PROCEEDINGS

OF THE

FIFTH NATIONAL CONFERENCE ON

REVOLUTINIZE ELECTRONICS AND COMMUNICATION TECHNOLOGIES

EDITORS

Prof. Pavitha P.P.

Prof. Ambika Sekhar

REACT '21

ORGANIZED BY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION

SREE BUDDHA COLLEGE OF ENGINEERING,

PROCEEDINGS OF THE

FIFTH NATIONAL CONFERENCE ON

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Department of Electronics and Communication Engineering

Sree Buddha College of Engineering

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MESSAGE

The 5th Annual Conference Series of Sree Buddha College of Engineering, Pattoor was conducted as an online event on 10th and 11th June 2021. Under the SBCE Conference Series, Department of Electronics and Communication Engineering hosted an Online National Conference on "Revolutinize Electronics and Communication Technologies - REACT 2021" with subthemes relevant to recent advancements in the varied areas of Electronics. I am glad to note that the technical papers which were presented in the REACT 21 conferences by the academicians, researchers and students doing their research work in various areas of computer science and engineering are now published as an e-book with ISBN No 978-93-5493-870-2. I appreciate the organizers for their effort and hope that the papers in this volume would be useful as reference material for the interested researchers and students.

Prof. K. Sasikumar

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FOREWORD

Sree Buddha College of Engineering (SBCE), Pattoor has been organizing Annual Conference Series from the year 2017 to provide a common forum for the academicians, researchers, industrial experts and students from the fields of Engineering and Technology to present their research outcomes, discuss recent advancements in respective fields and to explore future research avenues. The fifth Annual Conference Series was conducted as an online event on 10th and 11th June 2021. The Conference Series was inaugurated on 10th June in online mode. Dr. Amares Singh, Professor, SEGI University, Malaysia was the Chief Guest and Keynote Speaker of the function. A total of about 200 technical papers selected based on the review of received papers were presented in the six conferences by the authors which included industrialists, researchers, academicians and students from various engineering colleges in India. Department of Computer Science and Engineering hosted an Online National Conference on "Revolutinize Electronics and Communication Technologies.- REACT 2021" with subthemes relevant to recent advancements in the various areas of electronics and communication engineering. The online conference REACT'21 covered two days and program was further enriched by the presence of Dr. Sreeni K.G. and Dr. Lizy Abraham. I am happy that the technical papers which were presented in the REACT '21 conference are now published as an e-book with ISBN No 978-93-5493-870-2. I appreciate the valuable effort of the organizing team and earnestly hope that the proceedings will be useful for researchers, teachers, students and all those interested in the topics. I am glad to present this volume to the scientific community.

Dr. K.Krishakumar

ACKNOWLEDGEMENT

The Department of Electronics and Communication, Sree Buddha College of Engineering, Pattoor, Alappuzha, Kerala organized an Online National Conference "REVOLUTIONIZE ELECTRONICS AND COMMUNICATION TECHNOLOGIES" on 10th and 11th June 2021. The conference was inaugurated by Dr. Sam Koshy and the keynote speakers were Dr. Lizy Abraham, Dean Research & Consultancy, LBS Institute of Technology for Women and Dr. Sreeni K.G., Associate Professor, College of Engineering, Trivandrum. The conference provided amble opportunity for UG and PG scholars to exchange and share their ideas, experiences, and research results on various aspects of Electronics & Communication Engineering which include Smart Embedded System using IoT, Artificial Intelligence and Robotics, Image Processing using Machine learning and Deep learning, Low Power VLSI Design and Signal Processing. There were more than 30 participants from different engineering colleges inside and outside Kerala. Best paper award was given to Vaishak N Thrilok, B. Tech Scholar, Presidency University, Bangalore for his paper titled "Greenhouse gases emission monitoring". The conference was winded up with valedictory session. Delegates from various engineering colleges within and outside the state of Kerala, actively participated in the online conference. We thankfully acknowledge the contributions made by each member of Department of Electronics and Communication Engineering, SBCE for the success of the REACT 2021 conference.

Prof. Pavitha P.P, Asst.Prof. Ambika Sekhar

(Editors, REACT'21)

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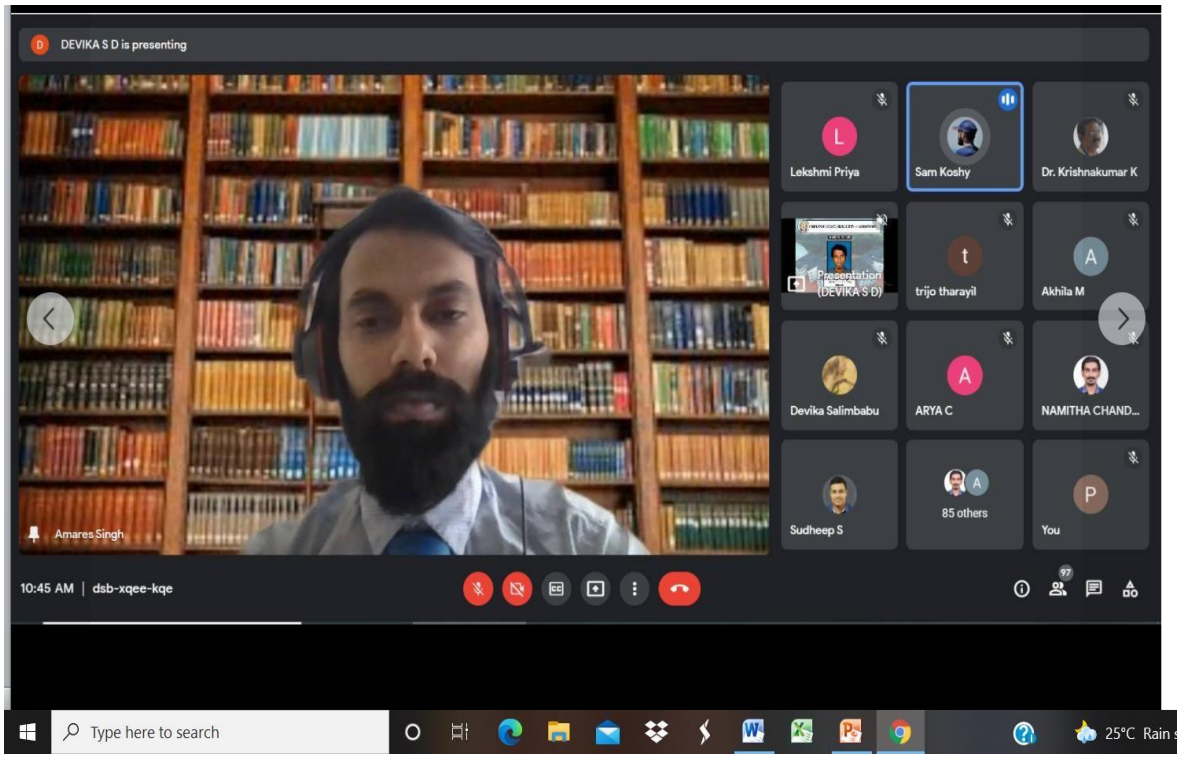
Name of the Activity/Event	Online National Conference REACT '21
Type of the Activity/Event	Student activity
Funding agency	Institute
Department	Electronics and Communication
Academic year & Date	10th and 11th June 2021

Description

The department of Electronics and Communication, Sree Buddha College of Engineering, Pattoor, Alappuzha, Kerala organized an Online National Conference "REVOLUTIONIZE ELECTRONICS AND COMMUNICATION TECHNOLOGIES" on 10th and 11th June 2021. The conference was inaugurated by Dr. Sam Koshy and the keynote speakers were Dr. Lizy Abraham, Dean Research & Consultancy, LBS Institute of Technology for Women and Dr. Sreeni K.G., Associate Professor, College of Engineering, Trivandrum. The conference provided amble opportunity for UG and PG scholars to exchange and share their ideas, experiences, and research results on various aspects of Electronics & Communication Engineering which include Smart Embedded System using IoT, Artificial Intelligence and Robotics, Image Processing using Machine learning and Deep learning, Low Power VLSI Design and Signal Processing. There were more than 30 participants from different engineering colleges inside and outside Kerala. Best paper award was given to Vaishak N Thrilok, B.Tech Scholar, Presidency University, Bangalore for his paper titled "Greenhouse gases emission monitoring". The conference was winded up with valedictory session.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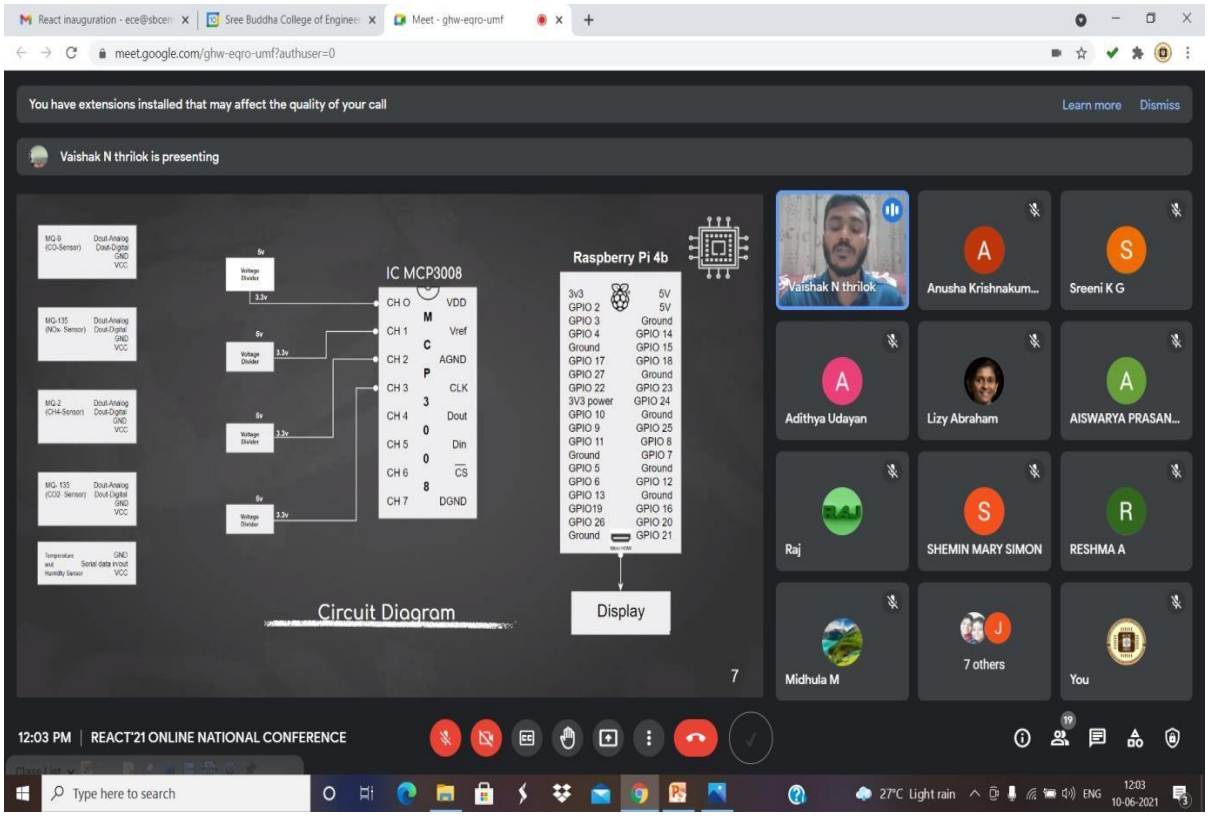
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Greenhouse gases emission monitoring

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***Abstract*—The carbon emissions have increased over the few decades causing unforeseen changes in the environment causing global warming, and many other disasters. Nearly all nations worldwide have taken steps to reduce their emissions. The carbon emission for a whole nation is calculated by considering the average emissions of a single person over a period of time and are averaged out for the whole nation givinga near approx value of that nation's emission for a particular year. When it comes to organizations or companies it is done in a totally different way manually considering all the physical parameters present in that particular area causing the emissions. We have tried to automate this process by neglecting the physical parameters and directly measuring the concentration of Greenhouse gases(GHG's) in the air**

Keywords—Emission, Greenhouse Gases, Environment, Global warming.

I. INTRODUCTION

In the past few decades, the world has seen monumental changes in the field of technology, during which we have bought down many bridges that paved our way to a greener and more sustainable future through our activities directly or indirectly. The increasing global warming is the byproduct of our activities that we have been carrying out for many decades now, we have just focused on the futuristic side neglecting the sustainable side. The question that arises now is, Have we as individuals, organizations, or as a country taken any measures to rectify our mistakes that we have been committing for so long?

"We care about the things only after we visualize the impact being created". Because it's a fact that visuals stick in long-term memory. The first country to acknowledge these blunders and act on them was Bhutan; they announced its commitment to remain carbon neutral in 2009. The first information technology company pledged to become carbon neutral by 2020. Now why are all the nations and organizations aiming to go carbon neutral and how do they calculate that they are carbon neutral. Here the term carbon emission comes into the frame, what is a carbon emission? Carbon emission is the total amount of **greenhouse gases(GHG's)** including carbon dioxide and methane that are generated by our actions[1]. This shows the carbon emissions contribution of any particular company or organization in **Metric Tonnes**.

Let's look at how it is done on an organizational level. This measurement of carbon emission is now being done manually keeping many physical parameters like the built and efficiency of machinery, automobiles, human intervention, electricity usage, and other sources of emission taken into consideration based on the values obtained from physical parameters compared to standard values to calculate the final carbon emission.

This calculation of carbon emission being done manually is time-consuming and expensive as well. We have tried to automate the process by measuring the concentration of emissions in the air at a particular point. The measured concentration of particular gases is used to calculate the carbon

II. OBJECTIVE

Ease and Reliability: In any project time and efficiency along with ease and reliability are key to a successful project. As the world is evolving there is a constant push in the field of innovation in all aspects of life. The manual process of calculating the emissions of any machine by

company that became carbon neutral in 2007 was Google. From India the first company of its type to commit to using their previously known efficiency. standard value to convert that efficiency Then using avalue to the carbon neutrality was Infosys. India's second-largest

concentration of emission produced by any particular machine. And now, using the same procedure to calculate the concentration of emissions from all possible machines inthat particular organization or company. This now has to be categorized and the emissions should be converted to standard ppm value. This procedure cannot be done without errors manually and without the guidance or direct involvement of professionals. By automating this whole process and taking a direct concentration of emissions in the air to calculate carbon emission this whole process can be done by any individual with basic knowledge of smartphones and as the calculations will be automated the readings are more reliable with less error.

Measuring and display: Measuring and displaying the concentration of Greenhouse gases (GHG's) brings a major change when the concentration of emissions in our surroundings is known, which helps to take a step to reduce the emissions. The use of different sensors for measuring the different emissions which constitute Greenhouse gases (GHG's) and displaying their concentration in a graphical way gives us a more clear picture. Hence making it easier to take these concentrations and ultimately automating the process of calculating the carbon emissio

Accuracy: It plays a major role in measurir ve are trying to measure one of the most impor at have to be measured and acted upon tosustain the life and growth of living beings. Hence all the values calculated are transformed into digital format, the accuracy of our readings is greater and precise. We have calibrated the sensors, where the output values are precise enough.

III. HARDWARE SPECIFICATIONS

Propane, and Hydrogen, also could be used for Methane and other combustible steam or gases.

3. MQ-135 Sensor: We are using this sensor for measuring the amount of CO_2 in the air(ppm). This sensor has high sensitivity, is wide-range, and has a quick response for detecting, Nitrogen oxides (NO_x), Ammonia(NH_3), Benzene(C_6H_6), and Carbon Dioxide (CO_2) within a range of 10-1000 ppm. It requires a circuit voltage of 5V±0.1. It works efficiently at a particular range of temperatures ranging from -10℃ to 45℃. Calibration was done manually to get better results. It can also collect data even in 65%±5% humidity.

4. MQ 9 Sensor: We have used this particular sensor to measure CO. The sensitive material here also is Tin dioxide(SnO_2) which has lower conductivity in clean air. It detects CO by using a cycle of high and low temperatures. Detects CO when the temperature is low(heated by 1.5V). As mentioned for low conductivity in clean air conductivity increases alongside an increase in gas concentration. At high temperatures(heated by 5.0V), It detects Methane(CH_4), Propane(C_3H_8), and combustible gas. It also cleans the other gases adsorbed under low temperatures.

5. MQ135 Sensor: This sensor is again used to detect Nitrogen oxides(NO_x). This sensor is made up of a micro- Al O ceramic tube,

1. MCP 3008: It is an 8 channel, 10-bit analog to digital (A/D) converter with a built-in sample and holds circuitry. The MCP can be programmed to communicate withraspberry pi using Serialperipheral interface (SPI) protocol to provide two or four pseudo-differential input pairs or four or eight single-ended inputs. One of the pins is chip select/ chip enable which is used toturn on or off the MCP.

2. MQ-2 Sensor: The sensor is mainly made up of a sensing material that is Tin dioxide(SnO_2), which has lower conductivity inclean air. The sensor's conductivity increases alongside the increase in gas concentration. With the use of a circuit built in-house the change of conductivity is converted to correspond to the output signal of gas concentration. this sensor selectively has a high sensitivity to LPG,and the sensitive layer is again made of Tin dioxide (SnO_2), a measuring electrode, and a heater is attached to a mesh made of plastic oxide and stainless steel. The necessary working conditions for the work of sensitive components are offered by heating. 4 of the pins are used to look for signals and another 2 are used to provide heating current.

6. DHT 11: This is the most complex of all the sensors we have worked on, yet is highly accurate. It is a complex temperature and humidity sensor. Its output is a calibrated digital signal. It uses a unique technology of digital signal acquisition, and as well as the temperature and humidity sensor technology, which ensures excellent long-term stability and high reliability. It has a resistive-type humidity measuring component and NTC temperature measuring component and connection to a powerful built-in 8-bit microcontroller, which has offered us an excellent response, fast response, anti-interference ability.

7. spberry Pi: We chose to use Raspberry Pi

considering its compact size and its computational abilities. It uses a Lightweight X11 desktop environment (LXDE) user interface which is widely used on System on chip (SOC) computers and is also based on the ARM platform. It also has free and open-source licenses with user-friendly Raspbian OS. it acts as the brain of our project. Because of its open design, modularity, and cost-effectiveness, it has a wide range of applications in robotics, climate monitoring, etc;

8. Display: We have used a 7-inch touch-capacitive display to showcase all ourreadings. It uses an LCD anti-interference design, making itmore stable. We considered that the interaction between the machine and user should be

visually enthralling as well as quite effortless. Giving the user a seamless experience. as the display was touch-sensitive the interaction was now taken to nest level with finger input making it more like a modern-day mobile phone. Its technology of USB protocol translator, which converts the touch signal into standard multi-points touch control.

IV. INTERFACING OF SENSORS

1. MQ-2 with Raspberry Pi: This sensor requires a voltage of about 5V to work. It is provided by connecting V_{cc} and GND to 5 volts. There are three pins in MQ-2 output, V_{cc}, and Ground(GND). The output pin gives out readings in form of voltage, which is proportional to the amount of Methane it is exposed to. A high voltage output indicates a high amount of methane present in the air. Occasionally when a 0 voltage output is obtained then the sensor is either exposed to a minute or no methane. Pin 2(V_{cc}) of the sensor has been connected to the output pin of the buck converter, which is connected to the battery. Whereas Pin 3(GND) of the sensor is connected directly to the Ground terminal of the Raspberry Pi.

2. MQ9 with Raspberry Pi: The sensor MQ9 has both digital and analog output signals. The digital signal is to detect gas leakage or no leakage outputting voltage within a range of 4.8V(High) or 0.2V(Low) respectively. The analog signal is to indicate the gas intensity, outputting voltage within the range of 5V(High) to 0.5V(Low). We are using the analog signal as output to measure the levels of Carbon monoxide. MQ9 has 4 pins of which pin1 is analog output, pin2 is a digital output, pin3 is GND and pin4 is Vcc. The sensor needs about 5 volts to run. It is obtained by connecting V_{cc} and GND by 5 Volts.

Sl.No	MQ-2 (Methane)	MQ-135 (Nitrates)	MQ-9 (Carbon monoxide)	MQ-135 (Carbon dioxide)
1	0.073V	0.073V	0.183V	0.113V
2	0.069V	0.069V	0.170V	0.128V
3	0.070V	0.070V	0.166V	0.124V
4	0.071V	0.071V	0.164V	0.130V
5	0.068V	0.068V	0.171V	0.119V
6	0.068V	0.068V	0.160V	0.120V
7	0.070V	0.070V	0.160V	0.128V
Average	0.070V	0.070V	0.168V	0.123V

3. MQ135 with Raspberry Pi: We are using two MQ135 sensors, one for detecting Co2 and also the other one for Nox. Interfacing is the same as below for bothgases. There are 4 pins V_{cc}, GND, A_{out}(analog output), and D_{out}(digital output). All the gas sensors used, require a voltage of 5 volts to work. Again here the V_{cc} and Ground(GND) are connected to 5 Volts. Here we obtain 5v voltage as output. This is excessive for the GPIOs, which is why we use a voltage divider that cutsdown the voltage.

4. DHT11 with Raspberry Pi: Unlike the gas sensors the DHT11 gives out humidity and temperature values as serial output over one wire. It measures the humidity in a percentage ranging from 20 - 90% RH and temperature ranging from 0 to 50°C. It has 4 pins, pin1 is Vcc, pin2 is data, and pin 4 is GND. Pin2 is specifically employed for electronic(data) communication in serial form. Since DHT 11 gives out serial data as output it is directly connected to the GPIO pin 4. The V_{cc} and Ground(GND) are also directly connected to the +5V and Ground(GND) ofthe Raspberry Pi.

V. ANALYSIS AND RESULTS

The value that we obtain from sensors is in terms of voltage.

Table 1.1 Readings of all the sensors

This voltage is converted to sensing resistance(Rs) using the formula:

$$\mathbf{R_S = ((V_S/V_O) - 1)*R_L}$$

Where R_S - Sensing resistance

V_S - Source voltage

V_O - Obtained voltage

R_L - Load resistance

This value is converted to the ppm value of sensors by using the sensitivity(Rs/Ro) versus the ppm graph provided by the manufacturer.

- **MQ 135 as NOx sensor**

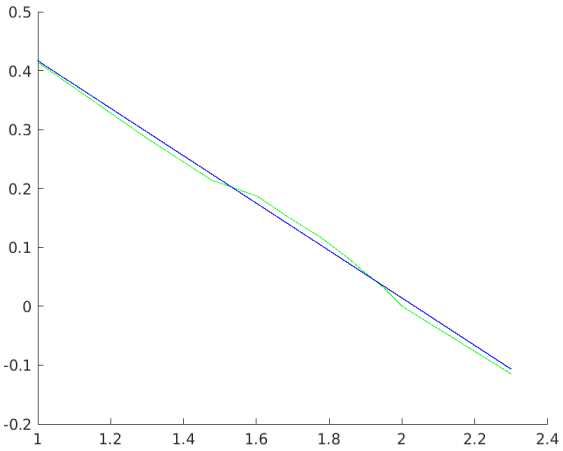

Fig. Sensitivity(Rs/Ro) to ppm conversion

Relative Humidity and Temperature dependency of MQ135

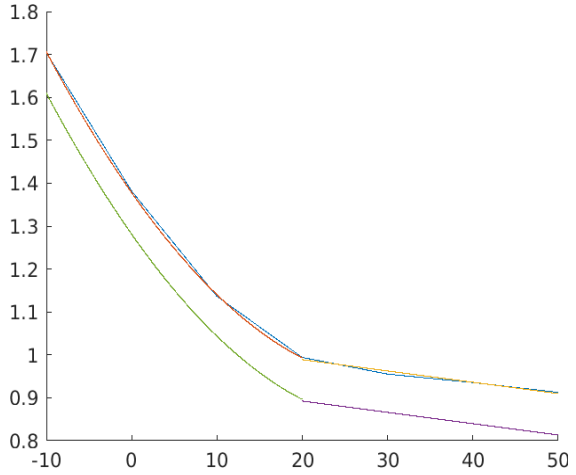

Fig. Relative Humidity and Temperature dependency of MQ135

- **DHT 11 as Temperature and Humidity Sensor**

Single-bus data format is used for communication and synchronization between MCU and DHT11 sensor. One communication process is about 4ms. Data consists of decimal and integral parts. Complete data transmission is 40bit, and the sensor sends higher data bit first.

VI. Conclusion

We have developed an effective device to monitor greenhouse gas emissions with a Raspberry Pi and specific gas sensors required to measure the concentration of greenhouse gas in the atmosphere and one temperature and humidity sensor against whose values the graphs are plot to increase the efficiency as the gas concentrations are temperature dependent. Our main purpose was to automate the measuring of the concentration of greenhouse gases in the air. Here we have tried to bridge the gap that we have created by our actions over a period of time to a sustainable future. Measuring, calculating, and displaying is not going to bridge the gap that we have created. After getting to know their carbon emission as an organization, they are required to take the necessary actions to help reduce it.

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Heart Disease Prediction UsingVarious Machine Learning Algorithms

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Abstract: Health is the first and foremost importantfactor for each and every one in this world. People can maintain good health by proper disease management. Disease management is done by preventing disease by taking proper diet plans, early disease detection and proper treatment of disease. Early diagnosis of disease helps to detecting symptomatic patients as early as possible so they have the best chance for successful treatment. Nowadays heart disease was becoming one of the health killer diseases. When this life-threatening disease care is delayed or inaccessible the chance of survival is low, and cause greater problems associated with treatment and higher costs of care. Therefore, this disease needs to be found in early stages.

In the healthcare industry, large amounts of data are frequently generated. Machine learning algorithms help to predict risk for heart disease from person's data. Analyzing ECG signal at initial stage helps to detect and prevent heart disease. Machine learning algorithms such as, Random Forest, Support Vectormachine and Decision Tree are used to predict disease earlier. By using the model mortality rate due to heart disease can be reduced by providing an option to get better treatment as early as possible.

Keywords —Random Forest, SVM, Diseaseprediction.

INTRODUCTION

Health is the supreme and long-lasting wealth that everyone needs. So, healthcare plays a vital role in everyone's daily life. Diagnosing health diseases at the early stages can help to prevent future complications with proper treatment. The abnormalities inside the body or under the skin

can be easily detected by various curing equipment like CT, MRI, PET etc. Also, uncommon diseases like heart stroke, heartattack can be easily prevented at the early stages if it is possible to diagnose it at early stage. In diseases, heart disease is the most commonly occurring disease and it is main cause of sudden death nowadays. Unawareness of the symptoms of heart disease is the main cause of death and other medical complications. In India there are almost three crore heart patients and 2 lakh open heart surgeries are done in every year. Mortality rate all over the world is nearly 17.3 million people every year. Early heart disease prediction is essential to reduce the mortality rate. Early diagnosis paves the path for early treatment thereby mortality rate is reduced. Since huge volume of data is available in today's era. Due toavailability of huge in biomedical and healthcare communities, early disease prediction by accurate study of medical data patient care and community services is possible. Also due to the tremendous increase in the world population, andthe unpredictable spread of degenerative illness in huge number create great trouble on modern health care systems. In this scenario there is a huge need of a disease prediction system that predicts disease at home.

By machine learning techniques the factors are studied to predict disease. Machine learning methodologies can review and process large volumes of data with high accuracy and efficiency. Various supervised machine learning techniques find the hidden pattern in data during training and helps to predict the presence or absence of heart disease when a new data input comes. The objective is to find out the efficient approach by measuring accuracy of various machine learning algorithms.

M. Chen, Y.Li,D.Wu,Y.Zhang and C.Youn camewith a wearable 2.0 system [3]. The system mainly consists of smart washable clothing. They believed that this approach can further improve the QoE and QoS of the coming generation health care system. Chen worked in the area of IoT based data collection system.This work helped him to invent a new sensor based smart washable cloth. As a result, doctors find it easy to capture the physiological conditions of the patient. The main issue hidden in the existing system is later discovered. They are negative psychological effects, sustainable big psychological data collection etc. B.Qian,X.Wang,N.Cao,H.Li, and Y.G Jiang proposed and designed a risk prediction system and its corresponding model by using the help of data of the patient. Here a real problem faced by the patient is solved [4]. Ajinkya Kunjir, HarshalSawant, Nuzhat F. Shaikh proposed a best clinical decision-making system. On the basis of historical data collected from the patients, diseases are predicted. They use pie charts and 2D/3D graphs for visualization purposes [5]. S.Leoni Sharmila,C.Dharuman and P.Venkitesanput forwarded a comparison of different kinds of machine learning techniques like Fuzzy logic, decision tree and Fuzzy Neutral Network. Apart from other machine learning algorithms Fuzzy Neutral Network results an accuracy of 91% in classifying the liver disease data set [7]. The limiting factor of this paper is that they could notuse large data set. Medical data is growing in a tremendous manner. So, it is necessary to classify those data is considered a challenging one. Shraddha Subhash Shirsath proposed a CNN- MDRP algorithm for predicting diseases. Here she used a large volume of structured and unstructured hospital data. CNN-UDRP used only structured data with the help of machine learning algorithm [6]. But in case of CNN- MDRP, it focused on both structured and unstructured data. So that prediction process was fast as compared to CNN – UDRP. Still, they are using bigger data is so challenging. Ramandeep Kaur, Er.Prabhsharn Kaur said that the data set may contain unnecessary, duplicate information. In such a situation, all the data should undergo a preprocessing technique to achieve better results [8].

WORKING OF PREDICTION SYSTEM

The project aims to foretell whether the individual is at the threat of heart disease byanalysing the dataset. This prediction will be done by employing machine learning algorithms on data set containing patient data. We execute the prediction model over real-life hospital data. Number of machine learning algorithms is used to check and predict the severe heart disease in patient. In this model heart disease data is takenfrom the kaggale web site is to be considered as an input data. Figure 1 shows the architecture of prediction system. Working starts with the data

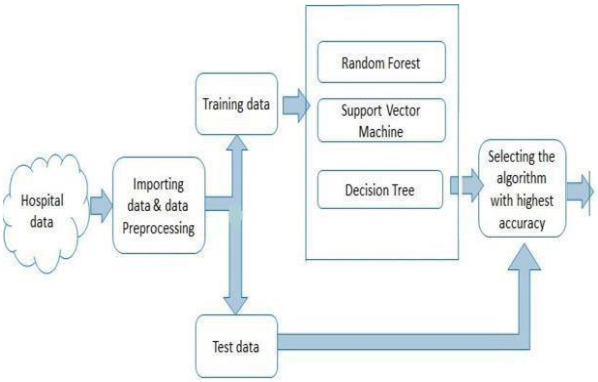

Fig. 1: Architecture of Prediction system

After selecting the algorithm with highest accuracy, the system is deployed to predict disease with data from patients. The machine learning model generates the output as presence or absence of heart disease and the corresponding report is generated.

IMPORTING LIBRARIES

The language used for making the machine learning model is Python. Importing libraries is the first step required for high performance collection; here in this step, different types of data mainly structured, semi-structured orunstructured can be collected from various sources like hospital, etc. Once the data are collected, that data are cleaned first to remove the missing values and to bring level of granularity same. After that the cleaned data are classified into training data and test dataset. After the data segregation, the data are fed into machine learning algorithms. This step is mainly done using training data to teach the machine so as to increase its predictive accuracy. Once the data have learnt enough, our learned model will be ready for testing. The learned model is tested with test data to check its predictive accuracy of different algorithms. The algorithm with highest predictive accuracy is selected, and then the model can be deployed. calculation, data visualization and data modelanalysis. The libraries used are:

Numpy, a Python library, is used for working with arrays and also for working in domain of linear algebra, matrices and Fourier transform.

Pandas' library is used for data science/data analysis and machine learning tasks.

