just not an outcome of year or so or person or a group it's an outcome of a tremendous evolutions that took the form of a digital era as we call it today. This advent of s called digital era can be perceived as a part of several Industrial Revolutions beginning from Industry 1.0 to 4.0. Our article emphasizes the role of Computing machines and IT technologies in industry 4.0, Since coined by a German researcher in 2011, Industry 4.0 has piqued the interests of many researchers. The number of scientific publications related to Industry 4.0 or Fourth Industrial Revolution increased tremendously the goal of the industry 4.0 is transformation of industrial manufacturing through digitalization and exploitation of potentials of new technologies. An Industry 4.0 production system is thus flexible and enables individualized and customized products. Our paper has been framed beginning from the introduction of Industry 1.0 to Industry 4.0 with more elaborate dwelling in Industry 3.0 and 4.0, Finally we have concluded with an insight on the fore coming Industry 5.0.

Keywords- Industry4.0 and 5.0, Server Farms, IoT, Data Analytics, Machine Learning

I. INTRODUCTION

The history of Industry 4.0 can be traced back from the historic Industrial revolution termed as Industry 1.0 followed by Industry 2.0 and Industry 3. It has to be lucid that all these classifications are made only on the basis of the technological advancement but there is no known standardization.

Our definition of the Industrial Internet or Industry 4.0 covers three aspects

- Digitization and increased integration of vertical and horizontal value chains
- Digitization of product and service offerings
- Introduction of innovative digital business models

This industry has several stages. Each new stage represents a revolution in the manufacturing process that has changed the way we think about and work in the industry which also brought ease in human living.

a. Industry 1.0

For centuries, goods including food, clothing, houses and weaponry were manufactured by hand or with the help of work animals. By the beginning of the 19th century, though, manufacturing began to change dramatically with the introduction of Industry 1.0, and operations rapidly developed from there [1]. In the 1800s, water- and steam-powered machines were developed to aid workers. As production capabilities increased, business also grew from individual to an Industry perspective.

b. Industry 2.0

The first Industrial Revolution represented the period between the 1760s and around 1840. Historians sometimes refer to this as "The Technological Revolution" occurring mainly in Britain, Germany and America [1]. By the beginning of the 20th century, electricity became the primary source of power. It was easier to use than water and steam and enabled businesses to concentrate power sources to individual machines. Eventually machines were designed with their own power sources, making them more portable. It has been

evident that none of the Industry 1.0 or 2.0 have an invent of computing machines but just a steady start.

c. Industry 3.0

It began with the first computer era. These early computers were often very simple, unwieldy and incredibly large relative to the computing power ..In the last few decades of the 20th century, the invention and manufacture of electronic devices, such as the transistor and, later, integrated circuit chips, made it possible to more fully automate individual machines to supplement or replace operators[1]. This period also spawned the development of software systems to capitalize on the electronic hardware. Integrated systems, such as material requirements planning, were superseded by enterprise resources planning tools that enabled humans to plan, schedule and track product flows through the factory.

d. Industry 4.0

The Fourth industrial Revolution is the era of smart machines, storage systems and production facilities that can autonomously exchange information, trigger actions and control each other without human intervention [1]. This exchange of information is made possible with the Industrial Internet of things (IoT) as we know it today. Key elements of Industry 4.0 include:

- Cyber-physical system — a mechanical device that is run by computer-based algorithms.
- The Internet of things (IoT) — interconnected networks of machine devices and vehicles embedded with computerized sensing, scanning and monitoring capabilities.
- Cloud computing — offsite network hosting and data backup.
- Cognitive computing — technological platforms that employ artificial intelligence.

II. THE FOURTH INDUSTRIAL REVOLUTION

The term Industry 4.0 was first introduced in 2011 by Fraunhofer-Gesellschaft institute and the German federal government as a collective term that draws together various information exchange, automation and manufacturing technologies [2]. In other words, the Industry 4.0 is combination of Internet of Things, Cyber-physical Systems (CPS) and Internet of Services cooperating with each other and with human within a system. Industry 4.0 is mainly based on highly automated smart factories as well as smart products and services. Development toward Industry 4.0 creates various opportunities in sustainable industrial manufacturing [12]. It has an ability to produce customized and small-scale products is among the consumer needs that can be covered through Industry 4.0.

In the 21st century, Industry 4.0 connects the internet of things (IOT) with manufacturing techniques to enable systems to share information, analyze it and use it to guide intelligent actions [2]. It also incorporates cutting-edge technologies including additive manufacturing, robotics, artificial intelligence and other cognitive technologies, advanced materials, and augmented reality. The development of new technology has been a primary driver of the movement to Industry 4.0. Some of the programs first developed during the later stages of the 20th century, such as manufacturing execution systems, shop floor control and product life cycle management, were farsighted concepts that lacked the technology needed to make their complete implementation possible. Now, Industry 4.0 can help these programs reach their full potential. The complete transformation of current systems into Industry 4.0 is not a simple process and it may take a while to happen, the signs of Industry 4.0 revolution have been already observed since 2014 in sensing, big data, networking, software and various other systems.

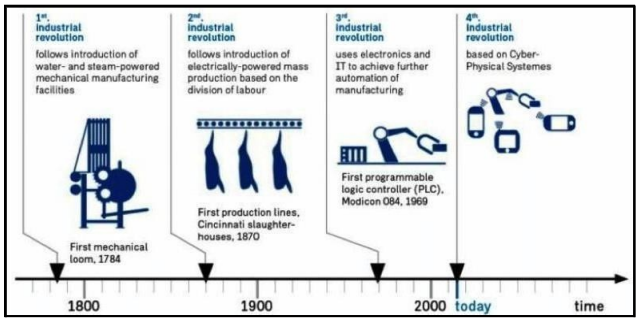


Fig.FromIndustry1.0toIndustry4.0

Previous industrial revolutions mainly focused on digital systems and various mass production technologies with the goal of liberating humankind from animal power. In January 2016, during the 46th World Economic Forum with subject of 'Mastering the Fourth industrial revolution', the founder and executive chairman of World Economic Forum (WEF), professor Klaus Schwab has published 'The Fourth industrial revolution' as a "technological revolution that will fundamentally alter the way we live, work and relate to one another". Professor Klaus Schwab described the fourth

industrial revolution as a range of new technologies that combine biological, physical and digital worlds and affect all disciplines to an extend that ideology of human being is challenged. He believes that the Fourth industrial revolution as a convergence of ICT (Information and Communication Technology) will fundamentally change the way people relate to each other which changes the way we live [1][2].

The Fourth industrial revolution will highly affect businesses through transforming the current economy and society using artificial intelligence (AI), robotics, IoT, autonomous vehicles, 3D printing, nanotechnology, biotechnology, materials science, energy storage and quantum computing. It has the potential to increase the quality of life among people through different means such as increasing the global income levels. Professor Klaus Schwab in 'The Fourth industrial revolution' clearly distinguished the Fourth industrial revolution as a separate and novel Industrial Revolution from the third one. He described the Fourth industrial revolution as a deeply interconnected world of technologies evolving at an exponential rather than previously known liner pace. He continued by mentioning the paradigm shifts that will be caused in individual lives as well as society upon Fourth industrial revolution and pointed out the fact that "It is not only changing the "what" and the "how" of doing things but also "who" we are". In the end, Professor Klaus Schwab mentioned of another aspect of Fourth industrial revolution as a transformation that covers the whole system of countries and industries as a whole that was not accounted in previous revolutions [1][2][3].

III. INDUSTRY 4.0 APPLICATIONS

The integration of industry 4.0 applications generates different advantages, both in terms of process and project:

Efficiency: of the entire process increases, sometimes dramatically.

Cost savings: are immediately accounted for, referred to increased processing time, reduced use of resources, reduction of downtimes, that reflects in a lower cost of products.

Flexibility, since it's possible to adapt products according to the operator choice. The plant can adapt itself, integrating automatically parameter modification, according to the needs, reducing dramatically latency between the request from the market the new jobs production.

Cross solution. The operator interaction is the same regardless the kind or type of control system architecture, the peculiarities of different plants are normalized through the cloud database.

IV. Industry 5.0

Industry 5.0 refers to people working alongside robots and smart machines. Industry 5.0 is about robots making humans work better and faster. It also refers to the necessary interaction between people and machines. In the manufacturing world, robots usually perform monotonous work, such as welding and painting in car factories and loading and unloading heavy materials in warehouses [5]. While science fiction is full of bad machines trying to kill humans or take over the world, in reality, robotics is practical. Think Roomba, the vacuum cleaner, and Lowboy, the robot that helps find or scan products in Lowe's home improvement stores. Pany's robots were first deployed alongside people in 2008 [3]. To understand Industry 5.0, here are three things you need to remember.

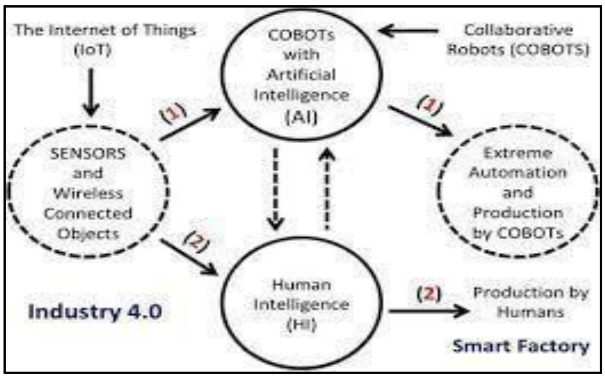
Industry 5.0 is about humans, not robots.*:* Robots are designed to help humans and make our lives better. Universal Robots uses the term "cobots" for collaborative robots to emphasize the importance of people in robotic technology [3][4] Through automation and cobots, the manufacturing process can be streamlined to allow humans to create something special and unique. The use of robots will actually bring back the human factor to manufacturing.

Industry 5.0 is meant to optimize human efficiency and productivity: Industry 4.0 is about the interconnectedness of machines and systems for optimal performance. Industry 5.0 takes such efficiency and productivity further by honing the interaction between humans and machines [4][5].A combined human and robot workforce will call for a new executive role, the chief robotics officer (CRO), who will be responsible for planning and managing all activities related to robotics and intelligent operational systems.

Industry 5.0 is inevitable: When it comes to technology, there's no turning back. The European Economic Social Committee (EESC) said it best: "The proliferation of robotic automation is inevitable [5]."

"Highly integrated systems are vulnerable to systemic risks such as total network collapse," according to the paper. While

manufacturers mull over those possibilities, they must also plan, prepare and equip themselves with the right knowledge and solutions to welcome the inevitable. The question is not whether the manufacturing industry would benefit from robotics, but how it should leverage the technology [6]. Most industries are only just getting to grips with the idea of connected factories and automated processes, as described by the term Industry 4.0.



Artificial intelligence and robotics: inevitable and full of opportunities: This is particularly the case for the manufacturing sector. Not only can technology in production enhance productivity, robots can also remove obstacles and better our working environment. Robots can help improve the working conditions in the manufacturing sector by phasing out dangerous and tedious tasks that traditionally have been done manually [5][6].

Birth of Industry 5.0:

Making Sense of Big Data with Artificial Intelligence, "The Internet of Things" and Next- Generation Technology Policy. We live in a hyper connected world and nothing seems too far, virtually. This was not always so. An unprecedented convergence over the last decade in three technology domains cultivated extreme automation, hyper connectivity, and ultimately, the IoT:

1. Broadband wireless internet availability and emergence of an inescapable, ubiquitous, and distributed computing environment across the planet,
2. Miniaturized sensors built into everyday objects and manufactured products as diverse as the milk carton in the refrigerator, home security and health monitoring systems, and collecting, connecting, and communicating data with sensors embedded in other products and humans [6].
3. Collaborative robots (co-bots) powered by AI and machine learning that permit real-time data analyses, learning, and sense making from Big Data streaming in from the embedded sensors of the IoT.

V. Conclusion

Industrial manufacturing today differs considerably from the past and there is strong evidence that this trend will also continue in the future. As technological innovations become ever more rapid, revolutions could ultimately follow one another in quick succession over the next 10 years and beyond. This industry promises to change the way business is done. Business models will be redefined, more processes will become automated, and organization will optimize their value chain even further. Whereas the first three industrial revolutions took decades to play out, today's revolutions last only as long as it takes for industry-wide implementation to complete itself. We should note that manufacturing 5.0 is an upgrade of4.0 and not entirely new. Naturally; universities are indispensable elements of this progress. It is important to carefully monitor and comparatively understand the recent developments in industry, and accordingly understand the impact of the trends in university organizations, computer science and software technologies.

