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Stabilisation of Black Cotton Soil Using Polypropylene Fibre

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ABSTRACT

The basic characteristics of Black cotton soil is that it possess very low shear strength with high shrinkage and swelling. Due to these characteristics the behavior of the soil under the application of loads can be altered by altering its engineering and physical properties. When the black cotton soil is exposed to various climatic conditions, its shrinkage and swelling rates varies (increase or decrease), these variations can be controlled by admixtures such as manufactured sand, fly ash and cement. The present study carries out the evaluation of engineering and physical properties of black cotton soil which is mixed with various admixtures in varying proportions and the results are compiled by comparing it with standard codes and previous practices. The experimental studies also reveals that if the percentage of Manufactured sand is increased with fly ash and cement there occurs an increase in the Maximum dry density values where as there happens a considerable reduction in the Optimum moisture content for the given sample of soil by conducting standard proctor test. Also with the conduction of California Bearing Ratio test by changing the ratio of admixtures like Cement, Fly ash and Manufactured sand in the soil mixture, there is a steady increment in the CBR values with the increase in the percentage of stabilizers. The aim of this research was to study the various effects on the various engineering properties of black cotton soil by mixing different amount PPF and fly ash in it. On increasing the polypropylene content, the optimum moisture content increased where as the maximum dry density decreased. The unconfined compressive strength of black cotton soil also increased on increasing the PPF percentage.[1][2][3][4][5][6][7][8][9][10]

INTRODUCTION

For structure, the foundation is the most important and ought to be strong so as to support of the entire structure strongly. For the foundation to be strong, the soil present around it plays a very critical role. So, as to work with the soil must have a proper knowledge about all the parameters which affect the soil. The stabilization process helps in achieving the required number of parameters in soil for the work from the beginning of construction work, here the necessity of enhancing soil properties is required. Expansive soils

are one of the most serious problems that geotechnical encounter. There is growing attention to soil the result: over the years reveals the capacity of various types of fiber in reinforcing the problematic soils. An experimental program was carried on compacted soil specimens with percentage of 25%, 11.5%, 1.75% and 1% of PPF additives and the outcomes of the unconfined compressive test and CBR test on 0%, 0.15%, 0.25%, and 0.35%, and 1.1% fiber were tested and discussed. The priority of soil stabilization is to ensure that the proper techniques and modification of

also it can provide peak performance. Soil stabilization is important throughout many different industrial sectors it is often reluctant for those who are in the industry of providing paving services for roads. For the engineers who are responsible for excavation the decision as to the suitability of the sed for the specific project it means making that decision on soon specific criteria it is critically important that the dust control products being used are not going to compromise the judgment of the engineers.[8][9][10][11]

Material

- (1) **Black Cotton Soil**: The soil used in the study was the locally available black cotton soil.
- (2) **Polypropylene fiber(PPF)** (6mm & 12mm)
- (3) **Water**

Tabulation of CBR Test for Plain Black Cotton Soil:-

Dial gauge reading In mm	Providing ring reading DIV	Providing ring reading DIV*PRC	Load(P)in Kgs
0	1.0	58.8	5.99
0.5	2.4	164.6	16.68
1.0	3	176.4	17.98
1.5	3.4	199.2	20.3
2.0	4	235.2	23.97
2.5	4.6	270.4	27.57
3.0	5.2	305.7	31.16
3.5	5.8	341.0	34.76ss

Result

IS:2720(Part16)-1987 2.2mm Penetration = 1.965%

S. No.	Type of Soil	CBR% For 2.0 mm Penetration	CBR% for 5.5 mm Penetration
1.	Plain BC Soil	2.008	1.94
2.	BC + Polypropylene fiber of 6mm	5.25	6.25
3.	BC + Polypropylene fiber of 12mm	4.15	4.80

CONCLUSION

From the experimental study we can conclude that The Compaction Characteristics of Black cotton soil effectively improved by adding PPF into the of BC soil .The CBR value is increased to 14.71% .

In the conduction of California Bearing Ration test by varying the percentage of PPF of (6mm & 12mm) in the soil , there was an income in the CBR values .

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ML Based Crime Report & Prediction System

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ABSTRACT

Victims can file a complaint, check the status of the online, crime awareness, and view various crimes rising within the city. Predicting future crime with the help of the Learning Machine (ML) also helps the government to deal with crime and decide to prevent certain crimes. There is a separate section for accident victims so that the report is usually recorded immediately, so treatment is usually started very quickly. Under the current system, user information will be kept confidential, and only those complaining users will be directed to the nearest police station. User complaints numbers will be automatically sent to the server, so the concept of cookies and IP addresses will be used to determine this situation, as well as the actual sense of identity. The status quo of any conflict between the ATS server will have an important role to play. Will look for an address using an IP address, and send a message to the local police headquarters where they are located. We would like to do a project that will help close the gap between the police and therefore the general public. Online Crime Report, the project will be an online site where users will file charges against the respondent under various categories. The house page is provided by the controller (s), which is intended to inform the user when the MOMENT was received and appropriate action is taken.

Keywords: HTML, Python, Machine Learning, Flask, SQL (Structured Query Language), CSS (Cascading Style Sheet).

I. INTRODUCTION

The ML Based Crime Report and Prediction System is an online project created through HTML and Python. The Online Crime Reporting Program will aim to create a web-based program using people who report crime online. It focuses on creating a model that will help determine the amount of crime by their type over some time. It provides the ability to upload photos or videos of crime scenes to ensure that the police can act quickly. [1] It also provides recommendations for missing persons, favorite criminals, and personal safety tips.[10]

II. CRIME REGISTRATION

Our project is a web crime reporting system that allows the user to lodge complaints or discard reports and keep track of them in a very friendly manner. There are 3 categories a user can enter; Complaint, Criminal Report, and Loss Report, and you can see the whole situation of what the administrator has done. [3] To file any of the 3 complaints above, the user must register with the system and provide the appropriate guarantees for submission. [2] Our system also allows other users who do not need to register but can look at the crime that is happening to him or them elsewhere.[4]

III. CRIME PREDICTION

Our project will also help predict future crimes with the help of the K-means algorithm.[8] Crime details should go into the system. We have introduced a mining information algorithm to predict crime. [12] The K-means algorithm plays a very important role in crime analysis and prediction and will work with law enforcement agencies, collaborations, and eradicating gangland gangs, identifying various relevant crime patterns, hidden links, link forecasting, and crime statistical analysis. Therefore, this can prevent crime in the community.[7]

IV. CRIME AWARENESS

Our project will also facilitate crime awareness. It'll aware of the people by giving alerts of ongoing/major crimes. [3] It'll also provide information about the crimes (i.e., basic info of crime, article, punishment/imprisonment). It will also provide safety tips for major/ongoing to stay alert and aware. [10] With a tremendous increase in Cyber Crime public awareness is much more concerned nowadays and this is where our system will help.[11]

V. MAP-BASED GRAPHICAL REPRESENTATION OF CRIME

Our system also provides the Map in which the crime rate is given area-wise based on crimes that occurred in that particular area. A different group of crimes will be represented by different colors and the rate will be represented by the intensity of that color. [5] It'll help the people in awareness of a particular area.

VI. CRIME GRAPH

Understanding the city, living or visiting is often the key to staying as safe as possible. [6] Our crime-related graph is designed to provide as much up-to-date information on crime statistics as possible.[9] a crime map helps us to understand as high as possible about a possible crime in our city or neighborhood. [5]

VII. IMPLEMENTATION OF PREDICTION MODULE

Fig 1: Selection of Crime according to Type of Crime & Year of Crime for Crime Against Women [8]

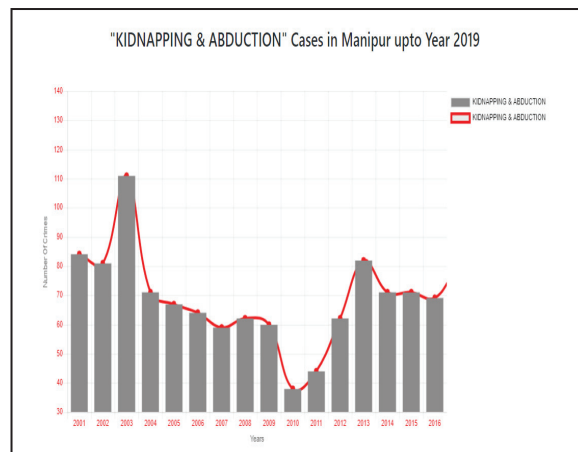


Fig 2: Showing the Result of the above-selected Parameters.

Fig 3: Selection of the year, crime type, and state of your choice for Crime Against Children

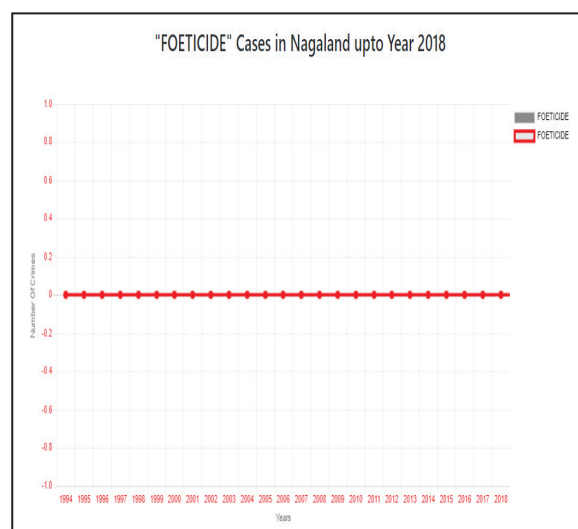


Fig 4: Showing the Result of above-selected Parameters for Feticide Case in Nagaland [8]

PREDICTIONS

CRIME AGAINST WOMEN

CRIME AGAINST CHILDREN

IPC CRIMES

SLL CRIMES

Select the year, crime type and state of your choice for appropriate predictions:

2017

▼

DOWRY

▼

Punjab

▼

Submit

Fig 5: Selection of the year, crime type, and state of your choice for IPC Crimes

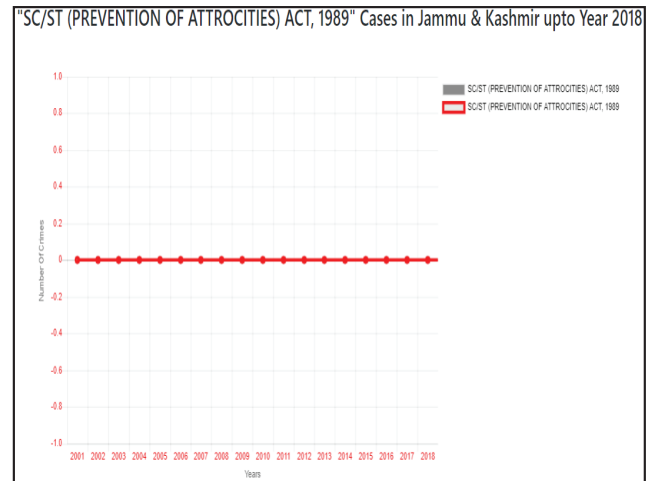


Fig 8: Showing the Result of above-selected Parameters

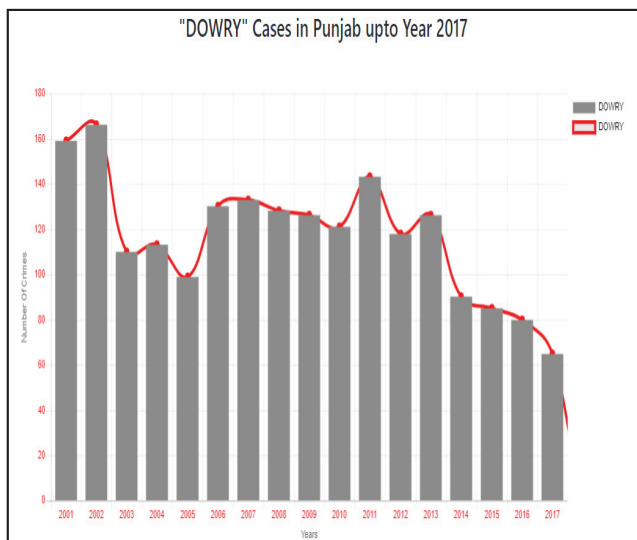


Fig 6: Showing the Result of above-selected Parameters for Dowry Cases in Punjab

VIII. IMPLEMENTATION OF CRIME VISUALIZATION

Crime Visualization

HOME ABOUT

1) State Comparisons For Crime Against Women

2) State Comparisons For Crime Against Children

3) State Comparisons For Crime Against Indian Penal Code(IPC)

Fig 9: Selection of Crime according to State Comparisons [7]

PREDICTIONS

CRIME AGAINST WOMEN

CRIME AGAINST CHILDREN

IPC CRIMES

SLL CRIMES

Select the year, crime type and state of your choice for appropriate predictions:

2018

▼

SC/ST (PREVENTION OF ATROCITIES) ACT, 1989

▼

Jammu & Kashmir

▼

Submit

Fig 7: Selection of the year, crime type, and state of your choice for SLL Crimes

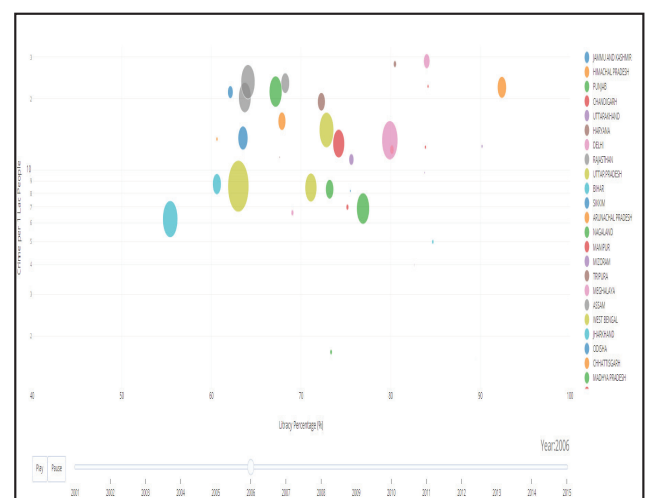


Fig 10: Showing the Result of above selected State Comparison for Crime Against Women

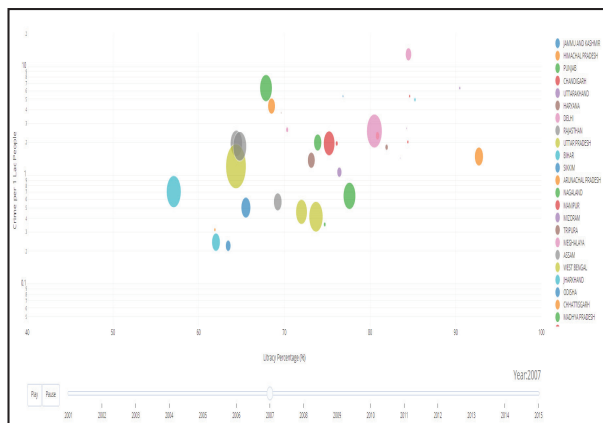


Fig 11: Showing the Result of above selected State Comparison for Crime Against Children [9]

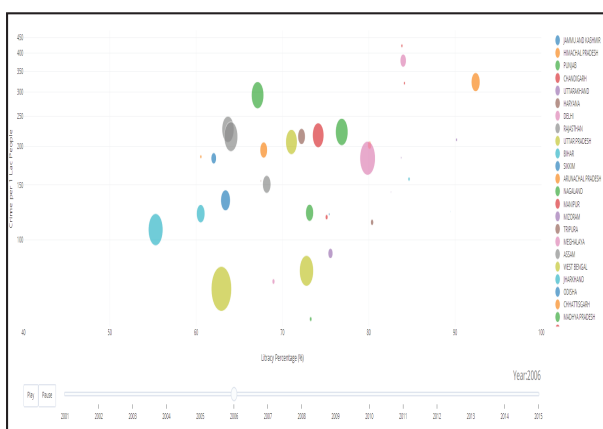


Fig 12: Showing the Result of the above selected State Comparison for Crime Against Indian Panel Code (IPC) [7].

IX. IMPLEMENTATION OF CHATBOT

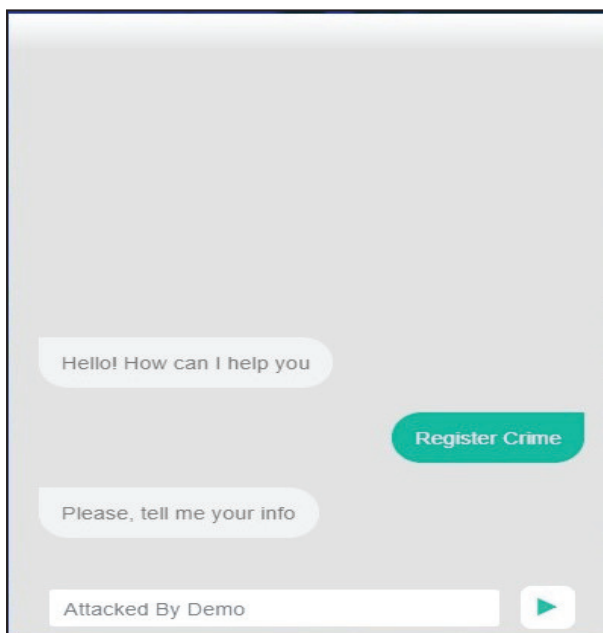


Fig 13: Register Crime with Chatbot

X. IMPLEMENTATION OF PREDICTION MODULE

Complainant Details
Complaint Against
Complaint Against
Name of person
Phone / Mobile
Address *
City
State
Country

Complaint Details
Complaint Details
Complaint Subject *
Details of Complaint *
Submit

Fig 14: Register Crime with the Help of User-Friendly Registration Form [10]

XI. IMPLEMENTATION OF CRIME MAP

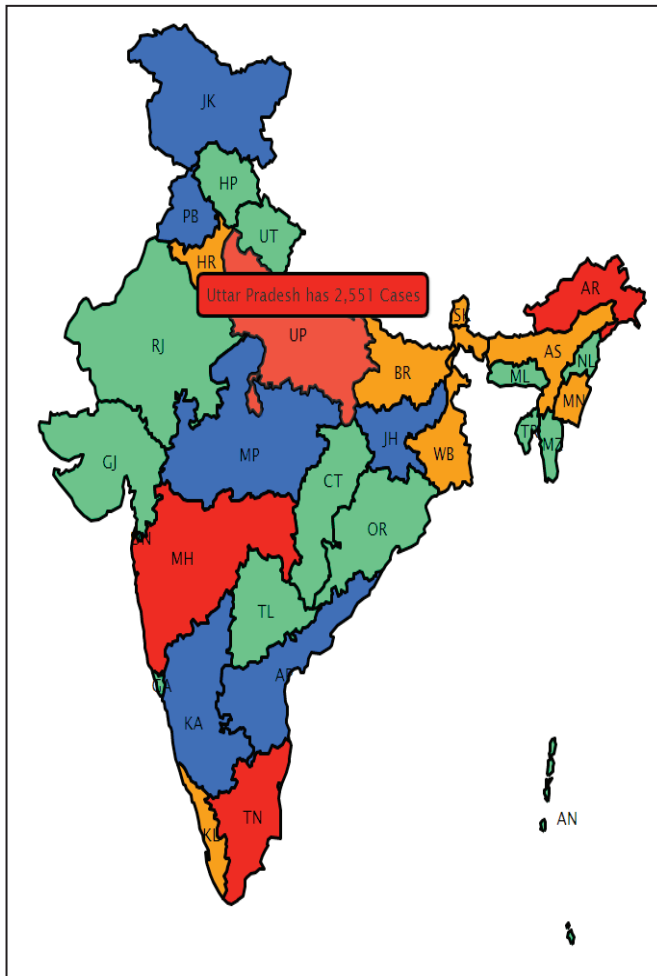


Fig 15: Showing the Crime on Indian Map by the Particular States

XII. CONCLUSION

“ML BASED CRIME REPORT & PREDICTION SYSTEM “ will be very useful people. it was designed, used, and successfully tested. This application is available effective and efficient. Simplicity and friendliness are the benefits of this Software. the built-in tools are very easy to use for anyone to use the application as long as it can access the system by logging in with a password. Software is built with all options such as criminal search options for future investigations, crimes, and criminal registration, etc. all requirements during analysis and style are fully met, which leads to the creation of excellent software. This project manages all small print except one accident.