3. Matplotlib Pyplot is a plotting library used for 2D graphics in python programming language **is**.It can be used in web application servers, python scripts, shell and other graphical user interface toolkits.

4. Seaborn is a Python library which uses Matplotlib underneath to plot graphs. It is used for data visualization and also it provides a high-level interface for drawing statistical graphics.

Pickle module is used in python for serializing and de-serializing object structures.

DATASET

The dataset used in our project is heart disease dataset taken from the UCI repository. To predict whether a person is suffering from cardiovascular disease or not the dataset is used.The dataset consists of 303 individual's data. There are 14 columns in the dataset, 5 of them contain numerical values and 9 of them contain categorical values.

S no	Parameters	Parameter description	Values
1	age	Age in years	Continuous
2	sex	Male or female	1= male
			0= female
3	thestbps	Resting blood pressure	Continuous value in mmHg
4	cp	Chest pain type	1= typical type 1
			2= typical type angina
			3= non-angina pain
			4= asymptomatic
5	chol	Serum cholesterol	Continuous value
			in mm/dL
6	fbs	Fasting blood sugar	1≥120 mg/dL
			0≤120 mg/dL
7	restecg	Resting electrographic results	0= normal
			1= having ST-T wave abnormal
			2= left ventricular hypertrophy
8	thalach	Maximum heart rate achieved	Continuous value
9	old peak	ST depression induced by exercise relative to rest	Continuous value
10	exang	Exercise induced angina	0= no
			1= yes
11	ca	Number of major vessels colored by fluoroscopy	0–3 value
12	slope	Slope of the peak	1= unsloping
		exercise ST segment	2= flat
			3= downsloping
13	thal	Defect type	3= normal
			6= fixed
			7= reversible defect

Figure 2. Parameter description

DATA EXPLORATION

The dataset is clean and contains all theinformationneeded for each variable.

DATA PRE-PROCESSING

Data preprocessing is used to convert the raw data into a clean data set. Whenever the data is gathered from different sources it is collectedin raw format which is generally incomplete or missing or may containing errors. If the missing data in input dataset is not handled wisely, it may result in incorrect predictionand affects the quality of the result. To avoid this data pre-processing is done. In dataprocessing all the null or the error values in thedataset were deleted firstly. After this the cleaned dataset is split into two separate sets, that means training set and test set. Usually, the dataset is split into 70:30 ratios or 80:20 ratios, i.e.; either take 70% or 80% of the data for training the model by leaving out the rest 30% or 20% for testing the model. The end step of data preprocessing in MachineLearning is Feature scaling**.** This method is used to standardize the independent variables of a dataset within a specific range. Feature scaling can perform in two ways: Standardization or Normalization. Here we use the standardization method. It is done by importing StandardScaler class of the sci-kit- learn library.

METHODOLOGY

We have used following algorithms for classification. They are

1.Random Forest Algorithm

Random Forest is a supervised learningtechnique. It is based on the concept of ensemblelearning, which is a process of combining multiple classifiers tosolve a complex problem and to improve the performance of the model

2.Support Vector Machine Algorithm

Support Vector Machine or SVM is one of themost popular Supervised Learning algorithms.The goal of the SVM algorithm is to create thebest line or decision boundary that can segregate n-dimensional space into classes so that we can easily put the new datapoint in the correct category in the future.

3.Decision Tree Algorithm

Decision Tree is a supervised learning technique. It is a tree-structured classifier, where internal nodes represent the features of a dataset, branches represent the decision rules and each leaf node represents the outcome.

IMPLEMENTATION

70% of the data is taken for training and 30% is used to test the system.For random forest algorithm we calculated the scores for different values of n_estimators. From n_estimators of 12 the random forest classifier has the highest score.From the line graph fordecision tree algorithm the maximum score formax_features of 9

RESULT AND ANALYSIS

Proposed machine learning model trained and testedusing different algorithms with the values providing highest accuracy and generated classification reports. Based on accuracy, precision, F1 score and recall the tested algorithms are compared to choose the right one.

Parameter	Decision tree	Random Forest	Support Vector
Accuracy	81	84	90
Precision	.73	.83	.89
Recall	.87	.81	.91
F1 Score	.80	.82	.90

Table 1. Comparison of RF, DT and SVM

CONCLUSION

The machine learning based disease prediction model predicts disease with the help of patient data. Various machine learning algorithms helped to make use of the tremendous data available in the medical field to predict disease earlier. The dataset is taken from UCI repository. Initially, the classification algorithms execute thetraining process which uses the dataset to study predicting the disease. A comparison on the accuracy for particular data set was performed. With the study it is inferred that KNN have highest accuracy of 96% out of all models.

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AI Based Smart Wheelchair System

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***Abstract*— Smart Wheel Chair is mechanically controlled devices designed to have self- mobility with the help of the artificial intelligence. On tapping the buttons, it will take the person sittingin wheelchair to desired destination. This reducesthe user's human effortand force to drive the wheels for wheelchair. Furthermore, it also provides an opportunity for visually or physicallyimpaired persons to move from one place to another. The wheelchair is also provided with obstacle detection system which reduces the chance of collision while on the journey.**

Smart wheelchair has gained a lot of interests in the recent times. These devices are useful especially in transportation from one place toanother. The machinescan also be used in old age homes where the old age persons have difficulty intheir movements. The devices serve as a boon forthose who have lost their mobility.

Different types of smart wheelchair have been developedin the past but the new generations of wheelchairs are being developed and used which features the use of artificial intelligence and henceleaves a little to tinker about to the user who usesthe wheel chair. The project also aims to build a similar wheel chair which would have a sort of intelligence and hence helps the user on his/her movement.

Keywords—artificial intelligence, obstacle detection system

INTRODUCTION

Smart wheelchairs are an assistive wheeled mobility device.The Worldhealth organization reported that 10% of global population (650 million people) has disability and 10% among them need wheelchair. Wheelchair made it easier for many to pursue their life activities including education, work and sociallife. We are making an attempt to design smart autonomous wheelchair to enhance the maneuvering tasks. The wheelchair requires no human intervention during navigation and perception in addition to processing which is basedon computer vision techniques. Obstacle detectionis done with the knowledge of image processing. Artificial intelligence makes the smart wheelchair more intelligent and human like. As far asImage processing is concern, the Artificial intelligence- based obstacle detection system has produced a hundred percent success rate of avoiding the obstacles in both the bright room and dim room. Ina hospital or airport people with mobility issues depend on a manual wheelchair alongwith wheelchair pushers, which hinders their freedom of movement as they use a powered wheelchair with joystick control and they need to manipulate the joystick and steer the wheelchair all the way to the destination. The map is automatically loaded on to a display. The autonomous operation allows users to relax and sip a cup of coffee, read a newspaper or chat with friends as the wheelchair takes them to the desired destination point on its ow assisted living communities, restaurants, washrooms, etc. AIbased smart wheelchair system can be implemented in busy airports, hospitals and even in homes and can provide a solution for all issues. Machine learning based wheelchair records theimages for object identification, followed by IR sensor and Lidar for obstacle detection andmapping the environment. Finally, information processed is fed into the electric motor for movements. Therefore, this intelligent wheelchair system increases the self-esteem and will-power ofthe disabled people.

LITERATURE SURVEY

A handicapped person with locomotivedisabilities needs a wheelchair to perform functions that require him or her to move around. He can do so manually by pushing the wheelchairwith his hands. However, many individuals have weak upper limbs or find the manual mode of operating too tiring. Hence, it is desirable to provide them with a motorized smart wheelchair that can be controlled by bio-signal & non bio- signal approach. Since the motorized wheelchair can move at a fair speed with minimum efforts. There are different types of wheelchairs availablenow days which are discussed below.

Manual Wheelchairs: These are the type of devices that help a person tomove him without any assistance of battery.

There are three types of manual wheelchairs namely self-propelled, attendant propelled, and wheelbase. A single-arm drive enables the user toturn either left or right while the two-armed driveenables user to move forward or backward on a straight line. Another type of wheelchair commonly used is lever-drive wheelchair. This type of chair enables the user to move forward bypumping the lever backend forth [1].

Electric Wheelchairs: A power chair can be used by someone whohasn't got the dexterity or mobility, perhaps, to drive a mobility scooter due to arm, hand, shoulder or more general disabling conditions, and do not have the leg strength to propel a manual chair with their feet. Powered wheelchaircan offer various powered functions such as tilt, recline, leg elevation, seat elevation, and others useful or necessary to health function [1].

Standing Wheelchairs: 'Redman power chair', it is the world's highest quality standing wheelchair. People with spinalcord injury can reap the health benefits of standing wheelchair. Physical benefits of standing wheelchairs are

- Decrease urinary tract infection
- Improver blood circulation around thebody
- Standing exercise greatly improve bowl function
- Wheelchair helps distribute your weight and improve healing bedsores
- Decrease the amount of musclestiffness
- Increase bone density
- Increase cognition, wellb eing and independence [2]

Pediatric Wheelchair: These types of wheelchairs provide a key-enablingtechnology to young children who would be unable to navigate independently in their environment. Standard powered wheelchairs are still heavily dependent on the cognitive capabilities of users. Unfortunately, this excludes disabled users who lack the required problem-solving and spatial skills, particularly young children. For these children to be denied poweredmobility is a crucial set-back; exploration is important for their cognitive, emotional and psychosocial development [3].

Stair climbing Wheelchair: The stair-climbing wheelchair exists at present can be grouped into 3 categories: - continuous stair climbing wheelchair, intermittent-stair climbing wheelchair and auxiliary stair climbing wheelchair. Continuous stair climbing wheelchairhas only one set of supporting device, the wheelchair relies on this supporting device for continuous motions. In Intermittent stair climbingwheelchair the process of climbing stairs of is similar to the people climbing up and down stairs,it is also called walking stair climbing wheelchair.Intermittent stair climbing wheelchair is one of the supporting devices that elevate the wheelchairand other set of support system. In auxiliary stair climbing wheelchair, the attachments rely on another device installed on the wheelchair and it needs assistance to help realize the function of climbing stairs. Stair lift requires wide stair way which is very expensive [4].

VARIOUS TECHNIQUE USED IN WHEELCHAIR SYSTEMS

There is a vast development in the field of wheelchairs. Out of all the methodologies, HCI (Human Computer Interface) and HMI (Human Machine Interface) are the latest and mosteffective techniques. In user interface systemsboth bio-signals and non-bio-signals are used as amedium of control. Bio-signal based devices mainly use bio-signals like EEG, EOG or EMG ascontrol signals. The bio-signal based approach is used for completely paralyzed patients who can only use their bio-signals as the only resource to control [5].

A. EEG based:

The Electroencephalography (EEG) records electrical brain signals from the scalp, where the brain signal originates from post- synaptic potentials, aggregates at the cortex, and transfers through the skull to the scalp. BCI is a device thatextracts EEG data from brain and converts it intodevice control commands using signal processingtechniques. EEG techniques are non-invasive and low cost. However, it brings great challenges to signal processing and pattern recognition, since it hasrelatively poor signal-to-noise ratio and limited topographical resolution and frequency range [6, 7, and8].

B. EMG based:

EMG measures electrical currents that are generated in muscles during its contraction. A muscle fiber contracts when it receives an action potential. The EMG observed is the sum of all theaction potentials that occur around the electrode site. In almost all cases, muscle contraction causesan increase in the overall amplitude of the EMG. EMG signals can be used for a variety of applications including clinical applications, HCI and interactive computer gaming. They are easy to acquire and of relatively high magnitude than other bio-signals. On the other hand, EMG signalsare easily susceptible to noise. EMG signals contain complicated types of noise that are caused by inherent equipment noise, electromagnetic radiation, motion artifacts, and the interaction of different issues. Hence preprocessing is necessary to filter unwanted noise in EMG. The EMG signals also have different signatures depending on age, muscle development, motor unit paths, skin fat layer, and gesture styles. The external appearances of two individuals' gestures might look identical, but the characteristic EMG signals are different [9].

C. EOG based:

EOG based technique are very useful for persons who born with any congenital brain disorder or forthose who are suffer from severe brain trauma. EOG signals records the potential differencebetween the retina and cornea of the eye. When theeyes are rolled upward or downward, positive or negative pulses are generated. As the rolling angleincreases, amplitude of pulse also increases and the width of the pulse is in directly proportional to theeyeball rolling process [10,].

D. Non-Bio-signal based:

Non-bio-signal based devices provide 100%accuracy and require less training for patients. In general, non biosignal

based techniques which make use of joystick control, sip-n-puff control, tongue control, Touch screen controlled,Voice actuated, head movement tracking etc [5].

E. Sip-n-Puff Technology:

In this method using air presser to generates controlsignals by sipping (inhaling) or puffing (exhaling) in a tube. This technology generates four control signals for motorized wheelchair which are initial hard puffs, hard sip, initial hard sip, and hard puff.It is mostly used for quadriplegics having injury intheir spinal cord or people with ALS. But this is not good for individual with week breathing.

Head Orientation Tracking Technique

Here in this method, head movements are transformed into cursor movements on the screen. Cursor movements are proportional to head movements. Head movements are calculated by different methods like accelerometer placed in a patient's cap or by capturing video of head movements. But the problem with this technique isthat differentially able people of certain categoriessuch as cerebral palsy patients cannot even move their head comfortably. Another problem of this technique is that forehead continuously needs to face the camera

F.Chin Control Technique:

In this technique chin is put in cup shape joystick and is usually controlled by neck movements (flexion, extension, and rotation). The majorproblem that arises in this mode of control is the need for constant pressure in chin cup .

G. Eye Tracking Technique:

In this technique wheelchair is controlled by an optical type eye tracking system (screen based system). Camera is used to continuously track the features of eye. There after a calibration algorithmis used to find the direction of eye gaze in real time. Then according to gazed position, screen movement control signals are calculated to control the wheelchair.

H. Tongue Controlled

This technology is based on Faraday's law. Permanent magnet is used here and is attached to tongue. As the tongue move in air core induction coil, the inductance is changed. A Hall Effect sensor is placed in the stud of tongue. Hall Effect sensor is a transducer that varies its output in response to change in magnetic field. The movement of tongue is traced by of Hall Effect sensor. Thereafter, the Output signals are collectedthat provide continuous real time analog output .

I.Image Processing Algorithm

Here, webcam is used for capturing image input from the finger of user. After that we use an image processing algorithm (image blurring, RGB toHSV conversion, HSV thresholding) that helps infinger detection. According to direction of finger,wheelchair moves in left-right or in front back direction [10]

J.Brain Actuated Wheelchair using Brain Wave Sensor

ULTRASONIC SENSOR

An ultrasonic sensor is an electronic device that target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humanscan hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver(which encounters the sound after it has travelled to and from the target). In order to calculate the distance between the sensor and the object, the sensor measures the timeit takes between the emissions of the sound by the transmitter to its contact with the receiver. The formula for this calculation is **D = ½ T x C** (whereD is the distance, T is the time, and C is the speed of sound ~ 343 meters/second). For example, if a scientist set up an ultrasonic sensor aimed at a boxand it took 0.025 seconds for the sound to bounce back, the distance between the ultrasonic sensor and the box would be:

D = 0.5 x 0.025 x 343

or about 4.2875 meters.

Fig 3.1 Ultrasonic sensor

Display

LCD is very helpful in providing user interface as well as for debugging purpose. It provides a simple interface between the controller and LCD. LCD is used as a monitor in most of the electronic project. 3 buttons as well as a destination selection map willbe provided on the display for navigation of wheelchair user in indoor and outdoor surrounding

Raspberry pi

Enabling the GPIO pin to raspberry pi.Raspberry pi sends the command to motor driver which is

Fig 3.2: Raspberry pi

Web camera

Web camera is used for capturing the image. We can also use HD (high definition) camera but it increase the memory size, system can't able to readthe image and it will increase the processing time. UV4L driver is needed for interfacing a camera with raspberry pi board

Fig 3.3 : Web camera

Motor

Two 12 v DC motor is used in project to demonstrate running of wheelchair in forward, reverse, left and right direction. L293D motor driver is used to interface with raspberry pi which is TTL compatible. Two H bridges of L293D can be connected in parallel to increase its currentcapacity to 2 Amp.

Fig 3.4: Motor

LANGUAGE USED

Python
Python is widely used general purpose, high-level programming language.

Its syntax allows the programmers to express concepts in fewer lines of a code when compared with other languages like C, C++ or java.

SOFTWARE USED

The Jupyter Notebook
The Jupyter Notebook is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text. Uses include: data cleaning and transformation, numerical simulation, statistical modeling, data visualization, machine learning, and much more.

3.1 HOW COMPUTER READS AN IMAGE

A computer sees an image as 0s and 1s. Pixel is the smallest unit in an image.

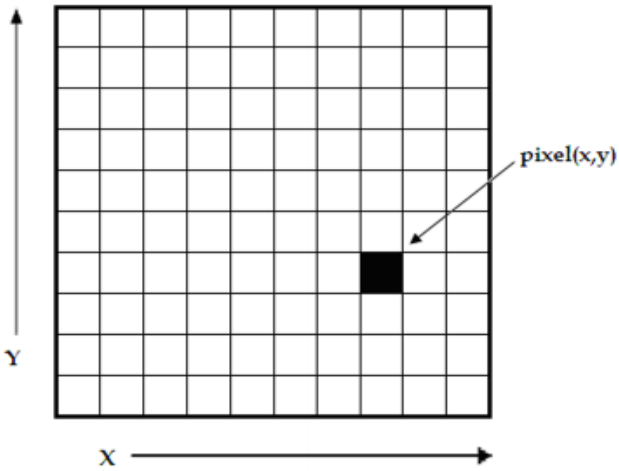


Fig 4.1 Pixel is an smallest unit in an image

When we take a digital image, it is stored as a combination of pixels. Each pixel contains a different number of channels. If it a grayscale image, it has only one pixel, whereas if it is a coloured image, it contains three channels: red, green and blue.

As shown in the BELOW representation of a digital coloured image, each channel of each pixel has a value between 0 and 255. Each of these values represented in binary before a computer who canunderstand the image

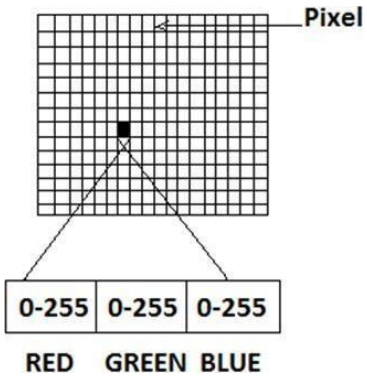


Fig4.2: Digital coloured images

In this case, just being able to read the image is of no use if it cannot understand what it means, or if itcannot describe what the image is about, and whatit contains. **This is where machine learning comesin.**

A machine (or a computer) can be taught how to understand an image and say what the image

contains.This is an example of machine learning, teaching a computer to understand and describe an image. It is similar to how we teach kids to identify different alphabets or differentiate between an apple and a banana by showing examples of each case. This is exactly how a computer learns to identify objects in an image. Like humans have different skills and one of the skills is to identify anobject in an image (a dog in the above image), computers have machine learning models, which can be thought of as a skill, to perform the same task. As humans need to be trained to perform a particular skill, computers need to train the machinelearning model as well. In both cases, training happens by examples. Similar to how a kid is taughtto identify an apple, a machine learning model canbe taught how to identify an apple in an image by giving several example images that contain an apple. From these example images, the model learning features of an apple, like its shape and colour. Now when a new image of an apple is presented to this computer with this model, it can use what it had learned about apples earlier and identify that this new image also contains apple

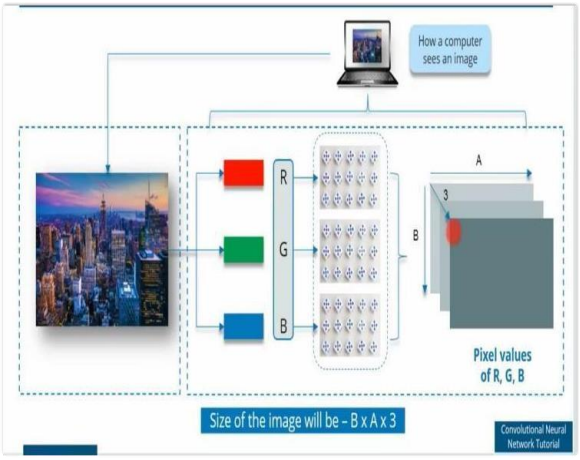


Fig4.3; Model example of CNN

3.2 WHY CNN?

Artificial Intelligence has been witnessing a monumental growth in bridging the gap between the capabilities of humans and machines.Researchers and enthusiasts alike, work on numerous aspects of the field to make amazing things happen. One of many such areas is the domain of Computer Vision. The agenda for this field is to enable machines to view the world as humans do, perceive it in a similar manner and evenuse the knowledge for a multitude of tasks such as Image & Video recognition, Image Analysis & Classification, Media Recreation, Recommendation Systems, Natural Language Processing, etc. The advancements in Computer Vision with Deep Learning has been constructed and perfected withtime, primarily over one particular algorithm —a **Convolutional Neural Network**.

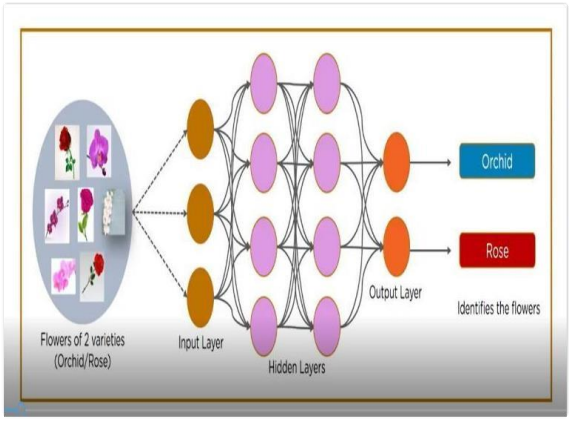


Fig 4.4 Convolutional Network

Over the years, research on convolutional neural networks (CNNs) has progressed rapidly, howeverthe real-world deployment of these models is oftenlimited by computing resources and memory constraints. What has also led to extensive researchin ConvNets is the accuracy of difficultclassification tasks that require understanding abstract concepts in images.Another reason why CNN are hugely popular is because of their architecture — the best thing is there is no need forfeature extraction. The system learns to do feature extraction and the core concept of CNN is, it uses convolution of image and filters to generate invariant features which are passed on to the next layer. The features in next layer are convoluted with different filters to generate more invariant andabstract features and the process continues till one gets final feature / output (let say face of X) which is invariant to occlusions. Also, another key feature is that deep convolutional networks are flexible andwork well on image data. As one researcher points out, convolutional layers exploit the fact that an interesting pattern can occur in any region of the image, and regions are contiguous blocks of pixels. But one of the reasons why researchers are excited about deep learning is the potential for the model to learn useful features from raw data. Now, convolutional neural networks can extract informative features from images, eliminating the need of traditional manual image processingmethods.

3.3 ConvNets Industry Applications

In fact, machine learning engineer Arden Dertat inan article in Towards Data Science states that CNNis the most popular deep learning model.According

to Dertat, the recent surge of interest indeep learning is thanks to the effectiveness and popularity of convnets. Such is the accuracy that CNNs have become the go-to models for a lot of industry applications. For example, they are used for recommender systems, natural language processing and more. The main advantage of CNNcompared to its predecessors is that it automatically detects the important features without any human supervision. For example, given many pictures of cats and dogs, it can learn the key features for each class by itself.Over the years, research on convolutional neural networks (CNNs) has progressed rapidly, howeverthe real-world deployment of these models is oftenlimited by computing resources and memory constraints. What has also led to extensive researchin ConvNets is the accuracy of difficultclassification tasks that require understandingabstract concepts in images. Another reason why CNN are hugely popular is because of their architecture — the best thing is there is no need forfeature extraction. The system learns to do feature extraction and the core concept of CNN is, it uses convolution of image and filters to generate invariant features which are passed on to the next layer. The features in next layer are convoluted with different filters to generate more invariant and abstract features and the process continues till one gets final feature / output (let say face of X) whichis invariant to occlusions.

Also, another key feature is that deep convolutional networks are flexible and work well on imagedata. As one researcher points out, convolutional layers exploit the fact that an interesting pattern can occur in any region of the image, and regions are contiguous blocks of pixels. But one of the reasonswhy researchers are excited about deep learning is the potential for the model to learn useful features from raw data. Now, convolutional neural networks can extract informative features from images, eliminating the need of traditional manualimage processing methods.Another area where wesee the application of ConvNets is in the preventionof fraud, which is a big concern for telecom companies. In a bid to develop algorithms thatdetect early potential frauds and/or prevent them, deep learning techniques, especially ConvNets are being used to detect fraudsters in mobile communications. In a research paper, published in Science Direct, fraud datasets culled from customer details records (CDR) are used and learning features are extracted and classified to fraudulent and non-fraudulent events activity. The paper revealed how deep convolution neuralnetworks surpassed other traditional machine learning algorithms such as random forest, support vector machines and gradient boosting classifier, especially in terms of accuracy.According to AI evangelist, Alexander DelToro Barba, convolutional neural networksrevolutionized the industry, due to the ability to handle large, unstructured data.

Hence, ConvNets are extremely successful in areas where large, unstructured data is involved, such as image classification, speech recognition, natural language processing.

ConvNets are more powerful than machinelearning algorithms and are also computationally efficient.

The trend was kickstarted in 2012 withAlexNet which was only 8 layers and how now progressed to the 152-layer ResNet.

CNN IN WHEELCHAIR SYSTEM

However, here we'll learn how to detet the line using Convolutional Neural Networks (CNN). Basically, we will be capturing a series of images ata predetermined interval using our web camera, then we'll used a pre-trained CNN to predict the direction in which our robot should move i.e. forward, right, or left.

Capture the images for CNN.

Train the CNN

Deploy the CNN on the raspberry PI

Capture the images for CNN

We require three sets of images for each of the four conditions i.e., forward, left, reverse and right to train our CNN. Once we train our CNN, it will be able to predict in which direction the robot is moving and then we can take corrective measure accordingly. For e.g. if there is a left turn of line, theCNN will predict that robot is going in right direction relative to line and therefore, we should move it in left direction.

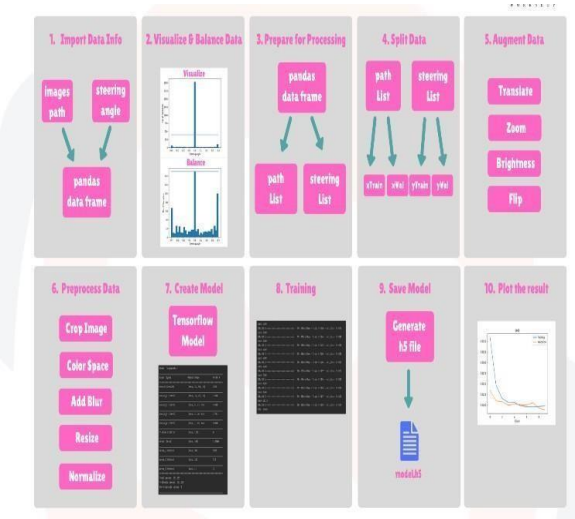
TRAIN THE CNN

You can train the CNN either on raspberry PI itselfor on a different more powerful system and then save the trained model which can be read by the Pi.

Deploy the CNN

Once we have trained our model, we can deploy iton our Pi.

TRAINING



CONCLUSION

Advances are made on the technology of smart wheelchairs with sensors to minimize the level of human intervention. The presented AI – based smart wheelchair allows the user to adapt and command the system at various levels of abstraction. The smart wheelchair system couldimprove the quality of life of the disabled people. The system can be successfully implemented to move the wheelchair in left, right, forward or stay in original position. This project totally aims at social process. Artificial intelligence-based obstacle detection avoids the obstacles in the path.This makes the wheelchair more intelligent .

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AI BASED CHATBOT WITH FACIAL RECOGNITION

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Abstract

In the pandemic situation, getting in contact with the strangers are athigh risk, but unavoidable too. Since all the offices, institutions andindustries will have visitors for their daily needs. So, we need a safe device to interact with them. One of the ideas which exist is chatbotbut facing more challenges in our daily life. To overcome this challenge, we have introduced an AI based chatbot system which is flexible and user friendly.

In last decade AI technologies become widespread and easy to implement and use. One of the most perspective technology in AI field is speech recognition as part of natural language processing. So, the new speech recognition technologies and methods will save a lot of communication time, replacing common texting with voice/audio. In additional to these features our chatbot is trained with multiple languages, night vision is possible and also by providing open API system. Here we are using, MTCNN for face detection, FaceNet is used for feature extraction by embedding 128 dimensions per face and SVM is used to classify the given training data with the extractedfeature of FaceNet.

Keywords— Face recognition, Natural Language Processing (NLP), API, MTCNN, FaceNet, SVM

I Introduction

From the start of the 20th century, technology is advancing vastly. Over the last few years, chatbot have played a prominent role as human computer interfaces. Chatbots are designed in such a way thatthe users are made to believe thatthey are talking to

an actual human being but rather they are talking toa machine. The chatbot will communicate with theusers with the help of natural language processing. Chatbot team was introduced by Michael Mauldinin 1994 to describe the conversational programs.The conversational programs provide support in designing various messenger- base applicationssuch as google, Facebook and WhatsApp.

Beside the chatbot could help to improve responsiveness, increase availability, and reduce dependence man power in today's world of automation.

In this paper we are introducing an AI based chatbot system for the crisis situation of COVID-19pandemic. The aim of the paper is to reduce the direct face to face communication between twopersons by implementing chatbot as anintermediateso that the chatbot can answer just like humans.So, we have introduced an AI based chatbot system which is more flexible and user-friendly. Here the system interacts with others using an audio output andalso it mainly deals with the field of facial recognition and natural language processing. Here we are trying to improve the convolutional chatbot system by using facial recognition for identify the person who is stand in front of it and also respond to the userin local language in the audio manner. The uniqueness of thischatbot is, it can add the details of an unknown person after meet them once and also adding Wikipedia API for extend its knowledge.

II LITERATURE REVIEW

History of Chatbots And TheirImplementation Techniques

ELIZA is the first Chatbots developed by Joseph Weizenbaum in 1966 at MIT AI Laboratory. It is the first program capable of attempting the Turing Test. Turing Test is the method of estimation in AI to check whether a computeris capable enough to think like human being or not. However, the development of ELIZA is not considered to be a failure. Itis a great source of motivation and knowledge for innovators focused on AI and NLP.

After ELIZA which simulated Rogerian therapist, PARRY attempted to figure out a person with paranoid schizophrenia. It was developed by Kenneth Colby in 1972.

It uses the same approach used in ELIZA but it is much more advance than ELIZA. It used complex system of assumptions, attributions and emotional responses to mimic the behaviour of paranoid individuals for health care analysis.

JABBERWACKY is a chatbot created by Rollo Carpenter in 1982. It is considered to use an AI technique called contextual pattern matching. It simulates natural human chat in interesting, entertaining and humorous manner and the first Chatbot to accept voice inputs. The new version of JABBERWACKY came in 2008 and now it is popular by name CLEVERBOT.

Inspired by Weizenbaum's ELIZA, Richard Wallace developed A.L.I.C.E stands for Artificial Linguistic Internet Computer Entity or simply ALICEBOT in 1995. ALICE is anatural language processing Chatbot based on heuristic pattern matching technique to evaluate response. Theprogram uses an XML dialect called Artificial Intelligence Mark-up Language popular as AIML. But it is based on predefined set of responses to generate output. However, it isnot able to pass Turing Test due to some drawbacks.

SMARTERCHILD is an intelligent Chatbot developed byActive Buddy. It was released in June 2001 by using AIM platform which is now discontinued. It is a Chatbot designedto provide quick access to news, weather, stock information, movie listings, and transit schedules. This type of bot completely changed the scenario of interaction with machines.