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Introduction to a Semi-Automatic Chat Bot

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ABSTRACT

Dialogue systems or conversational systems including chat bots, voice control interfaces and personal assistants are examples of HCI application that have been developed to interact with users using natural language. Chat bots can help customers find useful information for their needs. Thus, numerous organizations are using chat bots to automate their customer service. Thus, the needs for using artificial intelligence have been increasing due to the needs of automated services. However, devolving smart bots that can respond at the human level is challenging. In this paper, we survey the state-of-art chat bot approaches from based on the ability to generate appropriate responses perspective. After summarizing the review from this aspect, we identify the research issues and challenges in chat bots.[4]

I. INTRODUCTION

We are a service provider company and we claim to fulfil all the requirements of customer be it ordering food, booking tickets or paying electricity bills. The chat agents are expert in their fields. But they are inefficient and they lack the continuity required in increasing throughput in enhancing business. They need breaks and relaxation time which can be harmful to business specially a start-up. So, it is natural that business wants to change it orientation from humans to automation. Chappie was born as a requirement from business side and desire for efficiency and automation. As far as automation of user experience is concerned, they are three ways. First one is the flipkart/Amazon way wherein the customer has to search for his/her product and choose it herself before initiating payment. In this case, user will get a mechanical experience and far from the user experience that a company provides. Many people in Asia and in other countries/continents are not very computer friendly and will prefer chat to get orders fulfilled. Those are our potential targets. The second way is to automate chats in a way totally oblivious to the customer. In this way, she gets the user experience while nullifying the defects of a human agent at least partly. If something goes wrong, the bots route it to a human agent. But we assume that most of the services we are dealing with like booking flights or paying electricity bills can be automated. So, the second is a hybrid approach which has both automation and human element. The third approach is to totally automate the chat. This is the biggest challenge and has not been achieved satisfactorily by any known system whether it be Siri or Iris. So, there are 3 ways to automation: - • mechanical (flipkart) • semi-automatic (Chappie) • completely automatic (Futuristic/fictional chat bot - like Jarvis shown in the sci-fi movie Ironman)

In this paper, we discuss a semi-automatic intelligent chat bot called Chappie. The entire paper concentrates on the bot only and not the human element of the overall system. The long-term idea is to slowly get rid of humans by improving on algorithms and design of system. This way we can move to the futuristic chat bot which will be completely automated and simultaneously gives a seamless user experience. In the following sections, we try to understand existing bots and their limitations in section 2. Then we try to define an intelligent chat bot in section 3 and set criteria. Afterwards, we demonstrate the working of Chappie in section 4 and how it fulfils the criteria one by one.[1]

II. BACKGROUND OF CHATBOTS

The advent of chat bots has created a new dimension to AI research. Chat bots are intelligent interfaces that can make conversation in a coherent manner. They were made to replace human beings as chat agents. The conventional chat bots use AIML, a pattern matching xml parser, as a response system. AI community have tried to construct chat bots like ALICE and ELIZA. These are generic chat bots. There are others like chat bots for cultural heritage (Pilato et al., 2005), security training (Kowalski et al., 2013), blind high school students (Bigham et al., 2008). There has been discussion on the utility of chat bots (Shawar and Atwell, 2007). All these chat bots function similarly. If we consider Alice, it basically generates an AIML file from a dialogue corpus with patterns and templates (Shawar and Atwell, 2003). The limitation begins from the presence of a corpus which assumes all knowledge comes from previous dialogue done by human agents. Secondly generating AIML from a corpus cannot guarantee a coherent chat because there is a fear of getting repetitive statements, which will worsen the user chat experience. There are two defects in existing chat bots - lack of intelligence and similar responses for repetitive statements due to the pattern matching nature of AIML. There are works which try to understand the semantics (Augello et al., 2009). But the responses are generated using statistics. In this case the responses are memorized. Also, people have tried to capture semantics through different ways of knowledge representation (Pilato et al., 2012). This seems an over fitting approach because humans have a generalist approach towards understanding concepts. Different knowledge representation has an inherent undecidability problem of application in which context thus making the system unnecessarily complicated.[5]

Concentrates on the bot only and not the human element of the overall system. The long-term idea is to slowly get rid of humans by improving on algorithms and design of system. This way we can move to the futuristic chat bot which will be completely automated and simultaneously gives a seamless user experience. In the following sections, we try to understand existing bots and their limitations in section 2. Then we try to define an intelligent chat bot in section 3 and set criteria. Afterwards, we demonstrate the working of Chappie in section 4 and how it fulfils the criteria one by one.

III. WORKING OF A SEMI-AUTOMATIC INTELLIGENT CHATBOT

In this section, we demonstrate the way a Semi-automatic Intelligent Chat bot works in practice. We show how our methodology works that can be divided into two parts:

• Getting the intent using NLP tools

• Generating the response using AIML and a counting mechanism.

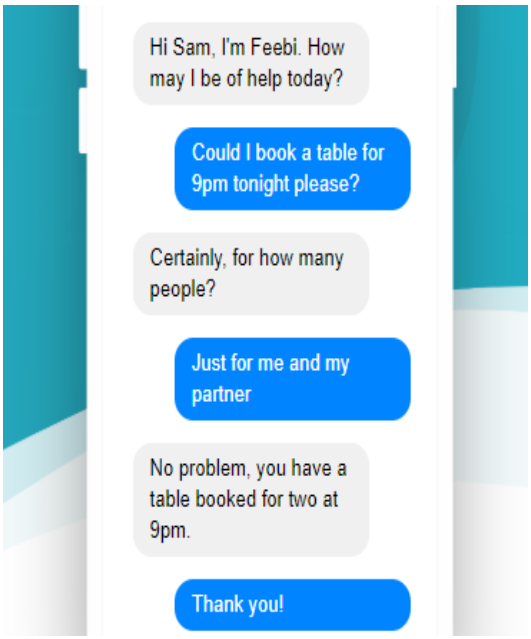
IV. INTENT EXTRACTION

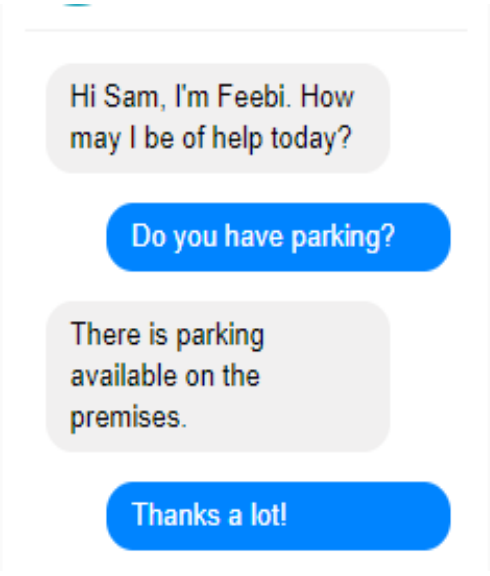
This is done to fulfil the first criterion. Every message from customer is treated equivalently. This is our key assumption. Any message can contain intent, name, email-id, places, etc. The first step is to extract names, places, emails, etc. from the message. Whatever is left can be an empty string or it may contain some intent. To get the intent, we categorize the statement based on a Naive Bayes classifier into one of the categories like food, travel, utilities, beauty-services, etc. based on services provided by our company. Then we obtain the intent and the sub-category of the message. Once we have all this information, we route the chat to a human agent who is an expert in that category. Also, we provide a score that how likely our classification is correct. This is done to generate training corpus for subsequent improvement of classification accuracy in case of messages which were wrongly classified.

V. RESPONSE GENERATION

This is done to fulfil the second and third criterion. Once we have the intent, name, email we traverse through a tree of all possible states. State is defined by the milestones achieved and the remaining milestones. If there are n milestones, there will be n! states. The tree is a representation of these states and the leaves define a particular state. It checks what all we have parsed and what items are left to be parsed and also maintains a counter for each state and that's how we solve the issue of repetition. Depending on the position in the tree and the count, we generate a response. Since we designed the tree and all possible conditions that we might have, we also designed an AIML file custom made for all such possibilities. So, we have shown how to fulfil the three criteria of an intelligent chat bot in a simple and straight forward way.[3]

The below figure represents restaurant chatbot.





VI. TOOLS FOR CREATING A SEMI AUTOMATIC CHATBOT

There are 10 tools to create a semi-automatic chat bot:

Chatty people:

Regular users of Facebook should consider utilizing Chatty People to communicate with their customers. With this tool, you'll be able to respond to customers without the need for any complex coding.

Telegram bots:

Telegram is a major messaging app. It can also be used to create a chat bot because Telegram made their code available to the open source community. Anyone can use their code to create chat bots of their own, which means the API used by Telegram can also be used.

MeOkay:

MEOKAY specializes in helping businesses to create conversational bots. Both developers and non-developers can create a perfectly passable bot using MEOKAY.

FlowXo:

FlowXO is a tool that has already created bots for FlowXO can serve as the foundation for a simple chat bot to a fully human-bot hybrid. FlowXO comes with a level of artificial intelligence that would have been unthinkable just a few years ago.

BotKit:

You need a toolkit to lay the foundations of your new chat bot. BotKit is a fantastic tool that doesn't just respond to customers but can provide conversational responses. BotKit is far better at mimicking the way humans speak

Smooch:

Incoming chat notifications can come from anywhere. They can come from business apps like Slack and Trello. They can also come in from common messaging apps, such as Facebook Messenger. Smooch is all about bringing these notifications together into one platform.

Beep Boop:

For those willing to invest in their chat bots, consider Beep Boop. It works slightly differently than the other items on this list, however. Beep Boop takes the source code created by other tools, such as those mentioned above. It then integrates this code with Facebook Messenger and Slack.

Face book Messenger Platform:

Few people know that Facebook Messenger also has its own platform that you can create a chat bot from. Although you can find it on their official page, it's designed for more complex makers of chat bots.

API.ai:

If your business needs a simple chat bot with no bells and whistles, API.ai is the option for you. You can include dialog management support and include advanced contextual functionality without the need to do anything complicated. It's a simple three-step process. And the bot trains itself over time, so it's only going to keep getting better and better.

Chat fuel:

Anyone who has a presence on Facebook may want to consider picking up Chat fuel. This tool guides you through the process of making a bot systematically. There's no coding required, therefore no need to bring in an outside developer.[2]

VII. CONCLUSION

Through A Semi-Automatic Intelligent Chat bot, we are trying to redefine chat experience in an automated manner. The novelty lies in the way we define our system as not merely a response generator but an intelligent interface to a response generator. Then we try to bring counting as a way to avoid repetitions. Overall a Semi-automatic Intelligent Chat bot is performing decently, but it needs more sophisticated algorithms to extract intent and classify chats more accurately. In the future, we will retain the milestone format but we need to scale A Semi-automatic Intelligent Chat bot to handle the entire conversation. So, there can be milestones within milestones. Overall A Semi-Automatic Intelligent Chat bot will be a cooperation of bots with a supervisor bot called Jarvis sitting on top of domain expert bots very much like the hierarchy of chat agents in our company.

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BASIC SCIENCE & HUMANITIES

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ORIGAMI ROBOTS THAT RESHAPE AND TRANSFORM THEMSELVES

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***Abstract*— Origami robots are created using folding processes, which provide a simple approach to fabricate a wide range of robot morphologies. Inspired by biological systems, engineers have started to explore origami folding in combination with smart material actuators to enable intrinsic actuation as a means to decouple design from fabrication complexity. The built-in crease structure of origami bodies has the potential to yield compliance and exhibit many soft body properties. Folding in nature creates a wide spectrum of complex morpho--functional structures such as proteins and intestines and enables the development of structures such as flowers, leaves and insect wings. Inspired by nature, engineers have started embedded smart material actuators to create origami robots. The design and fabrication of origami robots exploits top-down, parallel transformation approaches to achieve elegant designs and complex functionalities. Applications of origami robots for a variety of devices to explore folding powered by are investigated, and future directions of the field are discussed, examining both challenges and opportunities.**

Keywords—autonomous, origami robots, primer.