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Hand Gesture Based Recognition and Voice Conversion System for Deaf and Dumb

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ABSTRACT

The hand gestures are one of the best methods used in the sign language. It is very difficult for the deaf and mute people to communicate with the normal people. This project presents a solution in a way that it will not only automatically recognize the hand gestures but will also convert it the text into speech so that the deaf and mute people can communicate with the normal people. A web camera attached to the computer system will capture images of hand and feature extraction and recognition is done to recognise the hand gestures of the person. Based on the recognised gestures the recorded soundtrack will be played.

I. INTRODUCTION

Sign language is the most important channel between people to communicate with each other for the deaf and dumb people and the normal people. Over the past few years, there has been a great increment in the number of deaf and mute victims due to various reasons like birth defects, due to some accidents and various diseases. As we know that deaf and dumb people are not able to communicate with the normal person so they need to depend on some sort of visual communication.[10] Sometimes people used to interpret their messages wrongly either through sign language, through lip reading or lip sync etc. This project is made in such a way to help such kind of peoples which are specially challenged people so that they can hold equal part in the society.

We will do Hand Gestures recognition for the following character: digits (0-9), alphabets(a-z), combination of digits by combining individual recognised digits and combination of alphabets by combining individual recognised alphabets and also the small sentences using space(" ") character.

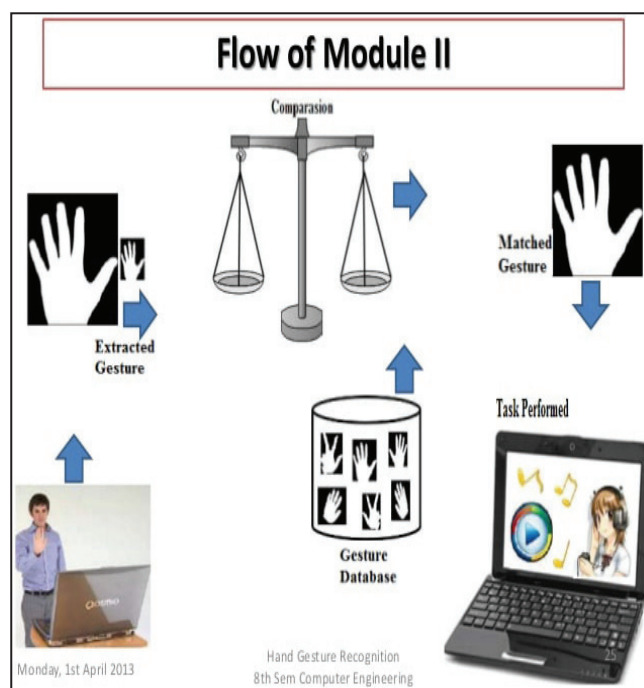


Fig. 1: Flow of module II

II. LITERATURE REVIEW

If we talk about the past techniques then their have been number of techniques in which one is glove based method in which we need to have a glove on our hand and by using it we need to make the gestures and then the system do the feature extraction and recognition in it[6]. Another techniques were iot based techniques which uses different IOT devices to perform the sign language recognition.[12][8]

Their were some projects in which there was only digit recognition or only alphabet recognition which was not complete solution in itself.[4]

III. SOLVING THE PROBLEM

Hand Gesture Based Recognition and Voice Conversion system mainly tracks the hand gestures of the user in order to maintain a communication medium for these specially abled people and with the other normal people. [7][11]



Fig. 2: Hand gesture

We will do Hand Gestures recognition for the following character: - digits (0-9), alphabets(a-z), combination of digits by combining individual recognised digits and combination of alphabets by combining individual recognised alphabets.

IV. SYSTEM ARCHITECTURE

Firstly we need to capture the image the image using the web camera. Then the area of interest is taken out which will be further used for the purpose of gesture recognition in the system then its binary conversion will be done and now it will be be given to the trained model and the model will predict the character for the hand gesture. Then it will be converted into the text and then the sound track of the recognized text will be played[5].

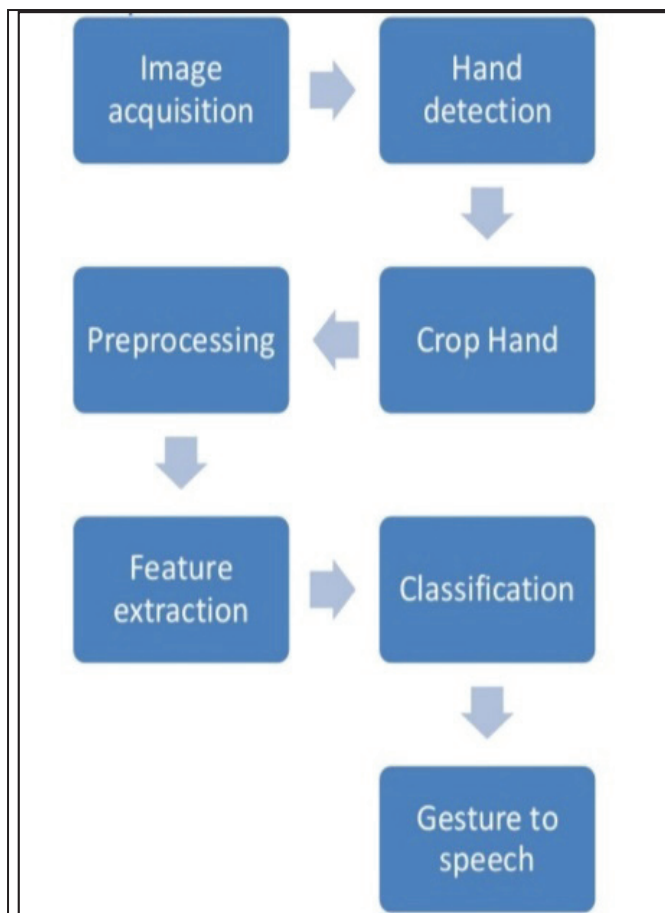


Fig. 3: System Architecture

V. IMPLEMENTATION OF THE SYSTEM

1. Finding a Dataset

In our project we have use 2 datasets. First is gesture_num which has 1200 images for each digit(0-9) i.e total 12000 images.



Fig. 4: gesture_num dataset

Second dataset is the gesture_alphabet dataset which consist of 1200 images for each alphabet(A-Z) and a space character(" ") i.e it is having total 32400 images.



Fig. 5: gesture_alphabet

2. Creating a CNN Model

We have used a convolutional neural network for the purpose of feature extraction and recognition. We have used layers like conv2D, max pooling, dense, dropout etc in our project. Then the model is trained with the dataset images. [9]

3. Creating a set hand histogram function

This function is created so that only a skin colour hand is detected from the cropped image and rest of the background will be converted to black.

4. Image capturing using webcam

Image is captured using the webcam. Then the area of interest is created which has our hand gesture then we need to cut that part of image which is our area of interest we need to convert it into the binary image for that firstly we need to convert it into threshold then into the binary image this binary image will be used to do the recognition task.[2][3]

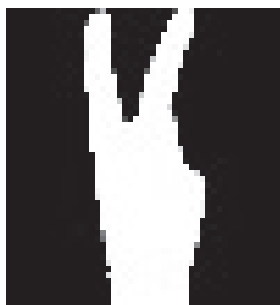


Fig. 6: binary image

5. Making predictions using this binary image

The CNN model which we have trained will be used to make the recognition of the character i.e predictions are made for the indi-

vidual character i.e digit and then alphabet Then we have worked on the combination of digits and alphabets to form numbers and words respectively. Then we used and space character also so that we can frame the small sentences using this.

6. Speech Conversion of the text

Firstly the sound will be produced for the individual recognised character and then the the number, word, small sentence whatever we get on screen as an output it will be converted into the voice. [1]

7. Results of our project

Convolution neural network error in various cases is as follows

Digit recognition :- 0.10 %

Combination of digits :- 0.20 %

Alphabet recognition :-0.22 %

Combination of alphabets :-0.19%

Combination of words :- 0.19 %

Predictions and outputs are as follows

Finally result is displayed in static text and the recognised displayed text gets converted into voice as a final output.

(a) Digit recognition using webcam

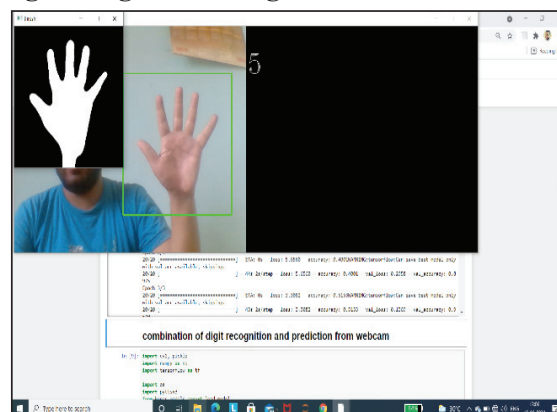


Fig. 7: Digit recognition

(b) Combination of digits

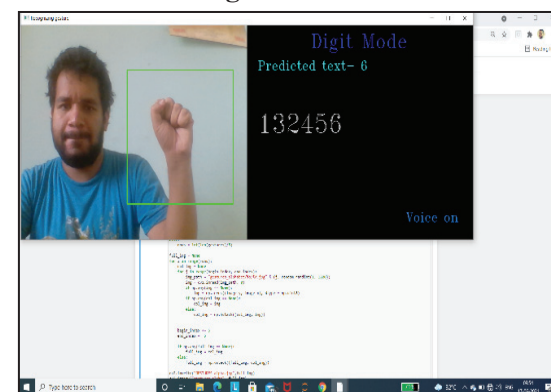


Fig. 9: Combination of digit

(c) Alphabet recognition using webcam

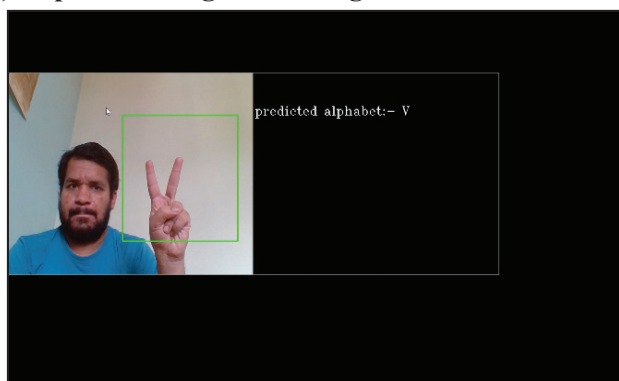


Fig. 10: Alphabet recognition

(d) Combination of alphabets

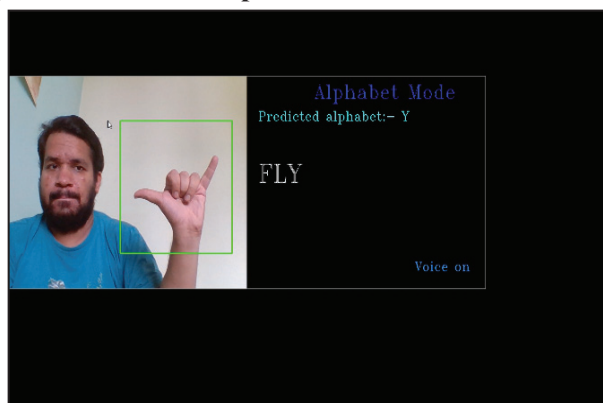


Fig. 11: Combination of alphabets

(e) Combination of words

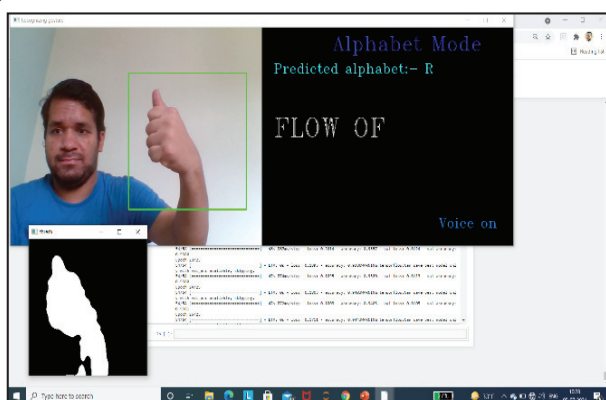


Fig. 12: Combination of words

8. APPLICATION DOMAIN

The application domain of this type of system is mainly the hearing impaired and the mute people who are totally dependent on the sign language for their communication purpose. As there is no other way that they can communicate with the normal people their weapon is sign language only through which they can transmit their message to the normal people.

The people who are not capable to speak with the normal people have their sign language only by which they can communicate with the normal people.

By using our system a person needs only to make a hand gesture in front of the camera and with the help of our system the recognised text will be displayed on the screen and its voice conversion will be done in order to make the communication better.

9. FUTURE SCOPE

Our system can be integrated with other devices for example mobile phones and IoT devices to improve the user interaction and user can use it in a very easy manner. This can be useful for the specially abled people so that they can communicate with the normal people in a much easier way and the normal people can easily understand what the person is wanted to say to them.

The use of this type of system can be further increased by integrating and making it compatible to be used by the normal people also for their particular needs. This type of system can also be used in making applications in which there is a requirement of this type of system in which we need to make the hand gestures and on the basis of it it will perform the desired function and which provides result as an output.

VI. CONCLUSION

We have made this project keeping in mind the need of communication for the deaf and mute sections of our society. This project will have a major impact on the life of specially abled people to communicate in daily life basis with other sections of the society in a much normal way. The deaf-mute people will be required to make the hand gestures then our system will act as a tool to recognize their hand gesture and make them able to communicate with the normal people.

Our project is able to do Hand Gestures recognition for the following characters :

1. Digits (0-9)
2. Alphabets (A-Z)
3. Combination of digits by combining individual recognised digits
4. Combination of alphabets by combining individual recognised alphabets
5. Combination of words by using space character (" ").

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Depression Detection using Convolutional Neural networks from Speech

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ABSTRACT

Depression is very common nowadays and has become a serious medical illness that affects our body mentally in the way how we think, feel and act and still underdiagnosed. The main thing in our speech consists of some beneficial methods for the precautions of depression. To select the features, practical and insightful information about the field are still very essential, due to which process become consuming and subjective. According to various studies, insight features which came from Convolutional Neural Network demonstrated a wide variety of success rate over handmade features. So to get rid of this problem in manual designing and processing, a combined feature of handmade and neural network feature has been proposed that helps to measure the cause of depression very effectively from speech. The method in which we are working a Neural Networks has been created to which is used to learn the insights from frequencies of an audio signal of images that are called Spectrogram. Now for a small problem of any sample dataset, we can use the Keras library which results in a set of images that increase the size of that sample dataset. DAIC-WOZ Depression Database also shows that this method works very effectively for the prediction of depression as compared to other methods. Keywords

Depressed screening, Feature Selection, Neural Networks, Audio Analysis, Public Health.

I. INTRODUCTION

Depression currently a day has arisen severe downside all told over the atmosphere among the youths and all over the societies Depression could be a malady that affects all our daily routine activities like our feelings, our thinking, our method of behaving ad more daily routines. However, the nice factor is that these maladies are often cured. Depression created unhealthy effects each showing emotion similarly as physically in any people's lifelike feeling of disappointment, emotions, irritations. In keeping with a scientific study, this malady cab is prevented in its inprogress stage.[1]

There square measures several facts printed by WHO that this malady is on the rise, especially for the children and additionally within the prime most psychological disorder among all malady.[3],[4]. Currently, as we tend to all understand that this malady is extremely dangerous for everyone however, besides its danger there square find several curing techniques additionally that help people to induce elimination, but there's one barrier within the country that is inaccurate depression analysis. Therefore, keep with some past studies, it's found the area unit some rule supported Machine Learning that simply facilitates to note whether or not a private is depressed or not exploitation audio.

Keep with past study it has been established that audio pattern has some smart properties in analyzing of depression. In police work, the depression handcraft feature is additionally smart in performance. But their square finds some drawbacks of these options in higher analyzing of depression as a result, it wants a ton of hard work and time in planning hand-craft options. So, for removing this physical work we switch to some good deep learning algorithms to make best model for predicting depression. This information is an element of Distress Analysis Interview Corpus (DAIC), which contains some virtual clinical interviews that are meant to support varied painful feelings like varied mental stress disorder. This information is a component of Distress Analysis Interview Corpus (DAIC), which contains some virtual clinical interviews that are meant to support varied painful feelings like varied mental stress disorder. The dataset in which we are working consist of some audio recordings with an average amount of time of approx. 18 minutes between a participant and a virtual interviewer and is enquired by another person in different room. [18] Each participant completed a form from that we can classify the psychological state (depressed, not depressed). We've got used Convolutional Neural Networks (CNN) to be told helpful, characteristic of depression from speech. Our CNN model is meant to extract options from a photo that in flip is employed for classification, of the audio photo into 2 categories depressed and non-depressed severally.[21] , [10]



Fig. 1: The Virtual Interviewer

II. WORK DONE

Audio Splitting: The dataset contains around 143 audio sessions. The interaction happened between a virtual interviewer called Ellie, and the participant. For classification, the features of audio segments are very useful. Silence removal splits the audio into multiple audio segments. After that speaker diarization separate those audio segments. The length of the audio segments obtained from the previous operations are varying such that there is spread

and gap in the obtained data.[12] , [6]

Data Imbalance: In the dataset, the ratio of depressed and non-depressed and depressed is not balanced. The ratio of depressed subjects and nondepressed subjects is four is to one. Due to which there would be biasing of “non depressed” objects. To remove this imbalance, random audio segments has been sampled from both the object classes in equal numbers.[9]

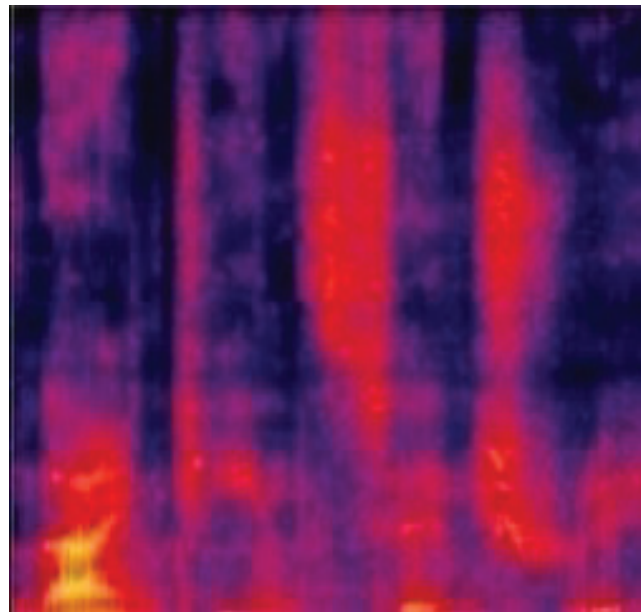


Fig. 2: Sample Wavelet Reflecting Sessions

Spectrogram Conversion: The sampled audio segments are then converted to spectrogram images of size 512×512 pixels. These sampled. The image tensor is normalized and fed into the audio segments are placed into different folders. Convolutional Neural Network. These folders have been created corresponding to different classes and further each folder is split into training and validation in the ratio of 8:2.[11]