Later on, SIRI is a virtual assistant released in 2011 fby Apple Inc. The assistant uses ASR (Automatic Speech Recognition) and advance machine learning algorithms to translate human speech into text, answer questions, make recommendations and perform actions. After few months, Amazon introduced its new iteration of virtual assistant that is ALEXA. It uses NLP algorithms for accurate voice interactions. It can also interact with Smart Devices and usedas hub to implement Home Automation.Looking forward, Google developed AI enabled GOOGLE ASSISTANT in 2016. It is an extension of GOOGLE NOW, and it supports both voice and text-based interaction. Workingon this conceptual philosophy, Samsung released voice powered digital assistant named BIXBY in 2017. Basic Block Diagram

Here it mainly deals with the field of facialrecognition and natural language processing. The facial recognition is used toidentify the person who is standing in front of it and the NLPis used for creating the answers to the user. We use an auto run program to automatically execute our needed program when it powers ON. As the first step, the live video from the camera is taken as the input. After that, the video file is converted into frames/photos. Those images will undergo facial identification process. If there is no face is present, thenit will go to the 1st step, i.e. collect video feed from the camera.

If the face is present in that frame. Then it will extract the feature of that face for facial recognition. The extracted feature will compare with the features present in the database.

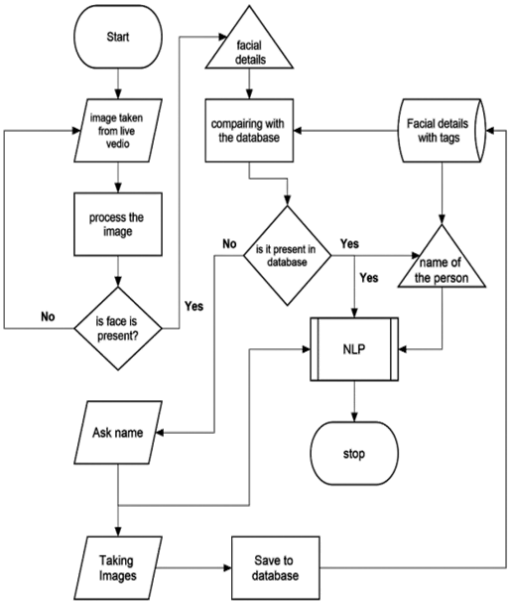

Fig1: Flowchart of Overall Working

If that data is present in the database, it will identify the nameof that person from that database. That name will give to the NLP section for the interaction. If the name of that person is not

present in the database, then it will ask the name and takesome photographs of that person as a sub process. These datawill save to the database and one copy will send to the NLP section.

A. Facial Recognition

Face recognition means identify a person's identity. For this we use many algorithms. As the first step the camera capture live visuals. That video is then converted to frames/photos. Before we are going to facial recognition we need to apply some filters for the pre-processing of the image. For this, we will convert this image from RGB scale to Gray-scale. Before facial identification we need to check is any faceis available or not. For that, we use harcascade classifier. If there is no face present, then it will go back to the image and taking video from camera and the loop goes on.

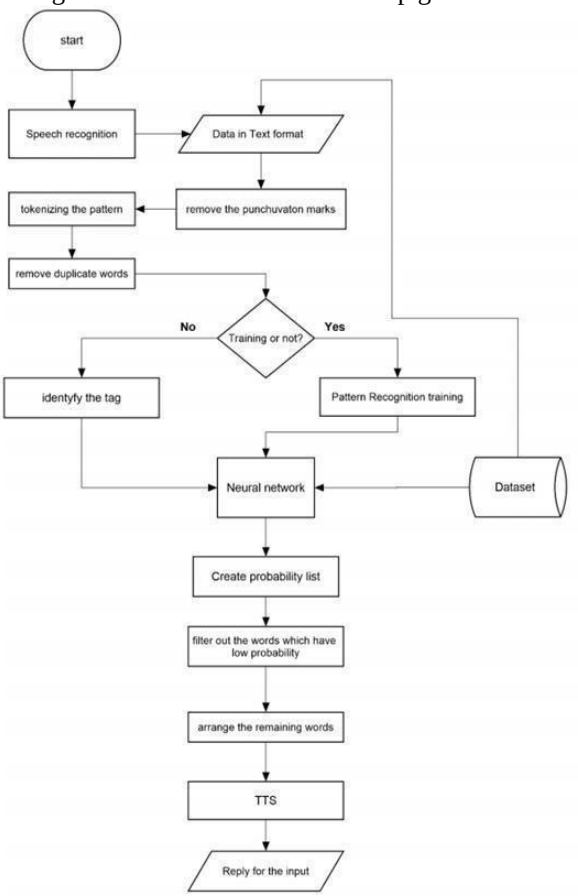

Fig2: Facial recognition flowchart

If that frame contains any face, then the next procedure for face identification will starts. For this, we need to normalize the face images and its orientations. This help to extract accurate feature in the coming steps. After normalization, weneed to enhance the images for improve its quality.

After these steps we are going to feature extraction stage. The extracted feature will compare with the features already stored in the database. These are all done with the help of Neural Network. After the comparison it will gives the nameof that person as output. Then data will transfer to the NLP section for the further procedures.

B. Natural Language Processing

Here we are going to interact the chatbot as like a human. It gives the audio output with the NLP. The main challenges in natural language processing frequently involve speech recognition, natural language understanding, and natural- language generation.

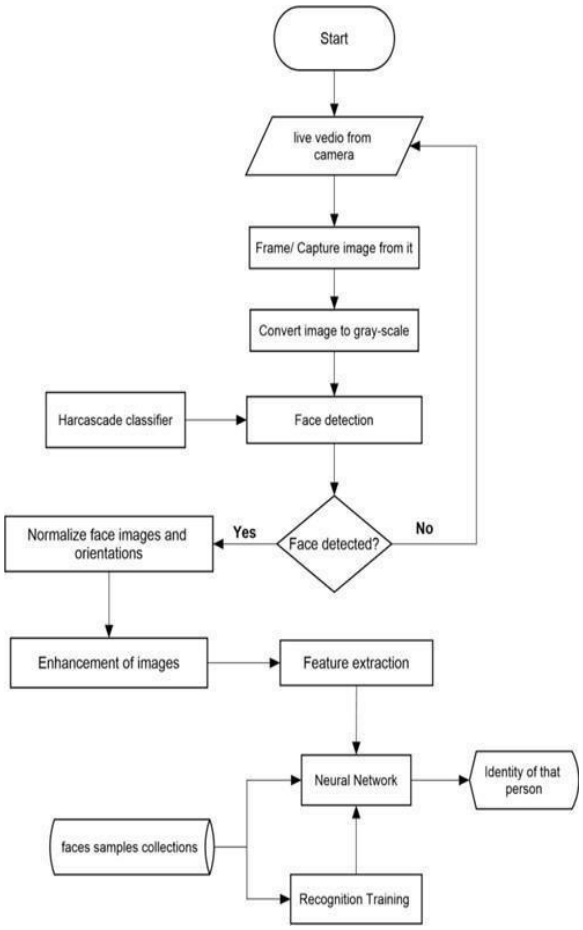

Fig 3: Flowchart of Natural language processing

In this chatbot system, we use speech recognition system usedto recognize what the user speaks. After speech recognition, that audio will convert to plain text format. Before going to NLP, we need to apply some pre-processing step. In this stagewe remove the punctuation marks and tokenising the pattern.After that we do the lemmatization part. It is typically done by having a look-up table of the lemma forms of words based on their part of speech and possibly having some custom rulesto handle words that we have never seen before.

If the data is for training purpose, then we will for the patternrecognition training. Otherwise we will go to find the tag andthe stop word. After identifies the proper tags and stop word,we are going it create the reply. It is the scariest part in the system. For that we will create a bag of the words which can be used for this to give reply. After creating this bag, we needto filter this bag for a better output. For that we will filtered out the words which have the probability below than the threshold probability. Then we need to arrange the remainingwords as a sentence. This will be in the form of plain text. This text will give to the text to speech converter. This converter will convert the plain text to audio format.

IV PROPOSED APPROACH

A. Face Detection

Multi-Task Cascaded Convolutional Neural Network (MTCNN) is used for face detection. We use the MTCNN library to create a face detector and extract faces for our use with the FaceNet face detector models in subsequent sections. The first step is to load an image as a NumPy array, which we can achieve using the PIL library. We will also convert the image to RGB, just in case the image has an alpha channel or is black and white.

Fig 4. Face Detection Using MTCNN

Next, we can create an MTCNN face detector class anduse it to detect all faces in the loaded photograph. The result is a list of bounding boxes, where each bounding box defines a lower-left-corner of the bounding box, as well as the width and height. We can use the PIL library to resize this small image of the face to the required size; specifically, the model expects square input faces with the shape 160×160.

B. Feature Extraction

FaceNet model is used for feature extraction. Features are extracted from pre-processed images. It is built on the Inception Resnet architecture and there are generally 22layers. The weight of FaceNet is optimized using the tripletloss function, so that it learns to embed facial images into a 128-dimensions.

C. Classification (Support Vector Machine)

For classification (feature matching), support vectormachine is used. Linear SVM is a linearly scalable routine meaning that it creates an SVM model in a CPU time which scales linearly with the size of the training data set.

The classification by SVM separate the classes from the extracted feature by FaceNet by calculating the distance. SVM algorithm implemented by scikit-learn is fast and easy to perform classification task.

Fig 4: Detected face.

A. Hardware

All the software needs a hardware to execute it. Or in other words, the software and hardware is mutually connected. The main hardware parts which are used for this project is listed below.

They are: -

- Raspberry pi
- Camera

- Speaker
- Microphone

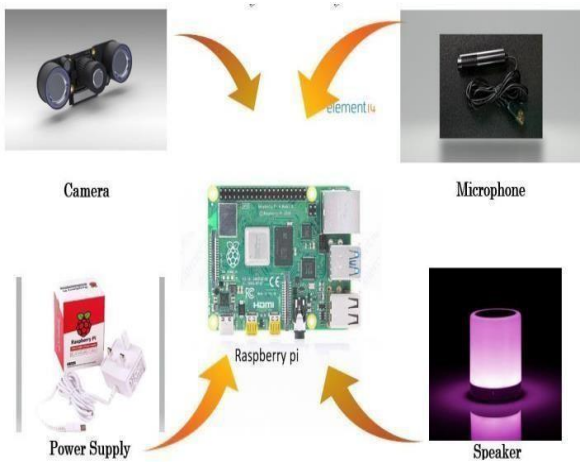

Fig 7. Hardware block diagram

The raspberry pi is the brain of this project. Here we are using RASPBERRY PI 4 B Model. It is one of the advanced boards in the raspberry pi series. It offers a ground- breaking increase in processor speed, multimedia

Fig 8: Raspberry PI4 model B

We use many peripheral devices to it. One of the major components is Camera. It will provide the needed facial data as input. Here we need the night vision facility. So that we choose the raspberry NoIR. The sensor of this camera is SonyIMX219-5MP and it supports 720p video recording. It uses the fish eye lens for the spreading of IR lights to a larger area.

Fig 9. Raspberry pi v2 camera module

In this chatbot we use audio signals also. For taking these audio signals we use an USB based microphone. It willcapture the audio signal and the convert it into electronic signals. Along with the microphone we use a speaker for getting the output in the audio format. Here we use the poweradapter of 5V with 3A with USB C type charging port.

V. RESULTS AND CONCLUSION

In this paper, we proposed an AI based chatbot system whichcan interact with the human and gives a speech output whichcan is audible to humans. And also, most of the chatbots are based on English. We are trying to improve the convolutionalchatbot system. It will use facial recognition for identify the person who stands in front of it. And also respond to the userin local language in the audio format. It uses NLP for framing the output for the user. The uniqueness of this chatbot is, it can add the details unknown person after meet them once. Wecan also add Wikipedia API for extend its knowledge. It willgo to the Wikipedia and find the solution for the unknown questions.

Here we proposed a new method for face detection and facialexpression recognition using deep learning techniques. To geta better accuracy for face detection by using the combinationof MTCNN, FaceNet and Support Vector Machine (SVM). In this proposed system, MTCNN is used for face detection, FaceNet is used for feature extraction by embedding 128 dimensions per face and SVM is used to classify the given training data with the extracted feature of FaceNet.

The Experimental result show that the proposed approach is good enough for face detection with an accuracy of 90.36%.

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LOW-COST 3D PRINTER FOR DENTAL APPLICATION

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Abstract: 3D printing has been hailed as a disruptive technology which will change manufacturing. Used in aerospace, defense, art and design, 3D printing is becoming a subject of great interest in surgery. The technology has a particular resonance with dentistry, and with advances in 3D imaging and modelling technologies such as cone beam computed tomography andintraoral scanning, and with the relatively long history of the use of CAD CAM technologies in dentistry, it will become of increasing importance. Uses of3D printing include the production ofdrill guides for dental implants, the production of physical models for the prosthodontics, orthodontics and surgery, the manufacture of dental craniomaxillofacial and orthopaedic implants, and the fabrication of copings and frameworks for implant and dental restorations. This paper reviews thetypes of 3D printing technologies available and their various applications in dentistry and in maxillofacial surgery.3D printing has many applications in the dental industry, including bridge models, surgical guides and dentures. However clear aligner manufacturing is on of the most commonuses of dental 3D printer today.

I. INTRODUCTION

3D printers use a variety of very different types of additive manufacturing technologies, but they all share one core thing in common: they create a three-dimensional object by building itlayer by successive layer until the entire objectis complete. It's much like printing in two dimensions on a sheet of paper, but with an added third dimension. 3D printing is a new technology, the birth of 3D printingwas in1984 at the hands of Chuck Hull who inventeda process known as stereo lithography, in which layers are added by curing photopolymers with UV lasers, after that, 1990 layer by layer technology used eachlayer has 0.1mm depth, in 1999 the first use in medicine, in 2000 the first parts of human such as ears, fingers was done, 2005 3D printing technology became open source, in 2006 the first SLS (selective laser sintering) machine become variable, in 2008 the first self-replication printer which made the printer able to print the majority of its own components also at the same year 3D technology developed to do a very hard shapesand artists for designers ,in 2009 Atom by atomprinting were done which allows for Bio3D printing, in 2011 the first 3D printer Robotic Aircraft at the same year the world's first 3Dprinted car and it became commercially available at the next year, at the same year the first gold and silver jewellery were done using 3D printer. Fused Deposition Modelling (FDM) is also called Fused Filament Fabrication (FFF). This type of FDM 3D printer is widely used in the market. Additive manufacturing, or 3D printing, has been a popular method of creating prototypes since the 1980s and is quickly becoming the fastest, mostaffordable way to create custom consumer goods, as well. There are several different methods of 3D printing, but the most widely used is a process known as Fused

Deposition Modelling (FDM). FDM.

use a thermoplastic filament, which is heated to its melting point and then extruded, layer by layer, to create a three-dimensional object. Thetechnology behind FDM was invented in the 1980s by Scott Crump, co-founder, and chairman of Stratasys Ltd., a leading manufacturer of 3D printers. The Brooklyn-based company MakerBot (now owned by Stratasys), was founded on a nearly identical technology known as Fused Filament Fabrication (FFF). The extrusion printers are the most common and possibly if you have seena 3D printer will be of this type. They are known in the 3D printing community as FFF (Fused Filament Fabrication). The operation is very simple; a nozzle takes out material to go creating the layers. These desktop printers are ideal to have at home and those that are discussed more thoroughly in this project. Thistype of printers is used both personal use and insmall and large companies. There are printers of all sizes but the most common are printers tomake objects that fit in the palm of a hand. Theprecision of the movements that the printer canmake and the thickness of the stroke it can make (0.4 mm). In the precision of movements, the difference between the minimum layer height (0.006 mm) and the X and Y axis (0.02 mm) is differentiated. The global 3D printing market was valued at $4,164.2 million in 2014 and is projected to reach $44,393.1 million by 2025, registering a CAGR of 21.8% from 2019to 2025. North America was the highest contributor to the global market, with $1,728.1million in 2014, and is estimated to reach$16,838.3 million by 2025, registering a CAGRof 20.8% during the forecast period. 3D printing, also known as desktop fabrication or additive printing technology, allows manufacturers to develop objects using a digitalfile and various printing materials. The materials used in 3D printing include several types of polymers, metals, and ceramics. 3D printing offers methodologies that can make manufacturing of complex designs an apparentreality.

II. RELATED WORKS

The credit of the development of the first working robotic 3D printer in 1984 is generally going to Charles W. (Chuck) Hull, this technology has been using in the manufacturing and prototyping industries since the late 1980s, but it became more popular when the desktop 3D printers werereadily available to the public in 2009. A desktop 3D printer is industry jargon for a smaller, less expensive 3D printer that a typical consumer can buy. In 1989 S. Scottand Lisa Crump patented fused deposition modelling (FDM) and co-founded the printer manufacturer Stratasys, Ltd. This technology is also known as fused filamentfabrication (FFF), where a plastic filament is fed into a heated extruder and then precisely lays down the material. Later, in 2005, this technology became the basis of the RepRap movement. James Norman, Rapti D. Madurawe, Christine M.V. Moore,Mansoor A. Khan, Akm Khairuzzaman published their research work on 3D- printed drug products on 18 March 2016. They showed in their research work that, to improve the safety, efficacy, and tolerability of medicines researchers proposed dozens of 3D printing innovations. The commercial feasibility of this technology has been shown through theFDA approvalof a 3D printed drug productin August 2015. Thabiso Peter Mpofu, Cephas Mawere, Macdonald Mukosera showed in their research that, the demand and the popularity of 3D printed parts in the market are increasing gradually in a different field.

III. WORKING.

Step 1–Creation

First in 3D Printing is to create a blueprint slash three-dimensional digital file of the object we want to print. The most commonway of creating a digital model is withComputer Aided Design – CAD. However,there is a large range of professional and entry level software that can produce a file suitable for 3D Printing.

- **DESIGN.**

We can use 3D modelling software like Blender, Sketch Up, AutoCAD, SolidWorks,Maya, Photoshop, Thinker Cad or others to create your own designs. Almost any 3D modelling software can be used to create a 3D printable file

Fig1. Design of an invisible aligner.

- **SCAN.**

Another way to create a three-dimensional digital file is through 3D scanning. 3D scanning is a technology, closely related to 3D printing, that analyses a real-world object and instantly creates a digital replica. 3D Scanning is widely used forreverse engineering tasks from industry professionals. Once an existing object isdigitized, we also have the option to modify it before printing. A 3D scanneris needed for this process.

- **DOWNLOAD.**

If you have minimal patience and just want to go ahead and print something, you can visit websites like Thingivers, YouMagine, CrabCad, and MyMinifactory Shapeways to download or buy filesthat other users have modeled. These files are 3d Print ready in most cases!

Lastly, there are several design requirements the 3D files have to meet before sending them to the printer. When designing for Additive Manufacturing (3D Printing), we need to keep in mind that we are design for the real world. Those are things like proper scale-size, minimum wall thickness, manifold/watertight just to name few, which we are going to take a deeper look a bit latter.

Links to Free Design Software, Ready to Print Files and Slicing Engines

Step 2– STL

Once you have a finished the CAD design, it is time to send it to the printer. First, we need to convert it into an appropriate file format. The most common 3D Printing fileformat is called STL, that stands for **St**ereo Lithography, and named after the first ever3D printing process. STL has several other meanings such as "Standard Triangle Language" and "Standard Tessellation Language". What is important to rememberhere is that STL is the usable file extension. This file format includes triangular mesh (polygons), the data that describes the layout/surface of a 3D object. Alternatives to STL are **.**OBJ and **.**3MF. Keep in mind that all those file formats don't contain color information. For 3D printing in full color, you need to use file formats like X3D**,** WRL**,** DAE**,** PLY

An important note here is not every STL or OBJ file is 3D printable by default. The file formats have to meet certain criteria like a maximum polygon count, water-tightness, proper physical size,minimum wall thickness etc. (Read More Here.) In short they have to be designed with 3D printing in mind!

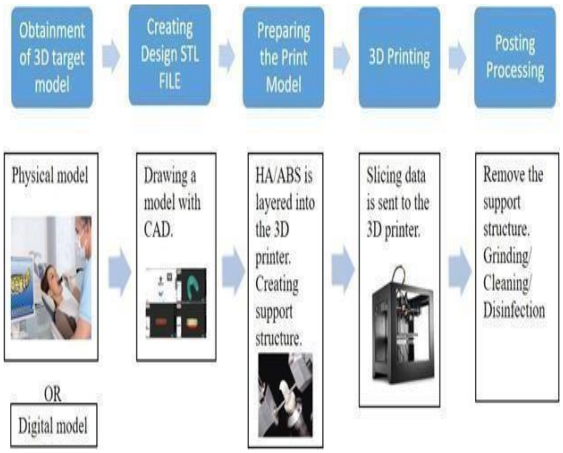
Step 3 – Slicing:This is the process of translating the 3D Fileinto instructions for the 3D printer to follow. Yep, that's the fun part and you need a special software to do only that! Basically, Slicing is dividing or chopping the 3D model into hundreds or thousands ofhorizontal layers, telling the machine exactly what to do, step by step. After the files are Sliced, a new file format is generated called G-code**,** with the file extension. g code**.** G-code is the most widely used numerical code programming language, mainly used in computer-aided manufacturing to control automated machine tools like 3D Printers and CNCs (Computer Numerical Controls). In a nutshell G-code is the language of the machine and what we use to communicate with it.

Step 4 – Printing:The printing machines are made of many moving and intricate parts, and they demand correct maintenance and calibration to produce successful prints. Most 3D Printers do not need to be monitored after the printing has begun. Themachine will follow the automated G- code instructions, so as long as there is no software error or the machine doesn't run out of raw material, there should not be an issues during the printing process.

Step 5– Removal:Removing the finished parts from the printer will vary for different 3D printing technologies. In some case, like for Desktop machines, it is as simple asseparating the print from the build platform.For some industrial 3D printers, theremoval of a part is a technical process thatrequires professional skills and specialized equipment within a controlled environment.

Step 6 – Post-Processing:

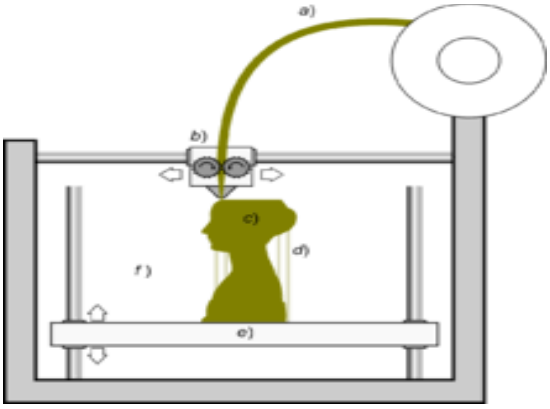
Again, post-processing of 3D printed parts will vary with 3D printing technologies andthe materials the parts were printed with. Some 3D printingtechnologies let ushandle the finished parts right away,while other technologies require additional steps to finish the fabrication process. Post- processing is an important step for the aesthetic and function of the parts.



I. METHODOLOGY.

We divided the whole process into fourmajor steps, I) Designing ii) Printing and

iii) Assembly iv) Installation Firmware. First of all, we designed several parts of the 3D printer using a Computer-aided design (CAD) software. CAD is the use ofcomputer systems (or workstations) which is used to create, modify, analyse, or optimize a design. In this case the SOLIDWORKS CAD software was used. At the printing section, we used a 3D printer(Up Mini) uses the most popular Fused Deposition Modelling (FDM) technology. Fused deposition modelling technique Fig.2 shows the general process of FDM 3D printing technology, where (a) input filament, (b) moveable hot end, (c) desired printed shape, (d) additional vertical support structure and (e) a moving platform. The used input filament was Acrylonitrile Butadiene Styrene (ABS) andthe nozzle and bed temperature were 230o C and 60o C. We installed Marlin Firmwareon the circuit board. Marlin is an Arduino platform-based open-source firmware forRepRap and another fused deposition modelling (FDM) 3D printers. Thisfirmware runs on the 3D printer's control board and manages all of the machine's real-time activities including movement through the stepper drivers, heaters,sensors, lights, bed levelling, LCDs and buttons. It supports many different boards and many designs of 3D printerThe general process of FDM 3D printing technology, where (a) input filament, (b moveable hot end, (c) desired printed Fig.4. Fused deposition modeling technique shape, (d) additional vertical support structure and (e) a moving platform. The used input filament was Acrylonitrile Butadiene Styrene (ABS) and the nozzle and bed temperature were 230o C and 60o



C. We installed Marlin Firmware on the circuit board. Marlin is an Arduino platform-based open-source firmware for RepRap and another fused deposition modelling (FDM) 3D printers. Thisfirmware runs on the 3D printer's control board and manages all of the machine's real-time activities including movement through the stepper drivers, heaters,sensors, lights, bed levelling, LCDs andbuttons. It supports many different boards and many designs of 3D printer

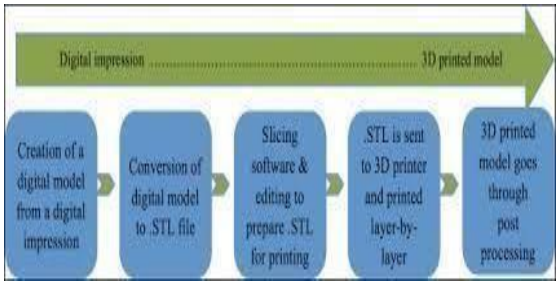


Fig.3. Process Steps for construction of the proposed 3D printer.

After completing all the necessary setup, four prints were done with two different input material (ABS & PLA) and same bedtemperature 60o C and different nozzle temperature 235o C & 185o C respectively.The print operation is done by an open- source software called Pronterface. It is a graphical interface. It is part of a set of software from Printrun, a group of G-code utility applications. With this software, onecan operate a 3D Printer easily.

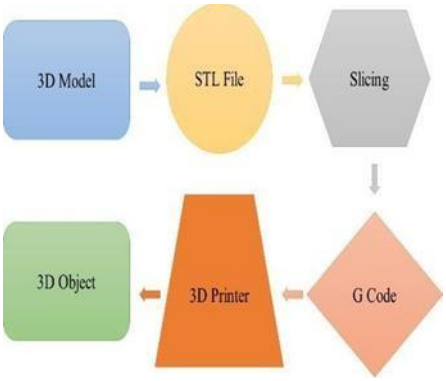


Fig5. Functional block diagram

VI. CONCLUSION.

In this work, we tried to design and construct an effective, better quality andunique model of an FDM 3D printer at a very low cost. The materials used in 3D printing include several types of polymers, metals, and ceramics. 3D printing technology could revolutionize and reshape the world. In our project a low cost 3D printer with a new technology. Here we made a new type of invisible dental braces. Nowadaysthe invisible braces are made by using transparent silicon sheets. Here it will have made by using the low cost 3D printer. That will be a new technology in the dentistry and it will change the entire dental field. It will help the doctors for developing the braces faster at the hospital itself with more efficiency this technology finds that thework has been reduced drastically and they are able to achieve accurate bracesusing 3D printer and it is also get in low cost with more efficiency.

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SOLAR POWERED ELECTRIC CAR

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***Abstract*— The purpose of this paper is to create solarautomobile solar automobile that will address issues such as pollution and fuel scarcitywhile also concentrating on energy conservation. A clever vehicle is one which relieves us of all automobile protection obligations whilst assuringthe driving force and passengers` protection and comfort. When growing any such automobile, quite a number of things ought to be considered. We organized the entire system into two primaryparts in our design:Vehicle tracking and monitoring system and Safety system The vehicle monitoring system incorporates a number of sensors that detect critical characteristics such as thetemperature of the car's battery chamber andother variables. Accelerometers and speed sensors detect anomalous vibrations in sensitive areas as well as over speeding. After being detected,the data is saved in the cloud. This allows for remote monitoring of the vehicle's performance and the activities of the driver.The safety technology detects the oncoming vehicle's speed and makes safe cuts and lane changes. This also involves sensing things in the vehicle's vicinity, which aids withparking and driving in congested areas. When a vehicle gets out of control, an Emergency Shutdown System is meant to halt it at the flip of a switch.**

Keywords—Solar, Efficiency, Safety, Performance

I.INTRODUCTION

The search for a reliable, safe, clean, and environmentally friendly fuel never ends. Fossil fuels and other carbon-based fuels are unsustainable and dangerous to our ecosystem. Renewable energy sources, which comprise all sorts of fuelsand energy carriers other than fossil fuels, such as the sun, wind, tides, hydropower, and biomass, are some of the choices. Solar energy is selected among these componentsbecause it has the potential to offer the cleanest, most sustainable energy for the longest period of time - a couple billion years from now. Photovoltaic output has doubled every two years since 2002, expanding at a rate of 48 percent per year. Due to its multiple environmental, economic, and social benefits, PV systems have become the quickest growing energy technology. The only constraint to solar power as an energy source, it might be said, is our understanding of how to design efficient and cost-effective technologies to utilise it.

The study that is relevant to the Paper will be explained in this chapter. Aside from that, this chapter will include crucial references, a journal, and project-related information.

1.1RENEWABLE ENERGY'S IMPORTANCE

According to Figure 1.1.1, India's capital, Delhi, is indeed one of the country's most polluted cities. According to a recent research, pollution from road dust and cars accounts for almost half of all pollution.

A variety of remedies have been offered, the most common of which being afforestation and automobile usage restrictions.

Fine particulate matter (PM2.5) is an air contaminant that can be harmful to people's health at high levels.

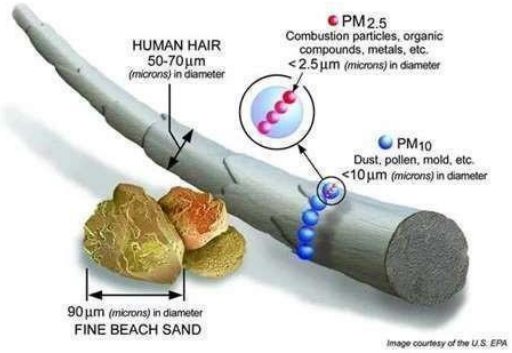

Fig 1: PM 2.5 Size Comparison

According to a recent worldwideresearch, State of Global Air 2020 (SoGA 2020), India ranks first in a number of concerning air pollution indicators. With a 17 percent risein the previous decade, India tops the list of nations with thegreatest annual average exposures to PM 2.5, a potentially hazardous fine particle matter, and the world's third highest overall o3 exposures.

The paper goes on to say that air pollution is responsible formore than 116,444 deaths in India, and that 1.67 million deaths are due to air pollution, which is now considered India's greatest health concern.

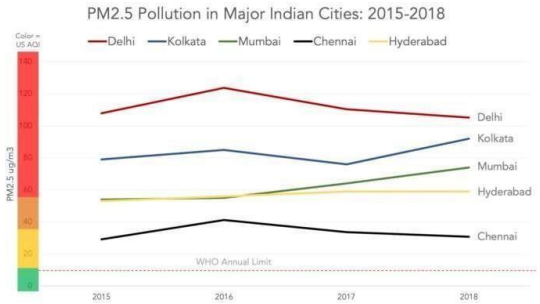

Fig 2 : Pollution in Major Cities

1.2 SOLAR POWER

Solar energy is the direct or indirect conversion of solar energy into electricity through photovoltaic (PV) technology. Concentrated solar energy systems use lenses ormirrors and tracking devices to focus a large area of sunlight into a small beam. Photovoltaic cells convert light into electricity by using the photovoltaic effect.

The International Energy Agency (IEA) is a non- profit organization Solar photovoltaic and concentrated solar power would provide around 16 and 11 percent of global energy consumption, respectively, by 2050, according to the"high renewable" scenario, and solar would be the world's greatest source of electricity. The majority of solar panels would be installed in China and India.