I. INTRODUCTION

Origami robots are autonomous machines, whose morphology and function are created by folding. Their bodies are made of many dynamic folds that act together to actuate the machine. The prototypical **origami robot** is made of a single planar sheet that is folded into a complex 3D morphology. A miniature robotic device that can fold-up on the spot, accomplish tasks, and disappear by degradation into the environment promises a range of medical applications but has so far been a challenge in engineering. Shape-shifting **origami robot** swaps bodies to roll, swim or walk. ... Heat is then applied to cause the exoskeleton to fold around the **robot** in a motion akin to a piece of **origami** assembling itself. The folds are created by lines cut into the sheet of plastic, with their depths responsible for the angle of fold.

Robots today can be made of various materials; we are no longer limited to heavy metal parts and assemblies. This project explores "informal" materials for movement of structures created from a single sheet of paper. By relying on the flexibility or rigidity of various materials, we use origami folding techniques to achieve a precise movement. Kinematics and mechanical principles seen in pop-up and flat folding structures are implemented using a laminate assembly technique.

We take inspiration from the ancient art of paper folding to create reconfigurable robots with unique attributes. Origami robots are flat, light-weight and have a large number of degrees-of-freedom, making them highly adaptable to a variety of applications. By leveraging origami characteristics along with novel fabrication techniques and actuation methods, we are creating a wide range of origami robots, including mobile robots, modular robots and adjustable stiffness structures.

II. SHAPE-SHIFTING ORIGAMI ROBOTS SWAP BODIES TO ROLL, SWIM OR WALK

A tiny transforming robot can put on special exoskeleton outfits tailor-made to help it complete different activities, including walking, rolling, sailing and gliding. This could one day be used as a blueprint for mini robotic surgeons or explorers.

Each exoskeleton starts out as a sheet of plastic onto which the robot, known as Primer, rolls. Heat is then applied to cause the exoskeleton to fold around the robot in a motion akin to a piece of origami assembling itself. The folds are created by lines cut into the sheet of plastic, with their depths responsible for the angle of fold.

The exoskeletons allow the robot to adapt to different situations. One gives it the ability to roll, meaning it can move twice as fast as without the exoskeleton; another is shaped like a boat, letting it float on water and carry nearly twice its weight. It even has a glider-shaped exoskeleton that allows it to soar when falling from a height.

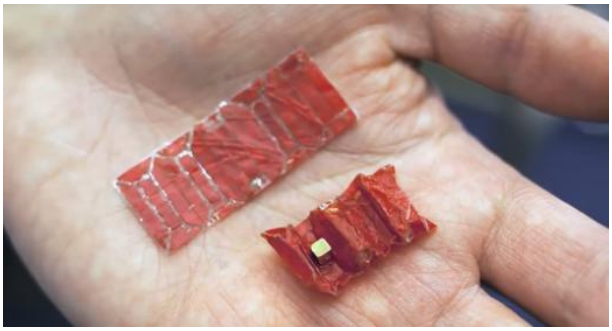
III. USED AS MINI-SURGEONS AND EXPLORERS

Once in the stomach, the tiny surgeons could use different exoskeletons to cut tissue samples or deliver medicine – applications that are still a long way off, but could have many advantages. "Some aspects of surgery could be done without incisions, pain, or infection," The robots could also be used for exploration tasks, or monitoring abandoned warehouses. This is a great example of how origami robots can take on diverse tasks using different clothing, meaning that you can mould the robot to different situations.

IV. ORIGAMI ROBOTS ARE INGESTIBLE

In experiments involving a simulation of the human esophagus and stomach, researchers at MIT, the University of Sheffield, and the Tokyo Institute of Technology have demonstrated a tiny origami robot that can unfold itself from a swallowed capsule and, steered by external magnetic fields, crawl across the stomach wall to remove a swallowed button battery or patch a wound.

The new work, which the researchers are presenting this week at the International Conference on Robotics and Automation, builds on a long sequence of papers on origami robots from the research group of Daniela Russ, the Andrew and Erna Viterbi Professor in MIT's Department of Electrical Engineering and Computer Science.



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V. ORIGAMI ROBOT FOLDS ITSELF UP, CRAWLS AWAY

In today's issue of *Science*, they report their latest milestone: a robot, made almost entirely from parts produced by a laser cutter that folds itself up and crawls away as soon as batteries are attached to it. And when these devices lift up from the ground into the third dimension, they do it in a thoughtful way." that you create this device that has computation embedded in the flat, printed version.

The robot is built from five layers of materials, all cut according to digital specifications by a laser cutter. The middle layer is copper, etched into an intricate network of electrical leads. It's sandwiched between two structural layers of paper; the outer layers are composed of a shape-memory polymer that folds when heated.

After the laser-cut materials are layered together, a microprocessor and one or more small motors are attached to the top surface. In the prototype, that attachment was done manually, but it could instead be performed by a robotic "pick and place" system.

In fact, while the researchers experimented with both single-motor and four-motor designs, the *Science* paper reports a design that uses two motors. Each motor controls two of the robot's legs; the motors are synchronized by the microprocessor. Each leg, in turn, has eight mechanical "linkages," and the dynamics of the linkages convert the force exerted by the motor into movement.

VI. ORIGAMI ROBOTSNOW COME WITH THEIR OWN TINY EXO-SKELETONS

We have probably seen origami "robots" before: flat sheets of metal or plastic that fold into bots that can walk, climb, and even swim. They're not of much practical use right now, but they represent a promising path for robot development. Now, in a bid to augment the bots' abilities, researchers at MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL) have come up with a new tool for them: origami exoskeletons. researchers describe four exoskeletons, each made out of a plastic sheet that folds into a predefined shape when heated for a few seconds. There's a boat-shaped exoskeleton and a glider: one for "walking," and another that folds up into a crude wheel for faster movement. Each exoskeleton can be donned in turn by a tiny lead boot called Primer.

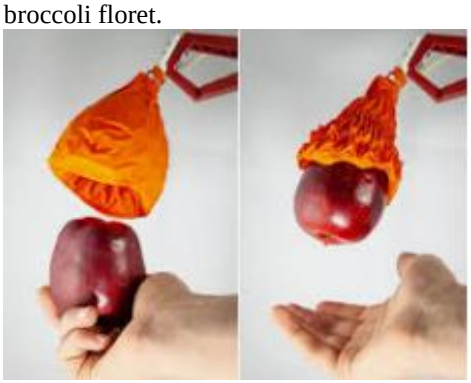
In the future, the researchers imagine this sort of approach to robot design could help up make multifunctional bots that can perform complex tasks remotely. They could be used for deep-sea mining operations, for example, or for building colonies in space. These are locations where you don't want to waste resources shipping out lots of different bots for different jobs, so it's more efficient to send one with a set of origami tools.

VII. ROBOT GRIPPER CAN GRAB DELICATE AND HEAVY OBJECTS

The gripper, which was inspired by the "origami magic ball," can surround an entire object and successfully pick it up without issues. It has three main parts: An origami-based skeleton structure, the airtight skin to encase the structure, and a connector. The team made it by using a mechanic rubber mold and an advanced heat-shrinking plastic that self-folds when it's hot. A team of researchers from MIT's Computer Science and Artificial Intelligence Laboratory (MIT CSAIL) built the robot gripper, which resembles a Venus flytrap, and it's capable of grabbing objects that are delicate or items that are 100 times its weight, Engadget reported.

Robots still have a challenging time picking up light and heavy objects, even those that have soft, flexible fingers made out of rubber. To help with this dilemma, MIT and Harvard researchers developed a new gripper: a cone-

shaped origami structure that collapses in on objects and is soft and strong enough to grasp and carry larger items. This motion enables the gripper to pick up many types of belongings, such as hammers, drones, apples, and a tiny broccoli floret.



By pairing the gripper with a standard robot, the gripper was able to grasp and lift items 70 percent of its diameter, so it was able to pick up all types of soft foods and bottles weighing over four pounds without damage. Even though the gripper can pick up cylindrical objects well, it still has some difficulty grasping flat objects, such as books and sandwiches.

Down the line, the team aims to solve the gripper's issue of angle and orientation by implementing computer vision, which would allow the gripper to "see" and pick up specific parts of items.

This is a very clever device that uses the power of 3D printing, a vacuum and soft robotics to approach the problem of grasping in a whole new way.

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A Brief Introduction to Artificial Neural Networks

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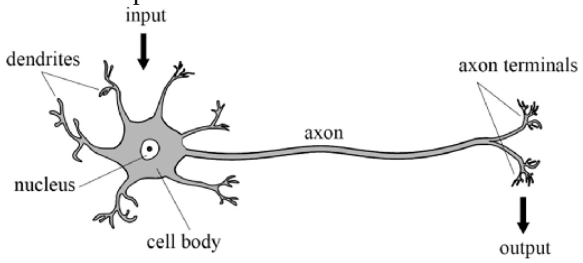
***Abstract* – Birds inspired us to fly, burdock plants inspired Velcro, and nature has inspired many other inventions. It seems only logical, then, to look at the brain's architecture for inspiration on how to build an intelligent machine. This is the key idea that inspired *Artificial Neural Networks* (ANNs).However, although planes were inspired by birds, they don't have to flap their wings. Similarly, ANNs have gradually become quite different from their biological cousins. The year 2015 was a monumental year in the field of artificial intelligence. Not only are computers learning more and learning faster, but we're learning more about how to improve their systems. Everything is starting to align, and because of it we're seeing strides we've never thought possible until now. We have programs that can tell stories about pictures. We have cars that are driving themselves. We even have programs that create art.**

I. INTRODUCTION

Artificial Neural Network (ANN) is an information processing paradigm that is inspired by the way biological nervous system, such as the brain, process information. Or we can say Artificial Neural Network (ANN)is an efficient computing system whose central theme is borrowed from the analogy of biological neural network. Artificial Neural Network acquires a large collection of units that are inter-connected in some pattern to allow communication between the units.These units, also referred to as "nodes" or neurons, are simple processors which operate in parallel. Every neuron is connected with other neurons through a connection link. Each connection link is associated with a weight that has information about the input signal. This is the most useful information for neurons to solve a particular problem because the weight exhibits or inhibits the signal that is being communicated. Artificial Neural Networks are also referred to as "neural nets", "artificial neural systems", "parallel distributed processing systems", and "connection systems". For computing systems to be called by these pretty names, it is necessary for the system to have a labeled directed graph structure where nodes perform some simple computations.

II. BIOLOGICALLY INSPIREDNEURON

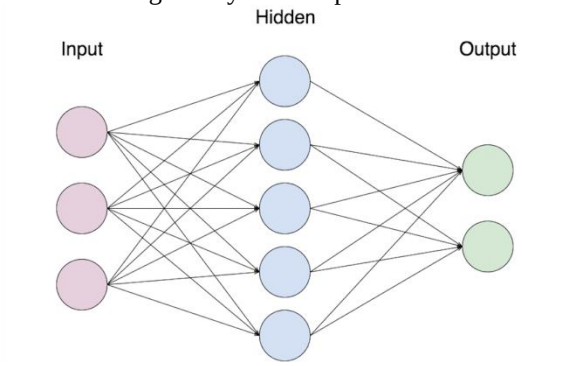
Although artificial neurons and perceptions were inspired by the biological process scientists were able to observe in the brain back in the 50s, they do differ from their biological counter parts in several ways. Biological neural networks process information in parallel; this is also true for artificial neural networks. Learning in biological neural networks is through past experience which improves their performance level; this is also true in case of artificial neural networks. Learning in biological neural networks involves adjustment of weights. A weight in artificial neuron network is similar to synapse in biological neural networks. Information transmission in biological neural networks involves using electrical signals. In artificial neural networks, electrical signals are also used in information transmission. Information storage in biological neural networks information is also stored in weights matrix. Future networks are expected to be autonomous, scalable and adaptive. During millions of years of evolution, nature has developed a number of different systems that present these and other characteristics required for the next generation networks. Indeed, a series of bio-inspired methods have been successfully used to solve the most diverse problems linked to computer networks. The key idea behind neural network is that they can talk in a lot of data, process it in parallel, and provide accurate output much as the human brain.