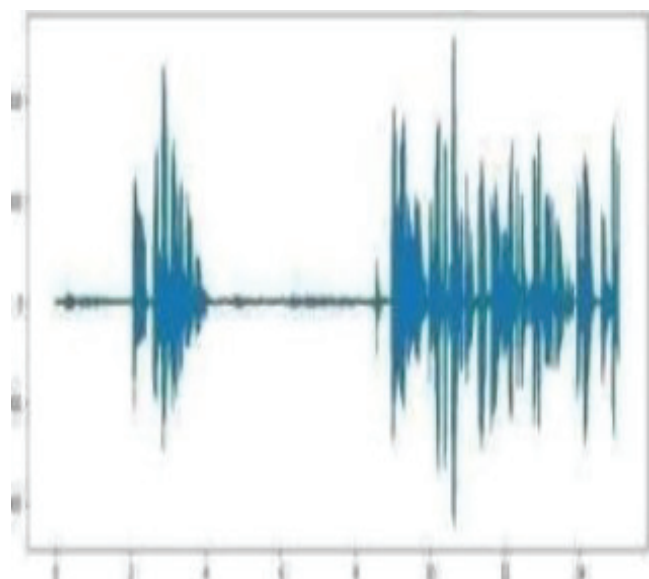


Fig. 3: Spectrogram Image

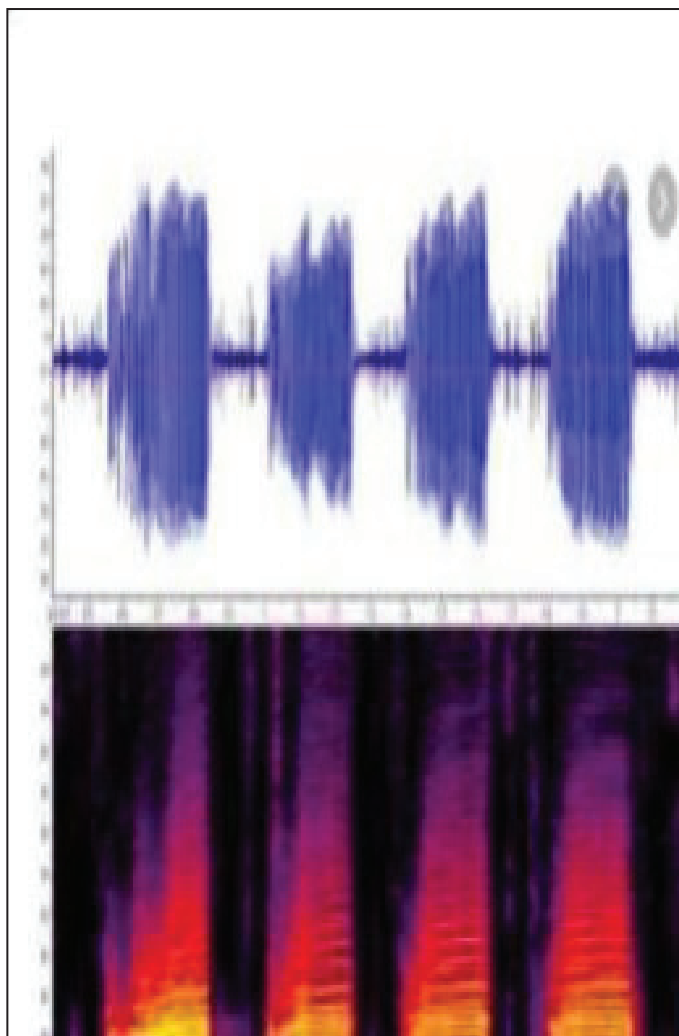


Fig. 4: Preprocessed Spectrogram

Image Preprocessing: These images are converted to Tensor-Flow tensor using the flow from a directory of the imageprocessing data generator method. [7] The image tensor is normalized and fed into the Convolution Neural Network.[19]

III. LITERATURE REVIEW

DAIC-WOZ Depression Database: This data is vital for a much bigger corpus, that contains clinical meetings intended to assist the analysis of mental trouble conditions like uneasiness, despondency, and post horrendous pressure issue. These meetings are done with several individuals to recognize verbal and nonverbal markers of dysfunctional behavior. Resources gathered incorporate sound and video accounts and broad poll reactions; this piece of the corpus also includes the Wizard-of-Oz interviews, directed by a virtual questioner called Ellie, constrained by a person's questioner in another room. Data has been interpreted and clarified for an assortment of verbal and nonverbal highlights.[1]

Spectrogram: A spectrogram may be a visual portrayal of the range of frequencies of a symbol because it differs with time. At the purpose when applied to a sound sign, spectrograms are once

during a while called Sonography, voiceprints, or voicegrams. At the purpose when the knowledge is addressed during a 3D plot, it'd be called cascades. An optical spectrometer, a bank of band-pass channels by Fourier change or by a wavelength change which is also known as a scalogram can be generally used to produce spectrograms. [2]

Spectrogram images provide a brilliant analysis of frequency. Making a spectrogram utilizing the FFT may be a computerized cycle. Carefully tested information, during this area, is separated into lumps, which normally cover, and Fourier changed to work the greatness of the recurrence range for every piece.[13]

Convolutional Neural Network: Convolutional Neural Networks(CNN) are like conventional ANNs therein they're contained neurons that self-upgrade through learning. The last layer will contain misfortune capacities associated with the classes, and therefore the entirety of the customary tips and deceives created for conventional ANNs apply. This allows us to encode picture explicit highlights into the planning, making the organization more appropriate for picture-centered assignments -while further decreasing the boundaries needed to line up the model.[5]

The benefit is their ability to develop an enclosed representation of a two-dimensional image. This permits the model to be told position and scale-invariant structures within the data, which is very important when working with images[14],[23]. It's an efficient algorithm that is widely utilized in pattern recognition and image processing. Generally, the structure of CNN includes two layers one is the feature extraction layer, the input of every neuron is connected to the local receptive fields of the previous layer and extracts the local feature.[8]

IV. DISCUSSION

Various explores in the depression discovery include the investigation of the dataset to anticipate the strange conduct and a self-destructive musing among people. These strategies intended is to utilize sound information which is the aftereffect of humans and a virtual questioner, and this sound information is utilized to anticipate the nature and outlook of the people. The forecast of the dataset should be exact while foreseeing the individual is discouraged or not. The expectation of the dataset should be exact while anticipating the individual is discouraged or not. The highlights in our discourse comprise some valuable data for the conclusion of sadness. To choose the highlights, physically planning and space information is still vital, because of which the cycle becomes devouring and emotional. As per different investigations, profoundly learned highlights dependent on neural organizations have exhibited elite rate over hand created highlights in different zones. So to beat the troubles in manual planning and preparing, a mix of hand-created and profound learned highlights has been proposed which can adequately quantify the seriousness of sadness from discourse. In the proposed strategy, Deep Convolutional Neural Network (DCNN) has been made to take in profound took in highlights from spectrograms and crude discourse waveforms.[15],[17]

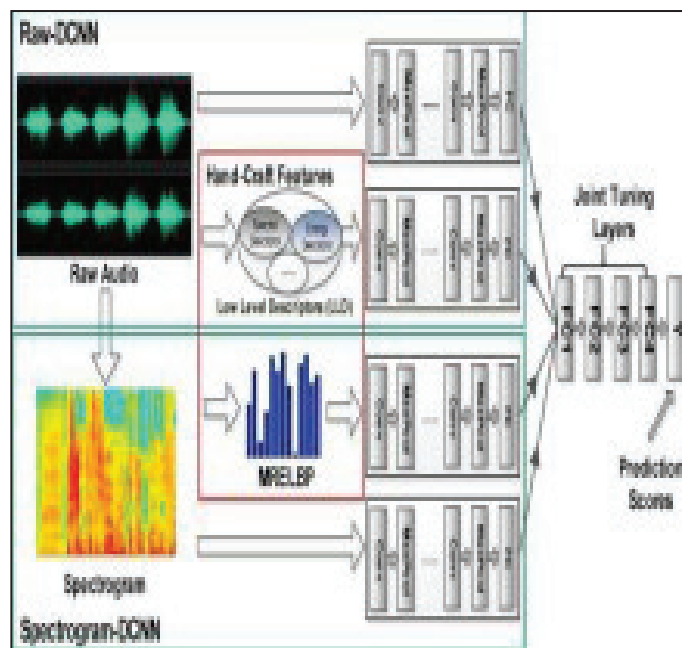


Fig. 5: DCNN handcraft architecture

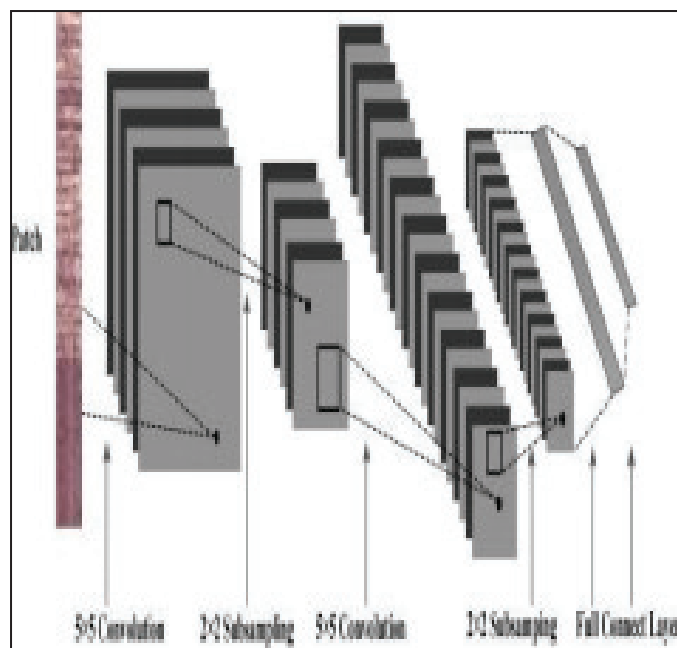


Fig. 6: Convolutional layers in CNN

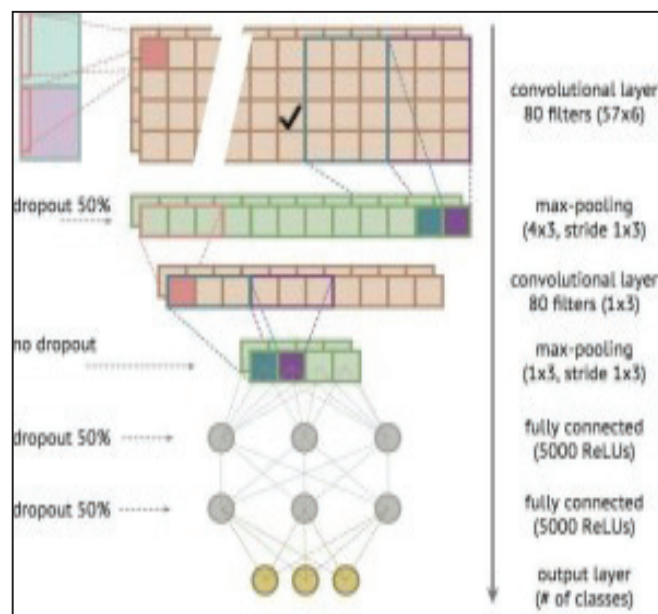


Fig. 7: CNN Layer Architecture

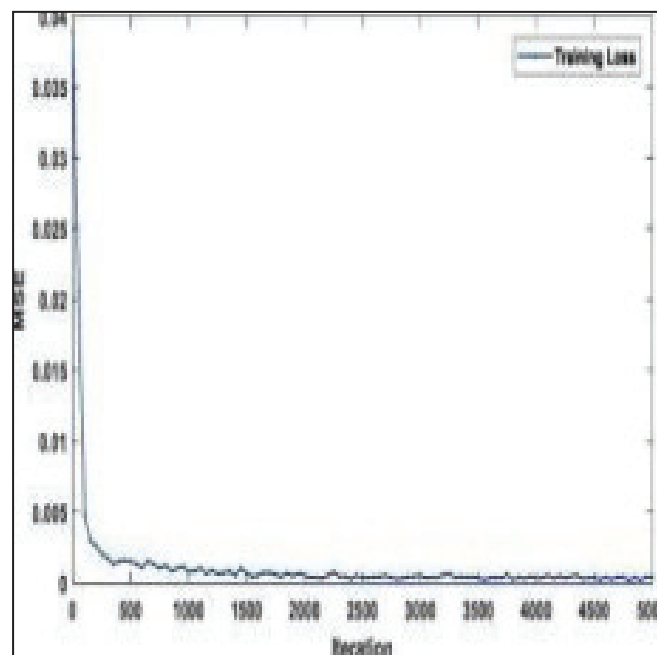


Fig. 8: MSE v/s iteration

V. CONCLUSIONS AND FUTURE WORK

A sum of 127 examinations was evaluated that measure acoustic highlights from discourse to separate mental from sound people through prescient AI methods. We gave a blend of protection, select speech eliciting errands, and improve speculation and reproducibility of AI methods. Certain issues have been less concentrated, for example, eat and tension problems. With the help of open access research datasets given by AVE rivalries 6064, we can resolve many issues such as MDD, PTSD, and bipolar issues. The DAIC dataset specifically provides a typical

structure to research developments. critical and non significant acoustic highlights across messes just like those that associate with a given problem seriousness. We examined rules on the bestway to obtain information, forestall puzzles, defend A held-out test provides equivalent information and assessment measurements, measures execution which increases overfitting (though there are few excellent ways to reduce overfitting). Also, it allows finishing future execution with an equivalent dataset. In this way, we support making open data sets, if conceivable through rivalries, as it was demonstrated to be exceptionally

profitable. While profitability is solid, reproducibility is critical: since the investigations in this survey fabricate computational models, information and code can without much of a stretch be shared preferably through compartments-to test claims and make progressive advancements as a local area.[16] , [20]

Besides, more examinations utilizing numerous datasets preregistering theories could improve speculation and resolve clashing discoveries concerning the huge and significant acoustic features in each disorder. All things considered, constructing AI models on discourse appears to be a right pathway toward improving mental health evaluations and medicines following preventive and customized medication.[22]

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Density Based Smart Traffic Light System

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ABSTRACT

We are all familiar that Traffic Management is one of the major concerns in metropolitan cities. The poor management of traffic systems leads to traffic jams, which impacts us almost daily. Use of technology and real time analysis can actually lead to a smooth traffic system. The common reason for congestion is due to poor traffic prioritization. We have tried to address the problem with the help of our project wherein the focus is to minimize the traffic congestion[11]. This system involves a density based traffic control system which uses Arduino UNO, camera and LED's for the live signal time controlling and vehicle density control at the junction.

Keywords: Traffic control system, Arduino UNO, camera, LED's

I. INTRODUCTION

In the present day world, with growing technologies and detrimental development in the metropolitan cities, traffic administration has become one of the most important fields to handle and provide a better infrastructure to the traffic system. The main role of a traffic administration is to constantly enhance the traffic control system and effectively regulate the same. With the number of vehicle users constantly increasing, the facility provided by the current system is limited and inefficient with respect to the energy and time consumed[9]. A survey shows that an average individual evote about four to six months of his/her entire life just waiting for the green light to be turned ON at a signal. It is also has been identified that this deficient facility and irrational distribution of signal control is leading to such traffic issues. These inefficient traffic control system is also contributing to various traffic rules violation wherein the people don't carry patience to wait for that interval of the signal at which the density of vehicle is lower than the other existing densities. To avoid the conditions of extreme traffic jams is highly important in the current direction. Hence in this prospective of traffic control system,

we focus on the vehicle density rather than just giving control to the signals on a fixed time basis. This proposed in based on vehicle detection by camera, analysis and computation of the scenarios by the Arduino UNO and then the time period is set according to the density of vehicle in the code to the LED's. On a whole, this system calculates the presence of the vehicle in that given lane and suitably gives control to the signals by setting the time interval according to density[2].

II. DEMERITS OF THE CURRENT SYSTEM:

1. The presence of a fixed time period of traffic signal operation regardless of the lack of comparison between the vehicle densities in the different parts of the road at a junction.
2. Even if the road is empty or has a low density of vehicles it still receives a fixed time period of green signal which is of no use.
3. This can lead to a large level of traffic jam since there is no uniform flow of vehicles from all sides at the junction.

- Human irritability will increase and this will lead to the main reasons for some traffic violations such as jumping signals, over speeding, etc[10].

III. PROPOSED TRAFFIC CONTROL SYSTEM

The main aim of the proposed system is to constantly monitor the vehicle density present in all parts of the road at the junction. The basic flow of operation is as follows: collection of vehicle density data from the roads; next is to send the same data to the device which analyzes the same and arrives at a particular characteristic output pattern; then the execution of the output pattern which is reflected in the signal pattern. In this model, the high focal length cameras are used to detect the presence of any vehicle in that part of the road. When it detects it produces an output to Arduino UNO which is the heart of the project. Then Arduino analyses the number of such triggered outputs from the set of camera placed in the different roads at the junction and correspondingly triggers the different LED lights in the signals in order to commend the vehicle movement, and if some emergency vehicle like ambulance fire van etc, is come on any side of the road then the camera will detect it as an emergency vehicle and put all the side of roads signal to red[3].

IV. RELATED WORKS

Below are some of the prominent researches and solutions proposed for this problem of traffic congestion.

Based on microcontroller

- Saiba P A *et al*** proposed a **density based traffic control system using PIC microcontroller** where three IR sensors are employed in each road for the detection of the presence of the vehicle and the density is identified in different levels such as low, medium and high. Based on the density listed the time period of the green light is decided by the microcontroller.
- Pramod Sharma *et al*** suggested a **density based intelligent traffic control system using IR sensors** using the ATME89C51 Microcontroller where IR sensors are used for the vehicle count and the control of the signals are taken over by the microcontroller
- Sakshi Pandey *et al*** suggested a **density based traffic control system** using ATmega8 microcontroller where IR sensors are used to identify the level of vehicle density present in each road at a junction and in case of emergency vehicles, their approach was identified by providing a unique RFID card for the same.

Based on the principle of image processing. (Prakash 2018 ,3)

- K.Vidhya *et al*** suggested a **density based traffic control system** using Raspberry pi and the concept of image processing. Under this, they evaluate the ways to obtain the vehicle density by figuring out the real time images of the vehicle densities and further processing it into a series of grayscale, threshold, canny, erode and contour images .

Based on IoT and its combined results

- K.Lalitha *et al*** suggested a **density based traffic management using IoT**. It involves the use of Arduino mega, IR sensors and an ethernet shield. The IR sensor identifies the number of vehicles present and sends the information to Arduino which then appropriately provides control to the signals via ethernet shield .
- Ashok. P.V *et al*** suggested an **IoT based traffic signaling system** using a combination of ultrasonic sensors, Arduino and Raspberry Pi3. The sensors are interfaced with Arduino which sends the data wirelessly to Raspberry which analyses the same and suitably controls the signals.
- Elizabeth Basil *et al*** suggested an **IoT based traffic light control system using Raspberry Pi**. This involves the mixed operation of Arduino UNO, Raspberry Pi, WiFi module and camera for image capturing. The software application is carried out using Arduino IDE and MATLAB(with Simulink support). This operation involves the continuous recording of the traffic density and reading the corresponding frames. Then the grayscale image conversion is attained followed by binarization, blob analysis, labeling to obtain the vehicle count using simulink. Based on the count obtained, the traffic signals are suitably controlled .

V. PROPOSED SYSTEM

1. Image Acquisition

The first step in the system is image acquisition in this process the live image or video is captured by the camera which is setup on the pole. The camera will capture the video or photo lane wise ,after capturing the video of one line the camera will move to another lane after a fixed timeperiod[1].

2. Image cropping

In this process the required frame of the video is pull out the main focus in image cropping is on the area where the vehicle are present,the surrounding noise and unwanted data like trees electric poles etc. are removed from the video .It helps to obtain ROI for the system which can also helps to improve the e-ciency of the system[8].