Photovoltaic power was originally used to power small and medium-sized applications, from single solar panel-powered computers to off-the-grid rooftop PV array- powered rural homes. As the cost of solar power goes down, the number of grid-connected solar systems has grown to millions, and hundreds of megawatts of utility- scale solar power plants are being built.

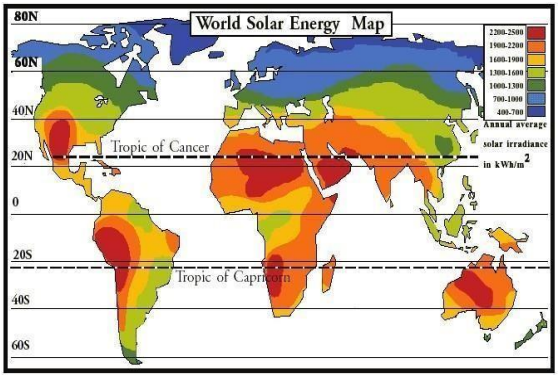

Fig 3 :Map showing the Solar Energy Distribution acrossthe Globe

1.3 SOLAR POWERED CAR

A solar-powered vehicle is one that makes use of a renewable resource that is acquired when sunlight strikes a solar panel mounted on the vehicle's surface. To keep the automobile functioning properly, the driver needs keep an eye on a variety of instruments to notice any issues. Wireless telemetry is almost always incorporated in automobiles without gauges, allowing the driver's team to track the car's energy consumption, solar energy capture, and other parameters while the driver concentrates on driving.

Solar vehicles bring together technologies from theaerospace, bicycling, alternative energy, and automotive sectors. The quantity of energy input into the automobile substantially limits the design of a solar vehicle. The majorityof solar vehicles are designed to compete in solar car races. Some solar cars are intended for public usage as well

Solar automobiles rely on a solar array that converts sunlight into power using photovoltaic cells (PV cells). Solar cells convert sunlight directly into electricity. Solar heat converts sunlight into heat for home, business, or electricity conversion. Photons from the sun excite electrons in the PV cell, allowing them to flow and generate electricity. Solar cells are made of semiconductor materials such as silicon, indium, gallium and nitrogen alloys. The most commonly used material is crystalline silicon with a efficiency of 1520.The first solar family car was produced in 2013.

1.4 OBJECTIVE

This paper proposes a design for more advanced safety features as well as methods for monitoring the vehicle's performance and the drivers' vitals. This concept also includes a cloud-based remote monitoring system to keep an eye on the car and the driver.

1.4.1 THE USE OF FOSSIL FUEL IS BEING REDUCED

Certain plug-in electric vehicles powered bygas- fired power plants emit up to 60% less pollution thana normal automobile with an internal combustion engine.

According to Hanergy (a world-leading thin film solar company that offers flexible solutions for home systems, BIPV, large projects, football stadiums, and agricultural), five to six hours of sunlight should allow thin film solar cells to generate 8-10kWh of power per day, allowing the car to travel about 80 kilometers on solar poweralone. The maximum range is around 350 kilometers.

1.4.2 IMPROVING THE DRIVER'S SAFETY

Impact detectors are used, which are directly connected to the kill switch. As a result, when a collision occurs, the kill switch disables the entire system. The driver'svitals, battery temperature, battery power level, and electricity generated will be tracked and uploaded at regular intervals. This information may also be monitored by the manufacturer, who can save the data in the cloud for future upgrades.

We'll be able to enhance performance based on traffic, and we'll be able to include features such as autonomous driving.

1.5 PROPOSED MODEL

The suggested concept is meant to meet all of the aforementioned goals by incorporating diverse characteristics within a traditional solar vehicle design. The characteristics that aren't included above are listed below.

- Features that ensure your safety
- Impact attenuator
- Emergency shut-off system
- Obstacle proximity
- Vehicle tracking and performance monitoring
- Temperature of the battery
- Power usage
- Vehicle speed

Sensors and a microcontroller with a built-in WIFI module are used to monitor the above-mentioned parameters, and data is sent to the cloud.

II. OBJECTIVES AND METHODOLOGY

A.Project Objective

The major goal of this paper is to build a solar car thatwill of distance every day, such as Dhaka city office commuters,for nearly no cost because it will operate on free renewable solar energy…

Project Overview

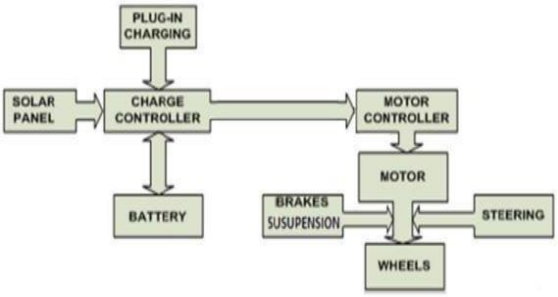

Fig 4: System architecture

B.Scope of the Project

The project's goal is to develop and build a prototype solar- powered clean automobile that is affordable, dependable, and ecologically benign. The parameters of the motor that drives the automobile are computed depending on the required speed and acceleration. This will allow you to figure out how much battery capacity and solar panel wattage you'll need to reach the specified maximum round trip distance using only solar power. A charge controller with the option of additional charging from AC lines is created, as well as a motor controllerto manage the car's speed and direction of travel. The car's chassis is built using crucial components such as a suspension system, a rack and pinion steering system, and a drum braking system. Finally, a design for an aerodynamic outer body is presented.

III. OVERVIEW

The following components make up the proposed solar car model, which includes many sophisticated safety measures and a vehicle monitoring system:

SL No.	Sensor Used	Parameter Measured
1.	ESP8266	Micro-controller which sends andreceives data from cloud
2.	TEMPERATURE SENSOR - LM35	Temperature ofbattery chamber
3.	TACHOMETER	Speed
4.	ACCELEROMETER	Unusual vibrations

5.	HM-10 BLUETOOTH SENSOR	This allows the system to be connected via Bluetooth so thatwe also control the car offline.
6.	ULTRASONIC SENSOR HC-SR04	This allows the car to keep average distance between object around
7.	NEO-6M	well-performing Complete GPS receiver.

IV. THEORY/MODELING/EXPERIMENTATION

Solar automobiles are simpler than internal combustion engines in that they have fewer key components. However, because the automobile is an electrical system, detailed estimations of the ratings of these essential components are required throughout the design phase. The ratings of the three key automotive components that will be decided are as follows:

1) The required motor power rating to accomplish thespecified speed and acceleration.
2) The battery capacity necessary to cover thedistance tobe travelled.
3) The solar panel requirements required to keep thebattery charged for the duration of the travel.

The motor's power rating determines the battery capacity(in Ampere-hour charge and voltage) necessary to exceed themaximum distance that the solar vehicle may go on solar power alone. As a consequence, the wattage of the panel required to keep the battery charged will be established.

4.1 THE MOTOR'S POWER RATING

The force required to push a vehicle is calculated by combining the force that must be applied to the vehicleto move it and the speed at which it must maintain its driving force. The motor's driving torque creates a drive force at the tire/road contact, and it is this drive force that propels the vehicle forward. It's easier to structure the calculation aroundthis driving force rather than the drive torque at the design stage.

As a result, the calculations in this section beginwith identifying the amount of this driving force, and then the drive power is calculated given a set of vehicle speeds. Individual force components arising from diverse physical events can be added together to approximate theoverall drive force that must operate on the vehicle to make it move (or keep it going). These are the forces required to overcome the wheels' rolling resistance on the driving surface, aerodynamic drag, and the acceleration of the vehicle's mass. Other effects may exist, but these are is how these competing forces are accounted for:

4.1.1 *The Resistance to Rolling*

The force that opposes the rolling motion of a tire as it rolls across the road is called rolling resistance. Rolling resistance is determined by the (magnitude) deformation of the wheels,the deformation of the road surface, and the movement under the road surface. Wheel diameter, speed, wheel weight, and other factors all affect. For example, rubber tires have higherrolling resistance on paved roads than steel train wheels on steel rails. Sand on the ground, meanwhile, provides more rolling resistance than concrete. The rolling resistance forceis calculated as follows:

$$fR = u0 * w$$

the most common. The following

Where W denotes the car's weight .µR is thecoefficient of rolling resistance, which varies according on the vehicle's

4.1.1 Drag Force in Aerodynamics

The force applied by the air to keep the vehicle from moving through it is known as aerodynamic drag. The aerodynamic drag force is calculated as follows:

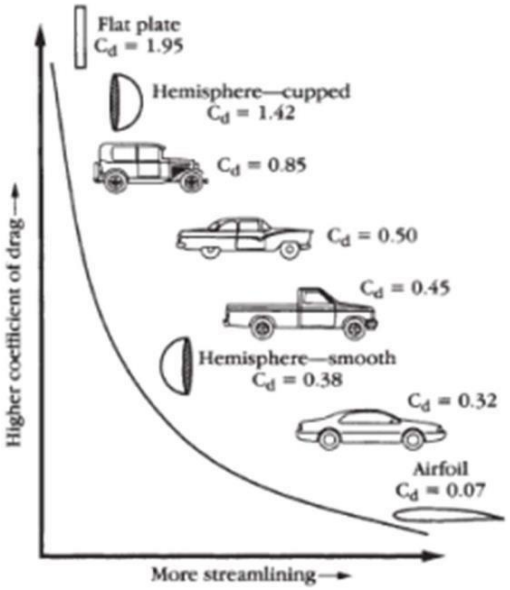

Fig 5: Coefficient of drag of different vehicle shapes Because the drag force is related to the square of the speed, it becomes more evident at speeds exceeding 40 km/h. Because batteries only give 1% of the power per weight of gasoline, optimising for high-speed or long- range performance goals necessitates keeping this crucial performance element in mind.

As seen in Figure 4.1.2, the lower the c D, the more streamlined the car's form is. According to estimates, the body's rear area accounts for more than 33% of c D in conventional car designs, followed by the wheel wells at 2%, the underbody area at 14%, the front body area at 12%, projections (minors, drip rails, window

recesses, etc.) at 7%,and engine compartment and skin friction at 6% each..

4.1.3 *Acceleration Force*

The force of acceleration, which is determined by Newton's 2nd law of motion, should only be considered when the automobile is accelerating.

$F_{\text{ACCELERATION}}$ [m∗a]

Where m is the mass of the car and a is the acceleration.

To move the automobile, the total driving power necessary to overcome the sum of these opposing forces is,

$$F_{\text{T}} = F_{\text{ROLLING}} + F_{\text{DRAG}} + F_{\text{AC}}$$

V. CONCLUSION AND FUTURE DIRECTIONS

To deal with rising fuel needs and the devastating environmental pollution caused by driving carbon-based cars,it is imperative to move to a new source of energy, namely solar power, which is a cheap, efficient, inexhaustible, and, of course, environmentally benign alternative. They are odourless, smokeless, and noiseless cars with zero emissions. They need minimum maintenance, are more dependable dueto the lack of moving parts, and can be charged effectivelyalmost anywhere. It goes without saying that it is incredibly cost effective.

We anticipate that, because solar vehicles can readily absorb future technologies, it will not be long until the majority of the world's inhabitants move to driving this contemporary vehicle, resulting in a good shift in their lives and the environment. This is only the beginning of a new technology, and further advancements will undoubtedly make solar cars the preferred means of transportation over internal combustion engines.

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Analysis Of Different Embedded Processors & Algorithms for DL Applications: A Review

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***Abstract*—| DL is as of now utilized for the vast majority computerized brains (AI) application like mechanical technology,Autonomous vehiclesand so on. They present state of the art executionhowever they likewise require gigantic figuring power for handling various capacities. They givehigh accuracy to a few AI errands, however at that point accompanies a cost of high computational time and assets. Likewise, there are various strategies that permit powerful handling of DL to propel energy ability and throughput without relinquishing application exactness or aggregate equipment cost which persevere the key difficulties looking in planningAI frameworks. Here Embedded processors assume an extremely critical part in development ofAI applications. They effectively act as a reason for speedy calculations. To empower ongoing applications, DL calculations should be speedy and exact. The CPU, ASIC, FPGA, and GPUare viewed as the main parts in making an able equipment stage for continuous cycles. NVIDIA's Jetson is a promising stage now- a-days for implanted profound learning applications which seeks after to accomplish a harmony between low power, minimal expense, high precision rate and throughput. Thus, we give a survey of works that evaluate different installed processors for DL applications.**

I. INTRODUCTION

In current years Deep learning have stayed advantageous indiverse fields like computer vision, autonomous driving, and social network services. Based on artificial intelligence application the development of processors as a platform aimed at processing deep learning algorithms have motivated researchers into this area. For fulfilling the computational demands of AI Algorithms, major vendors and start-ups have designed and launched low power hardware accelerators for deep learning techniques which are computational expensive. NVIDIA's Jetson is favourable and one of the most extensively used accelerators for inference phase of ML and DL. Jetson present CPU-GPU architecture which is variedwhere CPU can boot OS and CUDA accomplished GPU can be swiftly automated to speed up intricate machine-learning and deep learning tasks [2]. Moreover, it has very small form factor, which has low weight and power consumption which makes it ideal fit for power-constrained scenarios in AI applications. To comprehend a large quantity of data and perform complex operations in real time, a controlling executing system is required.

To accomplish this, an assortment of PC structures, for example, multicore CPUs, heterogeneous frameworks, and disseminated frameworks, have been proposed. In any case, by involving full force of Jetson for accomplishing continuous execution requires executing advancements for implanted equipment stage and Neural Network calculations. With the vogue of profound brain organizations (DNN) and Graphical Processing Unit sped up DL systems, calculations are being progressed with another viewpoint for Faster R-CNN, R-FCN, R-CNN, Fast R-CNN, YOLO and SSD, which have colossallyexpanded the presentation guidelines in this field. The at present standard profound learning calculations are YOLO, quicker R-CNN, SSD and R-FCN, which should be advanced for superior execution and exactness when joined with equipment gas pedals for ongoing AI applications.

II. OVERVIEW OF DEEP LEARNING

In this segment we accentuation on convolutional brain organizations (CNNs), repetitive brain organizations (RNNs), likewise profound support learning (DRL), which are most extreme profound learning systems comprehensively utilized. Profound learning is a kind of AI that succeedsat workingwith unstructured information. Profound learning keeps onbeating existing AI draws near. It helps PC models in logicallyengrossing qualities from information at many levels [5].

A. Convolutional Neural Network

CNNs are image features extractors as well as universal nonlinear function approximators [3]. They are primarily designed to deal with spatial information, such as pictures. A convolutional neural network's superiority is due to a specific type of layer known as a convolutional layer. CNNs are functional feedforward neural networks that

typically include up to 20 or 30 layers. Back propagation algorithms (BP) are used to change the network's parameters (weights and biases) in order to reduce the cost function's value [4].

B. Recurrent Neural Network

RNNs are a type of brain network that might be utilized to show grouping information. It was made because of feedforward networks, which act much the same way to the human cerebrum. They are a strong and trustworthy type of brain organization; inferable from an inner memory, the key calculation summons its feedback, making it reasonable for ML issues requiring consecutive information.

C. Deep Reinforcement Learning

Reinforcement learning (RL) is the piece of AI that agreements with consecutive dynamic. Profound supportlearning joins ANN with a support learning design that permits programming characterized specialists to concentrate on the best activities likely in virtual climate to accomplish their objectives.

III. OVERVIEW OF COMPUTING PLATFORM

The utilization of equipment gas pedals, whether they depend on FPGAs, ASICs, or GPUs, is turning out to be more normal constantly. It could be seen in the execution of AI and DL calculations specifically. The algorithmic transcendence ofthese calculations requires huge handling power as well as memory.

A. Graphic Processor Unit

GPU is a PC processor that is explicitly expected to do realistic handling errands. The constant exhibitionprerequisites for muddled and high-goal 3D parts in PC games, where critical parallelism is required, have pushed GPU progress in the past [7]. While doing colossally gigantic equivalent computations, a GPU incorporates hundreds or thousands of equivalent processors and may accomplish fundamentally more noteworthy throughput than a CPU. Different equivalent programming gadgets, including as CUDA [10] and OpenCL [11], have been precisely forefront to decrease the intricacy of GPU programming. The convolution tasks among the neuron layers and various spatial channels, which might be fundamentally sped by GPU, represent most of the figuring cost of examining a CNN. Subsequently, an enormous number of PC vision and profound learning programs, for example, OpenCV [12] and Caffe [13], have utilized GPU to support throughput.

B. Field Programmable Array (FPGA)

FPGA stands for field-programmable gate array, which is aunified circuit that can be programmed to perform a variety of digital logic operations. For two reasons, it is now mostly utilized for HPC. First and foremost, FPGAs are reconfigurable, and the same FPGA fabric may be automated to do several logic operations. It outperforms CPU and GPU architectures designed for general-purpose computing in terms of processing efficiency and energy consumption. For a number of computer vision algorithms such as optical flow, stereo vision, and local image feature extraction, an appropriately designed FPGA architecture has been shown to be more energy-efficient than CPU or GPU [14]. Altera has released its CNN accelerator for the Stratix 10 and Arria 10 FPGA chips, which are mass- produced using 20 nmtechnology. They have built- in DSP units that allow them todo floating point calculations efficiently. The Altera OpenCL programming language is used to implement the CNN accelerator [15].

B *Application-Specific Integrated Circuits (ASIC)*

FPGA is a flexible reconfigurable technology that may be used to reduce CPU or GPU overhead by utilizing an application-specific design, but it's often limited by sluggish operating rates and a large chip footprint. These flaws are inherent in its reconfigurability, which necessitates the programming of logic operations and the use of lookup tables and switches to link wires. By forsaking low-level reconfigurability, ASIC can give better performance than FPGA. For both designand validation, ASIC execution has a significant NRE cost, especially for today's large-scale systems. Because it is made for custom design, the ASIC is likely to have a smaller form factor for unique design parameters or specifications [9].

C.Digital Signal Processor (DSP)

DSP is a specific microchip that performs estimations on digitized signals that have been deciphered from the simple space. DSPs areintended for advanced signal control and can perform fast tasks like shift and add and increase and add. Numerous math-escalated signal handling applications utilize these guidance arrangements. Sound cards, modems, PDAs, and high-limit hard circles all have DSPs [17].

III. LITERATURE SURVEY

Lately, research on equipment execution of AI calculations has advanced, and a few study papers have zeroed in on this theme. The focal point of this exploration is on computationally costly and eager for power profound learning strategies for AI applications. For these calculations, equipmentspeed increase is the most ideal methodology. The objective is to make DL calculations process quicker and all the more productively. Many examination papers have been distributed somewhat recently on equipment and programming advancements, profound learning calculations, and AI application execution philosophies, which are all explored in this paper.

An undeniable level GPGPU execution and power indicatorwas proposed by G. Wu et al [18]. This indicator appraises theexhibition and force of the GPGPU piece across a few equipment designs utilizing execution counter assessments from one equipment setup. This approach processes an

assortment of commonplace scaling ways of behaving from anenormous preparation set utilizing K-implies bunching. Utilizing brain network classifiers, the presentation counter information will be shown against scaling qualities. On the present strong GPUs, it dependably predicts application scaling patterns. They exhibited that by utilizing this methodology, they had the option to foresee execution evaluations with a typical mistake of 15% over a recurrence scope of scope of 3.3×, a transmission capacity scope of 2.9× and a 8× change in number of CUs. Dynamic power assessment model has a common mistake of just 10% over a similar reach.

N. Ardalani et al [19] fostered a robotized execution expectation instrument that can convey precise evaluations of GPU execution time for any CPU code previous to fostering a GPU code. It is based on two experiences: I) Hardware attributes and program properties recommend the execution time. ii) By testing a huge swath of previously carried out GPU codes, alongside their CPU, we can utilize ML to decide the connection between's CPU program properties and GPU execution time. They fabricated a troupe model involving forward choice as the base student. When applied to test set, which was utilized arbitrarily from true bits, their apparatus showed 26.9% normal blunder. The fundamental constraint of this paper was the accessibility of huge preparation information.

To assess the assessment exactness of CGPredict, S. Wang et al [20] utilized the NVIDIA incorporated Kepler GPU on the Jetson TK1 advancement board. Since each program is open in both successive C and tantamount CUDA code, theypicked the Polybench benchmark suite [6] for well known applications. The benchmark assessment techniques utilize similar engineering components and application attributes as CGPredict, and it can appropriately appraise shared memory execution from tiled C code. The paper's weakness was that CGPredict right now doesn't empower information sharingacross pseudo-strings after twist creation for applications that request it and CGPredict as of nowcan't embed the synchronization natives consequently. The engineer needs to physically encase the synchronizations to gauge the likelihood of GPU speed increase for that application exactly.

Useful GPU reenactment has been demonstrated by K. O'Neal et al [21] to precisely estimate GPU execution, and thisapproach can be utilized during pre-silicon configuration space investigation. They utilized an Intel Skylake GT3 GPU to get a 14.3% mistake rate while running three to four significant degrees quicker than cycle-precise reproduction. This approach could likewise give different advantages, for example, beginning phase driver consistence testing, by bringing GPU equipment and programming co-advancement to prior plan stages. It's conceivable that the structure, alongside a prepared model, will be circulated as a pre-silicon assessment stage empowering outsider seller to assess responsibility execution when incorporated into a bigger framework. Highlight positioning can help GPU designers in rapidly recognizing execution bottlenecks on delegate responsibilities. These models are frequently not suitable to responsibilities that don't practice units planned to help the DirectX pipeline, for example, media jobs like video webbased or GPGPU occupations.

The idea of M. Lastra et al [22] was tried on an assortment of equipment stages, including a few CPUs and GPUs. Agroup hub in addition to a work area PC makes up these frameworks. Two Intel Xeon E5-2630 processors running at
2.30 GHz and 128 GB of RAM power the group hub. Every one of these processors has six centers, taking into consideration hyperthreading to approach 12 strings for each processor. This hub is furnished with four Nvidia Tesla GPUs, where Tesla is Nvidia's leader item. When contrasted with their CPU GTX reciprocals, these GPUs have more memory
and are steadier. Two models of GPUs were utilized: 1). 2 Nvidia Tesla K20m: Kepler engineering with 2496 CUDA centers and 5 GB of RAM running at 0.7 GHz. 2). Two NvidiaTesla M2090 GPUs with Fermi engineering, each with 512 CUDA centers running at 1.3 GHz and 6 GB of memory, are associated with a similar host machine through four PCI Express spaces. The Fermi design has a lesser number ofcenters however higher clock recurrence. In contrast with Fermi design, Kepler engineering, which is the latest, has a larger number of centers however a lower clock rate. As more GPUs are added, the exhibition scales basically directly, as per this system. This empowers for the productive usage of eachof the four GPUs' handling capacity, as well as a savvy technique for cost-cutting, high- thickness finger impression matching hubs. These outcomes are just conceivable by staying away from GPU inactive times and utilizing a productive nonconcurrent memory move plan. In any case, designs card (GTX 680) showed a lower execution disregarding higher clock recurrence because of decreased equal memory move capacities contrasted with Tesla. Fig.1 assessment of maximized execution of Nvidia GPUs for single-accuracy drifting point (FP32) number-crunching estimated by GFLOPs and power utilization.

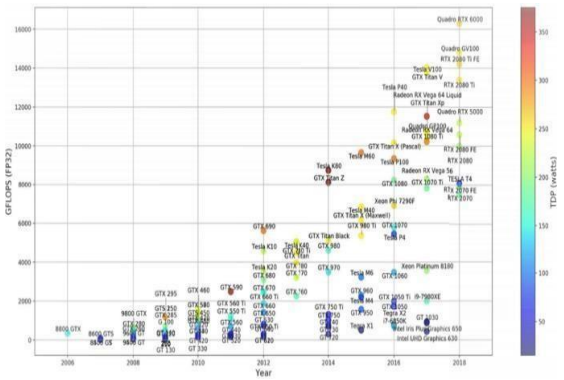

Figure 1: Computational throughput in relation of GFLOPS and power consumption in terms of TDP (watts) intended for single-precision floating-point arithmetic [35].

Strategies for enhancing RNN appraisal on versatile GPUs are introduced by Cao et al [33]. Since portable GPUs have coordinated memory and less centers than work area GPUs, utilizing a CUDA-like technique in versatile GPU makes RNN execution multiple times more slow than on Nexus5 versatile CPU [2]. Subsequently, the work is separated into numerous little pieces, bringing about extreme planning above. Their answer depends on the Render Script system [38], which permits the computation to be separated into reasonable work units that might be parallelized on GPU centers intermittently. They put their methodology under serious scrutiny on a RNN that had been prepared to foresee occasions in light of sensor inputs. When contrasted with different procedures, theirs givesa 4x speedup on versatile GPUs contrasted with the single- strung Nexus5 CPU execution. While utilizing Render Script for doing multi-stringing on CPU, execution accomplished is 70% of theversatile GPU execution. Ultimately, with expanding load on GPU, the RNN execution idleness increments further.

A.Li et al. [23] proposed 5 Correlation Ratio-based picture enrollment strategies advanced for GPU speed increase. They proposed a framework that totally kept away from clashes,was multiple times quicker than the past execution, had a more modest RMS blunder, and was very steady. When contrasted with elective methodologies, this plan depends on the algorithmic properties of CR, which exhibit a huge benefit on GPUs. They additionally took a gander at the effect of responsibility equilibrium, arranging, and smoothing on the contention free plan's exhibition and exactness, reasoning that:responsibility adjusting is basic for conveying execution; and above classification can be compensated on bigger dataset andby means of adequate reuse of the arranged outcomes; legitimate smoothing can lessen enlistment blunder without influencing its presentation. While nuclear procedure on shared memory are fundamentally quicker for old GPUs than on worldwide memory, this isn't true for new GPUs; the aboveof gigantic access is more than that of nuclear procedure on worldwide memory. Fowers et al. [24] analyzed the exhibition and energy utilization of sliding-window applications when carried out on FPGAs, GPUs, and multicore gadgets. Aside from humble info estimates, the FPGA gave much faster execution as a rule, with speedups of up to 11x and 57x when contrasted with GPUs and multicores. At the point when the essential sliding- window usefulness could be supplanted by recurrence area methods, GPUs conveyed the best outcomes. In essentially every situation, FPGAs were the most energy effective, and now and again, they were significant degrees better than different gadgets. FPGAs were the main gadget equipped for real inserted framework use for huge information sizes. The earliest constant sliding-window frameworks were made towork with top quality video with bits as extensive as 4545. Because of the decrease of PCIe move times, which represented up to 65 percent of execution time for the GPUand 64 percent for the FPGA, the outcomes uncover extensive enhancements when contrasted with gas pedal loads up. Low portion sizes brought about the biggest speedup for single- chip, sliding-window GPU executions, which was because of low calculation contrasted with informational index size. As information moved across the PCIe x16 transport was compensated against quadratically greater calculations, the speedup declined rapidly.

Pauwels et al. [16] utilized three fundamental picture handling issues to analyze the exhibition of GPU, FPGA, and CPU. They picked Nvidia's GPU for the test since their items empower the CUDA programming climate [11]. It has a sumof ten string handling bunches. Three streamingmultiprocessors, eight surface sifting units, and one level-1 store memory make up a string processor group. One guidanceunit, eight stream processors (SPs), and one neighborhood memory are available in each streaming multiprocessor (16KB). Subsequently, the GTX280 has a sum of 240 SPs. Ina streaming multiprocessor, one guidance unit is combined with eight SPs. With one XC4VLX160, 15x15 duplicate and add tasks (channel), 241 SADxy (x, y) (sound system vision), and 484 distances (k-implies grouping) may be generally finished in lined up with one XC4VLX160. Given the compromises between functional recurrence and fine

parallelism in FPGA, the GPU's true capacity is restricted to guileless estimation techniques in which all pixels can be dealtwith independently. As a result of its exceptionally small neighborhood memory and the memory access restrictions forced by its memory engineering, GPU can't execute further developed calculations that utilization shared exhibits. In thosecalculations, the GPU is more slowthan the CPU. The exhibition of CPU is 1/12 - 1/7 of FPGA, and that implies that CPU with quad- centers can execute around 1/10 tasks of FPGA in aunit time. The size and memory data transmission ofFPGAs limit their exhibition. They just utilized threeissues to analyze execution, and the exhibition of theprogram on the GPU and CPU were not significantlychanged. Power use and consumptions are not considered in the examination, which is one of the downsides.

For picture handling calculations, Potluri et al. [28] fostereda CNN UM model for GPU. CNN's equal registering capacities and cell connection make it ideal for picture handling. The OpenCL structure, which was used to build this model, gives a decent stage to pushing applications ahead on heterogeneous stages. Accordingly, we can say that the created CNN-UM model can run on the two CPUs and GPUs. We can see from the presentation concentrate on that involving GPU for picture handling applications truly does really accelerate handling and limit execution time.

Figure 2 shows that when the quantity of pixels is low, the GPU's presentation is generally equivalent to the CPU's exhibition. At the point when the quantity of pixels to be handled develops, how much parallelism obtained increments, and the GPU's speed moves along.

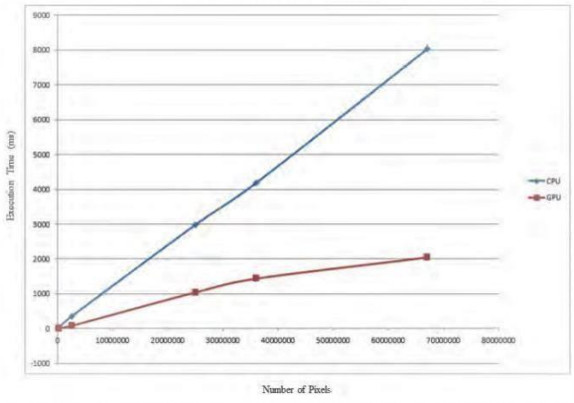

Figure 2. Benchmark for CPU and GPU [28]

A. Guzhva et al. [27] made a PC programming for the CPU determined to accomplish the quickest registering execution for a regular back-spread method in contrasted with GPU execution. They contrasted this CPU programming with many existing brain organizations to perceive how proficient it was. Twenty haphazardly created highlights were remembered for the test information. In light of the upsides of the information factors, the result information was produced as an exceptionally clear polynomial reliance (highlights). They felt that the starting loads made little difference to preparing speedexecution. The absolute number of examples in the informational index was 6,000. The preparation subset got60% of the information, while the test and approval sets got 20% and 20% separately. With the assistance of NVIDIACUDA innovation, a norm Back Propagation strategy with energy for preparing MLPs has been adjusted to run on contemporary NVIDIA realistic handling units. While preparing 6,720 MLPs, each with 1 secret layer, 1,648 data sources, 8 neurons in the secret layer, and one neuron in the secret layer, utilizing a sequentially fabricated video showconnector in viewof NVIDIA GTX 260, up to a 50x execution flood was acknowledged when contrasted with a very much improved CPU application. They should offerhelp for an assortment of brain structures on GPUs.

By keeping RNN loads on-chip, Diamos et al. [36] portray a way for further developing RNN preparing execution. They guide out that express synchronization is fundamental due toward the sequential reliance between time-occasions. At each time-example, the repetitive weight network should likewise be stacked from memory. They utilize a "multi-mass coordinated equal" machine strategy to upgrade this system. This strategy recreates GPU assets, for example, center count, transfer speed, synchronization above, and reserve/memory limit. Subsequently, their strategy endeavors to work out some kind of harmony between the expenses of handling, information move, and synchronization. The inconvenience of this technique is that it requires more worldwide memory data transmission than a strategy that isolates the lattice into tiles. Their methodology accomplishes quick throughput with little smaller than usual group sizes, lessening the requirement for enactment memory, and exhibiting great RNN solid scaling. The hindrance of this strategy is that it requires more worldwide memory transmission capacity than a techniquethat isolates the grid into tiles. Their answer has serious areas of strength for great of RNN preparing for up to 128 GPUsand empowers high throughput with little smaller than usual cluster sizes, which diminishes the requirement for actuation memory.