III. ARTIFICIAL NEURALNETWORK

Neuron in ANNs tends to have fewer connections than biological neurons. Each neuron in ANN receives a number of inputs. In ANN implementations, the

"signal" at a connection is a real number, and the output of each neuron is computed by some non-linear function of the sum of its inputs. The connections are called edges. Neurons and edges typically have a weight that adjusts as learning proceeds. The weight increases or decreases the strength of the signal at a connection. Neurons may have a threshold such that a signal is sent only if the aggregate signal crosses that threshold. Typically, neurons are aggregated into layers. Different layers may perform different transformations on their inputs. Signals travel from the first layer (the input layer), to the last layer (the output layer), possibly after traversing the layers multiple times.



The original goal of the ANN approach was to solve problems in the same way that a human brain would. However, over time, attention moved to performing specific tasks, leading to deviations from biology. ANNs have been used on a variety of tasks, including computer vision, speech recognition, machine translation, social network filtering, playing board and video games, medical diagnosis and even in activities that have traditionally been considered as reserved to humans, like painting.

ANNs are capable of learning and they need to be trained. There are several learning strategies −

Supervised Learning − It involves a teacher that is scholar than the ANN itself. For example, the teacher feeds some example data about which the teacher already knows the answers. For example, pattern recognizing. The ANN comes up with guesses while recognizing. Then the teacher provides the ANN with the answers. The network then compares it guesses with the teacher's "correct" answers and makes adjustments according to errors.

Unsupervised Learning − It is required when there is no example data set with known answers. For example, searching for a hidden pattern. In this case, clustering i.e. dividing a set of elements into groups according to some unknown pattern is carried out based on the existing data sets present.

Reinforcement Learning − This strategy built on observation. The ANN makes a decision by observing its environment. If the observation is negative, the network adjusts its weights to be able to make a different required decision the next time.

Types of ANNs include:

Single layer perceptron
Multilayer perceptron(MLPs)
Radial-Basis Function Networks (RBFs)
Hopfield network
Boltzmann machine
Self-Organization Map (SOM)
Modular networks (committee machines)

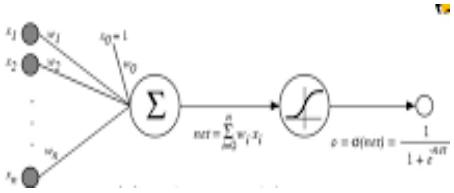
IV. FEATURES OF ARTIFICIAL NEURAL NETWORKS

- The output values can be represented as a discrete value, a real value, or a vector of values.
- Tolerant to noise in input data
- Time factor
- It takes long time for training
- Once trained, an ANN produces output values fast.
- It is hard for human to interpret the process of perdition by ANN.
- It is mathematical model implemented by mimicking brain neurons.
- It contains huge number of interconnected processing elements called neurons to do all operations
- Information stored in the neurons are basically the weighted linkage of neurons
- The input signals arrive at the processing elements through connections and connecting weights.
- It has the ability to learn, recall and generalize from the given data by suitable assignment and adjustment of weights.

The collective behavior of the neurons describes its computational power, and no single neuron carries specific information.

V. BACK PROPAGATION ALGORITHM

The back-propagation algorithm was originally introduced in the 1970s, but its importance wasn't fully appreciated until a famous 1986 paper by David Rumelhart, Geoffrey Hinton, and Ronald Williams. That paper describes several neural networks where



back propagation works far faster than earlier approaches to learning, making it possible to use neural nets to solve problems which had previously been insoluble. Today, the back-propagation algorithm is the workhorse of learning in neural networks. Information about errors is filleted back through the system and it is used to adjust the connections between the layers, thus improving performance. The Freed- Forward neural network architecture is capable of approximately most problems with high accuracy and generalization ability.

Back propagation algorithms are a family of methods used to efficiently train artificial neural networks (ANNs) following a gradient-based optimization algorithm that exploits the chain rule. The main feature of back propagation is its iterative, recursive and efficient method for calculating the weights updates to improve the network until it is able to perform the task for which it is being trained. It is closely related to the Gauss–Newton algorithm.

Back propagation requires the derivatives of activation functions to be known at network design time. Automatic differentiation is a technique that can automatically and analytically provide the derivatives to the training algorithm. In the context of learning, back propagation is commonly used by the gradient descent optimization algorithm to adjust the weight of neurons by calculating the gradient of the loss function; back propagation computes the gradient(s), whereas (stochastic) gradient descent uses the gradients for training the model (via optimization).

Why we need back propagation?

While designing a neural network in the beginning, use initialize weights with some random values or any variable for that fact. But are model is way different than out actual output that is the error value is huge. So, to reduce errors we have to train out model and called as back propagation.

VI. COMPRESSION

The transport of data across communication paths is an expensive process. Data compression provides an option for reducing the number of characters or bits in transmission. It has become increasingly important to most computer networks, as the volume of data traffic has begun to exceed their capacity for transmission. Typical algorithms that have been developed are: Huffman coding, Arithmetic coding, Shannon Fanon method, Statistical modeling and their variations. Artificial Neural Network (ANN) based techniques provide other means for the compression of data at the transmitting side and decompression at the receiving side.

Image compression refers to the amount of data required to store or transmit an image. Compressed image is then subjected to further digital processing such as error control coding encryption on multiplexing with other data sources, before being used to modulate the analog signal that is actually transmitted through the channel or stored medium.

Few of the compression techniques include:

- JPEG
- MPEG
- Wavelet
- GIF

VII. IMPLIMENTATION

ANN's are used in wide range of applications in different domains because of their advantages over conventional computation. The key functional components of artificial neuron are adders and multipliers

- The basis for the implementation is the reconfigurable hardware acceleration RAPTOR2000which is base of FPGA.
- MATLAB version R2007b
- The maximum error, MSE and PSNR are calculated

Artificial Neural Networks (ANN) has received a great attention from researchers in previous decade to predict different aspect of engineering problems. The aim of this research is to present an implementation of ANN to predict the Chloride penetration of self-consolidating concrete (SCC), containing various amounts of cement replacement minerals including fly ash, silica fume, and slag.

VIII. ADVANTAGES

Information such as in traditional programming is stored on entire network, not on a database.

- Ability to work with incomplete knowledge
- Having fault tolerance
- Having a distributed memory

In order for ANN to learn, it is necessary to determine the examples to the network, the network recess is directly proportional to the selected instances

- Gradual corruption: A network slows over time and undergoes relative degradation. The network problem doesn't corrode immediately.
- Ability to make machine learning.
- Parallel Processing capability: Artificial neural network has numerical strength that can perform more than one job at the same time.

IX. DISADVANTAGES

Hardware dependence: ANN requires processors with parallel processing power, in accordance with their structure. For this reason, the regulation of the equipment is dependent.
Unexpected behavior of network:
Most important problem

- It produces probing solution it doesn't give a clue as to why and how it is done. This reduces trust in network.

Determination of paper network structure:

- No specific rule for determining structure.
- It is through only experience, trial and error.
- Difficulty of showing problem to network.
- The duration of the network is unknown.

X. APPLICATIONS

- Every new technology need assistance from previous one i.e. data from previous ones and these data are analyzed so that every pros and cons should be studied correctly. All of these things are possible only through the help of neural network.

- Neural network is suitable for the research on *Animal behavior, predator/prey relationships and population cycles.*
- It would be easier to do *proper valuation* of property, buildings, automobiles, machinery etc. with the help of neural network.
- Neural Network can be used in betting on horse races, sporting events and most importantly in stock market.
- It can be used to predict the correct judgment for any crime by using a large data of crime details as input and the resulting sentences as output.
- By analyzing data and determining which of the data has any fault (files diverging from peers) called as *Data mining, cleaning and validation* can be achieved through neural network.
- Neural Network can be used to predict targets with the help of echo patterns we get from sonar, radar, seismic and magnetic instruments.
- It can be used efficiently in *Employee hiring* so that any company can hire right employee depending upon the skills the employee has and what should be its productivity in future.
- It has a large application in *Medical Research.*
- It can be used to for *Fraud Detection* regarding credit cards, insurance or taxes by analyzing the past records.

XI. CONCLUSION

Neural network is a computational model that stimulates some properties of the human brain. The connections and nature of units determine the behavior of a neural network. Perception is feed-forward networks that can only represent linearly separable functions. Give enough units, any functions can be represented by multi-layer feed-forward networks. Back propagation learning works on multi-layer feed-forward network. Neural networks are widely used in developing artificial learning systems.

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A note on Li-Fi: Future Wireless Technology

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***Abstract:*A breakthrough in modern technology, li-fi light fidelity the 5G visible light communication uses the visible light spectrum to transfer high amounts of data at high speeds. It suppresses the present day RF communication in terms of speed, capacity, security, accuracy, cost, electromagnetic interference and efficiency. This technology is still under research and further exploitation could lead to wide applications.**

I.INTRODUCTION

Li-Fi is light fidelity. Li-Fi uses the light to transmit the data. The speed of the Li-Fi is more when compared to the Wifi. Currently many countries were using this Li-Fi and a lot of research was going on. Now we are seeing that Wifi is helping us to make the things better, fast and easier. In this Li-Fi we are going to transmit the information using the LED (Light Emitting Diode). If we use this technology, then speed of the data transmission can be improved. As every technology evolves from the drawback of the existing technology even Li-Fi has a drawback i. e, it has the limited range of transmission. As we know that light can't be passed through the opaque substances, this becomes the obstacle for the data transmission.

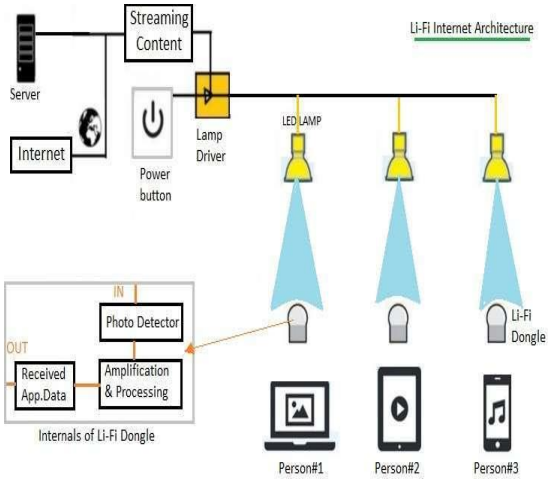
II.METHODOLOGY

The methodology used here - we will transmit the data using the LED. So we need to build the systems separately. In this separate LEDs were built in which the circuit diagram consists of the data transmission and other important tasks.

Lamp driver relates to internet on one end and with LED lamps on the other end. Streaming content from internet are pushed to the LED lamps through Lamp driver software.

LED lamps are placed at different locations as per requirement in the office or home premises for multiple users. Li-Fi dongle is used in order to use Li-Fi internet services by various users. As shown Person#1 is browsing internet in Laptop, Person#2 in tablet and Person#3 in smartphone. As shown Li-Fi dongle is composed of photo detector, amplification & processing and applications for different types of data. All the LED lamps can be switched on and off using a power button switch provided. Li-Fi internet provides very fast data rate at 1 Gbps speed.

By seeing the above diagram, we understand that the LED's are connected to the lamp driver. This lamp driver is connected to the internet and server. Here the LEDs are used as the routers in the data transmission. As it is very easy to operate the Li-Fi most of the countries are shifting to the Li-Fi.



III.HISTORY

Professor Harald Haas coined the term "Li-Fi" at his 2011 TED Global Talk where he introduced the idea of "wireless data from every light".

The general term "visible light communication" (VLC), whose history dates back to the 1880s, includes any use of the visible light portion of the electromagnetic spectrum to transmit information. The D-Light project at Edinburgh's Institute for Digital Communications was funded from January 2010 to January 2012 has promoted this technology in his 2011 TED Global talk and helped start a company to market it. PureLiFi, formerly pure VLC, is an original equipment manufacturer (OEM) firm set up to commercialize Li-Fi products for integration with existing LED-lighting systems.

In October 2011, aresearch organisation Fraunhofer IPMS and industry companies formed the LI-FI Consortium, to promote high – speed optical wireless systems and to overcome the limited amount of radio – based wireless spectrum available by exploiting a completely different part of the electromagnetic spectrum.