3. RGB to grayscale transformation

RGB Images have a large amount of data because of that it takes so much time to process the images or videos, to minimize this processing time the RGB image is transformed to gray scale and passed to the next step. The equation for rgb to grayscale conversion is given below:

$$\text{Gray} = ((0.3 * R) + (0.59 * G) + (0.11 * B)) [6].$$

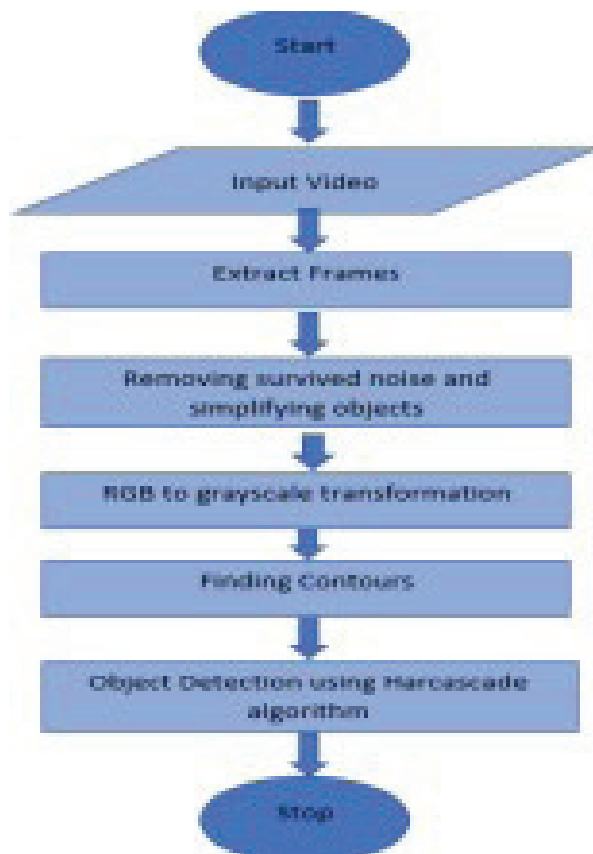
4. Threshold

Thresholding is used for analyzing the pixel numbers of images which are done by the help of grayscale images, those images which have pixel numbers ranging from 0–255. When we classify the images we set a threshold value for the specific colour of the cars. if the value of threshold will cross the value then the system will detect it as an ambulance of white colour[5].

5. Calculate traffic density

In this we find the density of the vehicles present at the different roads of the junction with the help of a camera set up at the pole. The camera will detect the number of vehicles and give the data to the further processing [1].

After capturing the video the video is provided to the system to extract the frame from it, the unwanted data like trees human etc are eliminated from the video and only useful data is goes for rgb to grayscale conversion after this the object will be detected and density of vehicle is measure, and then the timer for the green light is set according to the density of the vehicle on a particular lane[4].



[Fig. 1]

Design:

Arduino code:

The main required parts for this system are hardware model interfacing and software module. **Hardware Module:** Hardware module consists of an arduino board to control the traffic lights from red to green according to the density of the traffic, a USB

connected web camera to capture the video, a LCD display used to display the remaining time period of light.

Software Module: In software module MATLAB version R2021a is used for image processing task, it comprises specialized modules that perform specific tasks. Matlab is using the references and captured image.

Interfacing : The web came is connected to the system through a USB cable and arduino is interfaced to Marlab using serial communication[7].

```

if(timeIndex != -1){
  updateDisplay = true;
  stime = inputString.substring(timeIndex+2);

  line 1 le <Li q id&frystat, L>
  Li q idC ystal trd(AJ,A4,AJ,A2,At,A0);
  //trd(rs, ea, d4, dJ, d6, d7) ;
  eJefire ledt 6 //gree
  #define led2 7

  #define leJJ 8 // g een #defi e leJ4 9
  #define led5 10 // green
  4âelioe leé6 11
  #define led7 12 // Green
  4fiefine lefi8 13 // Active

  String irputstrig -
  ;
  // a String t0 J0ld ir<0
  tool st ingC0T$lete - false; // waethe tae string is ro

  void setup( ) (
  // initialize serial!
  Serial. begi (9660);
  // reserve 200 bytes f0r the irpvtst irg:

  inputString.reserve(200);

  trJ. begin(t6, 2) ;//initia lizi rg LED
  trd. setCu sor(0, 0) ;
  trd. p i t("start traffic");
  t£#. SPtL!J*S0r(e, t) ; trd. p i t("ros trol"); Jelat(tee);
  t&d.rYear();
  }int side = 0;

  char color = 'X';
  
```



```

Boolean updateDisplay = true;
String stile = ' ';

boolean dataUpdate = false;
void loop() {
    // put your main code here, to run repeatedly:

    if(st.indexOf("SIDE1") != -1){
        // Serial.print("SIDE1");
        // Serial.println(st);

        side = 1; if(inputString.indexOf("SIDE1") != -1){

            updateDisplay = true;

        }
        // if(inputString.indexOf("SIDE1") != -1){

        side = 2;

        updateDisplay = true;

        }else if(inputString.indexOf("SIDE3") != -1){
            updateDisplay = true;

        }else if(inputString.indexOf("SIDE4") != -1){
            side = 4; updateDisplay = true;

        }
        if(inputString.indexOf("RED") != -1){color = 'R';
            updateDisplay = true;

        }
        if(inputString.indexOf("GREEN") != -1){color = 'G';

        updateDisplay = true;

        }else if(inputString.indexOf("YELLOW") != -1){color = 'Y';

        updateDisplay = true;

        int timeIndex = inputString.indexOf("T:");
    }
}

```

```

        stime = inputString.substring(timeIndex+2);
        Serial.print("\nSUB:");
        Serial.println(stime);

    }
    dataUpdate = true;
    // clear the string:
    inputString = "";
    stringComplete = false;
}

if(dataUpdate){
    dataUpdate = false;

    String sSide = "";

    switch(side){
        case 1:
            sSide="SIDE: 1";
            digitalWrite(led1,HIGH);
            digitalWrite(led2,LOW);

            digitalWrite(led3,LOW);
            digitalWrite(led4,HIGH);

            digitalWrite(led5,LOW);
            digitalWrite(led6,HIGH);

            digitalWrite(led7,LOW);
            digitalWrite(led8,HIGH);
            break;
        case 2:
            sSide="SIDE: 2";
            digitalWrite(led1,LOW);
            digitalWrite(led2,HIGH);

            digitalWrite(led3,HIGH);
            digitalWrite(led4,LOW);

            digitalWrite(led5,LOW);
            digitalWrite(led6,HIGH);
    }
}

```

```

        digitalWrite(led7,LOW);
        digitalWrite(led8,HIGH);
        break;
    case 3:
        sSide="SIDE: 3";
        digitalWrite(led1,LOW);
        digitalWrite(led2,HIGH);

        digitalWrite(led3,LOW);
        digitalWrite(led4,HIGH);

        digitalWrite(led5,HIGH);
        digitalWrite(led6,LOW);

        digitalWrite(led7,LOW);
        digitalWrite(led8,HIGH);
        break;
    case 4:
        sSide="SIDE: 4";
        digitalWrite(led1,LOW);
        digitalWrite(led2,HIGH);

        digitalWrite(led3,LOW);
        digitalWrite(led4,HIGH);

        digitalWrite(led5,LOW);
        digitalWrite(led6,HIGH);

        digitalWrite(led7,HIGH);
        digitalWrite(led8,LOW);
        break;
}
String sColor = "";
if(color == 'R'){
    updateDisplay = true;
    sColor= " RED";
}
else if(color == 'G'){
    updateDisplay = true;
    sColor = " GREEN";
}

```

Results:

The results of the proposed model can be analysed in three different scenarios.

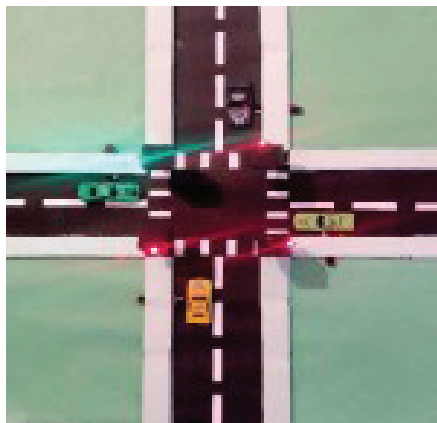


Fig. 1: Vehicle density present in all the roads

```

        sColor = " GREEN";
    }
    else if(color == 'Y'){
        sColor = " YELLOW";
        updateDisplay = true;
    }

    if(updateDisplay){
        updateDisplay = false;
        lcd.clear();
        lcd.setCursor(0, 0);
        lcd.print(sSide);
        lcd.print(" ");
        lcd.print(sColor);
        lcd.setCursor(0, 1);
        lcd.print("TIME REMAIN: ");
        lcd.print(stime);
    }
}

void serialEvent() {
    while (Serial.available()) {
        // get the new byte:
        char inChar = (char)Serial.read();
        // add it to the inputString:
        if(inChar == '\r'){
            inputString = "";
        }
        else if(inChar == '\n') {
            stringComplete = true;
        }
        else{
            inputString += inChar;
        }
    }
}

```

1. When there is vehicle density present in all the four roads of the junction, then the signal functionalises normally, similar to the existing system.
2. When there is an absence of vehicle density in one or more roads but present in atleast one road, then the signal for green light skips that particular road with no vehicle density and moves forward with the ones with density present.



Fig. 2

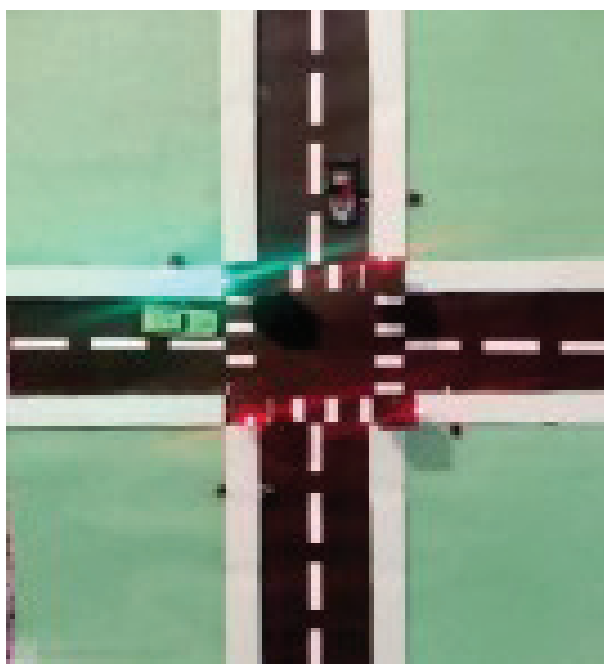


Fig. 3

3. When there is an emergency vehicle on any road at the junction, then the traffic light of all the side will go to red, and only an emergency vehicle will be allowed to go[9]. In reducing the number of accidents that take place just because of this improper traffic control system and paves way to a better traffic control system.

The proposed system aims to save the number of man hours wasted at the signals and hence making effective utilization of time. Further a lot of work and progress can be made on these lines by giving priority to emergency tag vehicles. Also, a lot of work can be done on the consumption of

solar energy for the operation of such systems which can also make them highly energy efficient. Gas sensors are used to control the timing of the timers in the traffic nodes. Using the GPRS map as an additional step for progress in this area, the best route can be figured out for emergency as well as police vehicles[11].



Fig. 4: ambulance detection

V. CONCLUSION

The proposed traffic control system is the very basic step towards achieving automation in the field of traffic control systems. With various advancements taking place in today's world, people are in search of automated systems which not only saves their time but also saves lots of energy in different forms. The saving of fuel (petrol, diesel, natural gas), reduction in time of the operation of automobile engines, reduction in the emission of harmful gases in the atmosphere[12]. Thus this system helps

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S.I.A.C. – Smart Identity and Access Card

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ABSTRACT

Radio frequency identification (RFID) is a rapidly emerging technology which allows productivity and convenience. Radio Frequency Identification (RFID) is a new generation of Auto Identification and Data collection technology which helps to automate business processes and allows identification of large number of tagged objects like books, using radio waves. This paper proposes RFID Based Library Management System coupled with Attendance Management System. Managing records of books along with recording and monitoring of class attendance is an area of administration that requires significant amounts of time and effort in a school/university environment. RFID is a technology that allows for a tag affixed on identity card of student to communicate wirelessly with a reader that would allow fast transaction flow and will make it easy to handle the issue and return of books from the library without much intervention of manual book keeping which benefits by adding properties of traceability and security, the system can also automatically capture student's attendance by flashing their student card at the RFID reader and save time, effort and cost of paper based records.

I. INTRODUCTION

A smart card will be a simple plastic card empowered with one of the cutting-edge technologies of current scenario, the RFID. The card will function as a medium to perform several daily routine works in the campus area for a student irrespective of them being in a college, university or a school! A RFID or Radio Frequency Identification is a radio-wave frequency based electro-magnetic coil. It charges as soon as radio-waves are incident on it. RFIDs charge in two ways. First is a passive way that does not require any batteries or constant power supply.

The second is an active way where a constant power source is required for the RFID reader. In this project, as a matter of fact, the card may be in an individual's pocket, we use the passive medium as it would be extremely difficult to provide a power source everywhere.

We are going to create a smart card which will act as a tool for a student, coming out of one of the most under-rated things that

an institute provide to their students— the ID card or the Identity Card. We named it the S.I.A.C. – Smart Identity and Access Card. It will be used by a student to punch in their attendance without coming in contact with any kind of attendance sheets, thus effectively reducing their touch to the publicly shareable thing. Moreover, the books that a student would like to follow from the library will be punched in straight away over the student's special ID, thus effectively removing the usage of a scanner-kind-of-joystick that the librarians share, or somewhere removing the register entry that the librarians share. Next, we aim to add functionality for the staff as well, where they can simply tug in the card of an individual and retrieve all kinds of educational history, including the those of attendance, for that individual, limited to the institute they are currently present in. This effectively removes the usage and maintenance of registers thus reducing the contact of touch between the staff members.

As a matter of fact, according to several research studies, the virus can remain infective on surfaces like glass, plastic, and others.

Thus, the aim is to avoid touching of these kinds of surfaces by the students.

Moreover, it was reported, that nearly 3% case drop would have occurred in the world if the surfaces were maintained to be clean. This would have dropped the number of deaths the world has suffered.

II. LITERATURE REVIEW

Radio frequency identification (RFID) refers to the use of radio frequency wave to identify and track the tag implanted into an object or a living thing.[1]

RFID is used to collect information automatically by radio frequency data communication between a mobile object and an RFID reader to identify and track them. They are most commonly referred to as reader and tag respectively in [8]. A radio-frequency identification system comprises hardware, known as interrogators or readers and tags also known as labels as well as RFID software or RFID middleware. RFID tags are of two major types, which include Active Tag and Passive tags.[2]

In recent years, RFID is one of the automatic identification technologies. There is a wide research and development in this area trying to take maximum advantage of this technology, and in coming years many new applications and research areas will continue to appear. RFID system has been successfully applied to different areas as diverse as transportation, healthcare, agriculture, and hospitality industry to name a few. RFID also brings about some concerns, mainly the security and privacy of those who work with or use tags in their everyday life which is proposed in [3].

For instance, the U.S. based retailer corporation Walmart, in aiming to reduce its logistics costs, has applied RFID systems to all its stores and its suppliers; it is estimated that Walmart can save 5% of its inventory costs and 7% of its inventory management costs each year, which in total amounts to 8.4 billion U.S. dollars. In addition to the logistics management industry, the RFID technology is also effectively used in Taipei Metro EasyCard, vehicle repairs, libraries, medical and healthcare industries, restaurants, hotels, etc.[10]

RFID is used to uniquely identify tagged objects or people. RFID systems have been widely used in many application areas such as inventory control, product tracking through manufacturing and assembly, parking lot access and control, Bank Locker Security System, Automatic Toll Collection System (ATCS), Library Management system (LMS), Attendance Management System etc. as discussed in [4,5,6].

Radio frequency identification (RFID) is a rapidly emerging technology which allows productivity and convenience. Radio Frequency Identification (RFID) is a new generation of Auto Identification and Data collection technology which helps to automate business processes and allows identification of large number of tagged objects like books, using radio waves. This paper proposes RFID Based Library Management System that would allow fast transaction flow and will make it easy to handle the issue and return of books from the library without much

intervention of manual book keeping which benefits by adding properties of traceability and security. The proposed system is based on RFID readers and passive RFID tags that are able to electronically store information that can be read with the help of the RFID reader. This system would be able to issue and return books via RFID tags and also calculates the corresponding fine associated with the time period of the absence of the book from the library database.[7]

Applicability of Radio Frequency Identification (RFID) system which is a new generation of Auto Identification and Data collection technology in a future Smart Library Management System is presented in this paper. It helps to automate business processes and allows identification of large number of tagged objects like books, using radio waves. In existing system barcode and token card system were used. Barcodes have no read/write capabilities; they do not contain any added information such as expiry date etc. and it needs line of sight, less security and it also can easily damage. By using token card system, they are very labour intensive and work process for the librarians was more. By considering the above demerits in the existing systems, the proposed Smart RFID system, which is a wireless non-contact system that uses radio frequency to transfer data from a tag attached to an object, for the purpose of automatic identification and tracking. RFID doesn't need the line of sight, it removes manual book keeping of records, improved utilization of resources like manpower, infrastructure etc.[9]

III. COMPONENTS

A. Hardware Components

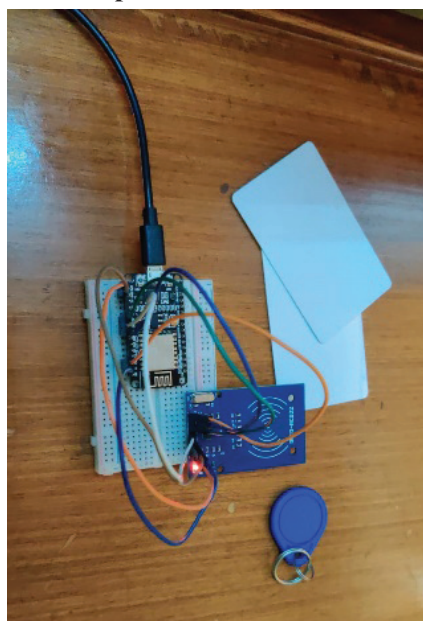


Fig. 1: Hardware

1. **RFID Tag:** The RFID tag is a part of the combination of RFID system as a whole. RFID tag or the Radio Frequency Identification tag is a kind of tags attached to some object (here, the card). The system consists of a tiny

radio transponder, and particularly a transmitter when it is a tag (the sender). Usually, the sleeves are made of a foil like material consisting of a combination of copper and aluminium, and then covered with some sort of strong material.

The tag, here, implies the antenna or the sender in the system.

- RFID Reader:** The RFID reader is the other part of the combination system of the RFID system. The reader is also said to be the brain of the RFID system and is necessary for any system to function. They are also called interrogators, and are the devices that receive the signal from the RFID tag. They receive the radio waves in order to communicate to the incoming signal from the transponder. The reader in case of a passive tag, as used in this project, can read up to a distance of 12 meters if the tags are far-range ultra-high frequency tags. On the other hand, the active tags can achieve a range of 100 meters or more depending upon the kind of tag used.
- Node MCU:** The NodeMCU ESP8266 development board comes with the ESP-12E module containing ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects.

NodeMCU can be powered using Micro USB jack and VIN pin (External Supply Pin). It supports UART, SPI, and I2C interface.

The NodeMCU Development Board can be easily programmed with Arduino IDE since it is easy to use. Programming NodeMCU with the Arduino IDE will hardly take 5-10 minutes. All you need is the Arduino IDE, a USB cable and the NodeMCU board itself.

B. Software Components

- Database:** The database that we are going to lay back will comprise of three different tables each for a given module. The ER diagrams of each are shared in the description of each module itself, with their usual semantics.
- Web Application:** The web application is simply a set of web pages that act as a common platform to all the features our smart identity and access card feature. The platform is built on php and is used in its minimal form. It provides additional features like registering a student against a new card ID, maintain an admin to regulate all the stuff and more.

IV. PROPOSED SYSTEM

We are going to develop a Smart Identity and Access Card that make use of latest cutting-edge technology the Internet of Things,


often abbreviated as IoT. The card will use the technology of RFID or the radio waves in order to provide a useful tool to a student for their campus lives. To develop the system itself, we plant an RFID reader and a microcontroller on the breadboard connected via the jumper wires.