TABLE I. Comparison chart of different Algorithms Speed and Accuracy on GPU platform.

ALGORITHM	FEATURES H/W-GPU	ACCURACY	SPEED	BENEFIT	DRAWBACK	PAPER
K-MEANS CLUSTER &ANN	Performance counters	Perf-~85% Power-~90%	20% oftarget executions eliminated	Power & perf models used to avoid executing alldesign points	Large % of design points required totrain model	[18] G.WU Et al;2015
FORWARD STEPWISE REGRESSION	Inherent gpu compatible parallelism	Kepler perf-64% Maxwell perf-73%	10x-20x slowdown over native hardware	Cross platform; predict gpu perf from cpu features	High model error	[19] N. ARDALANI al;2015
ANALYTICAL MODEL	Single threaded CPU memory &latencies	Jetson tki Perf-91%	Cpu execution pluscode instrumentation & ptxtransform time	Cross platform; Gpu perf from cpu code	Choose input sizes to limit instrumentation overhead	[20] S. WANG Et al; 2017
RANDOM FOREST REGRESSION	Functional simulation on execution statistics	Intel skylake gpu Perf-85.7%	~328x faster than cycle accurate simulation	Cross abstraction; host & target use same SW stack	Functional simulator instrumentationoverhead	[21] K. O'NEAL Et al;2017

GPUs work well for convolutional brain organizations, as per D. Strigl et al. [26]. The somewhat little amount of information to ship to the GPU for each example, as well asthe enormous lattices that should be taken care of inside the organization, seem to make GPGPU handling fitting. We estimated the exhibition and versatility of two elective organizations for our presentation and adaptability tests: Simard Net and the LeNet5. We thought about the three unmistakable executions depicted in the past area in all benchmarks. They utilized GNU C++ Compiler to make CPU executables and NVIDIA's CUDA Compiler to make GPU code. The fundamental information designs are from the notable MNIST data set. It contains size-standardized and focused pictures of transcribed digits and is quite possibly the most notable example classifier benchmark.

TABLE II. Comparison chart of different Algorithms on GPU and FPGA.

ALGORITHM	HARDWARE(GPU)	HARDWARE (FPGA)	PAPER
2D FILTERS, STERIO VISION,K-MEAN	NVIDIA GTX 280: betterthan fpga for 2d filter	XILINX VIRTEX-4: better than gpu for stereo vison-mean	[25] S.ASANO ET AL;2009
SAD ALGORITHM	NVIDIA GTX 295:80 fps for 720p image	ALTERA STRATIX-3: 10 fps for 720p image	[24] J.FOWERS ETAL;2012
2D CONVOLUTION	NVIDIA GTX 295:120fps for image 1280 pixelx720pixel	ALTERA STRATIX-3: 80fps for 1280-pixel x 720pixel	[24] J.FOWERS ET AL;2012
PHASE BASED OPTICAL FLOW	NVIDIA GTX 580: betterthan fpga for image warping	XILINX VIRTEX-5: better than gpu for local feature matching median filtering	[39] K.PAUWELS ETAL;2012
PARALLEL CONVOLUTION	NVIDIA TESLA C1060: better perf for large kernel	XILINX SPARTAN-3: better perf in small kernel	[40] D.CORTI E ET AL;2011

In each of the three variants, the backpropagation stage (bprop) consumes most of the all-out time. At the point when the GPU is utilized rather than the CPU for calculations, the wattage of a framework like the one utilized in this paper basically duplicates. Due to the monstrous speedup that might be gotten, the whole preparation cycle ought to use less energywhile running on the GPU. Extra tests, be that as it may, are expected for an intensive evaluation.

V. CONCLUSION

An overview of equipment gas pedals for DL is introduced in this review, as well as philosophies for streamlining them and methods for improving on calculations or plans. The utilization of equipment gas pedals, whether they're foundedon FPGAs, ASICs, or GPUs, is developing constantly. These calculations' algorithmic predominance requiresvery high registering power and memory use, whichcan be acquired by fitting equipment gas pedals to the application's necessities. The further improvement of these calculations will bring about new applications with a bigger asset utilization. Carrying out these calculations on equipment will result in quicker, more effective, and more exact AIhandling, which will help all enterprises. We could likewise suggest new appropriated and equal profound getting the hang of registering techniques and structures to assist with enormous scope profound learning model preparation. Nonetheless, we should settle the versatility challenge of enormous scope profound learning models to prepare a bigger profound model. Moreover, to stretch out the ongoing gas pedals to a wide scope of requesting situations, exceptionally energy-proficientequipment motors are important [30].

While the GPU's universally useful nature makes it supportive for a wide scope of utilizations, it likewise restricts complete GPU building streamlining for AI applications. Besides, to expand the scope of existing gas pedals to a wide scope of invigorating conditions, very energy-effective equipment processors are vital. Throughout the following couple of years, monstrous Deep Learning network progressions as far as both calculation examination and equipment configuration are projected to increment to settle the previously mentioned issues.

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A REVIEW ON STUDY OF NEGATIVE CAPACITANCE TRANSISTOR

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ABSTRACT

The achievement of the VLSI Industry is the decrease of MOSFET size. The numeral of devices per chip and the system performance is being improving exponentially over thepast two decades. As the channel length is reduced, the presentation improves, the power per switching event falls, and the density advances. But the power density, total circuits per chip, and the total chip power consumption has been increasing. In order to overcome all these problematic a new concept was introduced by Salahuddin and Datta in 2008.They proposed that a ferroelectric material operating in thenegative capacitance (NC) region couldperform as a step-up converter of the surfacepotential in a metal–oxide–semiconductor structure. By applying the negative capacitance effect in MOSFET we can reduce the operating voltage beyond the MOSFET. Based on this technology we are replacing silicon materials with othermaterials to reduce the problemssuch as short channel effect. In this paper includes some review on development of negative capacitance technology and operation on different transistors.

Key words: metal oxide semiconductor, negative capacitance

I. Introduction

Over the past three spans, CMOS technologyscaling has been a primary driver of the electronics industry and it provided a path toward both deeper and quicker integration. The transistors manufactured today is 20 times faster and occupy less than 1% of the area of those built about 20 years ago. The number of devices per chip and the system performance is being improving exponentially over the last two decades. As the channel length is reduced, the performance improves, the power per switching event decreases, and the density improves. But the power density, total circuits per chip, functionality, price of microprocessors and the total chip power consumption has been increasing [1-5]. CMOS technology is fronting some severe problems alike excessive short channel effects (SCEs), high power consumption, andthermal stress beyond the limits of the materials used in integrated circuits. Increasing request for faster operation specifies higher supply voltage VDD, which is truly being reduced to meet the power budget. Subthreshold leakage, which is the primary source of stand-in power, is going updue to lower threshold voltage (Vth)leadingto degraded switching ratio of 'ION' . the size of the MOSFET then we have toreduce the supply voltage(VDD), by reducingthe supply voltage we have to decrease the Threshold voltage (VTH). Which leads to the increase of Subthreshold leakage. This severely affects the dynamic power issues.

Many scientists trust that the fundamentallimits on the minimum operational voltage and switching energy of transistors is assumed by the 'Boltzmann tyranny'argument. Take, for example, a field-effect transistor. The operation of a FET bedetermined by on the controlled movement ofelectrical charge from one side of the device (the source) to another (the drain), and this movement is controlled by a barrier (the channel region) that separates the source and drain (fig 1). Only electrons with energies greater than the barrier height can contributeto the current, which can be controlled by applying a voltage to an outside electrode (called the gate) to change the height of the barrier. In the ideal case this should change the height of the barrier by qVg, where q is electron charge and Vg is the gate voltage. The electrons track a Boltzmann distribution, and the current through the channel is relational to **Expo (qVg /kBT)**, where kB is the Boltzmann constant and T is temperature. With simple algebra it is cool to show that Vgmust be changed by kBT ln10/q = 60 mV to change the current by a factor of ten at room

temperature. This value — expressed as 60 mV per decade — is known as the ideal FETsubthreshold slope limit, and is a useful indicator of device performance. In a nutshell, smaller subthreshold slopes correspond to faster devices and lower switching energies.

The FET also takes a capacitance: indeed, it can be measured as the sum of two capacitances — the insulator capacitance *C*ins and the semiconductor capacitance *C*s

— in series (Fig. 1).

Varying the gate voltage results in these capacitors being charged and discharged, which is accompanied by energy dissipation and the generation of a lot of heat. As we examine for alternative ways to physically signify information in future computing systems, it is suitable to re-examine the critical assumptions in the thermodynamic arguments that underlie the ideal FET subthreshold slope limit. A number of important contributions have been made in recent years.

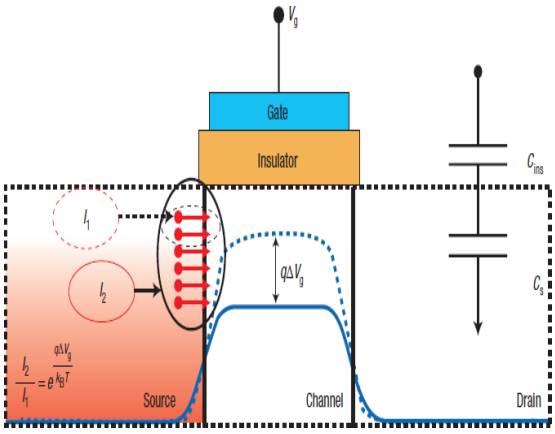
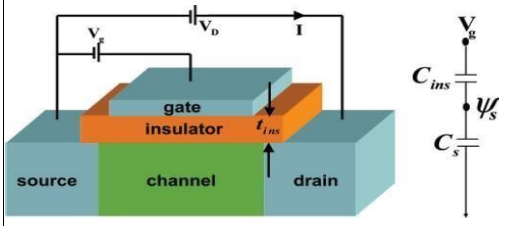
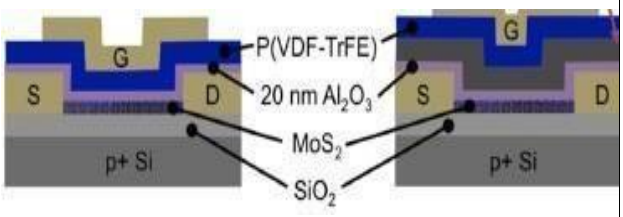
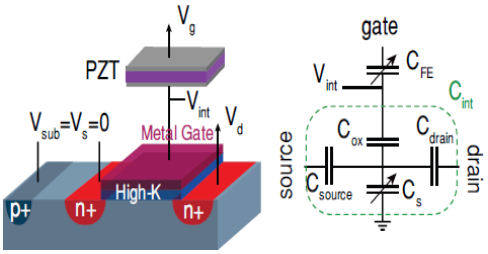
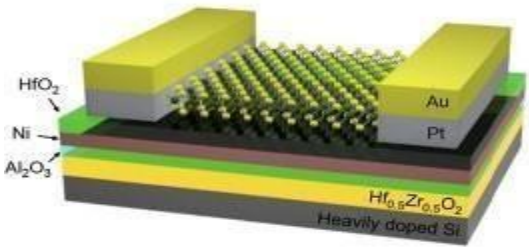
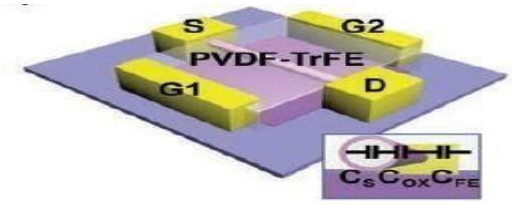
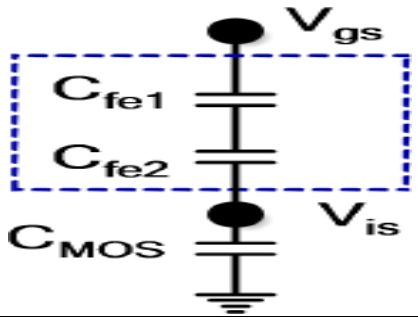
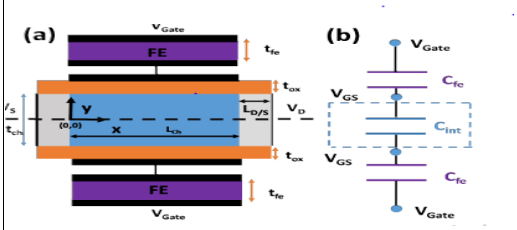
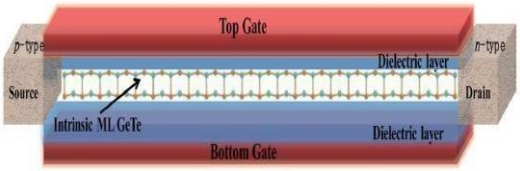
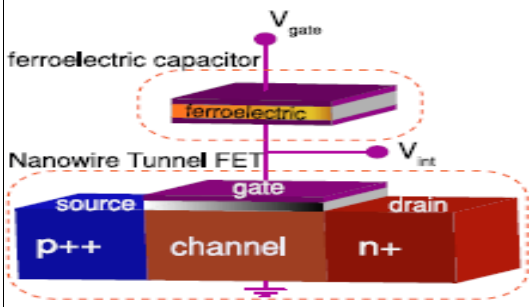


FIG 1: Schematic diagram of a field-effect transistor (FET). The source, channel and drain are made from a semiconductor, and the energy barrier in the channel is formed by doping. The channel is separated from the metal gate electrode (light blue) by an insulating layer(yellow). When a voltage (not shown) is applied across the source and drain, electrons (red) can flow from thesource to the drain if they have enough energy to get over the barrier (solid blue line) in the channel, resulting in a current of *I*2. Increasing the gate voltage, *V*g, by an amount Δ*V*g raises the energy barrier (dottedblue line) and reduces the current to *I*1. However, raising and lowering thegate voltage to control the current also costs energy (and therefore generates heat) because the FET has capacitance. Salahuddin and Datta propose that the switching energy of a device can be reduced by replacing traditional insulating materials with ferroelectric materials

NCFET STRUCTURE	Ferroelectri cDielectric Material	SS (mv/dec)	Typical Application Based on This NCFET Structure	Reference
	si	<60mv/dec	Step-up voltage transformer	S. Salahuddin and S. Datta 2008.
	Al2O3' MoS2	11.7mV/decade	Memories for "read" & "write " Operation	Felicia A. McGuire, Zhihui Cheng 2016
	Si (PZT capacitor connected togate) .	Hysteric-10mv/dec Non hysteric-20mv/dec	Low power device	AliSaeidi, Farzan Jazaeri, 2017
	WSe2	14.4 mV/dec	Steep-slope NCFET	Mengwei Si, Chunshengjiang, 2018

	Nano Wire	42 mV/dec	Inverter circuits.	Meng Su, a, b Xuming Zou 2018
	Si	Obtain NCFET	SRAM MEMORY STORAGE	Harshit Agarwal, Pragya Kushwaha 2019
	MoS2	Smaller value	Low voltage device.	Keshari Nandan, Chandan Yadav 2020
	GeSe & GeTe	GeSe-36-39mv/dec GeTe-0.4-0.74mv/dec	LP & HP device applications	PeipeiXu, Jiakun Liang 2020
	**Si or Ge**	10 mV/decade	**NC booster**	Ali Saeidi, Teodor Rosca, 2020

CONCLUSION

Overall, in this paper, a comprehensive literature survey in terms of progress, encounters and openings are summarized forferroelectric material founded transistor for ultra-low power applications. Device structures, process and parametric variations are inspected to lower the subthreshold swing. Negative capacitance based transistor has countless potential in semiconductor industry associate to other energy efficient emergent devices technology in the nanoscale domain. Our upcoming work will find an innovative solution to minor the subthreshold swing model and current model.

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[7] Girish Pahwa, Tapas Dutta, Amit Agarwal,Sourabh Khandelwal, Sayeef Salahuddin, Chenming Hu and Yogesh Singh Chauhan" Analysis and Compact Modeling of Negative Capacitance Transistor with High ON-Current and Negative Output Differential Resistance" *doi:10.1109/TED.2016.2614432*

[8] Jaesung Jo and Changhwan Shin "Impact of temperature on negative capacitance field-effect transistor**"** *ELECTRONICS LETTERS 8th January 2015 Vol. 51 No. 1 pp. 106–108*

[9] Girish Pahwa, Tapas Dutta, Amit Agarwal,Sourabh Khandelwal, Sayeef Salahuddin, Chenming Hu and Yogesh Singh Chauhan" Analysis and Compact Modeling of Negative Capacitance Transistor with High ON-Current and Negative Output Differential Resistance"*doi:10.1109/TED.2016.2614432*

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EMBEDDED SYSTEMS WITH MACHINE LEARNING FOR PROSTHETIC CONTROL: A REVIEW

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ABSTRACT

The field of neuro prosthetics that are controlled by the human mind is completely revolutionizing how human beings interact with machines. The design and development of reliable and comfortable Prosthetic arms that are able to move inan elegant and natural fashion is very essential in modern robotics to assist persons with amputation. This paper provides a review of works on machine learning based embedded systems for prosthetic control. Specifically we review in terms of the interfacing techniques, EMG signal processing methods, machine learning, pattern recognition algorithms used and the performance evaluation methods.

***Index Terms*—Embedded Systems, Prosthetic Control, EMG, Machine Learning, Deep Learning**

I.INTRODUCTION

The possibility of myoelectric control was made duringthe 1940s the advancement of the day was not palatable to make the clinical application functional. It was with the exposure of semiconductor contraption mechanics, and the connected diminished in device size and power demands that clinical application saw ensure, and imaginative work extended fundamentally. Basic progression was made all around duringthe 1960s yet it was during the 1970s that myoelectric prostheses began to have an immense clinical impact. Powered prostheses with myoelectric controllers were regularly fittedto upper extremity lacking clients, and clinical got to of thepragmatic benefits finished. Electrically fueled prostheses with myoelectric control enjoy a few upper hands over differentkinds of prosthesis:[1] the client is freed of lashes expected of body energized and mechanical switch control. The MESis painlessly perceived on the external layer of the skin the controller can be acclimated to facilitate control with relativeand muscle work expected to give control signals is close tonothing and can take after the work expected of a perfect limb.The association between a muscle's EMG and the ensuing improvement is consistently not obvious. Complex advancement, by and large, incorporate heaps of muscles filling in asone, which makes finding a relationship difficult. One method for managing comprehends the relationship is to use overseen learning, or sections[2].In such a technique, a lot of gettingready events are "learned" and related with an outcome signal
by an item trained professional, or classifier. The studying and alliance were refined by constructed build a gathering demo. The demo is a reason developed from construction examples which around some of the obvious fundamental connection. Then given it to a comparable, however beforehand concealed, occurrence later on, themodel (the trained to capacity) which is used to move arrangement of the latest signals into the proper result motion.

One of the first endeavors to group myoelectric signs of three volunteers was by Graupe and Cline[3]. Before very long, considers on prosthetic control prompted many advancesin the examination and comprehension of sEMG. Castelliniet al[4] noticed that myoelectric signals divergent remarkably from one individual to another and that models prepared for various subjects are along these lines not consequently reusable in any case, they

showed that a pre-prepared model could be utilized to order tests from comparative subjects.

The customary prosthetic knee is a mechanical framework which comes up short on the clever sensor and control frame- work. Along these lines, regular prosthetic knee can't naturallyadjust to the difference in speed and motion modal, prompting unusual and perilous step with expanded energy utilization[5]. The settlement with upward issues, ongoing advancements of prosthesis's knee showed a pattern towards the reconciliation to the chip and biometric construction configuration to get a handle on physiological stride for motion help.

In the work we are concentrating about the prosthetical region were advances had executed in various manners yet at the same time confronting realibility, absence of legitimate usefulness. The word prosthesis is gotten from a greek word prostithenai which implies experts 'to put' tithenai'place'. Herethe paper essentially manages OHMG (Osseointegrated Human Machine Gate Way) and Poliarticulated prosthetic hand. In OHMG ALC (artifical appendage controller)is utilizedwhich is the center of the framework having NS(neurostimulator) trailed by inconsistent message handling unit(PCCU).In poliarticulated prosthetic hand 4 EMG sensors are utilized which is associated with the wearable hub which is then interacts with prosthetic hand. Wearable hub is the center of the framework

. The two of them are utilizing diverse strategy for prosthetic control. ALC working and approval in real time myoelectric design acknowledgment are contrasted and wearable hub portrayed in this review.

A. Interfacing Techniques

The correspondence pathway between anxious control framework and the prosthetic appendage is very important. Weneed to acquire dependable and steady EMG or bio electric signals. Therefore the sign securing methods from the hu- man body is very important.The commotions and different impedances must be eliminated appropriately which implies we need to get great quality signs for additional prepar- ing.Sorts of different human machine interfacing procedures were utilized in this field .In A Robust, Real-Time Control Scheme for Multifunction Myoelectric Control[6].The request issue can be portrayed by any plan of development. It was clear to examine a four-class issue including hand and wrist control, as those with under elbow extremity need to address a colossal degree of prosthetic clients. Four channels of myoelectric data were obtained using tempered steel bipolar powerful anodes (Liberating Technologies, Hollington, MA). These were placed down on the lower arm over the wrist flexors and extensors, and on each side of the lower arm, by and large equidistant from the elbow and wrist. Information was gotten from 12 routinely limbed people; each was toldto perform wrist flexion, wrist extension, extended deviation, and ulnar deviation with ordinary power. No information was given to control the power level. Each pressure was held for5 s and inspected at 1000Hz using a 16-digit A/D change, prefiltered someplace in the scope of 10 and 500 Hz. This set- up of four tightening influences was reiterated on different occasions. Using Forearm Electromyograms to Classify Hand Gestures [7].

cardinal and gatherings sEMG signals related with a lot of hand movements. The destinations are (1) to show the prac- ticality of using the plan of surface electromyogram (sEMG) signals assembled from a human's lower arm muscles to divine the specific hand movement related with a lot of signs, (2) overhaul the request accuracy, and (3) clarify the portrayal model by reducing the rundown of capacities. For subject makes one of six hand movements while signals hush up from a lot of EMG sensors set on picked lower arm regions. The subject recurrent the movement on various events and the ac- cumulated signs are connected with the particular movement. The signs and movements are used to set up a classifier and expect the subject's normal approaching movements reliant upon the learned illustration of lower arm muscle signals. The figure precision is the estimation used to condemn the level of achievement: the number of signs authoritatively requested ina test isolated by the total number of movements attempted. Flexible Learning to Speed-Up Control of Prosthetic Hands:a Few Things Everybody Should Know[6]. Provide more understanding into the benefit of region variety for prosthetic control by augmenting. This brings about three exploratory settings, to be explicit (1) the primary assessment accordingto the course of action ordinary recorded as a hard copy [3]–[5] stretched out with severed subjects, (2) a similar arrangement with hyper-parameter streamlining and finally (3) a practical arrangement where we additionally address the theoretical issues. Investigating expanded getting a handle on abilities in a multi-synergistic.

Delicate bionic hand[8]A broadly utilized perspective to control progressed hand mastery comprises of utilizing design acknowledgment strategies dependent on a classifier. Example acknowledgment control strategies depend on the acknowledg- ment that the lingering appendage is rich in information about the intended movement and these data can be clustered in groups and used to identify various movements. The extricated subtleties is taken care of into a gap, which is prepared to perceive choosed hand stances. When the framework is in the beginning position and a characterized handle design is recognized, the

gadget is told to move and duplicate the related posture.Poliarticulated prosthetic hands[9]represent a strong instrument to reestablish usefulness and better personal satisfaction for upper appendage amputees. Such gadgets offer,on a similar wearable hub, detecting and activation capacities, which are not similarly hold up by regular communication and control techniques. The control in best in class arrange- ments is still carryout basically through complex encoding of motions in eruptions of constrictions of the lingering lower arm muscles, bringing about a non-instinctive Human-Machine Interface (HMI). Ongoing examination endeavors investigate the utilization of myoelectric motion acknowledgment for creative interconnection arrangements, but there endures a significant hole in-between research assessment and execu- tion into fruitful complete systems.Embedded System for Prosthetic Control Using Implanted Neuromuscular Interfaces Accessed through an Osseointegrated Implant [10].Comfort and usefulness extraordinarily been enormously improved by the usage of osseointegration for straightly skeletal associationof member prostheses . Osseointegration set up a longterm, precisely stable interface among science and the artificial-limb,inwhichatitanium embedded issurgically place into there main bone of the amputated extremity.The osseointegration innovation has been as of late appeal to permit bidirectional correspondence between embedded neuromuscular cathodes and the artificial appendage. This Osseointegrated Human-Machine Gateway (OHMG) consolidates the prosperity to the skeletal connection with dependability and also expanded datagiven by embedded strong terminals. The first endeavors on utilizing embedded anodes to supplant tactile input were di- rected more than 40 years ago.Here present the development of an inserted framework to take advantage of the upsides of the OHMG innovation. Endeavors were put down in equipment and programming configuration, cautiously looking for a har- mony intermediate the computation interest and also capacitiesof the center processor. Our Artificial Limb Controller (ALC) were [11]designed by an independent attire unit equipped for decoding motor volition and providing direct neural sensory reaction. This gathering gives a clinically feasible answer for the control of upward appendage prosthetic, just by an examination stage for additional request. The AL- C's plan and acknowledgment progressively myoelectric design acknowl- edgment (MPR).

B. System Architectures

Design recognition[4] was carryout on examination win- dows that may be up to 256 ms in length (a more broadened

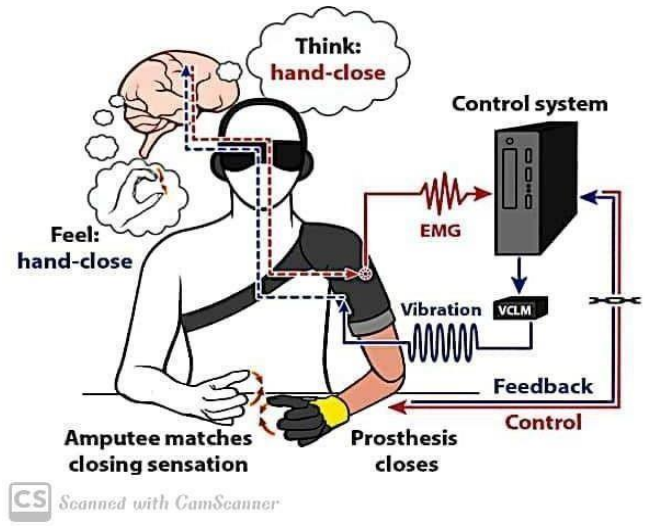

Fig.1. SystemModel

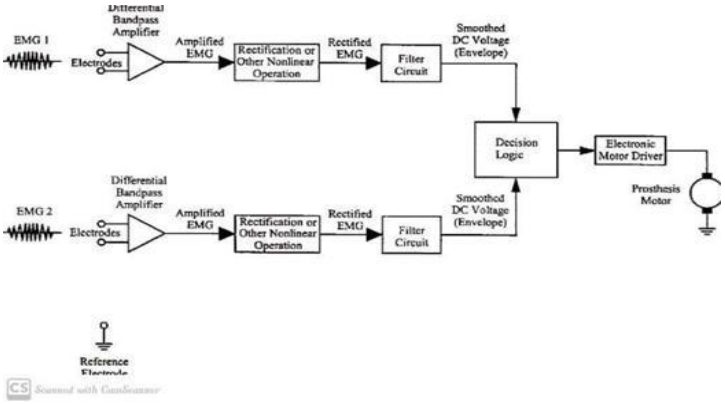

Fig. 2. Common Design Of Artifical Limbs

record would challenge the prerequisite of 300-ms adequate postponement). For each study window, a list of capabilities was processed, and these provisions gave to an example classification. The quality sets comprises to the time space insights at the first propose for transient signal[12] grouping, specifically, the quantity to zero intersections, the waveform long, the quantity of incline sign changed, and the meansoutright worth to every investigation windows .In,each windowwas segment in to various casings, and provisions work out oneach, with the goal that worldly construction may be caught. Inthis carry on with characterization contrive, nevertheless, the data are essentially fixed in any assessment window, so the property set was handled on a singular, unsegmented window. For a similar clarification, there is no advantage in using time-repeat systems, for instance, the wavelet pack feature set, which was shown to be so extraordinary in transient sign classification. Using the four-classdata from 12 points, these essential time-space estimations were agreed to the short period of time Fourier change, the wavelet change, and the wavelet

package change. For time region estimations beat these different capacities while dealing with tireless data. The subject [5]makes one of six hand movements while signalsare assembled from a lot of EMG sensors set on chosen lower arm regions. The subject repeats the movement on different events and the accumulated signs are connected with the particular movement. The signs and movements are used to set up a correspondence andexpect the subject's idea of future movements reliant upon the learned illustration of lower arm muscle signals. The guessing precision is the estimation used to condemn the level of achievement: thenumber of movements preciselyconfined in a test isolated by without a doubt the number of movements attempted ALC is collected[11] by three modules:1) Mixed Signals Processing Unit (MSPU),2) Prosthetic Control and Communication Unit (PCCU),3) Neurostimulator (NS). These three modules were sketch on committed Printed circuit Boards (PCB) utilizing commercially[13] accessible incorporated circuits. They con- tain a stackable plan with an external round state of 60mm breadth and complete tallness20 mm. General measure- ments were picked to fit industrially accessible prostheses for transhumeral amputees. The ALC structure is with and without itscase. The outside aluminum case has a 70 mm measurement and 30 mm stature. At the same time with the OHMG and prosthetic electromechanical extra the general framework stature is 70 mm. The center of the ALC frameworkis the MSPU, a mix ofa low-power AFE and a high level multi-reason MCU. System[10], which is gathered by: (1)a flexible arm band with 4 EMG sensors; (2) a wearable detecting hub liable for information procurement and group- ing, prosthesis incitation and Bluetooth correspondence; (3) a poliarticulated prosthetic hand(4) an individual door for infor- mation obtaining, acknowledgment calculation preparing and customized of framework parameters.The heterogeneous[14] BSN engineering intends to intensify the energy productivity of the node.The signal securing, the example acknowledg-ment calculation and the shut circle influence of the hand are executed continuously on the wearable hub, while the calculation tuning and the SVM training,which needn't bother with constant execution are given by the individual passage. Disconnected investigations of EMG signal acknowledgment for the most part report acknowledgment precision on every quiet example, paying little mind to their collocation during a motion. While activating a prosthesis, just one yield for every executed signal is required and the motion choice ought to be made at the earliest opportunity toward the beginning of its execution,while the separated of ensuing examples becomes superfluous. Be that as it may, the transient stage at the beginning of a motion is more hard to order when contrasted with a stable on-going contraction.Hence, a strong execution of a signal order needs to adapt to the underlying vulnerability in the review and to give an opportune choice to a right incitationof the hand.

C.Algorithms Used

An EMG put together prosthetic hand control based with respect to wavelet change and test entropy is given in [11].The simple methodology (that utilized in the original portrayalof the persistent classifier [5] is to use interfacing, disjoint examination windows of the MES. This is equivalentto ex- panding the window position by an aggregate identical to its size. In this arrangement, every outline window is comparable to 256 ms (256 models at 1000-Hz analyzing). Appropriately, ends are made at 256-ms extends, expecting that changing over can happen while[15] new data are being acquired.1 The dealing with delay, as depicted, contained the time expected to calculate the part vector and perceive the data. Planning estimations were executed in Matlab, with computationally intensive piece build-up to momentum up. The planning was carryout on a 1.0-GHz Pentium III-based workstation.2 For a 256- model examination window, this keeps in touch to take care of deferral of around 16 ms.