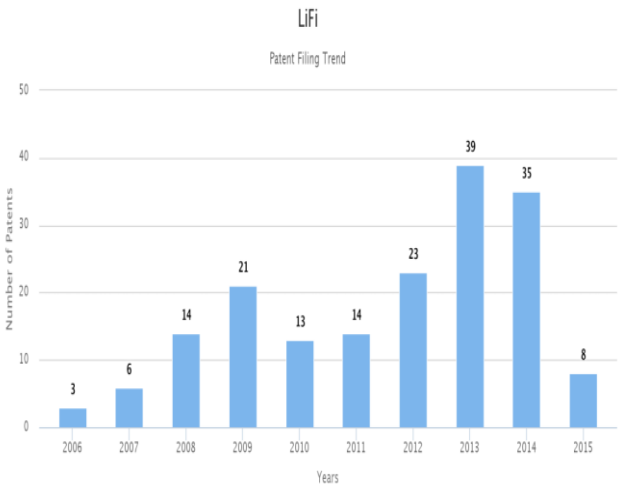
Several companies offer unidirectional VLC products, which is not the same as Li-Fi - a term defined by the IEEE 802.15.7r1 standardization committee.

VLC technology was exhibited in 2012 using Li-Fi By August 2013, data rates of over 1.6 Gbit/s were demonstrated over a single color LED. In September 2013, a press release said that Li-Fi, or VLC systems in general, do not require line-of-sight conditions. In October 2013, it was reported Chinese manufacturers were working on Li-Fi development kits.

In April 2014, the Russian company Stins Coman announced the development of a Li-Fi wireless local network called Beam Caster. Their current module transfers data at 1.25 gigabytes per second(GB/s) but they foresee boosting speeds up to 5 GB/s soon. In 2014 a new record was established by Sisoft (a Mexican company) that was able to transfer data at speeds of up to 10 GB/s across a light spectrum emitted by LED lamps.

IV.RESULTS

In 2013, we can observe that patents on Li-Fi was more because that was the time when the real time application of the Li-Fi started. Before that it was just a theory-based data transformation method.



V.COMPARISION OF LI-FI WITH WIFI

Feature	LiFi	WiFi
Full form	Light Fidelity	Wireless Fidelity
Operation	LiFi transmits data using light with the help of LED bulbs.	WiFi transmits data using radio waves with the help of WiFi router.
Interference	Do not have any intereference issues similar to radio frequency waves.	Will have intereference issues from nearby access points(routers)
Technology	Present IrDA compliant devices	WLAN 802.11a/b/g/n/ac/ad standard compliant devices
Applications	Used in airlines, undersea explorations, operation theaters in the hospitals, office and home premises for data transfer and internet browsing	Used for internet browsing with the help of wifi kiosks or wifi hotspots
Merits(advantages)	Interference is less, can pass through salty sea water, works in densy region	Interference is more, can not pass through sea water, works in less densy region
Privacy	In LiFi, light is blocked by the walls and hence will provide more secure data transfer	In WiFi, RF signal can not be blocked by the walls and hence need to employ techniques to achieve secure data transfer.
Data transfer speed	About 1 Gbps	WLAN-11n offers 150Mbps, About 1-2 Gbps can be achieved using WiGig/Giga-IR
Frequency of operation	10 thousand times frequency spectrum of the radio	2.4GHz, 4.9GHz and 5GHz
Data density	Works in high dense environment	Works in less dense environment due to interference related issues
Coverage distance	About 10 meters	About 32 meters (WLAN 802.11b/11g), vary based on transmit power and antenna type
System components	Lamp driver, LED bulb(lamp) and photo detector will make up complete LiFi system.	requires routers to be installed, subscriber devices(laptops,PDAs,desktops) are referred as stations

VI.APPLICATIONS

A. Security: In contrast to radio frequency waves used by Wi-Fi, lights cannot penetrate through walls and doors. This makes it more secure and makes it easier to control access to a network.As long as transparent materials like windows are covered, access to a Li-Fi channel is limited to devices inside the room.

B. Underwater application: Most remotely operated underwater vehicles (ROVs) are controlled by wired connections. The length of their cabling places a hard limit on their operational range, and other potential factors such as the cable's weight and fragility may be restrictive. Since light can travel through water, Li-Fi based communications could offer much greater mobility. Li-Fi's utility is limited by the distance light can penetrate water. Significant amounts of light do not penetrate further than 200 meters. Past 1000 meters, no light penetrates.

C. Aviation: Efficient communication of data is possible in airborne environments such as a commercial passenger aircraft utilizing Li-Fi. Using this light-based data transmission will not interfere with equipment on the aircraft that relies on radio waves such as its radar.

D. Hospital: Many treatments now involve multiple individuals, Li-Fi systems could be a better system to transmit communication about the information of patients.Besides providing a higher speed, light waves also have little effect on medical instruments and human bodies.Wireless communication can be done during the use of such medical instruments without having to worry about radio interferences hindering the efficiency of the task.

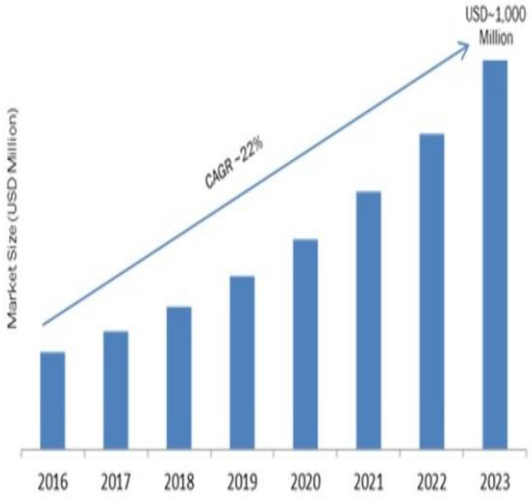
E. Vehicles: Vehicles could communicate with one another via front and back lights to increase road safety. Street lights and traffic signals could also provide information about current road situations.

F. Industrial automation: Anywhere in industrial areas data hasto be transmitted, Li-Fi is capable of replacing slip rings, sliding contacts and short cables, such as Industrial Ethernet. Due to the real time capability of Li-Fi (which is often required for automation processes) it is also an alternative to common industrial Wireless LAN standards. Fraunhofer IPMS, a research organisation in Germany states that they have developed a component which is very appropriate for industrial applications with time sensitive data transmission.

G. Advertising: Street lamps can be used to display advertisements for nearby businesses or attractions on cellular devices as an individual passes through. A customer walking into a store and passing through the store's front lights can show current sales and promotions on the customer's cellular device.

H. Education: Students and teachers can be part of a more active educational community in a classroom that is Li-Fi enabled. Students with devices such as smartphones or laptops can communicate with the teacher, or with each other, to create a more efficient learning environment. Teachers can be able to collaborate with students to help better understand class material.

VII.FUTURE SCOPE



VIII.CONCLUSION

We can conclude that in future Li - Fi is going to replace the wifi. Li-Fi is the most ideal solution for effective data transmission due to its basic building block: Light. Inexhaustible, accurate, fast, safe and cost effective, Li-Fi could potentially be the successor of Wi-Fi upon further development. Its working centers around the principle of varying the electrical signal based on the required output. Its applications range widely from toys to communication and can find uses in critical fields like military and medicine. Further research on Li-Fi is gaining pace in the recent times which will potentially resolve the many unsolved mysteries of the world.

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Is Time Relative or Absolute??

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***Abstract* - What is time? While most people think of time as a constant, physicist Albert Einstein showed that time is an illusion; it is relative — it can vary for different observers depending on your speed through space. To Einstein, time is the "fourth dimension." Space is described as a three-dimensional arena, which provides a traveller with coordinates — such as length, width and height —showing location. Time provides another coordinate — direction — although conventionally, it only moves forward. So, time is relative but not absolute.**

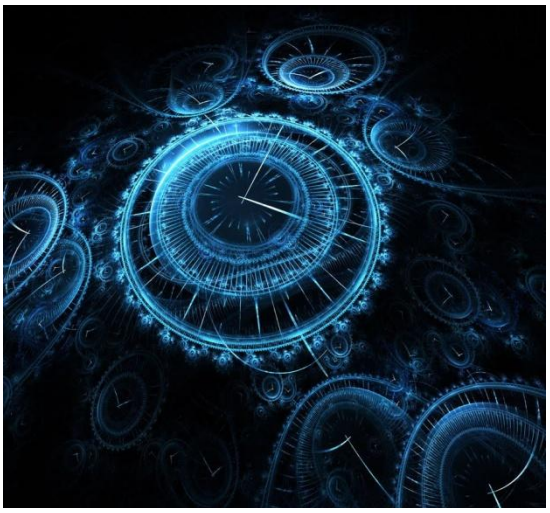
I. INTRODUCTION

Most physicists think time is subjective illusion, but what if time is real

Einstein's theory of special relativity says that time slows down or speeds up depending on how fast you move relative to something else. Approaching the speed of light, a person inside a spaceship would age much slower than his twin at home. Also, under Einstein's theory of general relativity, gravity can bend time. The bending of space-time causes objects to move on a curved path and that curvature of space is what we know as gravity. Both general and special relativity theories have been proven with GPS satellite technology that has very accurate timepieces on board. The effects of gravity, as well as the satellites' increased speed above the Earth relative to observers on the ground, make day. In a sense, this effect, called time dilation, means astronauts are time travellers, as they return to Earth very, very slightly younger than their identical twins that remain on the planet. They are many applications.

II. PARALLEL UNIVERSES

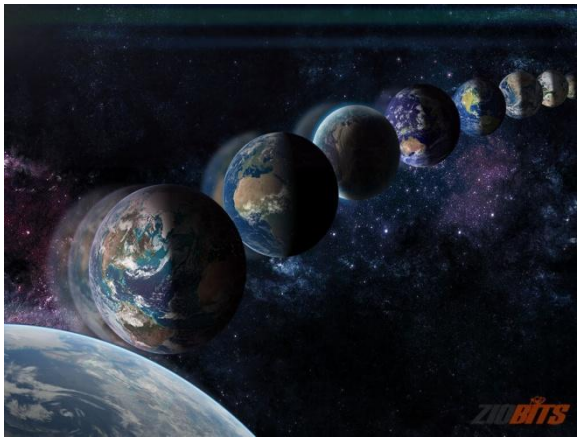
Is our universe unique? From science fiction to science fact, there is a concept that suggests that there could be other universes besides our own, where all the choices you made in this life played out in alternate realities. The concept is known as a "parallel universe," and is a facet of the astronomical theory of the multiverse. The idea is pervasive in comic books, video games, television and movies. Franchises ranging from "Buffy the Vampire Slayer" to "Star Trek" to "Doctor Who" to "Digimon" use the idea to extend plotlines. (A fuller list of parallel universes in fiction is at the bottom of the article.) There actually is quite a bit of evidence out there for a multiverse. First, it is useful to understand how our universe is believed to have come to be.

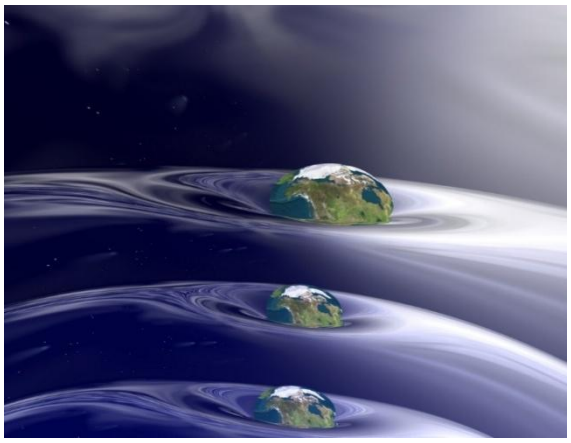


Our universe may live in one bubble that is sitting in a network of bubble universes in space.

III. ARGUING FOR A MULTIVERSE

Around 13.7 billion years ago, simply speaking, everything we know of in the cosmos was an





infinitesimal singularity. Then, according to the Big Bang theory, some unknown trigger caused it to expand and inflate in three-dimensional space. As the immense energy of this initial expansion cooled, light began to shine through. Eventually, the small particles began to form into the larger pieces of matter we know today, such as galaxies, stars and planets. One big question with this theory is: are we the only universe out there? With our current technology, we are limited to observations within this universe because the universe is curved and we are inside the fishbowl, unable to see the outside of it (if there is an outside.) There are at least five theories why a multiverse is possible, as a 2012 Space.com article explained:

1. ***Infinite universes:*** We don't know what the shape of space-time is exactly. One prominent theory is that it is flat and goes on forever. This would present the possibility of many universes being out there. But with that topic in mind, it's possible that universes can start repeating themselves. That's because particles can only be put together in so many ways. More about that in a moment.