In order to make things permanent and free of glitches, we solder the RFID reader. This system will act at the site where the smart card will be used. The card itself will consist of a RFID tag or a coil that charges up when electro-magnetic waves are incident on it, thus releasing signals, that are thence read by the RFID reader. Behind all this stuff, there will be a web application where the updates or changes are made.

Moreover, it will serve as a medium of intermediary for the two hardware sub-systems to coordinate and output something useful. We make use of C-like language to code for the board in the Arduino IDE. Also, we make use of php to code for the web application. In order to represent it as a model for big enterprise, we make use of a free Xampp (preferred if the host machine is Windows) or a Lammpp (preferred if the host machine is Linux) server, where we host our web application and also provide the underlying database. The student will simply tug-in the card at a site of use, say in the college library. This will activate the electro-magnetic coil and it will start emitting signals. Those signals are then read by the reader present on-site. The system than updates the web application as per the request by the user.

V. EXPERIMENT PROCEDURE

Module 1: The Attendance System



The screenshot shows a web application titled "Smart Identity and Access Card Interface". Below the title is a navigation bar with links: Users, Manage Users, Devices, Academics, Library, Admin, and Log Out. The main content area is titled "ATTENDANCE" and displays a table with the following data:

ID / NAME	SERIAL NUMBER	GENDER	CARD UID	DATE	DEVICE
11 / Kumar, Ajay	1	Male	117010408	2021-07-12	0
21 / Kumar, Shyam	2	Male	117010208	2021-07-12	0

Fig. 2: Attendance

RFID Based Attendance System is a modern attendance system. It can be useful in different places like schools, colleges, and universities to register the attendance of the students.

When a student attends a class, the RFID reader in this particular class room will read the student's information, which is stored in the RFID chip that is installed on the student's ID and then mark the attendance of that particular student. The attendance record is stored on a local server. The updates are then reflected in the database present on the local machine itself. The updates can then be viewed only by the lecturer.

A simple algorithmic approach to the module is as follows:

- Step 1: Bring the card near the reader.
- Step 2: The reader reads the card value and the microcontroller updates its local storage to it.
- Step 3: The system then sends the read value over the internet to our database where it is updated.
- Step 4: The steps 1 to 3 are repeated until all the available student gets himself/herself registered for the current lecture.
- Step 5: The database in interaction with the host web application displays the result of change only to the authorized user.
- Step 6: The authorized user can then get the complete list of students currently tagged-in with the card.
- Step 7: The list is then discarded but the updates have been permanently written to the database.

The database for the attendance system module is represented using the following ER diagram:

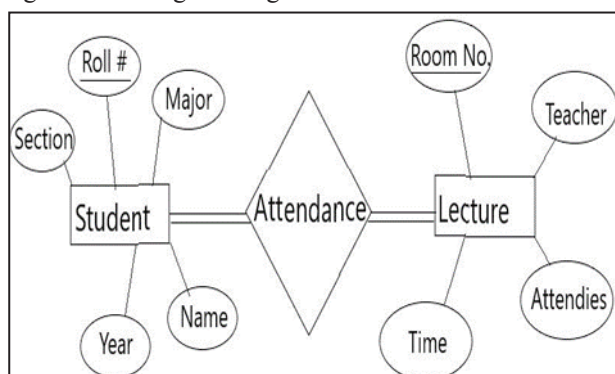


Fig. 3: Attendance E-R Diagram

Module 2: The Library Management System

CARD UID	NAME	DEPARTMENT	BOOKS	ISSUE DATE	DUE DATE	DUES
1171614836	Naman Agarwal	Computer Science and	Adolf Hitler	25-10-2019	25-11-2019	100
1171615780	Pankaj Sharma	Computer Science and	Harry Potter	23-03-2019	23-06-2019	0

Fig. 4: Library Record

Any student that issues a book will be done by students with help of the Card. Even the books here will be empowered by RFID

tags. The first scan will tug in the student information, while the consequent scans will result in book updating onto the student's Card. Students can now easily navigate using their Card to know the current book dues and/or operating fine on issued books. This will replace the current library computer system with a simple RFID reader attached to a more interactive touch screen that will run the smart campus card the student's Card. Students can now easily navigate using their Card to know the current book dues and/or operating fine on issued books. This will replace the current library computer system with a simple RFID reader attached to a more interactive touch screen that will run the smart campus card application to access information. An algorithmic approach for this module is as follows:

- Step 1: With every book in the library, attach a RFID tag.
- Step 2: The reader for the book and the user issuing the book is integrated at the counter.
- Step 3: Whenever a user requests for the book, the book is simply passed under the scanner. This step is repeated until all the required books are updated.
- Step 4: Now tug-in the user's card. This will automatically map the previously scanned books with the name of the user on our web application.
- Step 5: The user can then simply tug-in the card at any nearby library scanner and get to know the books details, or simply go to the web application or the same.

The database for the Library Management system module is represented using the following ER diagram:

Radio frequency identification (RFID) is a rapidly emerging technology which allows productivity and convenience. Radio Frequency Identification (RFID) is a new generation of Auto Identification and Data collection technology which helps to automate business processes and allows identification of large number of tagged objects like books, using radio waves. This paper proposes RFID Based Library Management System coupled with Attendance Management System. Managing records of books along with recording and monitoring of class attendance is an area of administration that requires significant amounts of time and effort in a school/university environment. RFID is a technology that allows for a tag affixed on identity card of student to communicate wirelessly with a reader that would allow fast transaction flow and will make it easy to handle the issue and return of books from the library without much intervention of manual book keeping which benefits by adding properties of traceability and security, the system can also automatically capture student's attendance by flashing their student card at the RFID reader and save time, effort and cost of paper based records.

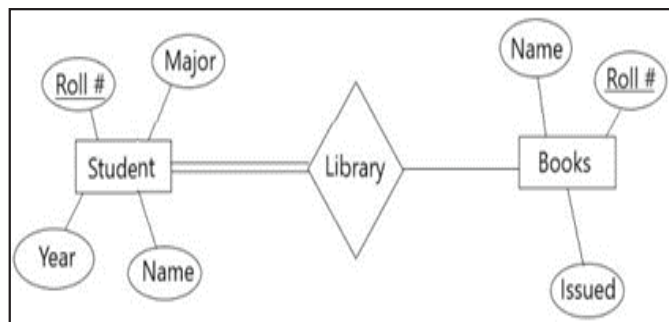


Fig. 5: Library Record E-R Diagram

Module 3: The Academic Record System

Smart Identity and Access Card Interface

Users Manage Users Devices Academics Library Admin Log Out

ACADEMIC RECORDS

CARD UID	NAME	DEPARTMENT	SEMESTER	CT MARKS	SEMESTER MARKS%	ATTENDANCE
11710-2252	Pankaj Sharma	AI	8	60	77	90
11710-1603	Harman Aggarwal	AI	8	75	84	90

Fig. 6: Academic Record

Any faculty or higher staff members eligible to access a student's academic information will be empowered here. They just need to scan the corresponding student's RFID base S.I.A.C. This will generate a request to the database server and information of the student will be available over the web app. The information comprises of:

1. Student's Class Test Marks.
2. Student's Attendance record. The database for the Academic

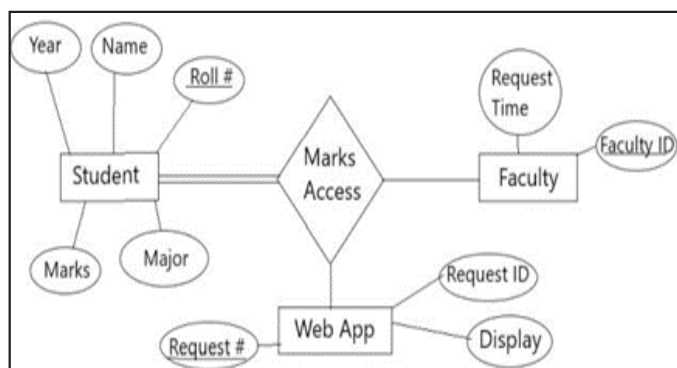


Fig. 7: Academic Record E-R Diagram

Advantages

1. In some universities around the world, students' attendance is done manually by the instructors during every lecture. This action might create inconveniences, like the instructor might forget to take attendance or by mistake he/she might mark the wrong student absent in case of having many students with similar names. Not only is this process time consuming, it also leads to stacks of files and folders that need to be stored and maintained. This is tackled by the Module 1: The Attendance System.
2. Another problem related to records, for a student, is of books issued and fines to a student's name, sometimes students forget books issued to them or date for re-issue of books and the fine keeps piling up. This issue is resolved via the Module 2: The Library Management System.
3. Similarly, record of student's academic score is also maintained by teachers manually, each subject's record is stored separately which is to be compiled for each student at the end of academic term.

VI. CONCLUSION

The paper concludes by providing a systematic and technologically advanced alternative to pursuing the orthodox attendance and library system. Moreover, the system should be error-free and marking of goods like books against an individual is hassle-free. The student can now immediately know the dues etc. against him/her and can rectify any kinds of misleads. The system also ensures that if a faculty member wishes to know about a certain individual in terms of their academic records, the faculty need not follow to other members like those of counsellor. Instead, a complete comprehensive way is available for the faculty in this regard.

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Smart Tech Autonomous Robot

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ABSTRACT

Smart Tech Autonomous Robot (STAR) is an IOT (internet of things) and machine learning based human interacting robot which can perform many tasks. The main objective of this project is to provide a helping hand or an assistant to people to ease their work. For this project, we are aiming to build a system which can interact with human beings, detects objects, read the text, and can move on the directed path.

Keywords: STAR, Smart Tech Autonomous Robot, IOT, Machine Learning, NodeMCU, Raspberry pi, OCR, Object Detection, Remote control car.

I. INTRODUCTION

Multi-tasking - "the ability to do several different things at once" is preferred by everyone as it completes all the works quickly. All people acknowledge those who are multi-tasking. Multi-tasking devices are also considered as boon as it increases efficiency, productivity, resilience, flexibility, adaptability of a device. Smart Tech Autonomous Robot or STAR is a multi-tasking IOT device which can perform various activities simultaneously. There are many devices available but for each task, a different device has to be purchased or used. STAR is made with the viewpoint that a device should be available to the customers or users that can perform the maximum number of tasks that the customer wants. STAR is a virtual assistant like an ALEXA, Siri, Cortana, etc. At the same time, it can detect the objects that are shown to it. It clicks a picture of it and tells which object has been kept in front of it. STAR can read the text also. It again clicks the picture of the paper kept in front of it and reads the printed text on it. Though, its accuracy totally depends on the size of the text, distance between the camera and the paper on which the text is written and also the resolution or quality of the camera used. It

tells about its surrounding weather with the help of temperature and humidity sensor or DHT11 sensor. STAR is also a locomotive device. It can be controlled with the Blynk App and can be moved in any direction that the user wants.

STAR is a simple but very useful device. It has been made with the use of latest technologies that are very popular in the industry. Object Detection has been implemented with the help of YOLO (You Only Look Once) library which is simpler and faster than many other object detection algorithms. Reading of text has been implemented with the help of Pytesseract library. Tesseract OCR accuracy is pretty high out of the box, but with a well-designed Tesseract[8] image preprocessing algorithm, it may be greatly improved. To move the gadget in the appropriate direction, the Node MCU and motor drivers are used.

II. METHODOLOGY

MODULE 1: Virtual Assistant module

In this module, the system takes a sound input from the user using USB microphone and that input is provided to the Raspberry Pi

for further processing. The virtual assistant is built around the system of keywords where it searches the text for key words to match. Thus, Raspberry Pi will then send that input signal to cloud server. Cloud server will then collect the data and searches for the keywords in the data. And after the essential terms are matched, it generates the appropriate output.[9] This is then transformed to voice using a text to speech program. The Raspberry Pi's audio connector is connected to 3.5mm jack speakers, which transmit the output. The virtual assistant can converse with people, making it appear as if two people are conversing with each other.

MODULE 2: Object Detection module

PiCamera is linked to the Raspberry Pi in this module. When the photo is requested, the camera taps it. To distinguish the articles, the image is preserved in the OS and OpenCV and YOLOv3 libraries are used. This model is capable of distinguishing multiple things at the same time. You only look once (YOLO)[6] is a top-of-the-line, always-on recognition architecture or algorithm. It has a few advantages over systems that rely on classifiers. It evaluates the entire picture at test time, so the picture's global setting shapes its expectations. In contrast to frameworks like R-CNN, which require thousands of evaluations for a single image, it also establishes expectations with a single organization evaluation. This makes it a thousand times quicker than R-CNN and a hundred times faster than Fast R-CNN[1].

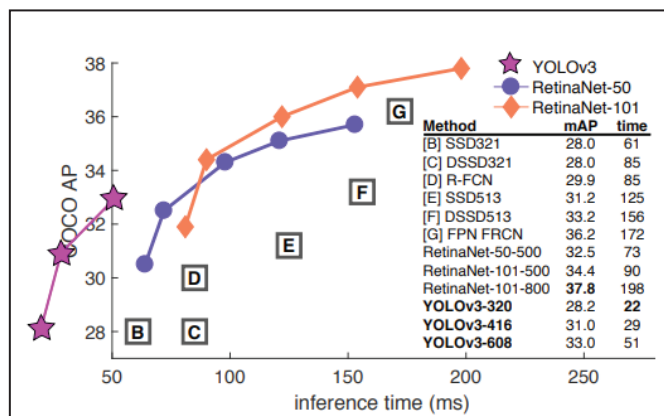


Fig. 1: Object Detectio Module

MODULE 3: Reading

The process of optical character recognition (OCR) was used to turn printed text into editable text. In a variety of applications, OCR is a very helpful and popular technology[12]. In this progression, a pi camera and a speaker are required. The reason for the camera is to catch the picture of the book or the paper that is set before it. When the picture has been caught it has been sent for preparing. The handling steps include the division of the content from the foundation in the caught picture. The content after isolated is sent to transformation measure. The Conversion cycle includes changing over the RGB tone into high contrast network that isolates the words into single person to perceive the content accurately. This lattice arrangement is appropriate to

work on the productivity of the framework. After the acknowledgment of the content the last yield is shipped off the client as text. The content yield is then changed over into sound utilizing text-to-discourse utilizing python libraries. The last sound yield can be heard on a speaker.

MODULE 4: Surrounding details

In this step, we'll connect the DHT11 sensor to the Raspberry Pi in order to get the temperature and humidity of the environment. The DHT11 humidity and temperature sensor is used in the first part to monitor moisture and temperature. The dampness and temperature are detected in the second portion using the DHT11 sensor.

The following section examines the output of the DHT sensor module and condenses temperature and moisture values into a manageable amount of rate and Celsius scale. Mugginess and temperature are also displayed on the screen in the third element of this process.

The framework association depends on a single wire sequential correspondence. First Raspberry pi convey a beginning message utilizing a python program to DHT module and afterward DHT gives a reaction signal containing temperature and stickiness information. Thus, right off the bat we compose a python program on raspberry pi and run it. After a fruitful execution of the python program, Raspberry pi gathers the yield information and concentrate it in two sections one is mugginess and second is temperature and afterward long haul steadiness. This sensor has a resistive type of moisture estimation section and an NTC type temperature estimation segment built in, as well as an 8-cycle micro-controller that has a quick response and is cost-effective, and is available in a 4-pin single line bundle. Sequential correspondence, i.e. single wire correspondence, is dealt with by the DHT11 module.

This module sends data in the form of a heartbeat train with a certain time period. Prior to delivering data to the Raspberry Pi, it is necessary to create an introduction order with a time delay.[5] Furthermore, the complete contact takes roughly 4 milliseconds. The Raspberry Pi delivers a high to low beginning signal to DHT11 with an 18-second delay to ensure the DHT's identification.

After that, Raspberry Pi should pull up the information line and wait 20-40 seconds for DHT's reaction. When DHT identifies the start signal, it's not a low voltage level reaction sign to the Raspberry Pi with an 80s time delay. After that, the DHT regulator pulls up the information line and saves it for 80s for DHT's information orchestration. When information transit is at a low voltage level, it means DHT11 is transmitting a reaction message. When it's finished, DHT pulls up the information line for 80s to prepare information transfer. Information design that is sending by DHT to Raspberry pi for each piece starts with 50µs low voltage level and length of high voltage level sign decides if information bit is "0" or "1". Because we'll be setting the DHT sensor at a distance of 20 metres in this case, we'll need a 5k pull-up resistor. A sufficient value draw up resistor should be used if

the DHT is to be positioned at a distance greater than 20 metres. It's far from a low-voltage reaction signal to Arduino with an 80-second time delay. DHT regulator then pulls up the information line and reserves it for 80s for DHT11's masterminding of information transmission. When information transit is at a low voltage level, it means DHT11 is transmitting a reaction message.

MODULE 5: Moving

In this step, we use NodeMCU, L293D motor driver, chassis, Arduino IDE to upload the code in NodeMCU and Blynk app to control the movement of the car. Firstly, we assemble the chassis with wheels and motors. Then we connect those motors with NodeMCU with the help of jumper wires. After connecting the NodeMCU with the car chassis properly, we configure the Blynk app and get the authentication key for the new project created in the app. After all this, we write a code in embedded C language on Arduino IDE. In this code we give the authentication key of Blynk app and ssid and password of the Wi-Fi which helps to connect the NodeMCU with Wi-Fi and Blynk app. And in the last, we just need to control the car with the help of Blynk app and then car moves on the directed path.

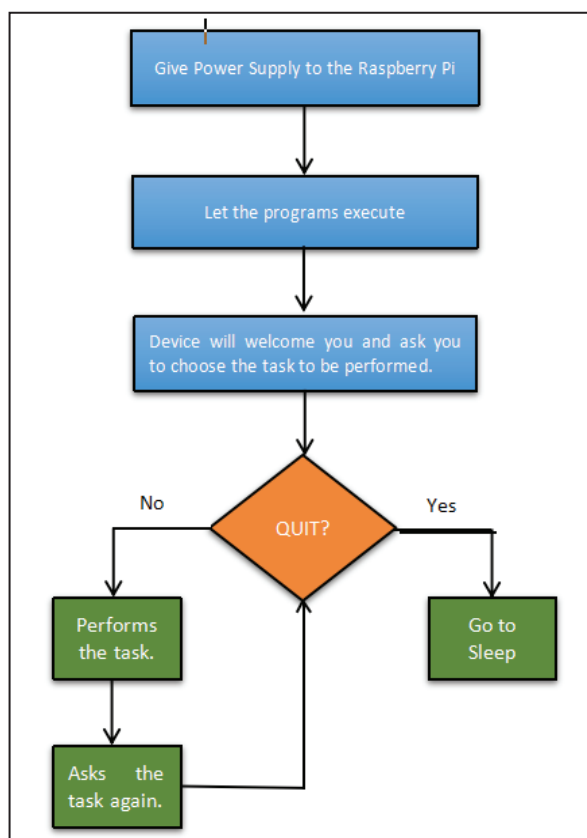


Fig. 2: Flowchart of Methodology

III. RASPBERRY PI

Raspberry Pi is a single-board computer. To get the interface, you can install the Raspbian Operating System (Buster or Stretch). The Raspberry Pi may be used as a mini PC by connecting hardware devices such as a keyboard, mouse, and display. Continuous

Image/Video Processing, IoT-based applications, and Robotics applications are all common uses for Raspberry Pi. Although Raspberry Pi is slower[3] than a PC or a workstation, it is still a computer capable of providing all of the standard features and capacities with low power consumption. Raspbian OS is based on Debian and is provided by the Raspberry Pi Foundation. They also provide NOOBS OS for Raspberry Pi. We can offer a few Third-Party OS versions such as Ubuntu, RISC OS, Windows 10 IOT Core, and so on. Raspbian OS is a complete operating system that is available for free. This operating system has been professionally upgraded for usage with the Raspberry Pi. Raspbian has a graphical user interface (GUI) that includes tools for browsing, Python programming, office, games, and so on. To save the OS, we should use an SD card (at least 8 GB is recommended) (working System). Raspberry Pi is more than a computer because it allows access to on-chip equipment such as GPIOs, which may be used to develop applications. We can associate and control gadgets such as LEDs, engines, sensors, and so on by going to GPIO. It has an ARM-based Broadcom Processor SoC and an on-chip GPU (Graphics Processing Unit). The CPU speed of the Raspberry Pi is increased from 700 MHz to 1.2 GHz. On-board SDRAM with capacities ranging from 256 MB to 1 GB is also included. For the Raspberry Pi, on-chip SPI, I2C, I2S, and UART modules are also available.