A Reinforcement learning-based procedure is used in[[5] forprosthetic arm control by the mind-machine interface.sEMG signals hushed up from one subject carry out six hand move- ments using the DelSys Myomonitor [8] electromyograph. Signal data were digitized and the Root Mean Square (RMS) values for a pick two-second window of each sign were enlisted. The window passes on to the time during which the sign was worked out, The game plan of RMS regardsand movements types were changed over into portraying features used by the Weka Machine Learning/Data Mining device. After allocated[16] planning runs, the data signal data were poor down and used to update the rundown of abilities momentarily round of course ofaction runs. Signal data were examined by surface sensors and given to a notebook PC.Each sensor was set to data a five-second range at a repeatof 1,000 models each second. delays EMGWorks Analysis writing computer programs was worn to manage the data.Representative planning occasion for all of the six movements.The item practice the RMS regards for the 2,000 digitized signal characteristics calm between the first and third seconds.Reinforcement learning is in like manner used in [3] in the mix with the thoughts of coadaptation and trims to show an adaptive frontal cortex machine interface. Adaptive Learning to Speed-Up Control of Prosthetic Hands[6]Domain

change estimations foster a gathering model for another pick using previous experience from the sources. Even more obviously, let us acknowledge that we have various sources, where each source is a portrayal model for a comparative plan of advancements. The used HTL estimations would then have the option to be described. Real-time vestige decline algorithm[2]Ourwavelet-based strategy follows two rule steps to perceive and diminish intruding relics: 1) Wavelet depositing using a fourthlevel SWT with Daubechies 1 wavelets to restrict taking care of time. The time-repeat include is used for the transient revelation of antiquated rarities. SWT was favor inferable from its time-invariant nature. 2) Thresholding: We analyzed EMG signals at 2000 Hz. The upsetting level consequently thinks about to a repeat range between 0-62.5 Hz. The sub-band of the third detail total tends to frequencies in the extent of 125- 250 Hz, and in this way contains the prevalent repeat portions of the myoelectric signal. The use of two perceive synergistic[9] course with the individual hand mechanics award to get joined advancements which cover the whole space.without need the introductionof additional classes in the model affirmation computation. A comparable development may possibly be applied to a totally percepetive computerized hand through an authentic control computation, while in the SH2-P is done by exploiting the remarkable architecture.A standard chain of MPR informationmanaging was execution[10] in the MCU, elegant enough withthe objective that key getting ready variable can be changed through external back-end. Data tests are accumulated into time windows of 200 ms with a 50 ms increment. Thus, another control yield is caused every 50 ms. Normal signal components are isolated from the get EMG, for instance, Mean Absolute Value (MABS), Waveform Length (WL), Slope Changes (SLPCH), and Zero Crossings (ZC) [30]. This course of action was picked to be dependable with the writing in MPR. The take-out features are available in a part vector arranged to take care of the deciphering computation. Then, the last piece of the time window is slid to convey covered windows. Three assorted impact estimations were done and evaluated detached and continuously, to be explicit DC, LDA [29], and SVM [2]. DC is the quality direct control where one channel drives simply a solitary turn of events. It midpoints the sign inside the time window (mean altogether worth) and assemble this value with an edge for motorinception. Model affirmation estimations (LDA andSVM) need more planning as more parts should be removed and the computation express surveying should be performed. They [17]also need memory where to store coefficients expected for a social occasions. The classifiers were ready in a PC through an open-source, plan affirmation research stage called BioPatRec. Dynamically, coefficients were downloaded into the MSPU's RAM andgained for continuous portrayal. On-board getting ready was not the first concern at this basic stage and it is held for future developments. A Linear SVM was picked for execution, maintained by the empiric consideration that it performs well sufficient so a non-straight piece change is unnecessary. Given a brand name vector x, LDA and straight SVM work the course of action comparably(1), their crucial distinction isstanding apart they find the confining hyperplanes. The SVM is a controlled learning estimation that better the introduction of key backslides techniques through the use of the tremendousspace for error requests. The disengaged getting ready time of the estimation uses really look at events of data to find outthe ideal separation hyperplane(maximum edge hyperplane) between two classes of data through the game plan of a bent smooth out issue. Such parcel plane is tended to by a lot of data vectors, called the Support Vectors (SVs), which have a spot with the limits of the two classes and they are used to portray new data cases.

D. Performance Evaluation

paper[4] demonstration of increase toward a most regular, more successful method for myoelectric control by the giving highest precision, low reaction time, and an intrinsic control interface to the client. That was likewise offers stinginess of information stockpiling and almost basic sign handling, whichis significant in an inserted execution. By taking advantage of the unavoidable progressed in the preparing limit of registering frameworks, the precision of this system.The key out preparing utilizing five sensor channels, and assessment utilizing 5- crease cross-approval. The Artificial Neural Network (ANN-6) seem to most elevated exactness at 93.3This are steady to the examination in [5]. Arbitrary Forest (RF-30) was next at 90 that, at that point 1NN at 86.7ANOVA was performed on all of the five sensor channels. All channels except for 2 (Flexor Digitorum Superficialis sensor) provide for the plan decision fairly. Divert 2 can in this manner be disposed of from future game plan runs. Channel3 was periphery as an isolating feature and could probably be killed without humiliating accuracy. The proposed amusement and assessment underpinning of the chip-controlled prosthetic knee was used to lead the speed adaption, walk stage recognition, and step balance tests. The example of different people during each progression stage are similar. The hip and knee focuses are just used to affirm the accompanying demonstration of the controller. What we want is walking data of an all-out step cycle. The data get by the technique for some, progressive advance cycles. The combination of twists little affects the accompanying show.It

is satisfactory to get data from one strong person. The subject was expected to walk around the treadmill in three unequivocal velocities, i.e., 0.6m/s, 1.1m/s, and 1.6m/s. The kinematic limits were measured through a nonstop 3D advanceand development assessment structure (RealGait, JIANGSU NEUCOGNIC Clinical CO., LTD. China). This strategy con- tains seventeen inertial sensors. Data combination and assess- ment of the whole body were cultivated all the while. The hip and knee joint bearings of the sound subject under three rates. The data showed here on hip and knee focuses are restricted toadvancement in the sagittal plane. These data are appropriated as the commitment of the going with limit reenactment and ap- praisal platform. The evaluation[10] of EMG feature extractionwas driven in the ALC and in a PC managing BioPatRec using a pre-recorded enlightening list. No adept dissimilarity among introduced and PC number-crunching was found (altogether botch around 1010). Connection of disengaged tests joining the ALC and BioPatRec. The figure shows bungle rates for Linear Discriminant check out (a) and Support Vector Machine

(b) for all subjects and all improvements (OH = open hand, CH = close hand, FH/E = flex hand or elbow, EH/E = grow hand or elbow, PR = pronation of the hand, SU = supination of the hand, RST = rest advancement, AVG = ordinary). Because of the OHMG pilot patient flexion and extension of the hand were get back with elbow improvements. No truly immense extraordinary between midpoints were found ($p = 0.77$). The MPR estimations were attempted disengaged and persistently by eight competent subjects, a natural transradial tragically handicapped person, furthermore, the OHMG pilot patient.Subjects were in an extent of 29.2 ± 6.1 years old. The in great shape and transradial subjects were prepared with six arrangements of surface EMG terminals (Ag/AgCl) for differential records also separated around the most proximal third of the lower arm. By virtue of the OHMG pilotpatient, the ALC was clearly connected with the OHMG implant, con-taining two bipolar and three monopolar epimysial terminals for control, and one sleeve anode with three objections for prompting. The genuine advancements were: hand open-close, hand flex-extend, expert/supination of the wrist, and no turn of events. For the transhumeral OHMG patient, hand flex- grow was displaced with elbow flex-widen. For all subjects, the Bluetooth dongle has associated with the side of the ALC'scase to achieve a far off association with a PC.Revel that utilizing a legitimate control masterplan on top of arrangementcalculation works on significantly the accuracy and the vigor of the last motion acknowledgment. In prosthetics, a reason- able difference between various methodologies isn't paltry,in light of the fact that recognize on the arrangement have an extraordinary effect of the exhibition. Additionally, while considering continuous control of a prosthesis, the example acknowledgment precision doesn't assess the over framework,which is worked on assessed by its capacity to ideal play out the planned client movement, with vigor to spikes, bogus compressions and misclassifications. Then, at that point can consider this metric the start to finish proportion. To adapt to this issues, and contrast our tackled and a writing benchmark we at first acknowledgment our framework disconnected on an EMG dataset, the NINAPRO information base, a firmly delivered broad assortment of hand signals for EMG acknowl- edgment. The NINAPRO information base gathers up to 52 recognize hand signals from 27 subjects, recorded with an exact arrangement utilizing a hand-following glove also, 10 Ottobock EMG sensors on the lower arm. From such dataset, choosed similar motions as the ones utilized in our application and we developed an interleaved dataset embeddings open motions between the others, to have a reasonable look at additionally of the FSM regulator. With respect to number of sensors, utilized the 10 EMG channels asthe information vectors (NF = 10). For the show assessment on benchmark datasets,duplicated the usefulness of the acknowledgment cal- culation andof the oversaw in a reproduced climate utilizing Matlab. Subsequently, we tried the framework with the infor- mation from the NINAPRO information base, assessing the quantity of accurately executed motions.

III. Conclusion

The conclusion goes here. The daily life controlof the prosthetic device should be natural and reli- able.Embedded system mixed together withmachine learning techniques.Development of computationally lighter algorithms in combination with suitable interfacing techniques and em- bedded systems that achieve precise wrist and ring control is necessary. The potential is evident from the review and the ML algorithms combined with properly designed embedded system is the way forward for modern day prosthesis and to improve to the quality of the life of persons with the ampu- tations..The performance of the overall system will depend heavily on how accurately and effectively we acquire andprocess the signals.

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Survey On Image Analysis Techniques UsedFor Retinal Fundus Image

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ABSTRACT- The prompt progresses of advanced imaging just as computer vision have broadened the happening utilizing those innovations into ophthalmology. Image processing frameworks be an ever increasing number of notable in clinical logicalframeworks just as particularly to ongoing ophthalmology. The retinal pictures give data comparable to the strength of the visual framework. Retinal sicknesses, for instance glaucoma, diabetic retinopathy, age-related macular degeneration, too as additional illnesses that can direct to visual impairment, noticeable themselves in the retina. A programmed framework offers reliable enormous scope test at a lesser expense, decreases humanmistakes, just as offers types of assistance to segregated regions. This audit paper gives the peruser awide survey of the current examination in mechanized retinal picture investigation. In this review document, automatic computer supported methods used to investigate retinal illnesses have been reviewed.

***Keywords*: Retinal image, Machine learning, Diabetic retinopathy**

I.INTRODUCTION

The critical eye sicknesses just as foundational infections stamped themselves in the retina. While a number physical constructions supply to the course of vision. It has various parts like the student, focal point, iris, cornea, alongside retina. Retina is consistently analyze in clinical settings as an implied of analysis of various diverse sickness. Most normal reason for visualdeficiency in the developed world that involve age- related macular degeneration, diabetic retinopathy, just as glaucoma, the retinal imaging just as picture investigation strategies alongside their clinical ramifications. Taking pictures of retina be performed through an visual gadget known as fundus camera. Fundus camera be a little force camera (used for retinalfundus imaging) proposed in the direction of catch pictures of the inside surface of the human eye. The characterization of retinal vessels into corridors just as veins in eye fundus pictures is a fitting undertaking for the programmed evaluation of vascular changes.

There are two sorts of vessels, arteries as well as veins. Arteries are more brighter, since they move blood wealthy in oxygen to the organs of the body. Theveins later bring the blood, which is at a low oxygen level and in this manner more obscure, to the lungs andthe liver. For various clinical application it would be ofincredible advantage, if the vessels could be notable into arteries just as veins, since there are various infections with one side effect being a sporadic proportion of the size of arteries to veins

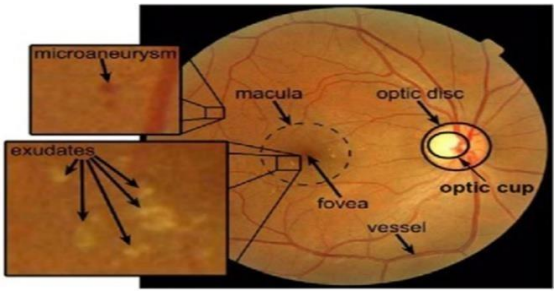

Fig.1 Fundus image sample

I.RETINAL BLOOD VESSEL SEGMENTATION

Retinal vessel division be a significant stage in fundus imaging. The physical finding of retinal vessels be a work concentrated just as tedious interaction not withstanding prerequisite of prepared with master client, in this way the computer assisted diagnostic(CAD) framework comes into depiction. Retinal picture datasets involve different picture goals. The current pictures contain distinctive morphological elements for instance, lesions, tissue structures just as commotion.

Numerous number of algorithms are recommended so as to join various strategies meant for programmed retinal vessel removal. Still, it be a troublesome errand. The reasons be low differentiation involving the veins just as its experience; the being there of irregularities similar to injuries, exudates, cotton fleece spots; alongside varieties in vessel look just as direction.

There be numerous strategies utilized for the discovery just as division of veins in the retina. Here, classified the papers as per the picture preparing procedures utilized just as the calculations utilized. These strategies are for the most part arranged into six fundamental classes: (a) matched filtering, (b) vessel tracking, (c) model-based approaches (d) machine learning method, (e) neural network method (f) deep learning.

A. Matched Filtering

Matched filtering convolves a 2-D part with the retinal picture. The piece models a quality in the picture at various situation just as direction, notwithstanding the presence of the component is given by the coordinated with channel reaction (MFR). The kernal react reasonably to vessels with a similar standard variety equivalent to that of the hidden Gaussian capacity. Thisfunctions admirably in support of a sound retina, albeit not to the vessels so as to dissimilar to profile.

The most crude methodology of utilizing matched filters be projected by Chaudhuri [1]. Wang [2] utilizedmatched filtering within gathering through multi- wavelet bits to part veins from lesions. This strategy needed accurate clamor assessment just as required upgrade for huge vessels.

C. Muramatsu et al.[3], utilized a programmed two dimensional directional coordinated separating strategyfor dividing a retinal vessel and computing the situation of retinal neural fiber layer . This strategy permits to eliminate regions block by veins and leavingstaying retinal region. The weak and scarcely noticeable nerve fiber layer(NFL) are recognized by joining various nearby textural highlights, touchy to unobtrusive NFL attributes and the element vectors submit to a neural-network classifier. Lastly acquirethe paired retinal guides of NFL appropriation. Disadvantage is need more computational exertion and it's a tedious interaction. Likewise the quantity of phony reaction increments with the foundation uniqueness just as presence of irregularities in the picture.

B. Vessel Tracking

Vessel tracking are utilized to section veins through following vessels. It commonly initiate by means of a bunch of seed focuses likewise after that use them toward delineate the retinal vasculature based on nearby power in any case surface data. The following follows a tree resembling construction since the vesselsbe associated.

Yedidya [4] proposed a technique dependent on following the focal point of the vessels through the Kalman filter. A straight model has been characterizedto follow the veins not withstanding the model be proper intended for the finding of mutually wide just as

flimsy vessels, yet within uproarious pictures. The Kalman filter- based following come up to instates the shape consequently, subsequently bringingdown the computational expense. Zhang [5] utilizeda joint methodology through maximum-a-posteriori(MAP) just as the multi-scale line identification measure. The Gaussian representation be consider as the traverse area just as the multi-scale line discovery the longitudinal way. Three kinds of vessel structure be separate through this scheme ordinary, branching just as crossing vessels. Numerical diagram hypothesis strategy be projectedby De [6] to take out the filamentary course of actionof the vessels. This be a two-venture approach. The initial step be the division any place the retinal vasculature arrangement be extricated just as its digraph representation be ready. The subsequent

advance is the following undertaking any place the matrix theorem forest is utilized. Exact analyses be perform on neuronal just as retinal picture datasets notwithstanding more prominent execution was accomplished in both the cases. The benefits of vessel following techniques be that they offer exact vessel widths. The significant hindrances of this strategy are its dependence on the pre-preparing pace, when the pre-handling stage includes the vessel upgrade of the multitude of vessels of changing sizes just as directions.

C. Model-based Approach

The model-based strategies be ordered into two classifications: (i) vessel profile model plus (ii) deformable model. In vessel profile model, the vessel cross-sectional power shape be unsurprising as a Gaussian bend in any case combination of Gaussians. Deformable models be able to do facilitate Multimedia tools additionally applications arranged into parametric(active contour) in addition to geometric (level set)- based approach. Parametric or else called snakes in any case dynamic form models are bends in order to rely upon demanding boundaries to be delivered. They section objects through right the bend to protest limits in the picture. The mathematical models are regularly executed through the level set interaction which be a mathematical strategy meant for following interface just as shapes.The Bayesian-based segmentation method be projected by Xiao [7]. The level set strategybe utilized to reduce the energy work. A speculation bearranged that the resulting possibility of every pixel be subject to that of their adjoining pixels. The energy work be demonstrated on the wellspring of that notion

.Jin [8] set forward a division calculation dependent scheduled snake contours. The system have three stages, factor instatement dependent on the Hessian property limit, neighborhood delineation notwithstanding ultimately the locale developing strategy to get the last vessels region. A mixture strategy with retinex-based picture in homogeneity change, neighborhood stage based vessel improvement just as chart cut based dynamic form division was proposed by Zhao [9]. The diagram cut based dynamic shape procedure utilizes the nearby stage channel alongside is extremely productive just as powerful in dividing the vessels from the further developed pictures. The primary benefit of this strategy is the simple to form with quick combination alongside accordingly have lower computational expense.The fundamental disadvantage of this technique is that it may direct to loose vessel division for strange pictures, since the dynamic shape might go to the neurotic region for such pictures.

D. Machine Learning(ML) Methods

Artificial Intelligence can empower the computer to think. Computer is made much extra wise through Artificial Intelligence(AI).Machine learning be the subfield of AI technology. Machine learning plays an essential part in Medical Image Analysis just as Computer Vision field. Machine learning algorithms beisolated into three fundamental sorts: supervised, unsupervised, plus reinforcement learning. In supervised method, introduced a readiness set of delineation through proper focuses just as based on thispreparation set, calculations respond effectively to every conceivable info. Gaining from models is another name of Supervised Learning. In unsupervised methods, the framework will take the choice without anyone else to some degree train on the foundation of some dataset. No naming is given to the framework that is utilized for forecasts. Lupascu [10] projected an administered method known as feature-basedAdaBoost classifier meant for vessel segmentation. A 41-D element vector be built. This vector modified the data on the nearby power course of action, spatial properties just as math at numerous scales. The component vector comprises of shape just as primary data, other than to nearby data at different spatial scales. The model offered low computational expenses.

The conditional random field (CRF)- based retinal vessel division calculation be advanced via Orlando [11]. The completely associated contingent irregular field model was talented through an organized yield support vector machine (SVM), which be a managed procedure. The procedure be more coordinated for the undertaking of portioning expanded constructions.

The novel supervised learning based Extreme Learning Machine (ELM) procedure be advanced by Zhu et al. [12]. A bunch of 39D element vectors be remove meant for each pixel just as a grid be develop based on highlight vectors alongside physical names. The network be given as the contribution to the ELM classifier alongside afterward enhancement be made to remove the area by means of under 30 pixels. This sculpt give quick just as exact retinal vessel divisionyet computational expense is high.

Sathananthavathi [13] projected a retinal vessel division procedure dependent on the Bat calculation just as arbitrary woodland classifier. A 40-dimensional component vector along with nearby, stage just as morphological provisions is extricated. Then, at that point Bat calculation is utilized to perceive the list of capabilities that limit the classifier botch. Random Forest classifiers when contrast with SVM include lesser preparing computational costs with generally similar execution.

E. Neural Networks(NN) Methods

Neural network delineate extension in computer supported investigation clinical picture division just as edge discovery towards visual substance examination, just as clinical picture enlistment for its pre-handlingjust as post-preparing. It points of expanding consideration of how neuralorganizations be fit for applied to these space just asto offer a reason for more examination just as sensible development.

Nekovei et al. [14] set forward a methodology dependent on the back spread neural organization intended for the disclosure of veins in angiography. The strategy utilize crude dark force upsides of pixels. The pixels of the little sub-window be feed since contribution to the organization. To cover the entire picture, a sliding window is framed. This way keep away from the trouble of component withdrawal.Kondermanc et al.[15], analyze two element extraction techniques just as two arrangement strategies dependent on Support Vector Machines (SVM) alongside Neural Networks utilized for the classification of retinal vessels as courses and veins. Since Diabetic Retinopathy (DR), a miniature vascular entanglement much of the time found in diabetes patients and it is the most inescapable reason for visual misfortune. Relies upon the untimely identification of DR, a programmed investigation of fundus pictureswould be of huge assistance to the ophthalmologist inferable from the little indication just as colossal number of patients. The main sign for DR are curiouslywide veins just as is prompting a bizarrely low proportion of the customary distance across of corridors to veins (AVR). Utilizing SVM strategy, looked at the arrangement aftereffects of four kernals and utilizing NN , contrasted one and two secret layers and different secret layers sizes somewhere in the range of 5 and 50 neurons and got the best outcome forforty secret neurons in a single layer. This is for size mix for input, one secret layer and yield layer. Disadvantage such technique is that some moment vessels are not separated, so grouping isn't occurred around there.

F.DEEP LEARNING(DN) Methods

The accomplishment of profound learning procedures in Computer vision application has constrained the utilization of Convolutional Neural Network (CNN) as a competent strategy in vessel division issues. Deep Retinal Image Understanding (DRIU), unmistakable as

an incorporated structure of retinal picture investigation, be planned. DRIU utilize a base organization foundational layout in which the CNN layers be gifted in a specific mode to manage mutually retinal just as optic plate division. The strategy be capable on DRIVE with STARE datasets likewise an unprecedented execution was accomplished. A blend structure of profound just as group learning beprojected by Maji [16]. A deep neural network (DNN) be utilized intended for unaided learning of vesselness word references through auto-encoders as well as usingsoftly gifted vascular patch. The DNN answer be utilized in supervised learning through a arbitrary forest in favor of recognizing vessels. The calculation was assessed with the DRIVE data set with a typical exactness of 0.9327 just as region under bend of 0.9195 was accomplished.

Liskowski [17] proposed a directed division technique to utilizes a profound neural organization model. All through the learning system, the organization separate low level components alongside then changes just as joins them into higher request highlights. The learned components are thereafter gathered into a perplexing capacity alongside this capacity maps an info fix to its name. This procedure is against to focal vessel reflex, responsive in vessel identification just as perform sound on obsessive pictures.

Oliveira [18] projected a way to manage the changing thickness just as bearing of the vessel arrangement. He joint the multi-scale examination through the Stationary Wavelet Transform in the company of a multi-scale Fully Convolutional Neural Network. Rotation tasks be utilized in favor of data increasenotwithstanding the data acquired from them was utilized for estimate.

Y. C. W. Weng et al.[19], utilize a Fully-Connected Convolutional Neural Network that be only adjusted for course or vein characterization. Here, a misfortune work that centers just around pixels having a place with the retinal vessel tree. The

exhibition of this strategy is determined on the RITE dataset of retinal pictures and accomplishing shows expected outcomes, through a precision of 96% on huge type vessels, and an overall exactness of 84.5%.Drawback is requires huge dataset subsequently this technique is costly.

Fantin Girard et al.[20], utilizes both deep learning and graph propagation strategy for A/V division. Here, a convolutional neural organization (CNN) technique is utilized to joint the fragment alongside arranging vessels into conduits and veins. The essential CNN is proliferated entirely through a chart portrayal of the retinal vasculature, whose hubs be characterized as the vessel branches in addition to edges are weighted by means of the expense of connecting sets of branches. To capability spread the names, the graph is rearrangedinto its most minimal crossing tree. This technique has an exactness of 94.81% for vessels division. A/V grouping acquire a particularity of 92.9% through an affectability of 93.7% on the CT-DRIVE data set contrasted with the cutting edge explicitness just as affectability and both of 91.7%. The outcomes show that this framework beats the top past chips away at a public dataset for A/V order and is by a long shot the best. Detriment of this procedure is requires enormous dataset thus this technique is exorbitant.

Wang et al.[21], proposed perform multi- tasks Siamese organization for investigating the capability ofprofound learning in the chart based A/V division strategy. Perform various tasks siamese organization which can learn viable profound learning components to together deal with the two errands, i.e., vascular tree unraveling just as vessel type arrangement. Convolution Along Vessel (CAV), which is altered for vessel-like items. Rather than convolving an entire picture pixel by pixel efficient, we oblige the convolutional parts 'stroll' along individual vessel portions carried out by consecutively directing vessel horizontalization just as convolution activity. Plan a CAV for decoupling visual and mathematical data in CNN highlights, which dominating profoundcomponents for various errands, i.e., vascular tree unraveling just as vessel type characterization. Perform multiple tasks siamese organization to learn profound elements gainful to the two errands by means of together taking care of issues of unraveling vascular trees just as characterizing A/V sorts. The principle benefit of this technique is that weight sharing, low computational assets just as cost, requires less number of informational indexes.

III. CONCLUSION

In this review paper, a wide-going overview of the modern retinal picture examination calculations just as procedures is addressed. The crucial stages of retinal picture examination be talked about through a short synopsis of the historical backdrop of retinal imaging.

There is no best strategy or probably calculation for retinal picture investigation. There are such countless variables like, exactness, time, computational intricacy just as vigor, which partake in most significant undertaking in choosing which strategy is the best one. Mechanical advancement has favored the development of inventive indicative imaging frameworks that make accessible high resolution blood vessel pictures. Pretty much every techniques from picture handling to AI have been apparently investigated. Since the absolute number of data is expanding progressively, extra capable execution is required. These have the option to focusing by means of utilize Graphic Processing Unit (GPU) just as profound learning methods.

Computerized retinal picture based algorithms be able to utilized to scrutinize patients expected in favor of sight undermining sicknesses. This will leave out the phony positive cases in view of less manual assessment too as different cases can be alluded to ophthalmologists on behalf of additional assessment.

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ESTABLISHING SECURE DATA USING BLOCK CHAIN TECHNOLOGY IN IoT MEDICAL DEVICES

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***Abstract*- IoT (Internet of Things) and blockchain technologies are being used in many fields, specifically for e-healthcare. In healthcare, IoT devices have the ability to provide real-time sensory data from patients which is to be processedand scrutinized. Collected IoT data are subjected to centralized computation, processing and loading. Such centralization can be problematic and there will be a possibility in data manipulation, interfering and privacy evasion. Blockchain can solve suchthoughtful difficulties by providing decentralized computation and storage for IoT data. Therefore, the integration of IoT and blockchain technologies can turn out to be a judicious choice for the design of a decentralized IoT-based e-healthcare systems. It resolves the data security issues to an extend. The healthcare industry is constantlyreforming and adopting new shapes with respect to the technological developments and changes. One of the crucial requirements in the current smart healthcare system is the execution**

of concepts for protecting the sensitive data of patients against the potential adversaries. Therefore, it is vital to have secure data access mechanisms that can ensure only authorized entities which canaccess the medical data of the patient.

Key words: Blockchain, Centralized computation, Entity, Privacy evasion, e- healthcare

1. INTRODUCTION

In recent years, IoT has appeared as a vital scientific representative to overcome interoperability, heterogeneity and internet-aware resistances. On the other hand, blockchain is also pitching up to serve security, immutability and trustless infrastructure. Healthcare is another area that unswervingly influence human lives. The concept of blockchain is being familiar for its use in bitcoin and cryptocurrencies. It has got widespread deliberation from various shareholders due to its immense business potential and

utilization in various applications such as banking, healthcare and supply chain organization [1]. Medical and healthcare services are one of the protruding and crucial services which need to be delivered on the required time and through secure and safer means. Blockchain as a decentralized and dispersed technology can play a key role in providing such healthcare services. Blockchain expertise promises to provideimmense opportunities in the healthcare sector such as secure data storing and distribution among various stakeholders, nationwide information interoperability and flexible and quick billing/payment modes[4].

With the recent improvements in the Internet technologies, the world is facing a digital revolution in terms of acquiring improved and better quality of daily life services. Technologies such as Internet of Things (IoTs), sensing technologies and 5G among others are providing abundant useful contributions in various aspects of the healthcare services [5]. The current healthcare systems are frequently based on centralized servers where multiple entities within the network requireapproval to access the medical information. This cancause delay in submission of the medical services and also potential leakage of the information. In such kind ofhealthcare systems, patients are mostly unaware regardingwhich entities are storing and using their medical data without their permission. One of the challenges with the current healthcare systems is the secure availability of themedical data by various entities within the system/network. Blockchain can be utilized in such cases to achieve the secure accessibility andtruthfulness of the healthcare data.

FIG 1: Secure IoT Communication usingBlockchain

The concept of blockchain technology was not the firstof its kind as it is progressed as a form of distributed ledger technology (DLT), which has a rich past. Blockchainis a decentralized ledger that stores all communications that have been made on top of a peer-to peer network in a secure, verifiable and transparent way. The main advantage of Blockchain over the existing technologies is that it enables the two parties to make transactions over the Internet securely without intrusion of any intermediary party. The omission of thethird party can reduce the processing cost while enlightening the security and effectiveness of transactions.

2, COMPARATIVE STUDY OF VARIOUS TECHNOLOGIES IN DATA TRANSMISSION WITH BLOCKCHAIN

In recent years, IoT has appeared as a vital technological feature to overcomeinteroperability, heterogeneity and internet-aware resistances. On the other hand,blockchainis also gearing up to serve security, immutability and trustless infrastructure. Healthcare is another sector that unswervingly influence human lives.

2.1 DLT System-Before blockchain technology a distributed register system

was used. It is a digital system for recording the transaction of properties in which the transactions and their details are recorded inmultiple places at the same time. Unlikeoutdated databases, distributed ledgers have no central data store or administrationfunctionality. So security issues are the main drawback of this technology.

2.2 BITCOIN AND DIGITALCURRENCIES- Although the ideas that would go into the blockchain were eddying around in computer science communities…it was the pseudonymous developer of Bitcoin, Satoshi Nakamoto, whodemarcated the blockchain as we know it in the white paper for BTC. In this way, blockchain technology began with the Bitcoin network. While blockchain has since gone on to see use in a huge varietyofother areas, in some sense it was designed specially for this digital currency and forproceeding the goals of digital currenciesmore generally.In the earliest stages,blockchainset up the basic premise of ashared public ledger that dealswith a cryptocurrency network. Satoshi's idea of blockchain makes use of 1 MB blocks of information on bitcoin communications. Blocks are linked together through a multifaceted cryptographic verificationprocess, forming an immutable chain. Even in its earliest guises, blockchain technique set up many of the central features of these systems, which remain today. Indeed, bitcoin's blockchain remains largely unaffected from these earliest efforts.

2.2 SMART CONTRACTS- As time went on, designers began to believe that a blockchain could do more than simply transactions of the documents. Founders of ethereum, for instance, had the idea that assets and trust arrangements could also benefit from blockchain organization. In this way, ethereum signifies the second-generation of the blockchain technology. The major innovation brought about by ethereum was the beginning of smartcontracts. Typically, contracts in the mainstream business world are achieved between two separate entities, sometimes with other entities assisting in the oversight process. Smart contracts are those that are self-managing on a blockchain. They are activated by an event like the passing of an expiration date or the achievement of a particular price goal; in response, the smart contract manages itself, making alterations as needed and without the input of outside entities. At this point, we may still be in the process of connecting the untapped potential ofsmart contracts. Thus, whether we have truly moved on tothe succeeding stage of the development of blockchain is debatable.

Smart contracts are simply programs stored on a blockchain that run when predetermined conditions are met. They typically are used to automate theexecution of an agreement so that all participants can be directly certain of the outcome, without any intermediary's involvement or time loss. A smart contract is an agreement between two people in the form of computer code. They run on the blockchain, so they are stored on a public database and cannot be changed. Thetransactions that happen in a smart contract are handled by the blockchain, which means they can be sent automatically without a third party. A smart contract is a self-enforcingagreement embedded in computer code managed by a blockchain. If implemented correctly, smart contracts could provide transaction security superior to traditional contract law, thereby reducing coordination costs of auditing and enforcement of such agreements.