2. ***Bubble universes:*** Another theory for multiple universes comes from "eternal inflation." Based on research from Tufts University cosmologist Alexander Vilenin, when looking at space-time as a whole, some areas of space stop inflating like the Big Bang inflated our own universe. Others, however, will keep getting larger. So if we picture our own universe as a bubble, it is sitting in a network of bubble universes of space. What's interesting about this theory is the other universes could have very different laws of physics than our own, since they are not linked.

3. ***Daughter universes***: Or perhaps multiple universes can follow the theory of quantum mechanics (how subatomic particles behave), as part of the "daughter universe" theory. If you follow the laws of probability, it suggests that for every outcome that could come from one of your decisions, there would be a range of universes — each of which saw one outcome come to be. So in one universe, you took that job to China. In another, perhaps you were on your way and your plane landed somewhere different, and you decided to stay. And so on.

4. ***Mathematical universes:*** Another possible avenue is exploring mathematical universes, which, simply put, explain that the structure of mathematics may change depending in which universe you reside. "A mathematical structure is something that you can describe in a way that's completely independent of human baggage," said theory-proposer Max Tegmark of the Massachusetts Institute of Technology, as quoted in the 2012 article. "I really believe that there is this universe out there that can exist independently of me that would continue to exist even if there were no humans."

5. ***Parallel universes:*** And last but not least as the idea of parallel universes. Going back to the idea that space-time is flat, the number of possible particle configurations in multiple universes would be limited to 10^10^122 distinct possibilities, to be exact. So, with an infinite number of cosmic patches, the particle arrangements within them must repeat — infinitely many times over. This means there are infinitely many "parallel universes": cosmic patches exactly the same as ours (containing someone exactly like you), as well as patches that differ by just one particle's position, patches that differ by two particles' positions, and so on down to patches that are totally different from ours. Famously, physicist's Stephen Hawking's last paper before his death also dealt with the multiverse. About the theory, he told Cambridge University in an interview published in The Washington Post, "We are not down to a single, unique universe, but our findings imply a significant reduction of the multiverse to a much smaller range of possible universes."

IV. TIME TRAVEL IN FICTION

Two 2015 articles by Space.com described different ways in which time travel works in fiction, and the best time-travel machines ever. Some methods used in fiction include:

1.One-way travel to the future:
The traveller leaves home, but the people he or she left behind might age or be dead by the time the

traveller returns. Examples: "Interstellar" (2014), "Ikarie XB-1" (1963)

2.Time travel by moving through higher dimensions:

In "Interstellar" (2014), there are "tesseracts" available in which astronauts can travel because the vessel represents time as a dimension of space. A similar concept is expressed in Madeleine L'Engle's "A Wrinkle In Time" (2018, based on the book series that started in 1963), where time is folded by means of a tesseract. The book, however, uses supernatural beings to make the travel possible.

3.Travelling the space-time vortex:

The famous "Doctor Who" (1963-present) TARDIS ("Time and Relative Dimension in Space") uses an extra-dimensional vortex to go through time, while the travellers inside feel time passing normally.

4.Instantaneous time jumping:

Examples include "The Girl Who Leapt Through Time" (2006), the DeLorean from "Back to The Future" (1985), and the Mr. Peabody's WABAC machine from "The Rocky and Bullwinkle Show" (1959-64).

***5.Time travelling while standing still*:**

Both the "Time Machine" (1895 book) and Hermione Granger's Time-Turner from "Harry Potter" keep the traveller still while they move through time.

6.Slow time travel:

In "Primer" (2004), a traveller stays in a box while time traveling. For each minute they want to go back in time, they need to stay in the box for a minute. If they want to go back a day in time, they have to stay there for 24 hours.

7.Traveling faster than light:

In "Superman: The Movie" (1979), Superman flies faster than light to go back in time and rescue Lois Lane before she is killed. The concept was also used in the 1980 novel "Timescape" by Gregory Benford, in which the protagonist sends (hypothetical) faster-than-light tachyon particles back to Earth in 1962 to warn of disaster. In several "Star Trek" episodes and movies, the Enterprise travels through time by going faster than light. In the comic book and TV series "The Flash," the super-speedster uses a cosmic treadmill to travel through time.

***Difficult methods to categorize*:**

There's a rocket sled in "Timecop" (1994) that pops in and out of view when it's being used, which has led to much speculation about what's going on. There's also the Time Displacement Equipment in "The Terminator" movie series, which shows off how to fight a war in four dimensions (including time).

V. TIME TRAVEL ISN'T POSSIBLE…OR IS IT?

Special relativity teaches us that the three dimensions of space and the solitary dimension of time are woven together like a fabric. It's impossible to think of them as separate entities, only a singular unified entity — space-time. We can't think of motion through space without being mindful of motion through time, and vice versa. Left-right, up-down, back-forth and past-future are all on equal footing. And yet, time does seem a little different. We have complete freedom of movement within space, but we cannot avoid our future. Time seems to have an "arrow," whereas the spatial dimensions are ambidextrous. Given the unity between time and space, it leads to the obvious question: Is time travel, of any sort, possible? Under any circumstances? At all?

Into the future: Sure

Oddly enough, the answer is yes! We cannot avoid moving into our futures, but we *can* control the rate that we move through time. This is a consequence of another lesson from relativity: Not all clocks are the same. The speed at which you move through space determines the speed at which you move through time. In the succinct phrase: Moving clocks runslow. IF you could build a big enough rocket (don't ask me how, that's an engineering problem) to provide a constant acceleration of 1g (9.8 meters per second per second; the same acceleration as provided by the Earth's gravity at its surface), you could reach the centre of the Milky Way galaxy — a healthy 20,000 light-years away — in just a couple decades of your personal time You could stop for a few hours, have a picnic near Sagittarius A* (the black hole at the centre of the galaxy), and then hop back in to your rocket and come back to Earth. By the time you return

you'll be eligible for retirement benefits, if the institution providing those benefits is even around,

because while you only travelled for a few decades according to the clock on your ship, about 40,000 years would've passed on the Earth.

A. Into the past: Nope

It's the same story every time (pardon the too-hard-to-resist pun). For every scenario
we concoct in general relativity to allow CTCs and time travel into our own past, nature finds a way to confound our plans and rule out the scenario. What's going on? General relativity allows — *in principle* — time travel into the past, but it appears

to be ruled out in every case. It seems like something funny is afoot, that there ought to be some fundamental rule to disallow time travel. But there isn't one. We can't point to any particle interaction at the subatomic level that clearly prevents the formation of CTCs. The inevitable progression of time from the past to the future resembles another indomitable law of nature: entropy. That's the iron law of thermodynamics that states that closed systems go from ordered to disordered. (This law explains why an egg will never just happen to unscramble itself if you leave it alone long enough).

VI. CONCLUSION

One of the most revolutionary concepts that we learned in the 20th century is that time is not a universal measurement. It doesn't matter how much our lives are governed by the same seconds, minutes, hours, days, and weeks, regardless of where we live on the globe, time will never be absolute. The rate at which it passes depends entirely on your speed and acceleration at any given moment.

But how exactly can time be slower and faster at the same time?

The rate at which time passes actually slows down the more you're moving. And I'm not talking about your perception of time, which recent research suggests is actually speeding up, thanks to the over-abundance of technology in our lives. I'm talking about the rate of actual time, shown in numerous experiments to slow down when particles such as muons and photons speed up. In Einstein's theory of relativity, time dilation describes a difference of elapsed time between two events, as measured by observers that are either moving relative to each other, or differently, depending on their proximity to a gravitational mass. Basically, it states that the faster we go, the more the time is affected. But if time is as relative as this suggests, it can seem a little contradictory.

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An Introduction to Night Vision Technology

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Abstract-- This article portrays the different night Vision techniques. "Night vision" is referenced as innovation that gives us the supernatural occurrence of vision in all out dimness and low light conditions. This innovation is an amalgam of a few unique techniques each having its own particular focal points and inconveniences. The most widely recognized techniques depicted here are Thermal Imaging and Image Intensification. This article additionally gives a brief thought regarding different night vision gadget(NVD) that enables pictures to be created in levels of light likewise clarifies different applications where night vision innovation is utilized different issues because of low light conditions.

Keywords:Thermal Imaging, Image Intensification, night vision innovation, (NVD).

Fig.1

A video which is shot with a Night Vision Camera in complete darkness_ link: https://youtu.be/UwKUuNXhzC8

(Source: YouTube)

I . INTRODUCTION

Night vision connotes the capacity to find in dull (night).This capacity is typically controlled by owls and felines , however with the advancement of science and technology gadgets have been created which empower the individual to find in dull also as in antagonistic barometrical conditions ,for example ,haze ,rain ,tidy etc .The muscles in the human eye can extend or contract consequently ,contingent on the power of light falling on the eye .The capacity to recognize and distinguish focuses during the evening and under poor comprehensible conditions has been a basic military prerequisite .The advanced armed forces have to work around evening time and under states of darkness .Likewise different natural life spectator need to confront issues of low light on grounds that numerous wild creatures are more dynamic amid evening time than day .In this way to make an individual unfit to find in dim by innovative means , night vision innovation has been produced.

Night vision technologies are classified into two main categories as follows:

*1. Image intensification***:** Night vision gadget using this technology amplifies light to achieve better vision. A conventional lens, captures ambient light .The gathered light is sent to the image intensifier tube. The light energy releases electrons from the cathode and accelerated. These electrons enter micro channel plate and bounce off and generate more electrons. Thousands of other electrons are released in each channel. Original electrons collide with other atoms creating a chain. In image intensifier tube, the electrons hit a screen. The energy of the electrons release photons and create green image on the screen. The green phosphor image is viewed through another lens.

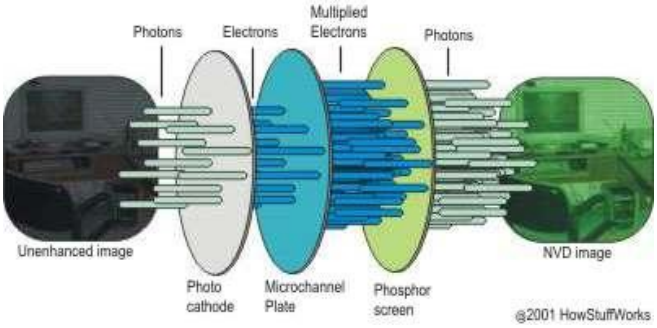

FIG.2

2. Thermal Imaging: It is the technique of using the heat given off by an object to produce an image of it or to locate it. All objects emit infrared energy as a function of their temperature. A lens focuses the infrared light. The focused light is scanned and

creates temperature pattern. The pattern created is translated into electric impulses. The impulses are sent into a circuit board that translates the raw information into data for the display. The signal-processing unit sends the information to the display, and appears as various colors.

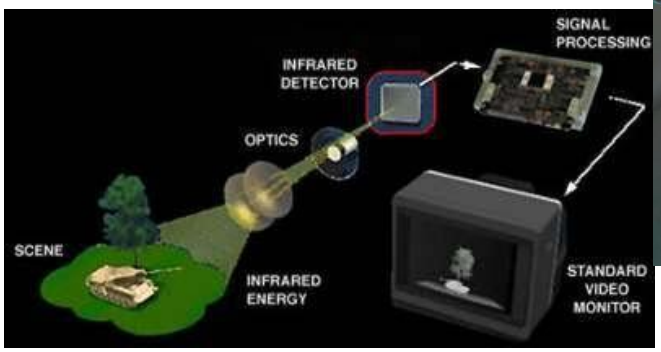

FIG.3

Advantages

- Low power and cost.
- Ability to distinguish individuals.
- High determination.

Disadvantages

- Basically no light .Substandard daytime execution when contrasted with sunlight**.**
- Magnificent low light level affectability.
- Possibility of sprouting and harm while watching splendid sources under low light conditions.

USES OF NIGHT VISION

Following are some different uses of night vision:

- Law enforcement.
- Wildlife Observation.
- Security.