IV. CONCLUSION

This paper portrays a device that can perform multiple tasks and prove to be a helpful hand in various fields. People from different sectors can use this device for different purposes. Any age-group person can use this device efficiently. This device is capable of handling huge computations as many new technologies and libraries have been used to make this machine more liable than other such devices. Raspberry Pi is playing a major role in this project as the coding part has been implemented in it and Node MCU is used to make the device movable. Yolo and Tesseract libraries and software are used with OpenCV to make the results of the modules more accurate and reliable.

V. FUTURE SCOPE

The present framework gives best outcomes in a plain foundation and henceforth puts certain imperatives on the user for effective working. The future work will incorporate usage of YOLOv4 as currently YOLOv3 has been used for object location and detection. The new version i.e. The backbone of YOLOv4 is made up of CSPDarknet53, a spatial pyramid pooling extra module, a PANet path-aggregation neck, and a YOLOv3 head. CSPDarknet53 is a new backbone that can assist CNN learn more effectively. Over CSPDarknet53, the spatial pyramid pooling block is used to expand the receptive field and extract out the most important context features. PANet is utilised for parameter aggregation for several detector levels in YOLOv3 instead of Feature Pyramid Networks (FPN) for object recognition[2].

YOLOv4 is twice as fast as EfficientDet with equivalent performance, and it improves YOLOv3's AP and FPS by 10% and 12%, respectively.

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Formulation and Development of Smart Mini Hydroelectric Power Plant

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ABSTRACT

Our project consists of Arduino uno and nano, WIFI module, alternator, turbine, and some sensors. In this some important things are automated and alarms based due to take more time and safety purpose. If we talk about the total generated power so it depends upon the head of water and discharge rate of flow i.e., $P=1000Qgh$. During the rotation of the turbine blade's temperature is also determine. To take the 50 Hz frequency the rotation must be equal to the 1500 RPM. If we want to know the information of earthquake so we can easily find in smart mini hydroelectric power plant. Voltage is transferred through the Wi-Fi module in the form of codes.

Key words: Earthquake system, an additional system for penstock, transferring the data by WI FI, level indicator related to reservoir, total generated power and sound system.

OBJECTIVE

1. To minimize the time during the readings.
2. To minimize the wastage of water in reservoir in rainy season.
3. To know the environment effect.
4. To know the effect of moisture (leakage of water) at the side of coupling.
5. To reduce the accidents.

I. INTRODUCTION

Mini hydroelectric power plant was first used to generate electricity in 1926. The range of power is from 200W to 200KW. As we all know that the water is renewable source which has potential and kinetic energy that can be converted into electricity by means of hydroelectric power plant. In this we use a turbine and an alternator with mechanical coupling. If we talk about the hydroelectric power plant so it converts kinetic energy and potential energy into electrical energy then electricity is transferred by the conductors which can be displayed. Now we are talking

about the smart mini hydroelectric power plant in which some automations and alarms are there like:

1. Automation related to the transferring the data(voltage).
2. Automation related to reservoir.
3. Alarms related to water present in penstock.
4. Alarms related to level.
5. Leakage of water at the coupling side.
6. Alarms related to earthquake.

Hydroelectric power plant generates 6.05 the electricity of the total power in the whole word. [1] The total output of hydroelectric power plant depends upon the efficiency of the turbine and alternator [1]. If we talk about the sensors in our project so moisture, temperature and vibration are used by which we can change the output level and pulse rate accordingly. The purpose of our project is to do smart work in generated voltage, coupling, blades of turbine, reservoir and penstock. Hydroelectric is a very clean sources, that does not consume but can be used the water again and again for making it available or other uses. [10] The simple principle of HPP follows that if water can and

might be piped from a particular (higher) level to lower level then the resulting water pressure can be used for generating [10]. It means that HP involves the use of potential energy released by weight of falling water with the help of vertical distance for generation of electricity. In project, vibration sensor is used for the earthquake protection at the side of plant. Moisture sensor is used for sensing the water at the side of coupling between alternator and turbine. The temperature sensor is used for the sensing temperature of blades of the turbine. We have made such type of system in which there is no water in penstock so we will get a message from a device.

Literature Review: The sources of water is depleting day by day. Which causes the environment issues like ozone layer and global warming, to avoid this problem came an idea about the project which we have developed and name is "FORMULATION AND DEVELOPMENT OF SMART MINI HYDROELECTRIC POWER PLANT". Arduino uno, nano and some sensors play major role advanced than normal power plant. Smart hydroelectric power plant is related to the automation and alarms by which accidents can be reduced.

Principle Behind the Smart Mini Hydro Power Plant: The principle behind the smart mini hydroelectric power plant is divided in two categories: Hardware and Software

Hardware: It is related to generation of electricity. [9] Whenever fluxes cut the conductor and conductor cuts the flux and any relative change in fluxes and conductors between them generates the electricity i.e., Faraday's law [9]. Which depends upon the rate of change of fluxes. That can be mathematical defined as

$$E = d\phi / dt$$

Where, E is the generated EMF.

d ϕ is the rate of change of fluxes.

t is the time.

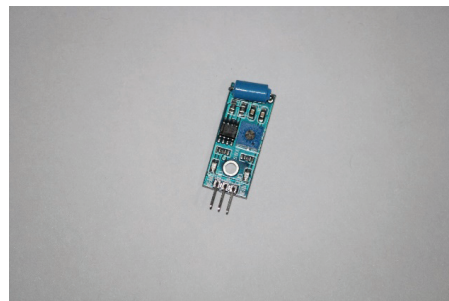
Software: The software project consists of functionalities; all functionalities must be in a modular approach so that development will be easier and faster. The principle of software is to provide the pulse and clock from the hardware, that pulse is able to do the desired work.

Main Components Used in Smart Mini Hydro Electric Power Plant. There are so many components which are used in project by which project makes.

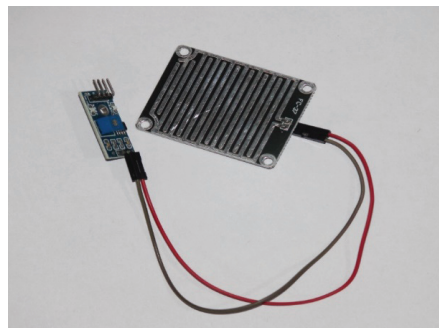
1. Arduino uno: Arduino uno is used to produce a pulse (clock) of desired frequency. It operates at 5v and clock frequency may be 16MHz. It has 30 male I/O headers.



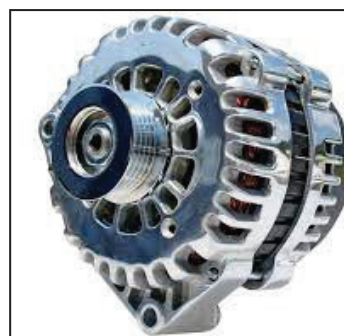
2. Arduino Nano: The Arduino nano is a microcontroller based on the microchip. Arduino uno has 14 digital pins and 6 analog pins. It operates at 5 v. It is used to transmit the data and receive the data wirelessly (networking application). It is also known as serial to Wi-Fi module, which belongs to the transmission way of IoT. In project, it is used for transmitting the voltage to the mobile.



3. Some sensors and voltmeter: sensors are used to sense and detect the object and environment issues moisture, temperature and vibration etc. are used. The function of the sensors is to convert from physical into measurable voltage. [4] Voltmeter is an electrical instrument that is able to measure the voltage in volt [4]. [3] It has infinite resistance because short circuit. It is always connected in parallel [3]. In this project, voltage display (voltmeter) is used. The specification of this display is 0.5 to 100v DC. Voltmeter works on the principle of ohm's law, that states the voltage across a resistance is directly proportional to the current, which is flowing through the resistance.



4. Alternator and Turbine: [8] An alternator is device which converts the mechanical energy into electrical energy [8]. A turbine is a device that converts kinetic energy of some fluid such as water, steam and air in the useful work. That is used in generation electricity.



5. Sound system and LEDs: sound system may be consisted of buzzer and speaker that is able to produce sound in alarms. [10] It stands for Light Emitting Diode. That gives off visible light when it is in forward bias. [2] LEDs are not made of silicon and germanium but made up of gallium arsenide and phosphide [2]. It is possible to produce different types of colours (red, yellow, and green). For example, if an LED is manufactured using gallium arsenide, it will produce a red light. LED is made with gallium phosphide; it will give green light. [4] When LED is in forward bias, the electron from n type material cross the pn junction and recombine with the holes in the p type material [4].



Working: we all know that flowing water has potential energy. If the water pressure is allowed to move mechanical component, then movement can be converted mechanical energy which can be used in generator. [6][8] The operation of a generator is based upon the principle discovered by Faraday in 1831 [6][8]. He found that when a magnet is moved past a conductor, it causes to flow of electricity. [5] Whenever water falls on the turbine through the penstock so there is kinetic energy due to flow of water and potential energy due to the height of the water [5]. The turbine is connected to alternator, that is able to generate the electricity which is dependent upon the given equation.

$$E = d\phi / dt \quad [11]$$

Where, E is the generated EMF.

$d\phi$ is the rate of change of fluxes.

t is the time.

Design and Power Calculation:

As we all know that $P_e = m \times g \times h$ when water is flowing then $m = m/t$ (mass per unit time)

$$P_e = mgh/t \quad \dots (1)$$

$$E = pt \text{ or } P = E/t \quad \dots (2)$$

From equation No. 2

$$v/t = 1m^3/s \quad \dots (3)$$

Equation no. 3 can be written as

$$(v/t) \times (m/v) = m/t$$

$$(v/t) \times \rho = (m/t)$$

From equation no. 3

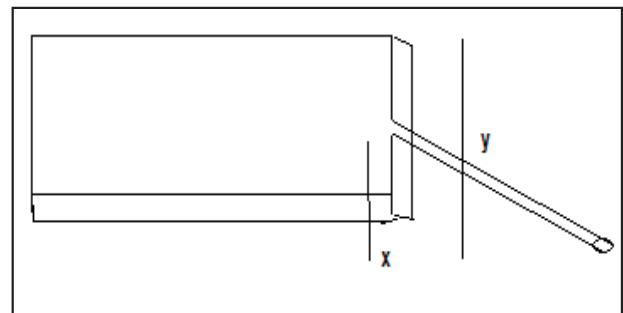
$$[7] (1m^3/s) \times (1000kg/m^3) = m/t \quad [7]$$

We all know that discharge of flow i.e., Q is equal to the $1m^3/s$ then

$$(Q) \times (1000) = m/t \quad \dots (4)$$

Putting in equation no.

$$\begin{aligned} [12] P &= mgh/t \\ &= Q \times 1000 \times g \times h \end{aligned}$$



$$h = (x+y) / 2$$

where, Q = Discharge rate of water

$$g = 9.81$$

$$h = \text{Height of penstock}$$

$$[7] \quad P = Q \times g \times h \times 1000 \text{ watt} \quad [7]$$

$$E = Q \times g \times h \times 1000 \times t \text{ watt}$$

Advantages:

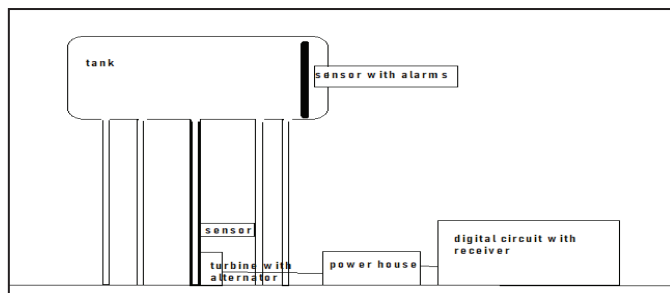
- [13] It is ecofriendly.
- There is high degree of flexibility.
- [10] Pollution free.
- There is a storage tank to generate additional energy when the chances of grids are failure more.

Disadvantages:

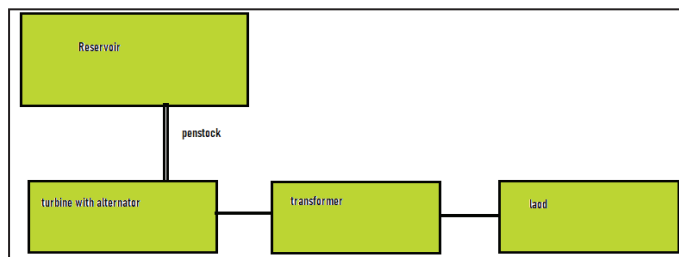
- Initial cost is high.
- Transmission cost is high due to far away from the distributors.
- Requires high catchment area.
- Hydrology dependent.

Schematic and Block Diagram of Smart Mini Hydroelectric Power Plant:

Figures show schematic and block diagram of smart mini hydroelectric power plant. With the help of schematic diagram, we can easily understand the principle behind the generation of electricity and block diagram gives the information about the software side in our project.



Schematic diagram



Block diagram

II. CONCLUSION

Mini and micro hydroelectric power plant is most important power plant for rural and urban areas to generate the electricity where the head and reservoir are present. Behind the designing of the system, our main aim is to reduce the human efforts by

some alarms and automation and also reduce the hazards from accident like: more water in reservoir in rainy season and no water in penstock. We have seen that our time is being saved using Arduino nano whenever we compare between smart and simple mini hydroelectric power plant so smart mini hydroelectric power plant is more efficient. In rainy season, if water goes to upper level so we can see the level on or control room. This project work provides us an excellent and good opportunity and experience to use our limited knowledge.

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Analyzing the Role of Laser in Military Operations

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ABSTRACT

This paper revolves around analyzing the role played by Laser in Military Operations. Laser technology has been evolving very rapidly since twentieth century. It has marked its presence in each and every field such as medical, printing, welding, communication, military, commercial, industrial, scientific etc. In this paper we will discuss about the impact which is caused by the advent of laser technology in various military operations such as range finding, target detection, target destruction and communication in high security regions.

Keyterm: Laser Technology, Range-finders, Target-detectors, Communication, Military.

I. INTRODUCTION

Laser is an abbreviation which stands for “Light Amplification by Stimulated Emission of Radiations”. As suggested by the name Laser is obtained through the amplification of the light beam which is emitted by the activation of the elements of physical medium. Thus, laser is categorized as an artificial source of light. Today there is a wide range of lasers available in the market which possesses different spectral bandwidth, frequencies, power, wavelength, efficiency and characteristics. The increasing advancements in laser technology have widened the horizon and scope of laser in various fields. In this paper, we have focused on how laser is playing a pivotal role in carrying out various military operations and the future scope of laser in this field.

II. MILITARY APPLICATIONS OF LASER

With the advent of laser technology in warfare and military communication, a new era has begun where it has become much easier and safer to communicate a message to the soldiers who are posted in a remote red-zone or critical zone. It has also facilitated the warfare practices by introducing the techniques through which one can determine the range of a target, designation of a target and remote-sensing.

2.1. Laser Range-Finders

To ensure the safety and victory of the soldiers in the battlefield, most important step is identification of a target. After

identification, the tracking of the target must be done with utmost precision and then the action of shooting a target is performed. To accomplish this critical process successfully an improved and precise system is required. Laser range-finders and target-designators make use of high-resolution staring techniques to locate a target which is situated beyond a forthright range. Fig.1 shows the block diagram of a laser range-finder (LRF).

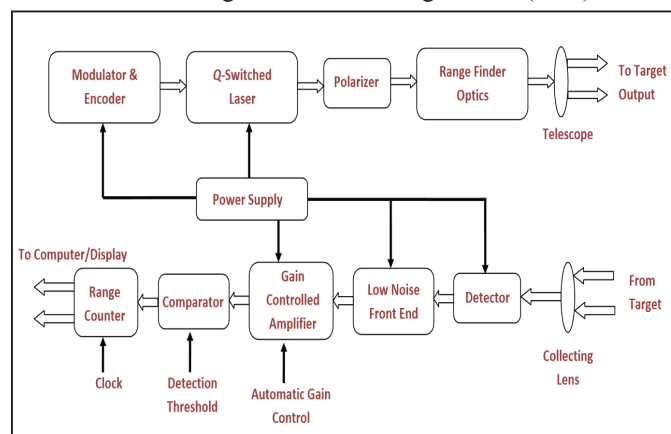


Fig. 1: Block Diagram of a Laser Range-Finder^[1]

Time-of-flight principle is used to measure the round-trip travel time between the transmitter and the target. LRF emits short pulses which are of 10 ns duration and have a low pulse repetition rate of about 1Hz- 20Hz which results in low atmospheric transmission loss.

2.2 Laser Target-Designators

In order to obtain the accurate marking of airborne or ground-based targets, Laser designators are used. The principle followed for laser designation is that the target is elucidated by the beam of laser. The light which is reflected back from the target is captured by weapon system which provides the precise location of the target. Fig. 2 demonstrates the concept of laser designators.

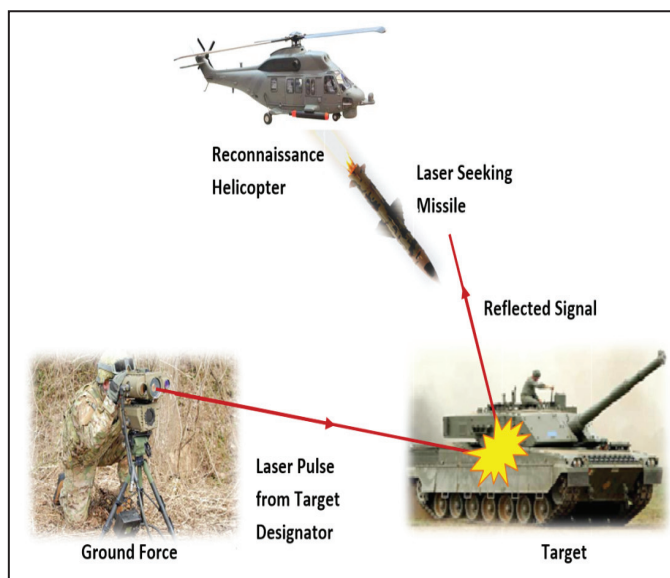


Fig. 2: Working of Laser Target Designators^[1]

2.3. Laser Communication

Several significant advancements have been observed over the years in laser communication. In order to fulfill the requirements of both Defence and commercial purpose, several investigations have been done for land-based laser communication links, spacial laser links, ground-to-air links, ocean-to-air laser links, as presented in Fig. 3. These advancements have shown a marvelous capability for upcoming laser-based warfare applications.

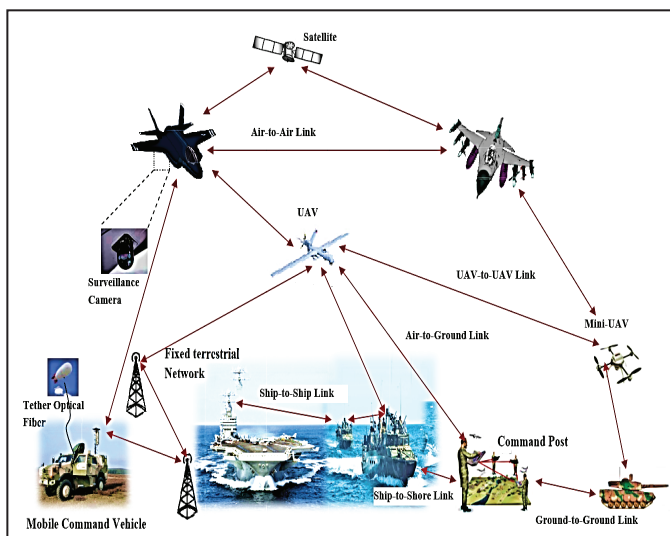


Fig. 3: Various scenarios for laser communication links^[1]

III. CONCLUSION

Laser is a modern technology which has marked its footprints in almost all the fields. It is rapidly growing its roots in Military and tactical operations also. Today the warfare environment and techniques are entirely changed and developed due to the advent of laser in the field. Currently all the nations are implementing this technique to update their traditional tactical practices and stand-out in the warfare.