FIG 2: HISTORY OF BLOCKCHAIN

3. TYPES OF BLOCKCHAIN

(A) Public Blockchain A public blockchainis a non-restrictive, permission-less distributed ledger scheme. Anyone who has access to the internet can sign in on a blockchain platform to become an approved node and be a part of the blockchain network. A node or user which is a part of the public blockchain is sanctioned to access current and past records, verify transactions or do proof-of- work for an incoming block, and do mining. However, it is only risky when the participants don't follow the security protocols honestly. Bitcoin is an example for Public blockchain.

Private Blockchain A private blockchain is a restrictive or permissionblockchain effective only in a closednetwork. Private blockchains are usuallyused within an association or enterprises where only selected members areparticipants of a blockchain network. The level of security, authorizations, permissions, accessibility is in the hands of the supervisory organization. Thus, privateblockchains are comparable in use as a public blockchain but have a small and restrictive network. Private blockchain networks are organized for voting, supply chain organization, digital identity, asset ownership, etc.

(B) Examples of private blockchains are; Multichain and Hyperledger projects,Corda, etc.

(C) Consortium Blockchain

A consortium blockchain is a semi- decentralized type where more than one organization accomplishes a blockchain network.

This is contrary to what we saw in a private blockchain, which is succeeded by only a single organization. More than one organization can act as a node in this type of blockchain and exchange information or do mining. Consortiumblockchains are typically used by banks, government administrations etc. Examples of consortium blockchain are; Energy Web Foundation, R3, etc.

(D) Hybrid Blockchain

A hybrid blockchain is a combination of theprivate and public blockchain. It uses the features of both types of blockchains that isone can have a private permission-based system as well as a public permission-less system. With such a hybrid network, users can control who gets admission to which data stored in the blockchain. Only a selected section of data or records from theblockchain is acceptable to go public keeping the rest as confidential in the private network. The hybrid system of blockchain is flexible so that users can simply join a private blockchain with multiple public blockchains. A transaction in a private network of a hybrid blockchainis usually verified within that network. But users can also issue it in the publicblockchain to get verified. The public blockchains intensify the hashing and involve more nodes for verification. This augments the security and transparency of the blockchain network. Example of a hybrid blockchain is Dragonchain.

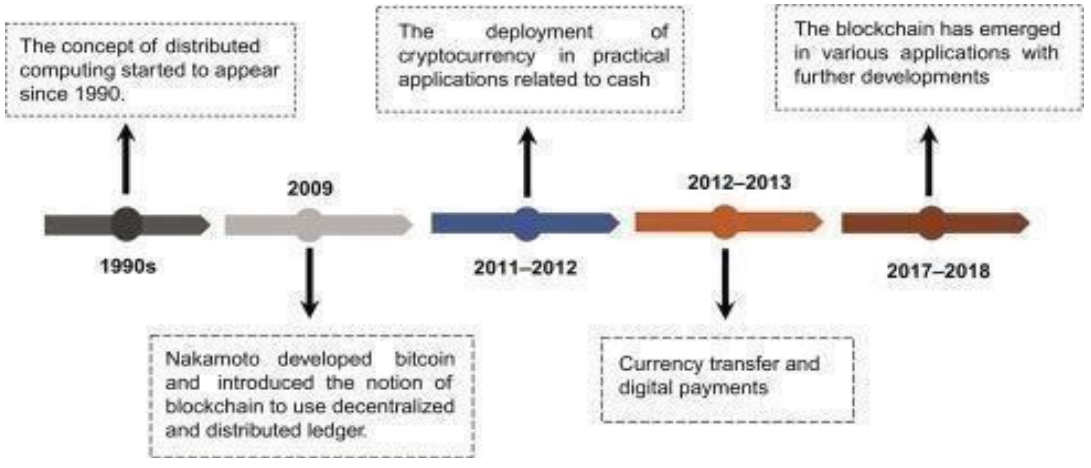

TABLE 1: COMPARISON BETWEEN BC & IoT

Items	Blockchain	IoT
System structure	Decentralized	Centralized
Resources	Resource consuming	Resource restricted
Privacy	Ensures the privacy of the participating nodes	Lack of confidentiality
Latency	Block mining is time-consuming	Demands low latency
Bandwidth	High bandwidth consumption	IoT devices have limited bandwidth and resources
Security	Has better security	Security is one of the big challenges of IoT

4. FUTURE OF BC

Scaling is one of the main problem in Blockchain technology. Bitcoin remains troubled by transaction processing times and bottlenecking. Many new digital currencies have attempted to revise their blockchains in order to accommodate these issues, but with changing degrees of success. In the future, one of the most important developments paving the wayfor blockchain technology going forward will likely have to do with scalability. Beyond this, new applications of blockchain technology is being discovered and implemented all the time. It's difficult to say exactly where these changes willlead the technology and the cryptocurrencyindustry as a whole. Supporters ofblockchain are likely to find this extremely exciting; from their perspective, we are living in a moment with an epochal technology that is continuing to grow and unfold. Eventhough, blockchain technology offers promising features, there is still a need for more research.

5. CONCLUSION

Blockchain in healthcare systems has brought immense opportunities in terms of not only providing secure and efficient data storing, sharing and access but also generates a potential scope in the healthcarebusiness for various participants. The main focus is to design a secure and efficient data accessibility mechanism for current healthcare systems using the blockchain technology. Blockchain technology hasevolved from the time it was familiarized to the world through Bitcoin into a general-purpose technology with use cases in several industries including healthcare.

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Review paper on Secure and Energy-aware Heuristic Routing Protocol for Wireless Sensor Network

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***Abstract*— Wireless sensor networks (WSNs) consist of tiny, mini computer embedded systems with constraints in memory, communication range, and battery power, called sensor nodes. The task of the sensor nodes is monitoring and recording physical conditions then sending collected sensory data to base stations. The sensor nodes communicate among themselves in ad-hoc manner. However, the main limitations ofsensor nodes are their finite resources for energy management, security, network throughput, scalability. Different solutions have been proposed by researchers to overcome these challenges. However energy management and networkthroughput are still the main research challenge. Thus the aim of this article is to compare different protocols to that of secureand energy-aware heuristic-based routing (SEHR) protocol for WSN to detect and prevent compromising data with efficient performance. The SEHR protocol not only makes use of an artificial intelligence-based heuristic analysis to accomplish a reliable and intellectual learning scheme but also attains security with least complexity along with reduced link failure and network disconnectivity.**

Keywords*— *Artificial Intelligence, Data privacy, Energy efficiency, Heuristic analysis, Wireless sensor network

I. INTRODUCTION (*HEADING 1*)

The field of Wireless Sensor Network (WSN) is explored by a huge number of applications such as the military, healthcare, smart buildings, agriculture to observe and gather physical data. The sensor nodes are distributed in a random or uniform manner to gather the data on a periodic or event-driven form. The users access the needed data from the base station (BS) through the Internet with the help of wireless broadband channels through the sensors. Although, sensor nodes perform a vital role in different academic and industrial fields. The infrastructure of WSN is characterized as unique from traditional networks, due to its easy installation, management, ad-hoc and self-configuredqualities. Most of the solutions are based on multi-hop data transmission towards BS. Nowadays, wireless sensor technologies are used in many applications such as medical, business, agriculture, etc.,. Moreover, the large numbers of small sensor nodes are organized in a wireless sensor network in an ecological field which is termed as sensing area; each node has less power that combines communication, sensing and computational abilities. Also, the main feature of WSN is without any human interaction the nodes are organized as clustering and form networks to execute an allocated monitoring task. Presently, wireless sensor technologies are used in many applications such as medical, business, agriculture, etc. Moreover, the large numbers of small sensor nodes are arranged in a wireless sensor network which is termed as sensing area; each node has less power that combines communication, sensing and computational abilities. Also, the main feature of WSN is without any human interaction the nodes are organized as clustering and form networks to execute an allocated monitoring task. However, one of the main threats in a wireless network is energy consumption; because the sensor nodes are designed with limited battery energy but to run the application the sensor nodes required more energy. One of the main hindrance in wireless sensor technology is energy management .To eliminate this issue many of the techniques are introduced to increase the node lifetime and to reduce energy consumption such as leach protocol, ECH, fuzzylogic.

II. LITERATURE REVIEW

A. LEACH: Low-Energy Adaptive Clustering Hierarchy

Recent advances in MEMS-based sensor technology, low-power analog and digital electronics, and low-power RF design have enabled the development of relatively low cost and low-power wireless micro sensors .These sensors are unreliable or inaccurate as their expensive micro sensor counterparts, but their size and cost enable them for applications to hundreds or thousands networks of these micro sensors, thereby achieving high quality, fault tolerant sensing networks.

LEACH [2] is a self-organizing, adaptive clusteringprotocol that uses randomization to distribute the energy load equally among the sensors in the network. In LEACH, the nodes organize themselves into local clusters, with one node as the local base station or cluster-head. If the

cluster heads were chosen in prior fashion and fixed throughout the system lifetime, as in traditional clustering algorithms, then energy of the cluster head would deplete faster leading to the fault in the network. Thus LEACH includes randomized rotation of the high-energy cluster-head. Furthermore, LEACH performs local data fusion to "compress" the amount of data being sent from the clusters to the base station. This decreases energy dissipation and increases system lifetime. Sensors elect themselves to be local cluster-heads at any given time with a certain probability. These cluster head nodes broadcast their status to the other sensors in the network. Each sensor node chooses the cluster it wants to belong by choosing the cluster-head that requires the minimum communication energy. Once all the nodes are organized into clusters, each cluster-head creates a schedule for the nodes in its cluster. This allows the radio components of each non-cluster-head node to be turned off at all times except during its transitiontime, thus reducing the energy dissipated in the individual sensors. The cluster-head collects all the data from thenodes in its cluster, the cluster-head node aggregates the data and then transmits this compressed data to the base station. Supposing that the base station is far away from the cluster head, this is a high energy transmission. However, since there are only a few cluster-heads, this only affects a small number of nodes. Since being a cluster head depletes energy, the cluster-head nodes are not fixed; rather, this position is self-elected at different time intervals. Thus a set C of nodes might elect themselves cluster-heads at time t1, but at time t1 + d a new set C0 of nodes elect themselves as cluster-heads. The cluster-head depends on the amount of energy left at the node. In this way, nodes with more energyremaining will perform the energy-intensive functions of the network

B. Adaptive competition-based clustering approach (ACCA)

The most significant part of clustering scheme [3] is the CH election. For CH election ACCA implements a hybrid scheme of the residual energy, centrality and distance among the Cluster heads. The idea is to elect the CCH nodeswith a high residual energy. A competition scheme is used where each node generates two competition numbersproportional toits residual energy and centrality. The first competition number is generated as

C1 (i) = Emin (i) + [Emax (i) − Emin (i)] × α = αEmax (i) + (1 − α) Emin (i)

Where Emax (i) and Emin (i) are the maximum and minimum residual energy of all neighbor nodes of node i, respectively, and α is a coefficient in [0, 1] which controls the energy level of the competition. The node with highest residual energy is selected as CCH. Another competition number is generated as

C2(i) = h j=1 d i,jH

where h is the number of neighbors of the i-th node in Rcomp. Each node broadcasts a CCH-Inf message to other nodes. Each node computes its distance to other neighbors based on the received signal strength of CCH-Inf. The node i waits for twait seconds and receives the message CCH-Inf from all its neighbors. When all messages were received, the node calculates C1(i) and C2(i). Then the node compares its residual energy Eres(i)) with C1(i). If Eres(i) ≥ C1(i), then C2(i) is compared with all received C2 (C2 of all its neighbors). Unlike the previous competition number, if the node finds itsC2(i)less than all the received C2, it elects itself as a CCH and broadcasts a CCH-ADV message to higher power levels. Otherwise, it waits for the CH-ADV message. If there are two nodes whose Eres is greater than C1, and their C2 are equal, the node ID is then used as the tie break. This reduces CCH advertisements and thus the message complexity. Distance condition for selection of CCH states that states that in order to make sure that the CHs are not close to one another, a CCH is elected as a CH, if its distanceto all the previously chosen CHs is greater than or equal to Dthr . After the CHs are selected, the nodes join the nearest CHs and the data of the ordinary nodes, afterbeing aggregatedin the CHs, are transmitted to the BS through a power-aware multi-hop path among the CHs. Using this ACCA protocol reliable with a long networklifetime.

C. Novel PEECR-based clustering routing approach

Novel optimized clustering routing approach based on predictive efficient energy consumption reclaim (PEECR) strategy for wireless sensor network has energy-saving clustering routing method based on node degree, relative distance between nodes and residual energy of nodes. When node selects cluster head, node degree and relative distance between nodes are fully considered. In data transferringstage of this approach, by using swarm colony optimization (SCO) idea, PEECR method is used for data transferring. On the basis of considering predictive values of used energy, hops and propagation delay on this route, this strategy gives a precise definition of route yield. In reception mode, energy consumption of transceivers from source node to sink node of wireless sensor network is similar to energy consumption from sink node to sourcenode, and both can be reduced in this approach

D. PSO based clustering approach

The protocol operation is dependent on a control algorithm which is centralized and that is implemented at the BS in which a huge sum of energy supplying node. The projected protocol works under many stages. This is subsequently follows through a steady state phase. Every node transmits data about their present locations and energy status to the BS at the beginning of every setup phase. The BS calculates the energy level on an average of every node depending on the above data. To make sure about the node with enough energy are chosen as cluster heads, the above energy level nodes with regular are capable to be a CH candidate for this round. Subsequently, the BS executes a PSO method to decide KCHs. The BS transfers the data which consists of the cluster head ID for every node back to every node withinthe network after the BS has recognized the CH and optimal set and its linked cluster members. To synchronize the cluster transmission of data, the node becomes a CH play as a local control center in its cluster. To remove collision over data messages, TDMA program is set up for their members, enabling the radio gadgets of every member to be turned off at every time, except while its transmission time, to reduce

further node's energy utilization. When the CH completes getting information out of its all members at every frame end, data fusion is performed by CH and data is sent to BS. Information in CH is sent to the BS employing a Carrier Sense Multiple Access method and spreading code.

E. A Novel Secure Architecture for the Internet of Thing

The proposed secure architecture is comprised of four layers. A novel system architecture, proposes a novel network secure framework that is to adapt to the future IoT.

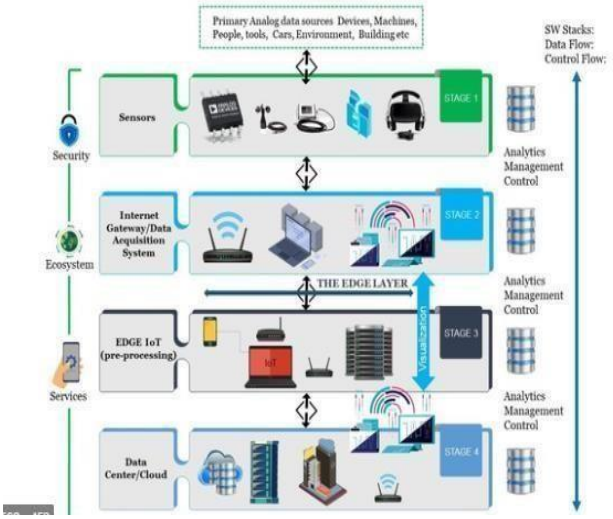

Fig 1 IoT architecture

1. Secure Architecture

To eliminate the problem of security domain, novel security architecture for the IoT was proposed .The security architecture consists of four layers in order to respond to specific security requirements in the corresponding layer in the given architecture .

2. Data Perception Layer

Security precautions which are mainly included in this layer are as follows, secure routing, key management, intrusion detection, wireless encryption, reputation evaluation.

3. Heterogeneous Network Access Layer

Network defense and counter measures involved in this layer mainly include User privacy, Data encryption, Data integrity, Multicast Security, Entity authentication, Access security.

4. Data Management Layer

The security defense and counter measures involved in this layer mainly include behavior entities certification, data metric, key generation and distribution, securitycomputation, secure communication, service multi-party computation.

5. Intelligent Service Layer

The security defense and counter measures involved in this layer comprises of access control management, security management, and privacy protection strategy.

E. Fuzzy Logic Based Clustering Algorithm for Wireless Sensor Networks

In CHs selection process, FIS has been used for the chance calculation of each sensor node[5]. Two input parameters for FIS are the residual energy of sensor node and closeness to the sink, and one output parameter is the chance value ofa sensor node to be selected as a CH of sensor network. The largest chance value means that the sensor node has large chance to be a CH. In this case, these input parameters are selected because of their importance for the network lifetime. The trapezoidal membership functions that describe the closeness to sink. From the fuzzy rules, the fuzzy chance of each sensor node are obtained. The CAFL protocol is an extension of CFFL approach. The algorithm of CAFL configures the CHs selection and the formation of clusters .The pseudo code of the CAFL routing protocol is outlined in the algorithm. In CHs selection process each sensor node calculates its chance value using two fuzzy parameters residual energy and closeness to the sink. If the maximum chance (chance 1) for a particular sensor node is less than a predefined threshold T(n), which is thepercentage of the desired CHs candidate, the sensor node becomes a CH for the present round, then CH broadcasts this advertisement, the sensor node computes the chance value for each CH by applying two fuzzy parameters which are the residual energy of CH and closeness to CH, then sets its ID with the CH that has maximum chance value ID. This protocol aims on CHs selection and clusters formation considering the residual energy of the sensor node and closeness to the sink in terms of CH selection process, and residual energy of CH and closeness to CH in terms ofclusters formation process

G. Enhanced Hierarchical Clustering Approach for Mobile Sensor Networks Using Fuzzy Inference Systems

Enhanced LEACH protocol, namely LEACH-MF, was proposed to prolong the network lifetime and reduce the packet loss for mobile sensing environments. In theproposed approach, fuzzy inference systems have been adopted to the cluster head selection. Nodes which hold higher residual energy, slower moving speed, and longer pause time have a higher probability to be selected as CHs. During CH selection stage, each sensor node generates a random number between 0 and 1. If the random number of a certain node is larger than a predefined threshold T, this node becomes a CH candidate. Next, the node estimates the chance using the fuzzy inference system and advertises a Candidate-Message with the chance (line 11-12). This message indicates that the sensor node is a candidate of CH with the value of chance. As soon as a node broadcasts a Candidate-Message, the node waits for Candidate-Messages from the other nodes. If the chance value of itself is larger than every chance values from the others, the sensor node is selected as a CH. The node chooses the nearest one as its CH and sends a JOIN-REQ request to the chosen head.After transfering of data CH will fuse the data from all its senor nodes and forward it to the base station using a carrier sense multiple access with the collision avoidance

(CSMA/CA) mechanism. The CHs selection depends on the maximum number of clusters, as function of the scalability, and after the uniform spreading of waking nodes in the area of network. The ECH utilizes sleeping-waking mechanism for the neighboring and overlapping nodes to minimize data redundancy.

H. An Enhanced Clustering Hierarchy Approach

In order to maximize the energy efficiency and the lifetime of WSNs by minimizing the data redundancy in network, an enhanced clustering hierarchy approach was proposed, namely ECH. the ECH technique that increases the energy consumption in WSNs and decreases the failure probability of the nodes by using the sleeping-waking mode isdescribed. The nodes (WSC nodes), in network model, are divided into sleeping nodes, waking nodes, and CHs. The waking nodes detect data from environment of interest, aggregate these data, and then transmit it to the BS via associated CHs, whereas, the sleeping nodes remain off during the current round. In next round, each node can change its status. In thisway, the energy consumption is increased in the network because the sleeping nodesconserve their energy by not with nodes communicating.

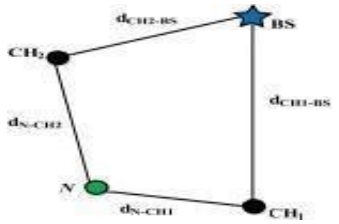

Fig 2 organisation of node with CH

J. Heuristic data dissemination for mobile sink networks

In this proposed protocol architecture comprehends three components double ring , the Heuristic function which encapsulates four values, the direction value, the transmission distance value, the perpendicular distance value, and the residual energy value. Third component is data routing which includes the sink-related routing, the ring related routing, and the source-related routing. In addition to that, HDD adopts two traffic patterns, query based traffic pattern and hybrid traffic pattern. The query based traffic pattern is utilized for sink operations. The current access node transmitsthe mobile sink location and a specific timetable using the heuristic routing to deliverpackets to the ring. The timetable'saim is to allow thesource nodes to disseminate the sensory data in a specific time to the mobile sink. Second, hybrid traffic pattern (event-driven and time-driven patterns), and this is related tothe source node operations. Once a source node has a sensory data, it sends a sink location query to the Ring (event-driven). When the source node receives the mobile sink location, it disseminates the data heuristically to the mobile sink directly within the given time (time-driven). Usually, some mobile sink network adopts intermediate virtual structures to reduce the communication overhead caused by -sink mobility. However, the intermediate virtual structure has two problems, hotspot and flooding. Hotspot problem occurs when the number of nodes comprising the virtual structure is small. This results in high traffic load on these nodes. Flooding problem occurs when the number of nodes constituting the virtual structure is large. This results in great communication overhead within the virtual structure. It includes an easily accessible virtual structure (Double Ring), as an intermediate structure between the sinkand the sensor nodes to exchange control packets. The data dissemination process in this work is a random process, and the packets are disseminated to the target node based on fourprobabilistic distributions, direction, transmission distance, perpendicular distance, and residual energy distributions.

K. A novel heuristic based energy efficient routing strategy in wireless sensor network

The AB-TTDD protocol is designed with several sensor nodes in the homogenous structure; also each and every node is aware of its own location. Also, the transmission process is proceeding with a grid structure. Furthermore, each node are edited as β × β3 square structure, here β × β isrepresented as grid structure.

Hence, the source node measures the specified location for each neighboring hub or dissemination points at the location of (p, q) respectively. For each four dissemination position Pl, the source nodes send a data proclamation message to Pl.If the node is near to Pl than its neighboring nodes then the transmission of data or information will be stopped. In such a case, if the node distances to Pl are smaller than a threshold β, it becomes a distribution or dissemination server node of Pl. The proposed AB-TTDD routing protocol affords an efficient and uninterrupted communication channel in WSN. Therefore, the communication channel is protected by the early identification of the energy drained nodes. Once the less energy nodes are classified, the TEMA mechanism is activated immediately for the routemaintenance by creating the reference link.

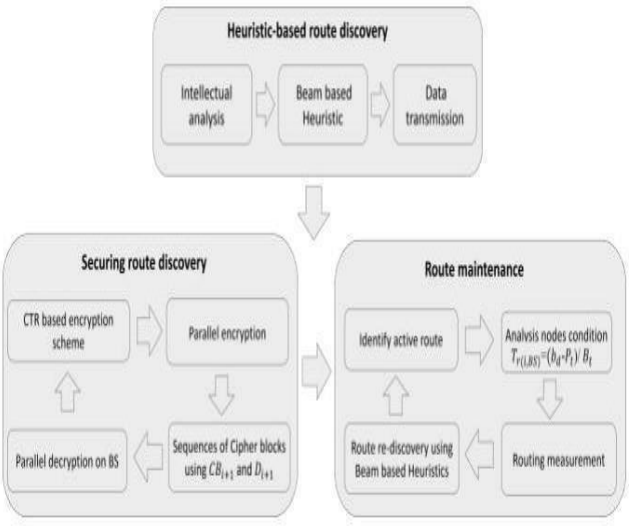

Fig 3 Architecture of SEHR protocol

Protocol	Contributions	Limitations
LEACH protocol	proper load balancing among all the nodes	not suitable for larger networks
ACCA	Suitable size clusters, energy efficiency, network lifetime	• Not appropriate for large size network region, no link evaluation and data security
Energy-efficient fuzzy logic-based clustering	Energy efficiency and even distribution of cluster heads	Network overheads, no link evaluation, and data privacy
PEECR-based clustering routing	Energy-efficient clusters and improved data routing	Additional energy consumption and no data security is provided against malicious nodes
PSO) based routing protocol	Reduce energy consumption with better network lifetime and routing	No data confidentiality and integrity against potential threats
novel security protocol for WSN using cooperative communication	Network resiliency, data reliability, and integrity	Applicable to a small number of sensor nodes, routing performance is not evaluated in terms of optimal and improved network throughput
enhanced hierarchical clustering approach for mobile sensor networks	Energy conservation and improvement in packet drop ratio for mobile sensor nodes	Managing with the latest position of mobile sensors, communication overheads, and no data security.
Fuzzy logic-based clustering algorithm (CAFL). No.	Improve the process for cluster heads selection and clusters formation	No optimal routing performance and secure data transmission
enhanced clustering hierarchy (ECH) approach	Minimized data redundancy, increases the network lifetime and energy efficiency.	Overlooked the limited constraints of sensor nodes in data routing, open for network threats over the insecure transmission links
Heuristic data dissemination for mobile sink networks.	Decreases data latency, energy consumption with improves the network lifetime using the heuristic function	The valuation of wireless links is not considered in the routing performance and no security measurement against malicious threats
Novel heuristic-based energy-efficient routing strategy in WSN	The fitness function is used to decrease the load of energy consumption and packet drop ratio. Identify the energy-deficient nodes on the earlier stage of data transmission	Routing performance is not optimal based on nodes parameters, data privacy and integrity can be compromised

APPLICATION

IDS Based on Artificial Intelligence Technique

The algorithm used for detection of intruder using the techniques in artificial intelligence is discussed. Some of the primary assumptions made in the algorithm are:

1. The activities of the system are observable and
2. The normal and intrusive activities have distinct evidence.

Types of intruders considered are both internal and external

A random-generate and test process is used. A self-learning process determines if the random bit strings are generatedby the sensor nodes, sent to each node of WSN and later self-strings which is already assigned to the nodes during initialization are matched. If a match is found true, then IDS is not activated and the detection process is rejected. Otherwise, detector is set and an alarm is sent to all the neighboring nodes. At network layer, a four-layered architecture is designed for protecting the WSN from misbehaviors and abuses by adversaries. The two phases of the proposed architecture includes learning phase and detection phase. In the learning phase, there are two possibilities: learning and detection is implementedseparately for each neighboring node or the learning and detection can be implemented at a single instance for all the surrounded neighboring nodes in the predicted area of attack. A local response is given by each node which is cooperative and the local detection is performed. At lower level, the data is collected for preprocessing. This preprocessed data is learnt by each node in the learningphase. Later, at higher level the detection is performed locally with a local response sent at higher level

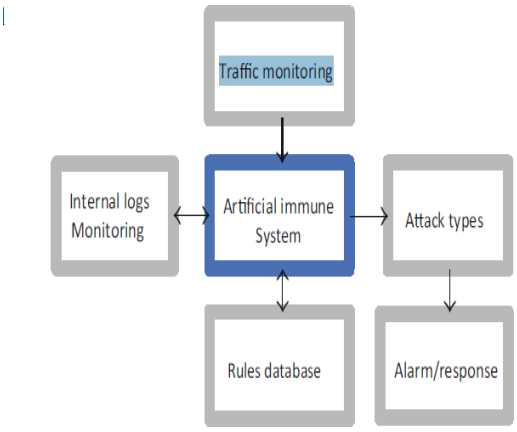

Fig 4. Flow diagram of self-learning process

CONCLUSION

The paper presents a review on secure and energy-aware heuristic routing protocol for WSN, which aims to optimize the routing strategy with the intelligent decision against malicious nodes. The SEHR protocol focuses on critical factors such as energy consumption, secure data delivery, and route maintenance, which are the essential constraints to achieve reliable and trusted transmission for WSN. The SEHR protocol provides artificial intelligence-based heuristic function, which uses residual energy, hop count to BS, and link integrity factors to improve the network performance in terms of data routing and reliable transmissions. Also, the analysis of traffic exploration in the vicinity of the BS helps to prevent the network disjoining and improves route maintenance. Moreover, the SEHR protocol provides data security based on light-weight, simple, and randomness characteristics of the counter mode encryption algorithm.

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A review on deeplearning methodologies in medicalimage processing

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***Abstract*—Recent advances in machine learning, especially with regard to deep learning, are helping to identify, classify, and quantify patterns in medical images. At the core of these advances is the ability to exploit hierarchical feature representations learned solely from data, instead of features designed by hand according to domain-specific knowledge. Deep learning is rapidly becoming the state of the art, leading to enhanced performance in various medical applications.**

Deep learning is contributing to the high level of services to the healthcare sector. As the digital medical data is increasing exponentially with time, early detection and prediction of diseases are becoming more efficient because of the deep learning techniques which reduce the fatality rate to a great extent. The main focus of this paper is to provide the comprehensive review of deep learning in the domain of medical image processing and analysis .The use of new deep learning architectures in oncology for the prediction ofdifferent types of cancer like the brain, lung, skin, and also diseases like pulmonary embolism and so on are explained here. The state-of-the-art architectures effectively carry outanalysis of 2D and 3D medical images to make the diagnosis of patients faster and more accurate. The use of popular approaches in machine learning such as ensemble and transfer learning with fine-tuning of parameters improve the performance of the deep neural networks in medical image analysis.

Keywords—convolutional neural networks (CNN), computed tomography pulmonary angiography (CTPA).cancer, convolutional neural network, 3D CNN, capsule network, transfer learning, ensemble learning, deep learning, pulmonary embolism (PE)

I. INTRODUCTION

. The automated imitation of the brain is one of the emerging technology and has driven large focus and attention of the researchers and big research organizations towards itself. Deep Learning is the subfield of machine learning which uses techniques inspired by the learning ability of the human brain[1]. The deep neural network is the neural network with many layers and the architecture of these deep nets is a little complicated but is computationally precise than any other machine learning methods like Linear Regression, Logistic Regression, Random forest, k-nearest neighbors, Support Vector Machine (SVM), etc. Deep neural networks have the hierarchical architecture where each layer categorizes some information, makes modifications and finally passes this information to the next layer. These networks are trained on many levels of concepts, ideas and abstractions ranging from simple to complex ones. Deep learning has set its flag in many fields like Natural Language Processing, Computer Vision, Prediction analysis, etc. It has emerged as the powerful tool and produces phenomenal results in many applications like image processing, object detection, text summarization, machine translation, game playing etc. Many companies like Google's Deep Mind, Apple, IBM, Microsoft, NVIDIA, etc. are using the deep learning techniques for building up new technologies. Horus Technology with its fascinating innovation helps the blind people to see. They are developing a wearable device that uses computer vision, deep learning, and GPUs to understand the surrounding environment and describe it to users so that they get the insight of the things around them. Along with other applications, deep learning is deployed at the front lines of healthcare and has produced the influential results by analyzing huge electronic medical data for the treatment of the diseases. Researchers showed that they could predict heart failure nine months before the traditional techniques. The future of personalized medicine is expected to be accomplished by deep learning techniques. Deep Genomics are using deep learning to understand the variations of the genes that cause diseases . Deep learning techniques are used for analyzing X-Rays, CT Scans and MRIs images which has improved detection, diagnosis, and treatment of disease. Cancer is a deadly disease [2]and the number of patients suffering from cancer is increasing rapidly. Indian Council of Medical Research (ICMR) stated in 2016 that the total

number of new cancer cases is expected to reach nearly 17.3 lakh in 2020 . The early detection of such deadly disease can reduce the fatality rate and the deep learning methods have proved to be beneficial in the early detection of diseases. The deep nets in medical diagnosis are more efficient than the previous image processing techniques. One of the state-of-the-art architecture used in deep learning image processing is a Convolution Neural Network (CNN or ConvNet). TheCNN is very effective in the areas of image recognition and classification problems.