FIG.4

II. CONCLUSION

In this article, we have depicted different night vision advancements which are accessible and furthermore it's working with a specific end goal to dodge different low light issue.

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Chandrayaan – 2

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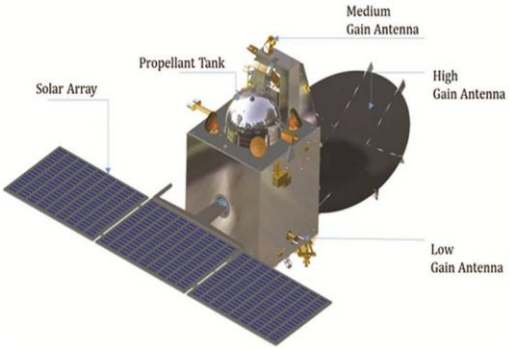
Chandrayaan-2, India's 2nd moon mission (after Chandrayaan-1 launched in 2008) was successfully launched on 22nd July at 2:43pm by GSLV-MK-3-M1 (Geosynchronous Satellite Launch Vehicle Mark 3) from second launch pad at Satish Dhawan Space Centre, Sriharikota (A.P.) What makes it so special is that it is the 1st space mission aimed to conduct soft landing in a high plane between two craters, Manzinus C and Simpelius N, at a latitude of about 70° south on moon's south polar region and it is the 1st Indian mission to explore the lunar terrain with home – grown technology.

The Rs. 978 crore Chandrayaan-2's total journey estimated to be around 3,84,000km. Its manufacturer is ISRO and it consists of fully indigenous lunar orbiter, lander (VIKRAM) and rover (PRAGYAAN). The mission of the orbiter is expected to run for a year and the same for VIKRAM lander and PRAGYAAN rover is for 14 earth days. The power intakes of orbiter, lander and rover are 1kw, 650w and 50w respectively. It provides detailed information of moon's topography and atmosphere leading to a better understanding of moon. The lander and rover will carry out experiments to find water on the lunar surface and map for chemicals topography.

It attempts to faster a new age of discovery, increases our understanding of space, stimulates the advancement of technology, promotes global alliances and inspires a future generation of explorers and scientists.

ORBITER CRAFT

It is built around a cuboidal structure and houses the propulsion tanks and separate mechanism of the launch vehicle at one end and lander at the other end. The orbiter decks have the different housekeeping systems of the space craft. The solar array consists of two solar panels which are stowed in the launch configuration and deployed on separation to provide the power required for the orbiter craft using different phases around the earth and the moon. The lithium ion battery provides power support during the eclipse and peak power requirements of the space craft. Orbiter is a three-axis body stabilized space craft with reaction wheels which provides a stable platform for imaging. Thrusters are present for momentum dumping and altitude corrections. A bio-propellant liquid engine is used to raise the orbit of the composite from earth parking orbit to 100km lunar orbit. The attitude and orbit control electronics receive the attitude data from the star sensors and the body rates from the Gyros for s/c control.



LANDER

Lander structure is a truncated pyramid around a cylinder which houses the propellant tank and the interface for the separation mechanism of orbit. The vertical panels have solar cells while the stiffener panels house all the electronic systems. The lander leg mechanism provides stability upon landing on different terrains. The body mounted solar panels provide power for the different systems during the mission in all phases. In addition, lithium ion battery supports the power requirements during eclipse and the lander descent. The electronics provide the interface to all the sensors and the actuator drives. The sensors are configured for inertial navigation from separation to the end of the rough braking and the absolute sensors determine the position & velocity with respect to the landing site to guide the lander beyond the rough braking phase to the identified site.

ROVER

Rover is a six-wheeled mobility system with the objective of performing mobility on the law gravity and vacuum of moon &in addition conducts science for understanding the lunar resources. The design of the rover is based on the well proven space rover "Sojourner" that was deployed by NASA for the exploration of mars in July 1997. Rover chassis houses all the electronics and has two navigation cameras to generate stereo images for path planning. The deployed solar panel provides the power during the mission. The rocker bogie mechanism along with the six wheels ensures rugged mobility system over obstacles and slopes along the identified path for exploration of region. The two rover payloads conduct science on the lunar surface.

ORBIT

The lander – orbiter pair will go into an initial elliptical (170×45,475km altitude) earth orbit, followed by a trans–lunar injection. Both craft go into an initial elliptical lunar orbit. After orbit insertion, the lander and orbiter separate. The orbiter evolves into a 100km circular polar orbit and the lander brakes from orbit and lands on the surface in high latitude areas near the South Pole.

The Chandrayaan-2 mission profile starts with the GSLV MK3 launch vehicle injecting the combined stack of lunar orbiter and lander nodules (wet mass -3320kg) into a transfer orbit. The orbiter & lander are injected to a 170×45,475km transfer or EPO (Earth parking orbit by the launch vehicle. A series of mid – course orbit rising maneuvers and the final insertion maneuver are performed to place the space craft in a 100×100km circular lunar orbit. Based on mission planning, after achieving the desired initial conditions, the lander is separated from orbiter and a short burn de-boost is carried to reduce the perilune to 6 km. After a long coast phase, the lander will reach the perilune. Near the perilune, a second longer de-boost burn is carried out for horizontal breaking. The objective of the braking phase is to efficiently kill the horizontal velocity to zero at desired altitude. The lander will then follows a vertical descent, during which periodic firing shall be done to reduce the vertical velocity & achieve 0 m/s velocity, at 4m height where the thrust will be cutoff. The final phase is the free fall from 4 m to impact point with touchdown velocity less than 5 m/s.

MISSION PROFILE

This integrated navigation system consists of an INS (inertial navigation system), star tracker (2), altimeter (2) and image sensor (2) will be utilized.

Altitude control thrusters placed at the bottom of space craft, to decelerate the space craft for braking and soft landing on lunar surface. The lander craft will be released from lunar orbit, which will further undergo various lunar bound phases like de-boosting, rough braking, precision breaking and vertical descent. The engines will be operated together in different phases to reduce space craft's velocity to move from 100km north pole to 6 km South Pole lunar altitude location. The lander will have onboard a radio altimeter, a pattern detection camera and a laser inertial reference and accelerometer package (LIRAP). The thermal protection system has been designed to maintain the temperature of lander-craft systems within the soft limits during this phase.

The lander-rover module with a mass of about 1250kg will be soft landed on the specific lunar south polar site. The lander will deploy a lunar rover (~20kg) to carry out in-site analysis. The rover comprises of six independently driven wheels which are connected to the body of the rover using a rocker –bogie mechanism with 10 degree of freedom (DOF). Rover chassis houses all electronics and has two cameras for generating stereo images for path planning. The deployed solar panels provide all the power during the mission. Rover is the integration of locomotion, navigation system, communication system, manipulator and science equipment. Onboard software will allow the rover to roam the surface of the moon in a semi –autonomous manner.

ISRO will provide partial command and control instructions from the ground.

MISSION OPERATIONS

One of the key elements essential for safe landing is the Hazard detection and Avoidance (HDA) system. The HDA system comprises of several sensors like Orbiter Higher Resolution Camera (OHRC) for characterization of landing site, cameras for horizontal velocity calculation, camera for pattern matching and position estimation, microwave and laser altimeter, laser doppler velocimeter. All these sensors provide information like lander's horizontal velocity, vertical velocity. The HDA system on board the lander processes the inputs from various sensors, compass the data collected with the information already stored in the lander and provides the required inputs to the Navigation and Guidance system in real time to correct the trajectory at the end of rough braking to enable a safe and soft landing.

The spacecraft consists of an orbiter, a lander and a rover together referred to as "Composite Body". Lander was separated from the orbiter on September 2.

TECHNOLOGY

Orbiter sensor compliment: (CLASS, XSM, IIRS, SAR, CHACE-2, TCM-2)

The Chandrayaan-2 orbiter will orbit the moon at an altitude of 100km.The mission will carry five instruments on the orbiter. Three of them are new, while two others are improved versions of these flown on chandrayaan-1.

CLASS (Chandrayaan 2 Large Area Soft X-Ray Spectrometer)

CLASS is provided by ISAC (ISRO Satellite Centre), Bengaluru. The objective of the CLASS is to nap the abundance of the major rock forming elements on the lunar surface using the technique of X-ray florescence during solar flare events. CLASS is expected to provide global maps of major elements from Na to Fe at resolutions of a few tens of km. Together with mineralogical data this would provide a comprehensive picture of lunar surface chemistry.

XSM (Solar X-Ray Monitor)

XSM is provided by the PRL (Physical Research Laboratory) of Ahmedabad for mapping the major elements present on the lunar surface. XSM instrument will have two packages namely, the XSM sensor package and the XSM electronics package. XSM on board Chandrayaan-2 will be the 1st experiment to use such detector for solar x-ray monitoring.

IIRS (Imaging IR Spectrometer)

The IIRS instrument is provided by SAC of Ahmadabad. The goal is to map the lunar surface over a wide wave length range for the study of the minerals, water molecules and hydroxyl present .Study of mare volcanism, variations in basaltic compositions, mantle heterogeneity at basin and local scale.

SAR (Synthetic Aperture Radar in L- and S- band)
SAR was developed at SAC (Space Applications Centre), Ahmedabad for probing the 1st few tens of the lunar surface for the presence of different constituents including water, ice.SAR is expected to provide further evidence conforming the presence of water ice below the shadowed regions of the moon.

CHACE-2(Neutral Mass Spectrometer)

CHACE-2 developed at SPL (Space physics laboratory), Thiruvananthapuram to carry out a detailed study of the lunar exosphere. The CHACE-2 will be used to study the global distribution of the lunar exosphere. It will also study of the day-night variation of the lunar neutral exosphere as well as the variation during the passage through the geomagnetic tail.

TMC-2(Terrain Mapping Camera -2)

TMC-2 is provided by SAC (Space Applications Centre), Ahmedabad. The objective is to prepare a 3-D map essential for studying the lunar mineralogy and geology.

Vikram Lander Sensor Compliment (RAMBHA, ChaSTE, ILSA, LRA)

The Chandrayaan-2's VIKRAM Lander will detach from the orbiter and descend to a lunar orbit of 30km x 100km using its 800N liquid main engines. It will then perform a comprehensive check of all its on-board systems before attempting to land on the lunar surface.
RAMBHA (Radio Anatomy of Moon Bound Hypersensitive Ionosphere and Atmosphere)

The RAMBHA instrument is provided by the SAC Thiruvananthapuram. RAMBHA is a unique payload package that would provide a comprehensive exploration of lunar plasma environment. RAMBHA consists of three experiments, a LP (Langmuir Probe) and DFRS (Dual Frequency Radio Science).

ChaSTE (Chandra's Surface Thermo physical Experiment)

It is provided by PRL (Physical Research Laboratory). The goal is to measure vertical temperature gradient and thermal conductivity within the top 10 cm of regolith.

ILSA (Instrument for Lunar Seismic Activity)

It is provided by ISRO. The objective is to measure seismicity around the landing site.

LRA (Laser Reflector Array)

It is provided by NASA /GSFC for precise measurements of earth moon distance.
Rover Sensor Complement (APXS, LIBS)

APXS (Alpha Particle X-Ray Spectroscope)

The APXS is provided by PRL (Physical Research Laboratory) of Ahmedabad. The objective is to study the elemental compositions of lunar rock and soil onboard Chandrayaan-2 rover by irradiation the lunar surface with alpha particles and x rays using a radioactive alpha particle source.

LIBS (Laser Induced Breakdown Spectroscope)

It is developed by LEOS (Laboratory of Electro Optic systems), Bengaluru. The objective is to perform multi element determination matter in diverse forms namely solid, liquid or gas.