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Gesture Control Robot

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ABSTRACT

This research paper is a representation of a medical assistance system, which is a wirelessly controlled system, controlled via gesture, for specially challenged people. A gesture is detected by a gesture sensor (accelerometer) or gesture change, for which the patient will be controlled by assistance of a robot and a microcontroller; the desired direction will depend on the sensor's value.

The whole process has two parts, namely receiving circuit and transmitting circuit. The most important part for any medical assistance is associated with the patient and in this particular case it will be a transmitting circuit. So it is easy to carry and use as well. And the governing microcontroller which has been used in our project is Arduino Lilypad, it makes the transmitting circuit wearable.

I. INTRODUCTION

A robot can be controlled in various ways in this modern era. There are many ways to control a robot among which one is - gesture, which makes it smart, efficient and easy to use. Our motivation for this project is to provide easy medical assistance for those who are partially and fully abled.

By using gesture control it makes it easier for them to use our technology. Scope of our technology is very vast, it's not just limited to medical assistance. It can be used in the fields of military and in heavy industries as well. Criteria fulfilled by our technology is easy to carry and easy to get the service.

In this paper accelerometer alongwith gesture controlled system, encoder, motor-driver, Arduino Lilypad, decoder, four DC motor is proposed and to make the system wireless we have used a RF module.

II. BLOCK DIAGRAM OF THE OVERALL WORK

We have presented the overall working principle of our work in the following block diagram. Our work consists of mainly two parts among which one is transmitter section and the other being receiver section. An accelerometer is connected to the Arduino Lilypad in the transmitter section.

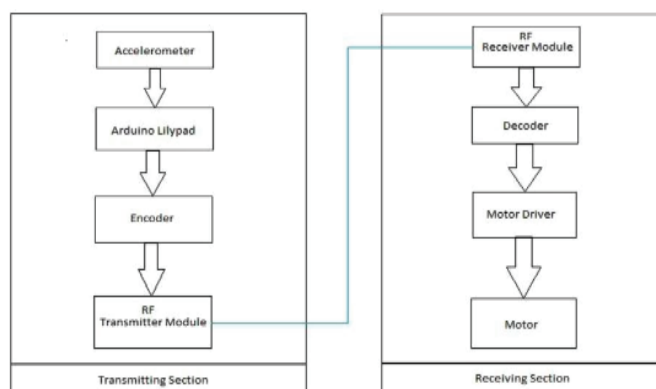


Fig. 1: Block diagram of the complete book.

III. TRANSMITTER

Microcontroller, Accelerometer, Encoder, Transmitter are four parts of the transmitter section. The electromechanical device which is used to measure the acceleration of an object across three axes or multiple axes is known as an accelerometer. It is used to detect velocity, position, orientation and vibration of an object. The power supply is connected to the X-pin and Y-pin of the accelerometer. The gesture controlling algorithm can be written using arduino IDE, and uploaded to the microcontroller.

afterwards, then the decision is sent to the encoder in the digital format. A 433 MHz transmitter-receiver module is being used to make the data transmission process wireless.

III. RECEIVER

Decoder, Receiver Module, Voltage Regulator, Motor Driver IC and DC Motor these all are the components of the receiving section. HT12D is being used in our project. The address bits of the encoder are kept at the lowest state. Address pins are connected in the format of (pin 1- pin 8) of the decoder to ground. Data gets decoded only when local address bits get matched with the serial data received from the receiver module. The motor driver IC L293D has two H-bridge driver circuits in it which helps to drive two motors in two directions i.e. clockwise and anti-clockwise simultaneously as shown in the following table.

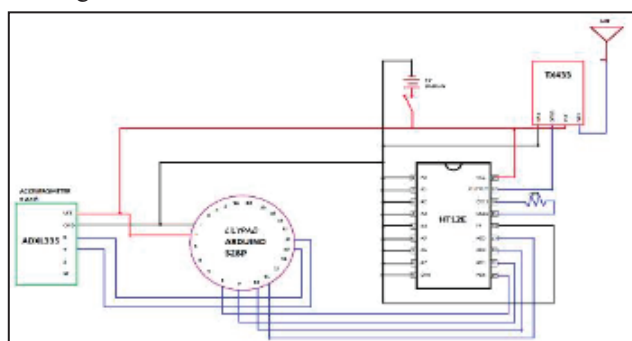


Fig. 2(a): Transmitter section circuit diagram

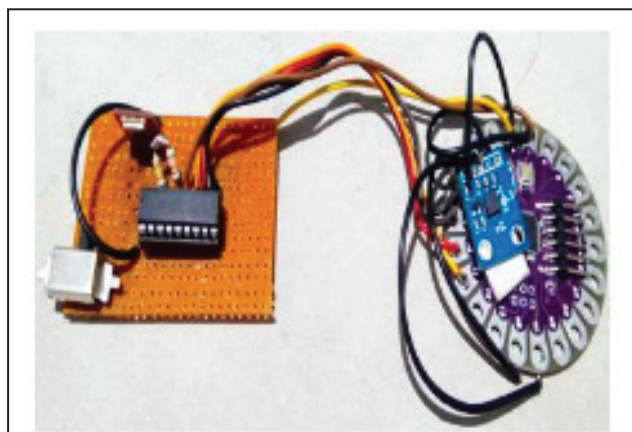


Fig. 2(b): Transmitter section implementation with Arduino Lilypad

Table 1.Motor Movement according to input logic

Input Logic	Movement
00	STOP
01	Clockwise
10	Anti- Clockwise
11	STOP

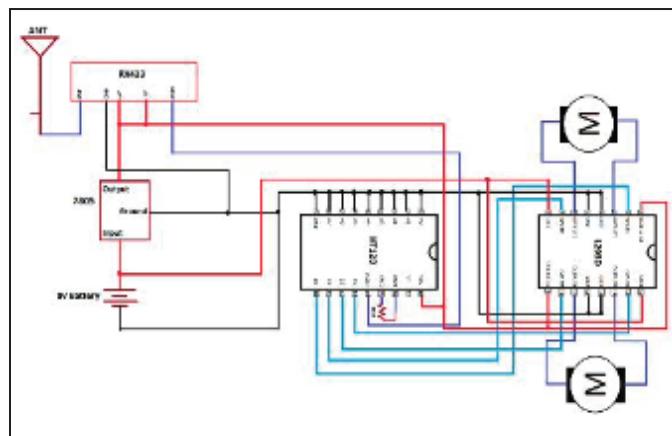


Fig. 3(a): Receiver section circuit diagram

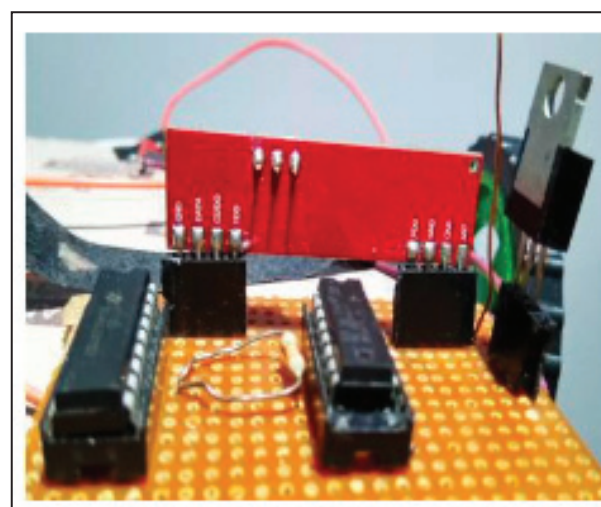


Fig. 3(b): Receiver section implementation with Arduino Lilypad

IV. SOFTWARE IMPLEMENTATION

Arduino IDE is used to implements of ware parts. Software implementation is shown below. The gesture and the corresponding X and Y coordinate value in the serial monitor of the arduino IDE is shown in following figures.

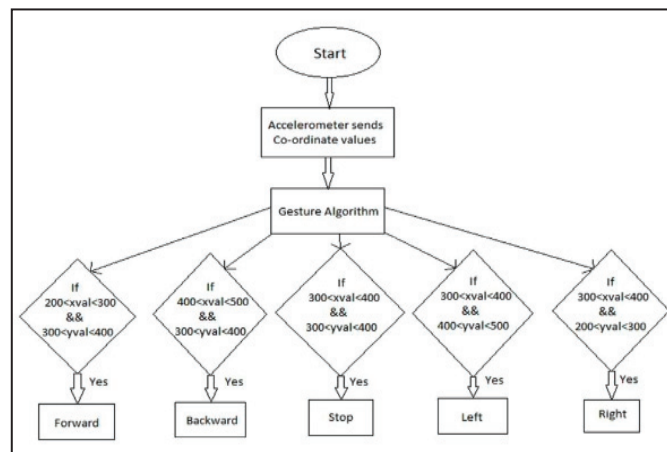


Fig. 4: Flow chart

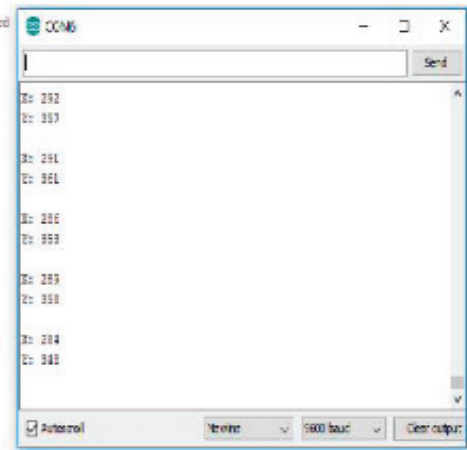


(a)

```
if((xval > 200 as xval < 300)(yval>100 as yval<400)) //forward
{
  digitalWrite(pin1, HIGH);
  digitalWrite(pin2, LOW);
  digitalWrite(pin3, HIGH);
  digitalWrite(pin4, LOW);
}

if((xval > 300 as xval < 400)(yval>400 as yval<500)) //left
{
  digitalWrite(pin1, HIGH);
  digitalWrite(pin2, LOW);
  digitalWrite(pin3, LOW);
  digitalWrite(pin4, HIGH);
}

if((xval > 300 as xval < 400)(yval>100 as yval<400)) //right
{
  digitalWrite(pin1, LOW);
  digitalWrite(pin2, HIGH);
  digitalWrite(pin3, HIGH);
  digitalWrite(pin4, LOW);
}
```



(b)

Fig. 5(a): Gesture (b) Co-ordinate value for Forward Motion

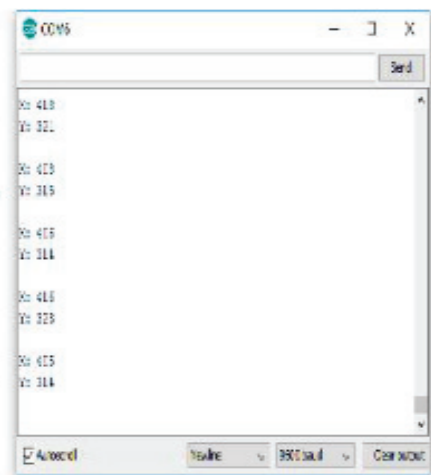


(a)

```
if((xval > 400 as xval < 500)(yval>400 as yval<600)) //backward
{
  digitalWrite(pin1, LOW);
  digitalWrite(pin2, HIGH);
  digitalWrite(pin3, LOW);
  digitalWrite(pin4, HIGH);
}

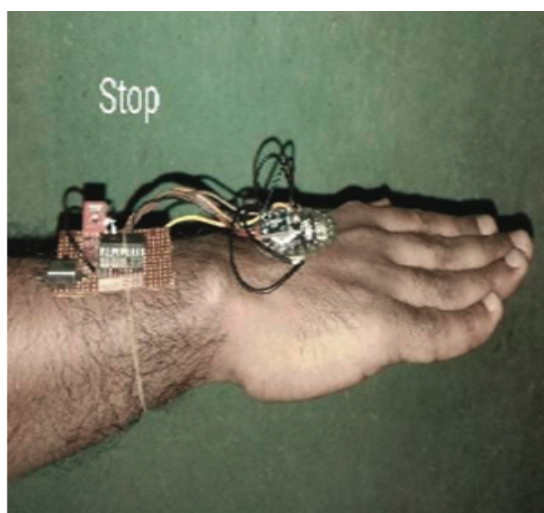
if((xval > 200 as xval < 300)(yval>100 as yval<400)) //forward
{
  digitalWrite(pin1, HIGH);
  digitalWrite(pin2, LOW);
  digitalWrite(pin3, HIGH);
  digitalWrite(pin4, LOW);
}

if((xval > 300 as xval < 400)(yval>400 as yval<500)) //left
{
  digitalWrite(pin1, HIGH);
  digitalWrite(pin2, LOW);
  digitalWrite(pin3, LOW);
  digitalWrite(pin4, HIGH);
}
```



(b)

Fig 6. (a) Gesture (b) Co-ordinate value for Backward Motion

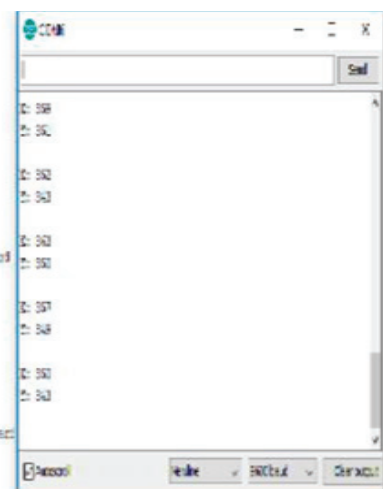


(a)

```
if ((xval > 100 as xval < 400)(yval>400 as yval<600)) //stop
{
  digitalWrite(pin1, HIGH);
  digitalWrite(pin2, HIGH);
  digitalWrite(pin3, HIGH);
  digitalWrite(pin4, HIGH);
}

else
{
  if((xval > 400 as xval < 500)(yval>400 as yval<600)) //backward
  {
    digitalWrite(pin1, LOW);
    digitalWrite(pin2, HIGH);
    digitalWrite(pin3, LOW);
    digitalWrite(pin4, HIGH);
  }

  if((xval > 200 as xval < 300)(yval>100 as yval<400)) //forward
  {
    digitalWrite(pin1, HIGH);
    digitalWrite(pin2, LOW);
    digitalWrite(pin3, HIGH);
    digitalWrite(pin4, LOW);
  }
}
```



(b)

Fig 7. (a) Gesture (b) Co-ordinate value for Stop

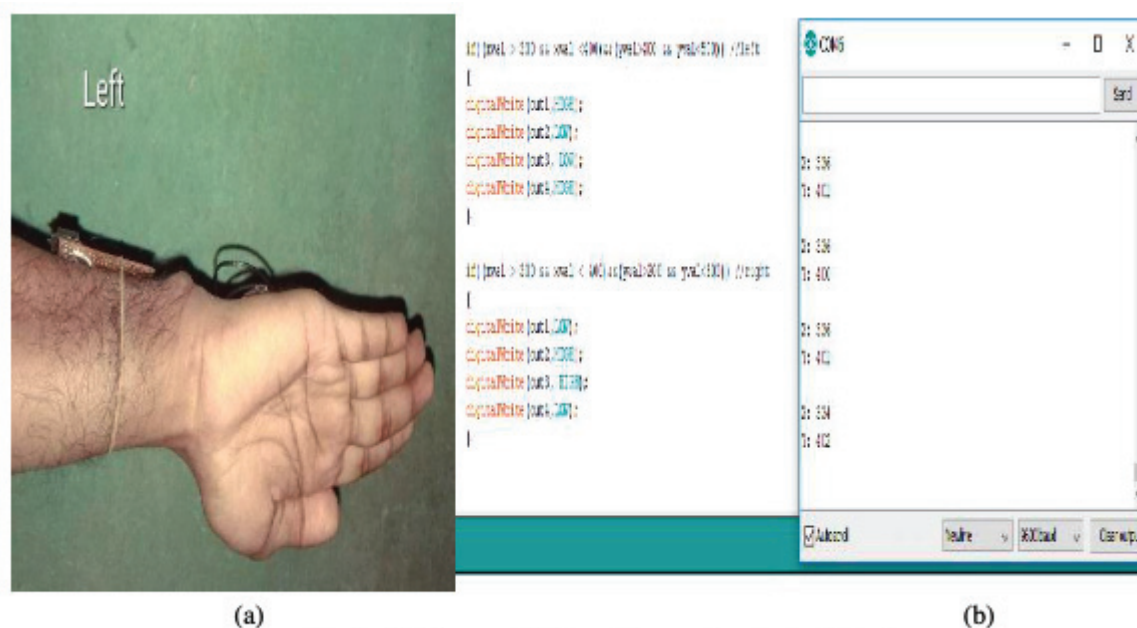


Fig 8. (a) Gesture (b) Co-ordinate value forLeft Motion

The coordinate values for Left movement if the accelerometer is tilted perpendicularly to the ground is shown in the following figure.

III. BACKGROUND

A. Existing System

At an early stage of robotics the robots are controlled by physical means between robots and the user controlling they device that is wires were the medium of connection. Because of this the operating range was reduced as it will depend upon the length of the wire. To avoid such limitation wireless connections is introduced. With the help of wireless technology the devices(robots) can be controlled remotely. For remote activation IR transmission was used but there was a limitation that there must be line of sight between robot and the user controlling it. After this there comes gesture recognition with image capturing using camera was introduced. In this gestures were captured by the camera and then these are processed by the robot. All the gestures were supposed to be updated in the library then only the robot can understand and process the information. Because of this there becomes a very huge library of the hand gestures to be handled, so it consumes lots of time in processing.

B. Proposed System

Through this model it is proposed that instead of capturing the images and processing the gestures, the robot can be controlled by human's hand gestures. This can be done with the help of accelerometer used for detection of tilting of hand position and produce analogue value. These values are received at the receiver end through Arduino Uno to make the robot move in all direction.

IV. CONCLUSION

This work presents a hand gesture based wireless medical assistance system for specially abled people with Arduino Lilypad. Arduino Lilypad mainly designed for e-textile purpose reduces the size and weight of the easily wearable transmitter part. Results of the system design are also discussed in detail. According to the hand gesture the motors of the medical assistance system can be controlled in different directions.

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VI. RESULT

The result obtained for Gesture Controlled Robot is that the robot can be controlled by the gestures made by the human.

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Fabrication of Advanced Autonomous Agribot

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ABSTRACT

Here we piled up together the advancement of agriculture and robotics to get an agricultural system which we called it as Agribot. This innovation gives ideal and proficient arrangement for wide ranges of generation with their pros and cons. This automated framework is named as Autonomous Agribot. We have to be create a robot competent of performing some activities like programmed furrowing, seed apportioning and watering. It moreover gives manual control when required. The main component here is the AVR at mega microcontroller that oversees the complete handle. At first the robot works the complete field arrive continues to furrowing, at the same time apportioning seeds side by side. After seeding procedure is done the robot then levels the ground and waters the soil. For controlling the robot one can use the Bluetooth Pairing application which makes it easy to operate the robot inside the field.

Keywords: Micro Controller, Seeding, Watering, weed cutting, Ploughing.

I. INTRODUCTION

In later a long time, mechanical technology in farming segment with its execution based on exactness farming concept is the recently developing innovation. The most reason behind mechanization of cultivating forms are sparing the time and vitality required for performing tedious cultivating assignments and expanding the efficiency of surrender by treating each trim independently utilizing exactness cultivating concept [1]. Planning of such robots is displayed based on specific approach and certain contemplations of agribusiness environment in which it is aiming to work. These contemplations and distinctive approaches are talked about in this framework, moreover model of an independent. Autonomous Robot is displayed which is specially outlined for trim cutting, furrowing, soil leveling, seeding and water splashing [2].