Healthcare providers generate and capture enormous amounts of data containing extremely valuable signals an information, at a pace far surpassing what "traditional" methods of analysis can process. Machine learning therefore quickly enters the picture, as it is one of the best ways to integrate, analyze and make predictions based on large, heterogeneous data sets Healthcare applications of deep learning range from one-dimensional bio-signal analysis and the prediction of medical events ,e.g. seizures and cardiac arrests ,to computer-aided detection and diagnosis supporting clinical decision making and survival analysis, to drug discovery and as an aid in therapy selection and pharmacogenomics, to increased operational efficiency, stratified care delivery, and analysis of electronic health records .

II MACHINE LEARNING, ARTIFICIAL NEURAL NETWORKS, DEEP LEARNING

In machine learning one develops and studies methods that give computers the ability to solve problems by learning from experiences. The goal is to create mathematical models that can be trained to produce useful outputs when fed input data. Machine learning models are provided experiences in the form of training data, and are tuned to produce accurate predictions for the training data by an optimization algorithm. The main goal of the models is to generalize theirlearned expertise, and deliver correct predictions for new, unseen data. A model's generalization ability is typically estimated during training using a separate data set, the validation set, and used as feedback for further tuning of the model. After several iterations of training and tuning, the final model is evaluated on a test set, used to simulate how the model will perform when faced with new, unseen data. There are several kinds of machine learning, loosely categorized according to how the models utilize its input data during training. In reinforcement learning one constructsagents that learn from their environments through trial and error while optimizing some objective function. A famous recent application of reinforcement learning is AlphaGo andAlphaZero, the Go-playing machine learning systems developed by DeepMind. In unsupervised learning the computer is tasked with uncovering patterns in the data without our guidance.Clustering is a prime example. Most of today's machine learning systems belong to the class ofsupervised learning. Here,the computer is given a set ofalready labeled or annotated data, and asked to producecorrect labels on new, previously unseen data sets based on the rules discovered in the labeled data set. From a set of input-output examples, the whole model is trained to performspecific data-processing tasks. Image annotation using human-labeled data, e.g. classifying skin lesions according to malignancy or discovering cardiovascular risk factors from retinal fundus photographs, are two examples of the multitude of medical imaging related problems attacked using supervised learning. Machine learning has a long history and is split into many sub-fields, of which deep learning is the one currently receiving the bulk of attention.

A. Artificial neural networks

Artificial neural networks (ANNs) is one of the most famous machine learning models, introduced already in the 1950s. Roughly, a neural network consists of a number of connected computational units, called neurons, arranged in layers. There's an input layer where data enters the network, followed by one or more hidden layers transforming the data as it flows through, before ending at an output layer that produces the neural network's predictions. The network is trained to output useful predictions by identifying patterns in a set of labeled training data, fed through the network while the outputs are compared with the actual labels by an objective function. During training the network's parameters – the strength of each neuron – is tuned until the patterns identified by the network result in good predictions for the training data. Once the patterns are learned, the network can be used to make predictions on new, unseen data, i.e. generalize to new data. It has long been known that ANNs are very flexible, able to model and solve complicated problems, but also that they are difficult and very computationally expensive to train This has lowered their practical utility and led people to, until recently, focus on other machine learning models. But by now, artificial neuralnetworks form one of the dominant methods in machine learning, and the most intensively studied. This change is thanks to the growth of big data, powerful processors for parallel computations (in particular, GPUs), some important tweaks to the algorithms used to construct and train thenetworks, and the development of easy-to-use software frameworks. The surge of interest in ANNs leads to an incredible pace of developments, which also drives other parts of machine learning with it.. The basicform of artificial neural networks the feed-forward neural networks, are parametrized mathematical functions $y = f(x; \theta)$ that maps aninput x to an output y by feeding it through a number of nonlinear transformations: $f(x)=(fn \circ \cdots \circ f1)(x)$. Here each component fk, called a network layer, consists of a simple linear transformation of the previous component's output, followed by a nonlinear function: $fk = \sigma k (\theta T k\, fk-1)$. The nonlinear functions σk are typically sigmoid functions or ReLUs, and the θk are matrices of numbers, called the model's weights. During the training phase, the network is fed training data and tasked with making predictions at the output layer that match the known labels, each component of the network producing an expedient representation of its input. It has to learn how to best utilize the intermediate representations to form a complex hierarchical representation of the data, ending in correct predictions at the output layer. Training a neural network means changing its weights to optimize the outputs of the network. This is done using an optimization algorithm, called gradient descent, on a function measuring the correctness of the outputs, called a cost function or loss function. The basic ideas behind training neural networks are simple: as training data is fed through the network, compute the gradient of the loss function with respect to every weight using the chain rule, and reduce the loss by changing these weights using gradient descent. But one quickly meets huge computational challenges when faced with complicated networks with thousands or millions of parameters and an exponential number of paths between the nodes and the network output. The techniques designed

to overcome these challenges gets quite complicated. One of the simplest class of neural network is the multilayer perceptron, or feedforward neural network, originating from the work of Rosenblatt in the 1950s . It is based on simple computational units, called neurons, organized in layers. Each layer therefore computes a weighted sum of the all the outputs from the neurons in the previous layers, followed by a nonlinearity. These are called the layer activations. Each layer activation is fed to the next layer in the network, which performs the same calculation, until you reach the output layer, where the network's predictions are produced.

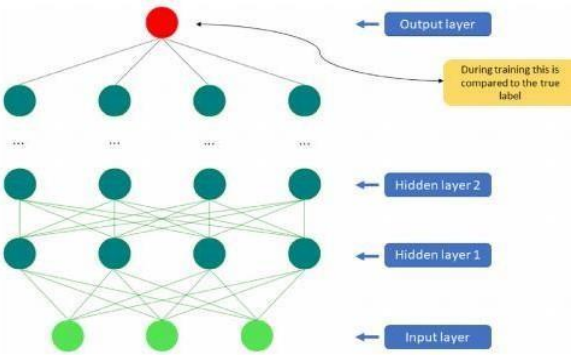

Figure 1. Artificial neural networks are built from simple linear functions followed by nonlinearities

. Writing i for the ith layer and j for the jth unit of that layer, the output of the jth unit at the ith layer is z (i) j = θ (i)T j x. Here x consists of the outputs from the previous layer after they are fed through a simple nonlinear function called an activation function, typically a sigmoid function σ(z) = 1/(1 + e−z) or a rectified linear unit ReLU(z) = max(0, z) or small variations thereof.. In the end, you obtain a hierarchical representation of the input data, where the earlier features tend to be very general, getting increasingly specific towards the output. By feeding the network training data, propagated through the layers, the network is trained toperform useful tasks. A training data point is fed to the network, the outputs and local derivatives at each node are recorded, and the difference between the output prediction and the true label is measured by an objective function, suchas mean absolute error (L1), mean squared error (L2), cross-entropy loss, or Dice loss, depending on the application. Thederivative of the objective function with respect to the outputis calculated and used as a feedback signal. The discrepancy is propagated backwards through the network and all the weights are updated to reduce the error. This is achieved using backward propagation, which calculates the gradient of the objective function with respect to the weights in each node using the chain rule together with dynamic programming, and gradient descent, an optimization algorithm tasked with improving the weights.

B. Deep learning

Traditionally, machine learning models are trained to perform useful tasks based on manually designed features extracted from the raw data, or features learned by other simple machine learning models. In deep learning, the computers learn useful representations and features automatically, directly from the raw data, bypassing this manual and difficult step. By far the most common models in deep learning are various variants of artificial neural networks, but there are others. The main common characteristic of deep learning methods is their focus on feature learning: automatically learning representations of data. This is the primary difference between deep learning approaches and more "classical" machine learning. Discovering features and performing a task is merged into one problem, and therefore both improved during the same training process. In medical imaging the interest in deep learning is mostly triggered by convolutional neural networks (CNNs) a powerful way to learn useful representations of images and other structured data. Before itbecame possible to use CNNs efficiently, these features typically had to be engineered by hand, or created by less powerful machine learning models. Once it became possible to use features learned directly from the data, many of the handcrafted image features were typically left by the waysideas they turned out to be almost worthless compared to featuredetectors found by CNNs.

III COMPUTER-AIDED ANALYSIS FOR MEDICAL IMAGES

The four principle stages of medical image analysis are image acquisition, image enhancement, image segmentation and feature extraction.

Medical images such as X-Rays, CT Scans, MRIs, etc are captured for analysis and diagnosis of disease. M. S. Al-Tarawneh have mentioned image enhancement methodssuch as Gabor Filter, auto enhancement algorithm and Fast Fourier Transform (FFT) to improve the quality of the image. there are many other methods that can be used for enhancement, segmentation and feature extraction such as Histogram equalization, Adaptive Histogram Equalization, CLAHE, Histogram of oriented gradients (HOG), Local binary patterns (LBP), etc.

A. State-of-the-art architecture for classification

AlexNet, VGG, GoogLeNet and ResNet are the popular architectures that were introduced for the image classificationdesigned the first deep Convolutional Neural Network called AlexNet which is the 8 layer architecture composed of 5 convolutional layers and 3 fully connected layers. Then the University of Oxford presented their architecture called VGG which is the 19 layer architecture and made the improvements over AlexNet where the authors used multiple small size kernels to detect more complex features. To utilize the computing resources Google introduced their model called GoogLeNet/inception. It cited the problem of computing efficiency and tried to design inception module that is efficient in the amount of computing. The inception modules are stacked on each otherforming the 22 layer architectures. To overcome the problemof vanishing gradient and training error that most deep neuralnetworks faced during backpropagation, there introducedResNet. It is a 152 layer architecture formed of residual module stacked over each other. They have huge memory and high computation power so the availability of requirements for these models is an important concern especially during training. The accuracy of the models is improved with the addition of layers making the architecture computationally intensive so there is a tradeoff between accuracy and computation

B. Segmentation in medical images

Segmentation is an essential step in medical image analysis. It isolates the region of interest and significantly improves the performance of image classification. Several

variations of CNN is used for the precise segmentation of the object of interest. The most popular CNN architecture, U-net is used for the segmentation of 2D biomedical images .The architecture consists of the equal number of the downsampling layers to capture features and upsampling layers for accurate localization. The information of the downsampling layers is transferred to the upsampling layers by means of skip connections. The U-net takes the entire images in one forward pass and results in the segmentation map. Furthermore, Vnet which is the variant of U-net is used for the volumetric segmentation of the image. It is the fully convolutional neural network and performs segmentation of 3D medical images .

C. Automatic extraction of features

The extraction of distinct features is very difficult and need to be carefully designed so that the chances of missing out any distinct features is reduced. The deep learning techniques for medical image analysis eliminates the overhead of manually s selecting features and hence improves the classification and the performance of the system.For example, Deep learning method like Faster Region-based Convolutional Neural Network (Faster R- CNN) is used to train networks for the detection of cancer inlungs.

. D. Classification of cancer

Many new architectures were designed which worked very well for medical images like K. J. Geras et al. have proposed the Multiview Deep Convolutional Neural Network (MVDCN) that takes the HD medical images for the classification of the breast cancer. The model is trained on 866,000 images and has classified images as BI-RADS 1 (”Assessment is incomplete”), BI-RADS 2 (”Negative”) and BI-RADS 3 (”Benign findings”). In CNN is designed for the classification of H&E stained breast biopsy images into 4 and 2 classes. The four classes in which images are classifiedare normal, benign lesion, in situ carcinoma and invasive carcinoma and the two classes are carcinoma and noncarcinoma. The SVM is used as classifier where the features extracted by CNN are given as input and classified into benign or malignant. F. Analysis of 3D volume medical images CT scan and MRI produces hundreds of images for a single patient and analyzing all these images one by one is timeconsuming. Therefore, 3D Computer Aided Design (CAD) technologies are used which take these CT Scanimage slices and stack them into a concise 3D area. 3D- Convolution Neural Networks also performed tremendously well for 3D volume medical images. In the volumetric medical image analysis, 3D CNN has shown better results than 2D CNN imaging data. The output is either 1 (input patch will have a tumour at next time point) or 0 (input patchwill not have a tumour at next point of time). The methods offusing invasion and expansion such as Late Fusion, Early Fusion and End to End Fusion are studied to take an advantage of the invasion and expansion information.

IV. COMPARISON OF DEEP LEARNING WITH TRADITIONAL TECHNIQUES

Deep learning techniques show favourable results when compared with traditional image analysis techniques. Harshita et al. have proposed 9 layer CNN architecture for two applications called cancer classification and necrosis detection of stomach cancer from H&E stained images. The authors have compared their proposed CNN architecture with traditional methods - LBP histograms, Gabor filter-bank responses,[3] Gray histograms, HSV histograms, Gray level co-occurrence matrix, and RGB histograms followed by machine learning method called the random forest. The proposed model is comparatively analyzed with standard architecture, ALexNet, for classification problems. RGB histograms followed by random forest among other traditional methods achieved the highest classification accuracy of 76.41%, AlexNet achieved 73.28% and the proposed architecture achieved 69.90%. For necrosis detection, the proposed architecture achieved the overall highest accuracy of 81.44%. In the efficiency of the existing prostate CAD was compared with the proposed Deep Learning g based Prostate-CAD (CADDL). CADDL attained 86% detection rate whereas CAD attained 80% detection rate.

V. TRANSFER LEARNING AND ENSEMBLE LEARNING USED IN MEDICAL IMAGE ANALYSIS

Transfer learning is an optimal solution when there is limited data available for training, where pre-trained weights of the standard deep network architectures are used as initialization weights. Transfer learning [4]is the good approach to start the learning process by reusing the pre-trained weights of a pre-trained model (Inception-V3) as the initialization weights for their proposed model. The loaded weights were fine-tuned so that the model better fits the new Breast Cancer Digital Repository (BCDRF03) dataset and hence improves the performance of the network for the better detection of breast cancer. Transfer learning with exponential decay of learning rate yielded an accuracy of 97.50% and AUC= 0.96. Results on the three tasks were , the first is carcinoma which is the prevalent type of skin cancer. The second is the most dangerous type of skin cancer called melanoma and the third is dermoscopy images of melanoma. The pre-trained model is retrained with their ISIC dataset and the parameters are fine-tuned across all layers. Transfer learning with fine-tuning reduces the training time and improves the performance of a model. The ensemble networks were also proposed to maximize the performance of the network. In the performance of GoogLeNet is improved by an ensemble of networks for preprocessing anddecision fusion to classify microcalcification of a breast. In contrast with standalone models, ensemble models show better accuracy and are highly preferable. Codella et al. have proposed ensemble models including deep residual networks, CNN, and fully convolutional U-Net architectures to segment the skin lesion, analyze the detected area and its surrounding tissue for recognition of melanoma. I. Capsule Network Convolutional Neural Networks are translation and spatial invariant. When the object in an image is altered in position or rotation it can still classify that object but does not predict any additional information of alternation. Hilton et al. proposed the implementation of the idea of CapsNet. A CapsNet is basically a neural network that performs inverse graphics and it is composed of many capsules. A capsule is a function that predicts the presence and instantiation parameters of a particular object at a given location. A capsule is a group of neurons whose output is the activity vector that represents the instantiation parameter of the entitysuch as an object or object part. Length of the vector represents the probability of the existence of that entity and its orientation represent that parameter. The authors have trained their network on the MNIST dataset. They have usedan iterative ‘routing by agreement’ mechanism which means

the capsule at the low level will send its output only to the neurons at the high level which has an activity vector with a big scalar product. By big scalar product we mean the probability of having an accurate output at the last layer will be through these neurons at a high level. The CapsNet got the low test error (0.25%) on a 3 layer network which was previously achieved by deep networks with many layers

Different deep learning architectures were used for the analysis of medical images for the detection of the various cancers where each architecture takes the different size of images as input and the performance of the architecture is measured by different performance metrics.

Architecture	Cancer	Image Size	Dataset	Performance metrics
Inception -V3	Skin	299x299	ISIC Archive, Edinburgh Dermofit library, Stanford Hospital, 129,450 images	Three-way accuracy = 72.1% ± 0.9% Nine-way accuracy = 55.4% ± 1.7%
MV-DCN	Breast	2600x2000	129,208 patients, 201,698 exams, 886,437 images	macAUC = 0.733 for 100% of data used for training.
CNN	Brain	33x33x4	BRAT 2013 : 65 MRIs & BRAT 2015 : 327 MRIs	Dice coefficient metric: BRAT 2013 = (0.88, 0.83, 0.77) & BRAT 2015 = (0.78, 0.65, 0.75)
XmasNet	Prostate	32x32	341 cases (DWI images+ADC maps+ Ktrans+T2WI images) 207144 images	AUC = 0.84
CanNet	Lung	128x128	1018 patients (LIDC-IDRI) 150 to 550 CT Scan images/patient	Test accuracy = 76.50%
DCNN	Lung	5x20x20	1018 patients (LIDC-IDRI) 150 to 550 CT Scan images/patient	sensitivity (true positive rate) = 78.9%

VI EXAMPLE:DEEP LEARNING IN PULMONARY EMBOLISM.

Pulmonary embolism (PE)[5] is a life-threatening clinical problem and computed tomography pulmonary angiography (CTPA) was the golden standard for diagnosis. Prompt diagnosis and immediate treatment was critical to avoid high morbidity and mortality rates, since PE remains among the diagnoses most frequently missed or delayed. Here,we developed a deep learning model—PENet, for automatic detection of PE on volumetric CTPA scans was an end-to-end solution for this purpose. A pulmonary embolism is a blood clot which occurs in the lungs. It[6] can damage part of the lung by restricting blood flow, decrease oxygen levels in the blood, and affect other organs also. Large or numerous blood clots can be fatal. Blood clots can form for wide range of reasons. Pulmonary embolisms are often caused by deep vein thrombosis, a condition in which blood clots form in veins deep in the body. The blood clots often causes pulmonary embolisms which begin in the legs or pelvis.

The methodology used here was called[7] PENet architecture. PENet is a 3D convolutional neural network that aims to detect the PE in a series of slices from a CTPA study. The use of 3D convolutions allows the network to use information from multiple slices of an exam in making each prediction. That is, with 2D convolutions each slice would be considered independently, whereas 3D convolutions aggregate information from many consecutive slices. This is especially relevant in diagnosing, where the abnormality rarely occupies just a single slice. The model thatdeveloped, the PENet, is built using four architectural units:

the PENet unit, Squeeze-and- Excitation block, the PE-Net bottleneck and the PE-Net encoder41. The PENet unit is meant to process 3D input data, using a 3D CNN followed by group normalization and activated by LeakyReLu.42 The Squeeze-and-Excitation block (SE-block) serves to modelthe interdependencies between channels of the input and adaptively recalibrates channel-wise features. A PENet bottleneck is built using three PENet units, with a SE-block inserted after the group normalization layer of the lastPENet unit. A skip-connection is also applied between thePENet bottleneck input and the SE-block output. MultiplePENet bottlenecks, ranging from three to six, join insequence to build the PENet encoder. Our final modelconsists of an individual PENetUnit, following by fourPENet encoders and Gap Linear activation. The depth of thenetwork was chosen via cross-validation on the trainingdata: shallower networks were not able to model the complexity of the dataset, whereas deeper networks showed lower performance on a held-out validation set due to overfitting.

The purpose of this work was to develop and evaluate an end-to-end deep learning model capable of detecting a PE using the entire volumetric CTPA imaging examination with simultaneous interpretability at the volumetric level that is robust to application on external dataset.And also for timely diagnosis of this important disease, including in settings where radiological expertize is limited.

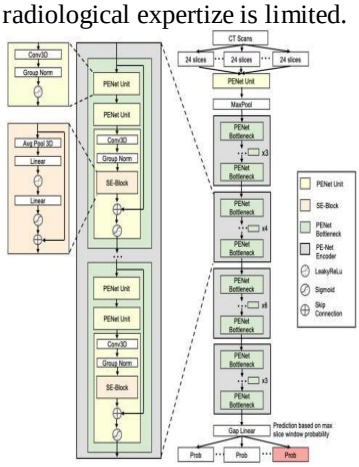

FIG PENet architecture

VII CONCLUSION

The analysis of medical images such as X-Rays, CT Scans and MRIs[12] is a difficult task because of the increase in digital medical data every year which requires high potential analysis techniques. Deep learning is in fame because of its phenomenal classification of millions of images. It came in collaboration with the medical imaging and performed exceptionally well. We have highlighted the use of deep learning techniques for the detection of cancer.

The state-of-the-art such as ResNet, GoogLeNet or VGG are used for medical image analysis. Also, new architectures were designed that performed better for the classification of cancer. 3D deep networks were introduced for 3D volumetric medical image analysis detecting the most discriminating features that classify the number of diseases. The ensemble of CNN models is also used to improve the predictive powerof the model for better prediction of

cancer. Transfer learning with fine-tuning of parameters is incorporated in medical image analysis increasing the performance of pre-trained models for better classification and reducing the training time. Regularization methods help to overcome the problem of overfitting and tuning of hyperparameters improve the performance of the deep neural networks without making any kind of changes in the architecture which is very effective and feasible. The CNN models have worked a lot in medical image analysis and performed comparatively better than the traditional image processing techniques. CapsNet has achieved the desirable accuracy by only the 3 layer architecture which is usually achieved by deep layer networks. We expect that medical image analysis will improve more with the use of CapsNet. Deep learning is revolutionizing the healthcare with its extraordinary capabilities making the diagnosis and detection more accurate and faster. All these emerging technologies and new fascinating advancements in medical sciences contribute to the better health.

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A Review On Optical Nanoantennas

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Abstract

The optical nanoantennas which is a rapidlydeveloping field in the area of optics , isreviewed. Nanoantennas are able to produce promising results over the traditional antenna, especially in the near-fieldapplications. Since, the increasing advances in nanoscience and nanotechnology, the improvement of fabrication techniques andthe developments of optical measurement devices have paved way tofurther development of optical antennas, thus making the theoretical study of optical antennas desirable to uncover their underlying mechanism and unknown characteristics. Recent research in nano- optics and plasmonics has generatedconsiderable interest in the optical antenna concept
. A brief history of evolution of optical nanoantennas , it's physical properties
, and application are discussed. We will concentrateon the use of optical nanoantennain THz frequency range of communication. And concluded with the prospects of future research and applications.

Key words: Nanoantennas, THz frequency,plasmonics

I. Introduction

An antenna is a device used to propagate,receive,and/or transmit electromagnetic waves which have information embedded within it. This concept of antennas can be extended when we consider thebranch of science called nano-optics which is the studyof the transmission and reception of optical signals by submicron and even nanometer-sizedobjects[1-3].

Nano means one-billionth. A naoantenna is an antenna that is very , very small.nanoantennas can contribute to various fields like space communication,broadband wireless links,wireless optical communication,mobile commincation(5G & 6G) , RADAR detection and higher order frequency application (THz) in the future.

Optical antennas accomplish the samepurpose as that of the radiowave and microwave antenna , that is to convert enegy of free propagating radiation to localized energy , and vice versa.Optical nanoantennasexploit the unique properties of metal nanostructures , which behave as strongly coupled plasma at optical frequencies. The recent research going on in the field of nano- optics and plasmonics have established interest in optical antennas.And studies are focusing on how to translate established radiowave and microwave antennas into optical frequency regime.

Due to their small size optical nanoantennasare less common as compared to conventional antennas. Recent advances in naoscience and fabrication technologies has made it possible to realize stuctures of nanometer size[4] and hence improvement in the design of optical nanoantennas.

I. Brief History

The invention of optical antennas was motivated by microscopy.In analogy to it'sradiowave and microwave counterparts,optical antenna is a device designed to efficiently convert free-

propagating optical radiations to localized energy , andvice versa.

In letter dated April22,1928, Edward Hutchinson Synge described about a microscopic method in which the field scattered from a tiny particle could be used as a light source[5]. John Wessel in 1985 wrote " The particle serves as an antenna thatreceives an incoming electromagnetic
field",[5] and was unfamiliar of Synge's work at that time, hence making him the first to mention explicitly the analogy of local microscopic light source to classic antennas – a concept that has since been explored intensively.

In 1988 , Ulrich Ch. Fischer and Dieter W. Pohl carried out an experiment similar to Synge's and Wessel's proposals [7] . They used gold-coated polystyrene particle as lightsource , which were later called gold nanoshells.Their results provide the first experimental evidence of near-field scanningoptical microscopy. Ten years later , Laser- irradiated metal tips were proposed as opticalantenna probes for near-field microscopy and optical trapping[8,9] , and since then variousantenna geometries were studied.A few of them are reviewed below.

An antenna attached to a metal-to-metal point contact was used in 1968 by Ali Javan and co-workers for frequency mixing of IR radiation [10]. It was shown that the rectification efficiency of these whisker diodes could be increased by suitably "kinking," or bending the wire antenna [11]. These experiments were performed at IR wavelengths, at which metals are good conductors. IR antenna fabrication has expanded considerably in the past few decades, notably including work by Glen Boreman, who since the late 1990s has fabricated many types for use in IR detectors, bolometers, and nanophotonics [12– 14].Below figure 1 shows some of these antennas.

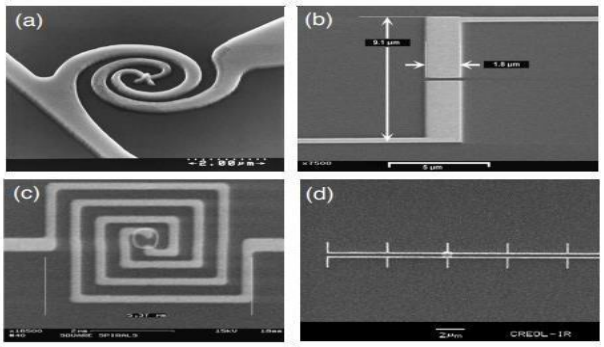
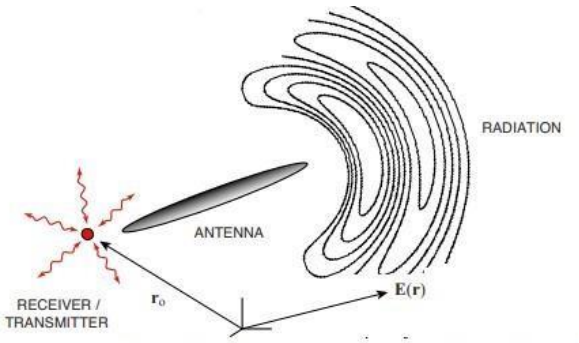


Fig 1

a) Assymetrical spiral antenna[15]
b) Microstrip dipole antenna[16]
c) Square spiral antenna[13]
d) Phased arrayed antenna

II. Physical properties

Eventhough optical antennas are analogus toRF and microwave antennas , but there is much difference in their physical properties and scaling behavior. One reason for this difference in physical properties arises because of the different unusual shapes (tips, nanoparticle, etc..) and hence their properties maybe highly shape and material dependant owing to surface Plasmon resonance. The figure 2 below shows the general problem statement of optical antenna theory.



Problem statement of optical antenna theory. A receiver or transmitter (ato ion, molecule...) interacts with free optical radiation via an optical antenna.

Fig. 2

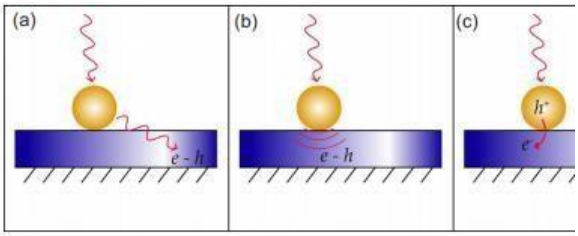
The presence of the antenna modifies the properties of the receiver/transmitter, such asits transition rates and, in the case of a strong interaction, even the energy-level structure. Likewise, the antenna properties depend on those of the receiver–transmitter, and it becomes evident that the two must be regarded as a coupled system.The following are the important parameter to be considered while studying the physical property of an optical nanoantenna.

(I) Local density of electromagneticstates
(II) Power dissipation and antennaimpedance
(III) Antenna efficiency , directivity andgain
(IV) Radiative enhancement
(V) Antenna aperture and absorption crosssection
(VI) Wavelength scaling
(VII) Influencing the light – matter interaction
(VIII) Non linear antenna behaviour
(IX) Characteristics of optical antenna

111 Applications of optical nanontennas

In this section, we review recent advances, highlight application areas, and discuss future developments in the field of optical antennas.

1. ***Antennas for Nanoscale imaging and spectroscopy*** : The ability of optical nanoantennas to influence light on nanometer scale is the concept behind nano-imaging applications.Here an optical antenna acts as a near - field optical probe which is used to interact with the unknown sample surface. The antenna is guided over the sample withclose proximity and the optical response(scattering, Fluorescence, antenna detuning) is detected for each pixel. It is possible, however, to write the interaction between antenna and sample as a series of interaction orders [18], and in many cases it is legitimateto retain only a single dominant term.
2. ***Antennas for photovoltaics*** : The traditional approach to photovoltaics isto use light for generating charge carriers in a semiconductor. There are at least three distinct ways in which nanoparticle antennas can interact witha photoactive substrate when placed in close proximity to it, as illustrated in Fig.3



Schematic of different types of antenna effects in photovoltaics. scattering, leading to a prolonged optical path. (b) Near-field scatte locally increased absorption, and (c) direct injection of photoex into the semiconductor.

Fig 3

I. Optical nanontenna for THz communication

The THz band has been characterized as the last undiscovered frontier of the total EM spectra range that urges for exploration and investigation, since current data traffic and bandwidth hungry applications will no longersatisfy their speed and latency demands with existing technologies and system architectures. Among competitive technologies, CMOS-based electronic interconnects are definitely out of the competition, in order to meet THz speed, lowpropagation signal loss, and the impedance match between THz link components. A photonic solution is indeed; ; a viable approach for providing high data rates at low propagation losses, still the component size isone with two orders of magnitude larger thanwhat required for THz band case. Plasmon based THz link components, on the other hand, due to their extremely small size and their ability to operate at ultra-highdata rates, seems to be a promising approach for equipping wireless THz nanoscale communication systems. Owing to unique electronic and plasmonic properties at terahertz (THz) band, two-dimensional nano material graphene make it easy for the designof highly miniaturized ultra-wideband (UWB) reconfigurable THz antenna with simple nano structure at subwavelength scale. Terahertz nanoantenna can overcome the current limitations of terahertz spectroscopy such as low sensitivity and low spatial resolution.Below figure 4 gives the three wireless THz nanocommunication applications

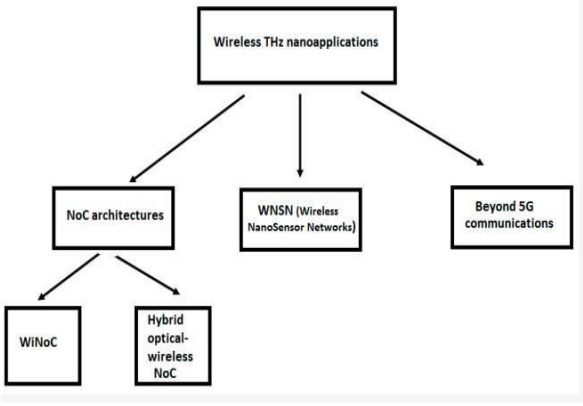


Fig 4

CONCLUSION

In this paper a brief review of optical nanoantenna and it's application is carried out. New ideas and developments are emerging at a rapid pace, and it is clear that the optical antenna concept will provide new opportunities for optoelectronic architectures and devices. There is a great potential of nanoantennas in the field THz devices ,and communication. The THz band has been characterized as the last undiscoveredfrontierof the total EM spectra range that urges for exploration and investigation, thus migration to higher carrier frequency bands and specifically in the THz band is required, via adoption of newtechnologies, equipping future THz wireless communication systems at the nanoscale, in order to accommodate a variety of applications that would satisfy the ever increasing user demands for higher data rates.

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