A note on Evolution of computers

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***Abstract*—This article presents the five generations of computers and major technology developments that have led to the computing devices that we use today. The history of computer development is a computer science topic that is often used to reference the different generations of computing devices. Each one of the five generations of computers is characterized by a major technological development that fundamentally changed the way computers operate. Most major developments from the 1940's to present day have resulted in increasingly smaller, cheaper, more powerful and more efficient computing devices.**

I. INTRODUCTION

A complete history of computing would include a multitude of diverse devices such as the ancient Chinese abacus, the Jacquard loom (1805) and Charles Babbage's "analytical engine" (1834). It would also include discussion of mechanical, analog and digital computing architectures. As late as the 1960s, mechanical devices, such as the Marchant calculator, still found widespread application in science and engineering. During the early days of electronic computing devices, there was much discussion about the relative merits of analog vs. digital computers. In fact, as late as the 1960s, analog computers were routinely used to solve systems of finite difference equations arising in oil reservoir modeling. In the end, digital computing devices proved to have the power, economics and scalability necessary to deal with large scale computations. Digital computers now dominate the computing world in all areas ranging from the hand calculator to the supercomputer and are pervasive throughout society. Therefore, this brief sketch of the development of scientific computing is limited to the area of digital, electronic computers.

The evolution of digital computing is often divided into *generations*. Each generation is characterized by dramatic improvements over the previous generation in the technology used to build computers, the internal organization of computer systems, and programming languages. Although not usually associated with computer generations, there has been a steady improvement in algorithms, including algorithms used in computational science. The following history has been organized using these widely recognized generations as mileposts.

II. GENERATIONS

A. 1st generation (1940-1956): The first computer systems used vacuum tubes. These are invented by Lee De Forest.

Hardware Technology:-

- They used vacuum tubes for circuitry and magnetic drums for memory.
- Input of the computer was through punched cards and paper tapes.
- Output was displayed as printers.

Software Technology:-

- Instructions were given in machine language i.e., 0 or 1 for coding.
- They could solve one problem at a time.

Physical appearance:-

- These computers were enormous in size and required a large room.

Examples:-

- UNIVERSAL Automatic computer (UNNAC).
- Electronic Numerical Integrator and calculator (ENIAC).

They were used for scientific application as they were fastest computing devices.

B. 2nd generation (1956-1963): These are designed using transistors. These are invented by Bardeen, Brattain, Shockley.

Hardware Technology:-

- Transistors allowed computers to become smaller, faster, cheaper, energy efficient and reliable.
- They used Magnetic core technology-10 memory
- Magnetic tapes and disks-20 memory
- They used the concept of stored program where instructions were stored in the memory of computer.

Software technology:-

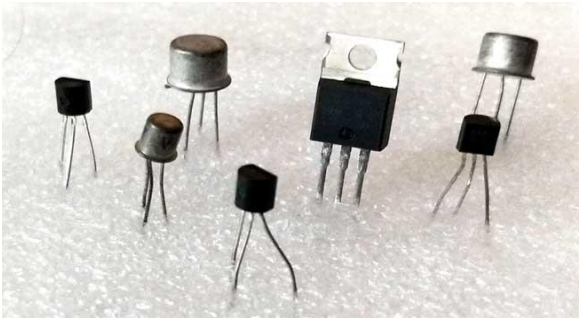
- Instructions were written using assembly language i.e., ADD for addition etc.
- It is easier to write instructions in assembly language than writing instructions in machine language.
- High level programming languages such as COBOL, FORTRAN were developed during this period.

Physical appearance:-

- As transistors are smaller in size compared to vacuum tubes, thus computer size is reduced.

Examples:-

PDP-8, IBM 1401&CDC 1604.



The cost of commercial production of these computers is very high, though less than 1st generation computers. Transistors had to be assembled manually in 2nd generation computers.

C. 3rd generation (1964-1971): These are designed using integrated circuits. These are invented by Rober Noyee and Jack kilby.

Hardware technology:

- In an IC chip, multiple transistors are placed on a silicon chip.
- Silicon is a semiconductor, the use of IC is to increase speed and efficiency of computer.
- They used keyboard and monitor to interact with 3rd generation computers.

Software technology:

- The keyword and monitor were interfaced through the operating system.
- Operating system allowed different applications to run at the same time.
- High level languages are used.

Computing characteristics:

- Computing time was in nanoseconds.

Physical appearance:

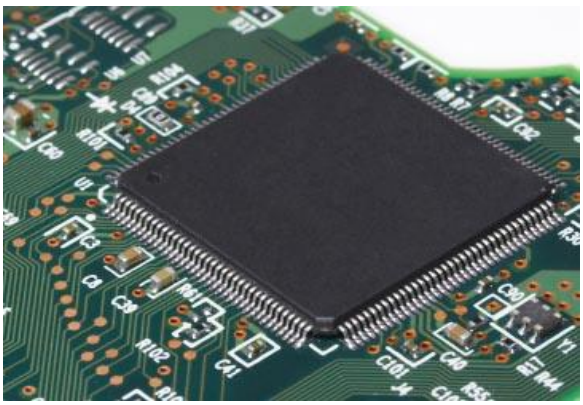
- The size of the computers are quite small compared to 2nd generation computers.

Examples:

- IBM 370, PDP 11.

Computers became accessible to mass audience. They are smaller, cheaper than their predecessors.

D. 4th generation(1971-present): These are designed using microprocessors, which was invented by Ted Holf & Stanley Mazor.



Hardware technology:

- They used Large scale integration (LSI) and very large scale integration (VLSI).
- Thousands of transistors are integrated on a small chip using LSI technology.
- The computers were linked to form networks that led to the emergence of Internet.
- The generation also saw the development of pointing devices like mouse and handheld devices.

Software technology:

- Several new operating systems like the MS-DOS and MS-Windows developed during this time.
- This generation of computers supported Graphical User Interface (GUI).
- GUI is user friendly interface that allows user to interact with the computer via menus and icons.
- High level programming languages are used.

Computing characteristics:

- Computing time is picoseconds.

Physical appearance:

- They are very small that they can be fit into the palm of hand.

Examples:

- Intel 4004 chip was first microprocessor.

They are used for commercial purposes. Personal computers became available to the home user.

E. 5th generation (present-next): These are invented by James Maddox using Artificial Intelligence. Scientists are now trying to develop 5th generation computers in a way that they can think on their own. This is called Artificial Intelligence. Robots work on this technology.

Super computers: A supercomputer is a type of computer that has the architecture, resources and components to achieve massive computing power. Today's super computers consist of tens of thousands of processors that are able to perform billions and trillions of calculations or computations per second. Supercomputers are primarily are designed to be used in enterprises and organizations that require massive computing power. A supercomputer incorporates architectural and operational principles from parallel and grid processing, where a process is simultaneously executed on thousands of processors or is distributed among them. Although supercomputers houses thousands of processors and require substantial floor space, they contain most of the key components of a typical computer, including a processor(s), peripheral devices, connectors, an operating system and applications. As of 2013, IBM Sequoia is the fastest supercomputer to date. It has more than 98,000 processors that allow it to process at a speed of 16,000 trillion calculations per second.

Artificial Intelligence and Influencing Factors on Recruitment of Engineering Students

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***Abstract*—Artificial Intelligence is showing lots of influence on the industry and at the same time on the potential employability of technical graduates. Electronic companies in India are also trying to adopt the latest technologies in all functional areas of Artificial Intelligence and at the same time expecting various skills and talents from the technical graduates to recruit in their organizations. Artificial Intelligence (AI) is influencing to a great extent in the recruitment process. This article focuses on the skills and talents that are expected to be possessed by the potential candidates for getting into absorbed in the industries and organizations in the era of influence of Artificial Intelligence .**

Keywords—Artificial Intelligence, speech recognition, object detection, solving problems

Artificial Intelligence is emerging field to all areas and speeding up exponentially. AI is used all day in many jobs in organizations and other places. The main aim of AI is to create intelligent machines. All industries are adopting AI due to its potential use which contributes for the productivity of the organizations. Artificial Intelligence helps in speech recognition, object detection, solving problems and learning from given set of data, plan an approach for future tasks to be performed and many other significant tasks where human beings face difficulty in the performance.

Recent consumer electronics trade show's held at various places in India shows the influence of AI on electronic devices. The recent iPhone 11, iPhone 11 Pro and iPhone 11 Pro Max has been launched with great enthusiasm all over the world as Apple has confirmed that it has used the AI technology in the manufacturing and even launching of the iPhone on September 10th 2019. It has been launched at Steve Jobs Theater in Cupertino, California. AI is not only confined to one area but it has been to all areas in everyday life of all of us. It is a general perception that machines are taking away humans jobs and talents. Proved research has shown that machines can do equal or sometimes even better than human beings.

AI is showing influence in the functions of one and all like retail sales people, Psychological testers, financial reporters, crew members on guided – missile destroyers, hiring managers etc. AI is going to replace the jobs of car drivers and medical field, functions of Government and even in software applications. At the same time organizations are not able to get the right talented people to cater their needs. Top companies like Wipro, HCL, Syntel etc in Private sector and Public sector organizations like BHEL (Bharat Heavy Electricals Limited), ECIL (Electronics Corporation of India Limited) and NTPC (National Thermal Power Corporation) are also in the adoption of the AI in their organizations. In the recently launched ISRO Chandrayaan-II it is known fact that scientists have relied on AI to a great extent and have been successful to much extent by its usage. AI is not only confined to one area but we can see its presence in every second and every day of our life in near future.

It is a surprising factor that on one side all the employees working in the organizations and the potential technical graduates and others are worried about their losing jobs and placement. At the same time the organizations are spending crores of rupees in the investment of AI and training, and at same time worried about the availability of the right people to cater its need in all functional areas of the industry. AI is an interdisciplinary field. It is not just related only to computer or IT branch. The existence of AI is extended to a large extent to Electronics and Communication engineering and even other branches of engineering.

When coming to the influence of AI in the area of Electronics and Communication Engineering branch AI has several applications in many areas. For example, if we take the example of Robot which needs to perform various tasks like walking smoothly avoiding hurdles in the task and performing smoothly a specific task, the role of Electronics come into interference. Embedded systems will be part of the function of the robot. Without restricting or confining to a particular area its impact is seen in all signaling system, communication system etc in railways, air force and even in defence areas. All Semi conductor companies in India like Intel, Qualcomm, Nvidia etc run adopting and making more research in the areas of AI. Thus, to cater the needs of the industry we must get ready to acquire the knowledge of AI and along with that we must acquire certain skills to get into the organizations. The skills set can be like:

- High degree of imagination
- Creative analysis
- Strategic thinking
- Building relationships
- Persuasion
- High levels of flexibility
- High energy levels , Government of India is concentrating FIT INDIA programme on war footing basis as it recognized the urgent levels of healthy youth to cater the needs of the industry.

- As per the recommendations of WHO and in its research it is found that in India many young people may have required set skill set but they are not physically and mentally fit to perform the task at 360 degree level. So FIT INDIA programmes

Plenty of new jobs will be coming to the doorsteps of industry. Some of the job roles are still at its primary stage and may come into full length in a short period. Many of the future job roles will take birth in the coming years. At the same time it's really a blessing to get adapted to the AI technology. The following are the facts with regard to the AI in India with respect to the companies.

- In a proved research it is found that 83 percent of the organizations feel that humans and AI will work together in the journey of attracting and hiring future ready candidates.
- 61 percent of companies in India investing in AI recruitment procedure process
- 34 percent of companies do not have the right technology for the hiring process
- Organizations in near future adopt AI in recruitment in areas of resume collection, Candidate matching, Interview scheduling, Pre-Screened assessment and candidate sourcing etc.
- To grab the job in the latest areas new techniques of interview skills must be practiced. Eg., Social media, Video Interviews, acquiring knowledge in interview scheduling software etc as these are gaining in favour as ways to augment interviews
- It's a known fact that organizations are also under a pressure to hire the best candidates in an increasingly tight job market.
- 53 percent of companies in India prioritize recruitment of engineering candidates with speed and quality.
- Companies like Infosys are planning to conduct physical and mental fitness tests along with technical and HR rounds to the prospective employees. This measure is taken into account as lots of money and time is being invested on the recruitment and training levels of employees and at the same time employees are not able to work as per the requirements of the organizations reaching the dead lines of the task assigned. Many of the employees are availing their sick leaves in the hour of need to the organizations.
- Organizations are taking care of health of employees and due to that reason gym, yoga centres, meditation halls have been part of the organizations. Stress management, time management and crisis management etc have been part of the training to the employees along with other technical training.

CONCLUSION

Thus we can see the world is changing at a considerable pace and so is the talent. Organizations are shifting their strategies and adopting latest technologies to survive and compete in the corporate world. Technical graduates are always in demand if they possess the required skills and make learning a continuous process accepting the challenges of the corporate world and keeping ourselves fit in all aspects.

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