Agribusiness assumes a significant job in India's economy. The requirement for the mechanization in the field of farming area is for the most part because of the expanded need of agrarian items because of expanded populace and lack of work in the horticultural division [3].

Objectives of the Paper

1. Fabrication of Advanced Autonomous Agribot.

2. This paper is chiefly worried about the computerization of an incomplete procedure associated with the agribusiness.
3. The customary techniques for seed planting incorporate telecom, putting seeds behind the furrow, line planting, transplanting, spilling and so forth.

II. MATERIALS AND METHODOLOGY

The mechanical structure of the Autonomous Agribot includes Servo Motors, Micro Controller (L298), Bluetooth Module (HC-05), Submersible water pump, Motor Drivers, DC Motors [4].

2.1 Servo Motor

A Servo motor is an electrical device which is a modified version of a DC Motor through which we can precisely control angular position, velocity and acceleration [5].



Fig. 1: Servomotor.

2.2 Bluetooth Module (HC-05)

Bluetooth is used as a basic universal Remote control for Bluetooth enabled serial devices such as Bluetooth modules connected to the microcontroller [6]. HC-05 Bluetooth Module can be utilized to send the messages to the farmer and by the farmer about the operations which are performed by the robot and which are get to be performed by the farmer [7].

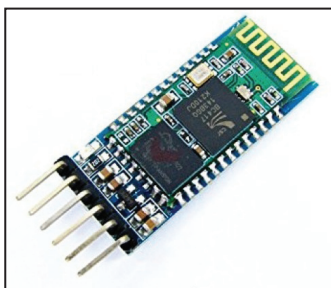


Fig. 2: Bluetooth Module (HC-05).

2.3 L293D Motor driver

L293D may be a commonplace motor driver or motor Driver IC which permits DC motor to drive on either heading [8]. L293D may be a 16-pin IC which can control a set of two DC motors at the same time in any heading. It implies simply can control two DC motor with a single L293D IC [9].

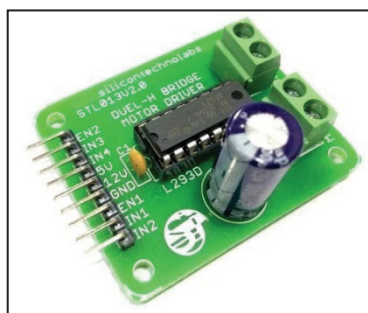


Fig. 3: L293D Motor Driver

2.4 Pump Motor



Fig. 4: Pump Motor.

The pump motor is a device which is used to move liquid/gases from one place to another by using mechanical action [10].

2.5 DC Motor

DC Motor – 100RPM – 12Volts equipped engines are by and large a straightforward DC motor with a gearbox connected to it [11]. This may be utilized in all- territory robots and assortment of mechanical applications. These motors have a strung penetrate gap within the centre of the shaft hence making it basic to associate it to the wheels or any other mechanical get together [12].



Fig. 5: DC Motor

III. RESULTS

The cause of trying out is to find out errors. Testing is the manner of looking to discover each manageable fault or weakness in a work product. It offers a way to check the functionality of components, subassemblies, assemblies and/or a completed product. It's miles the technique of exercising software with the cause of ensuring that the software machine meets its necessities and consumer expectancies and does now not fail in an unacceptable manner. There are various kinds of take a look at. Every check type addresses a specific testing requirement.

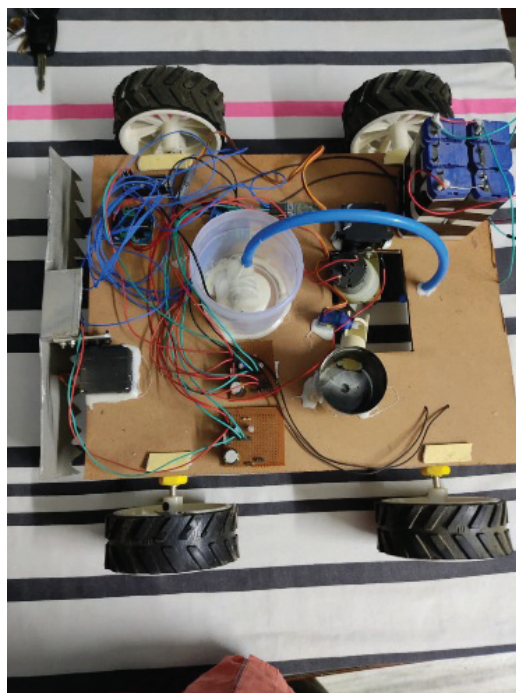


Fig. 6: Autonomous Agribot

IV. TEST CASES

The table 4.1 shows how the user activates the Bluetooth

Table 4.1: Activating Bluetooth

Test Case ID	Activate Bluetooth
Description	The application requires Bluetooth to be enabled for working
Input	Pair the Bluetooth of the Smartphone with the Bluetooth of Agribot.
Expected output	Connection established devices paired
Actual Output	Connection established. Devices paired
Result	Sources

The table 4.2 shows how the user selects a basic operation on the Smartphone.

Table 4.2: Select an Activity (Basic Operation)

Test Case ID	Select an activity
Description	To select an activity from a list of activities. The main operations are seeing, harvesting, water pumping.
Input	Choosing of an activity
Expected output	Movement of Agribot
Actual Output	Visible movement of the Agribot based on activity selected.
Result	Operation performed successfully

The table 4.3 shows the case for selecting an activity from a list of activities.

Table 4.3: Select an Activity

Test Case ID	Select an activity (basic operation)
Description	To select an activity from a list of activities. The basic operations are forward, reverse, left, right, stop.
Input	Choosing of an activity
Expected output	Movement of Agribot
Actual Output	Visible movement of the Agribot based on activity selected.
Result	Success

V. CONCLUSION

In this paper we made an effort to overcome some problems faced in agricultural activities or methods. The rapid growth in the industries and not having efficiency in the agricultural methods is influencing the labors who are situated in the villages to migrate to cities [13]. Thus, creating problems involving decrease in the availability of labors and increase in the wages for the labors [14]. The developed model can be used for multiple activities like ploughing, seed sowing, water sprinkling, soil levelling and cutting the crop which overcomes the drawbacks of the current existing system. This robot and the application are designed in such a way that it is easy for the farmers to use. The Agribot can work in any sort of climatic condition as well as can work nonstop unlike humans. One of the developed model's benefits is that it helps the farmers to grow crops with less effort, time and low cost.

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Effect of Drilling Parameters on Surface Roughness on Al/15%vol. SiC-MMC Using Different Drill Bits

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ABSTRACT

The Al/SiC-MMC is quickly replacing traditional materials in various aerospace and automobile industries, But machining on Al/SiC-MMC is one of the major issue, which resists its wide spread different engineering application. it is found that the tool wear is excessive and machining surface is very rough. So from the past research, it is also clear that generation of drill holes on the Al/SiC-MMC is very difficult by utilizing H.S.S. drill bits without any coating. Past results also shows that excessive drill bit wears during generation of hole on aluminium silicon carbide. Recently the metal matrix composites widely replacing the monolithic materials in the advanced industries for manufacturing of different aerospace and automobile components. The research investigation is conducted for generation of holes on Al/SiC-MMC using different drills bits. To investigate different machining parameters e.g. type of drill bit, feed and speed of spindle during drilling which affects the surface roughness.

Keywords: Surface roughness, Al/SiC-MMC machining, Taguchi Method, ANOVA

I. INTRODUCTION

Aluminium based metal matrix composites are gaining increasing industrial acceptance in the aerospace, automotive, automobile, offshore and onshore oil exploration fields etc. Composites are multifunctional materials which having different mechanical, chemical and physical properties that can be meet the requirements of the above applications. An Aluminium silicon carbide based metal matrix composites (Al/SiC-MMC) having very less in weight, high mechanical strength, stiffness, greater resistance to corrosion, oxidation and wear as compare to that of cast iron or different types of steel. These unique properties of Al/SiC-MMC can be used effectively in the engineering application such as aircraft related components, drive shafts, brake rotor, airframe structure, horizontal stabilizer, and strokes, automobile components such as piston, cylinder liner, engine block, turbocharger, brackets etc. The presence of SiC in the Al/SiC-MMC cause rapid tool wear during machining by using different drill bit.

The drilling of SiC-particulate with aluminium metal matrix composite by conventional drilling process utilizing ordinary drills is really difficult as SiC is harder than WC. From the past literature, it is found that Poly-Crystalline Drill (PCD) is best for drilling such composites. But PCD drills are very costly, which again imposed another restriction to wide use of Al/SiC-MMC in industry. Hence, a depth experimental research investigation on the drilling of Al/SiC-MMC is needed to identify the suitable drill for economic drilling with satisfactory performance.

Objective

1. To examine the one of a kind drilling rameters consisting of spindle velocity, feed charge influences the drilled hollow surface roughness top in the course of drilling of Al/SiC-MMC.
2. To determine the most significant parameters for effective drilling of Al/SiC-MMC.

Important mechanical properties of Al/SiC-MMC are listed below.

Table 1: Properties of different materials in comparison to Al/SiC-MMC.

Property	Aluminium (6061-T6)	Titanium (6Al-4V)	Steel	Percentage of SiC particle		
				25	55	70
Coefficient of Thermal Expansion (10 ⁻⁶ /°K)	23	9.5	12	16.4	10.4	6.2
Thermal Conductivity (W/m.°K)	218	16	17	160-220	160-220	160-220
Density (g/cm ³)	2.77	4.43	7.76	2.88	2.96	3.00

II. LITERATURE REVIEW

From the past literature it is clear that some research work on the drilling of metal matrix composites have been carried out by the previous researchers but still a lot of applied research on drilling of Al/SiC-MMC is required. So, to explore the successful utilization of the process parameters through appropriate setting of the drilling parameters and also to search out the effective drilling for achieving the critical fulfillment and economy in unit production.

J. Paulo Davim¹, Pedro Reis, C². Conceicao² Antonio studied that the effect of cutting parameters such as cutting speed, feed rate and the effect of metal matrix composite under the specific cutting force, surface roughness (Ra) during drilling of FRP.

C. Murphy, G. Byrne, M. D. Gilchrist⁶ studied that the effect of coatings on the performance of tungsten carbide drill during drilling by carbon fibre-reinforced epoxy material.

Ramula, P. N. Rao⁷, H. Kao studied that during drilling on 10 vol.% and 20 vol.% Al/Al₂O₃ based metal matrix composites using HSS, carbide tipped and polycrystalline diamond drills. The drilling forces were recorded by dynamometer.

B. W. Huang, H. K. Kung, A. W. L. Yao⁹ studied that On the dynamic instability, effect on drilling force in the drilling process.

Hiroki Endo and Etsuo Marui¹⁰ studied the effect during drilling of 1 mm dia. holes on two typical engineering plastic sheets. The shape of drilled hole was studied using optical micrometer. The drilling accuracy i.e. radius error was estimated by calculating the least square circle.

A. Manna, B. Bhattacharyya^{5,11} investigated on the different tooling arrangements used to machineing on aluminium 10 vol% SiC based metal matrix composite (Al/SiC-MMC). The effect of timing in cutting and time of machining length on tool wear and the effect of cutting speed, feed rate, depth of cut, tool inclination angle in tool holder on the surface finish was established for each of the tooling system.

A. Manna, B. Bhattacharyya^{5,12,13} investigated, the machinability of silicon carbide particulate aluminium based metal matrix

composite during turning operation using fixed rhombotic tools. The effect of machining parameters, such as cutting speed, feed rate and depth of cut on the cutting force and surface roughness.

Shiva Kalidas, Shiv G. Kapoor Richard E. DeVor^{14,15} develop a finite element thermal model for obtaining the temperature formation over the entire work-piece due to heat, evolved at the cutting lips, chisel edge and drill margins during drilling.

A studied on drilling on casting through squeeze processes Magnesium-MMCs consisting of an AZ91 magnesium alloy with 20 vol.% δ-Al₂O₃ short fibres and 20 vol.% carbon fibres metal matrix composites by K. Weinert, M. Lange, V. Petzoldt.

III. EXPERIMENTATION

3.1 Assigning the Cutting Variables in Drilling

Assigning suitable cutting variables in drilling and enlarging holes for concrete machining conditions (work material, tool material and geometry, surface finish requirements, machine tool in which the job is to be done, etc.) amounts to a determination of a feed and cutting process will be the most productive and economical.

The order in which the cutting parameters are selected:

1. The rate of feed is selected in accordance with processing and mechanical factors (required surface finish, type of machining, drill strength, etc.) from tables given in various handbooks. The feed is corrected, if necessary, to suit the kinematics data of the machine (the next smaller available feed is taken).
2. The cutting speed permitted by the cutting capacity of the drill is calculated for the given drill life. In drilling

$$v_t = \frac{C_v D^{z_v}}{T^m s^{y_v}} K_v \text{ m per min}$$

In enlarging hole with a drill

$$v_t = \frac{C_v D^{z_v}}{T^m t^{x_v} s^{y_v}} K_v \text{ m per min}$$

where

C_v = constant factor for characterizing the material being drilled and the machining conditions

D = drill diameter, mm, T = drill life, min, s = feed, mm/ rev, t = depth of cut in enlarging holes, mm, m = exponent of relative drill life, z_v , x_v and y_v = exponents

K_v = general correlation factor for taking into account all other concrete machining conditions differing from those for which C_v is given.

3. The spindle speed (rev/min) is calculated for the determined cutting speed by the formula

$$n = \frac{1000v_t}{\pi D} \text{ rpm}$$

The corrected rotational speed n_a is used to calculate the actual cutting speed at which the drilling job is to be done. Thus

$$v_a = \frac{\pi D n_a}{1000} \text{ m per min}$$

- The speed and feed are checked in respect to the strength of the weakest links in the main drive and feed mechanisms.
- The machining time is calculated from the finally accepted values of n_a and s .

In determining v_t , F and N_{cut} , the pertinent tabular data of handbooks can be used, taking into consideration the required correction factors.

Table 2: Values of C_v , m , z_v , y_v and x_v in drilling

Work and tool materials	Type of machining	Feed s , mm/rev	Factor and exponents				
			C_v	m	z_v	y_v	x_v
Structural carbon steel, $\sigma_t=75$ kgf/mm ² , Bhn 215	Drilling	≤ 0.2	7	0.2	0.4	0.7	-
		> 0.2	9.8	0.2	0.4	0.5	-
High speed steel P18	Enlarging holes	-	16.2	0.2	0.4	0.5	0.2
Grey cast iron, Bhn 190	Drilling	-	34.2	0.2	0.45	0.3	-
Cemented carbide BK8							

Different test for drilling were conducted on Al/SiC-MMC by using automatic feed Drilling Machine. Table-3 shows that, the detail about of machine tool, work-piece and different drill bits used in experimentation. Table-4 shows that, the different factor for the investigation. The Taguchi method based robust design $L_{25}(5^6)$ orthogonal array was used to investigate. For measuring drilled hole surface roughness, each test sample was cut into two pieces along the centre line of each hole. So that inner surface does not get damaged. Surfcom 130A surface measuring instrument was used to measure the hole surface roughness. For each half-hole surface, three readings were taken in different locations, i.e. at entry of the hole, middle of the hole and at exit of the hole along direction of drilling.

Table 3: Details of experimental conditions

Machine Tool	HMT manufactured Radial drilling Machine with automatic feed system
Twist drills, 118° point angle	(i) Carbide tipped drill (size : 6.50 ϕ mm), (ii) Pure carbide drill (size : 7.5 ϕ mm), (iii) Nitrite coated drill (size : 7.00 ϕ mm), (iv) Co-Ti coated drill (size : 7.00 ϕ mm), (v) HSS drill (size : 7.00 ϕ mm).
Work-piece	Al/SiC-MMC: 15% volume fraction SiC particulate reinforced with Al-metal matrix composite, APS: 34 μ m.
Cutting Fluid	Not used

Table 4: Drilling parameters and their levels

Parameters, their symbols and units	Parametric Levels				
	1	2	3	4	5
Vc : Spindle Speed (rev/min)	100	400	700	1000	1300
F : Feed rate (mm/rev)	0.025	0.225	0.425	0.625	0.825

3.2 Taguchi Method based Design used for Experimentation

According to the Taguchi method, $L_{25}(5^6)$ orthogonal array was used to experimental investigation. Table 8 shows the $L_{25}(5^6)$ orthogonal array.

Table 5: The $L_{25}(5^6)$ orthogonal array

Experiment Number	Column					
	1	2	3	4	5	6
1	1	1	1	1	1	1
2	1	2	2	2	2	2
3	1	3	3	3	3	3
4	1	4	4	4	4	4
5	1	5	5	5	5	5
6	2	1	2	3	4	5
7	2	2	3	4	5	1
8	2	3	4	5	1	2
9	2	4	5	1	2	3
10	2	5	1	2	3	4
11	3	1	3	5	2	4
12	3	2	4	1	3	5
13	3	3	5	2	4	1
14	3	4	1	3	5	2
15	3	5	2	4	1	3
16	4	1	4	2	5	3
17	4	2	5	3	1	4
18	4	3	1	4	2	5
19	4	4	2	5	4	1
20	4	5	3	1	3	2
21	5	1	5	4	3	2
22	5	2	1	5	4	3
23	5	3	2	1	5	4
24	5	4	3	2	1	5
25	5	5	4	3	2	1

In the study, different drill bits were used to analyze the surface roughness height. different graph have been plotted to analyze the effect of speed and feed rate on the surface roughness height.

3.3 Experimental Results and Discussion for Surface Roughness Height

Table 6 shows the experimental setup of $L_{25}(5^6)$ orthogonal array with experimental results of surface roughness height, (R_a , μ m) during drilling on Al/SiC-MMC. From the table, it can be seen that carbide drill and nitride coated drill give comparatively low

surface finish values among all five different drill bits.

Table 6: Drilled hole surface roughness height, Ra (μm) in different drill bits

Spindle Speed (rev/min)	Feed (mm/rev)	Surface Roughness, Ra (μm)				
		Car-bide Tipped drill	Car-bide drill	Ni-tride-coated drill	Co-Ti coated drill	HSS drill
100	0.030	4.430	0.917	0.606	2.098	3.750
300	0.230	5.212	1.129	1.110	1.753	3.800
600	0.430	4.790	0.302	0.630	2.187	1.318
900	0.630	6.070	1.051	1.430	3.280	2.160
1200	0.830	8.100	1.372	1.120	3.668	3.440
100	0.230	5.870	1.015	0.510	2.713	3.590
300	0.430	6.800	0.368	1.410	2.289	3.410
600	0.630	3.680	0.438	1.830	2.887	1.837
900	0.830	6.950	1.295	1.370	3.510	2.430
1200	0.030	5.860	0.284	0.257	2.493	1.620
100	0.430	5.400	1.186	1.960	2.817	3.730
300	0.630	6.843	0.494	1.590	3.174	3.400
600	0.830	7.520	1.627	1.890	3.718	2.232
900	0.030	4.440	0.385	0.430	0.825	1.390
1200	0.230	6.050	0.683	0.530	3.180	1.780
100	0.630	6.580	1.465	2.070	2.886	3.600
300	0.830	5.760	0.780	1.670	4.237	3.860
600	0.030	4.230	1.240	1.730	1.012	1.920
900	0.230	5.118	0.570	0.937	2.431	1.580
1200	0.430	6.520	0.909	1.920	2.870	2.170
100	0.830	5.800	2.126	1.370	3.816	4.680
300	0.030	4.600	1.072	0.587	1.431	3.350
600	0.230	5.850	1.238	1.190	1.786	1.637
900	0.430	4.250	0.876	1.230	2.258	1.539
1200	0.630	6.480	1.211	0.760	3.940	2.460

3.4 Graphical Representation of the Effect of Parameters on Surface Roughness Height

From the figure 1, it is clear that the surface roughness height value increases with increase in feed rate.

From the figure 2, it shows that the surface roughness height value increases with increase in feed rate.

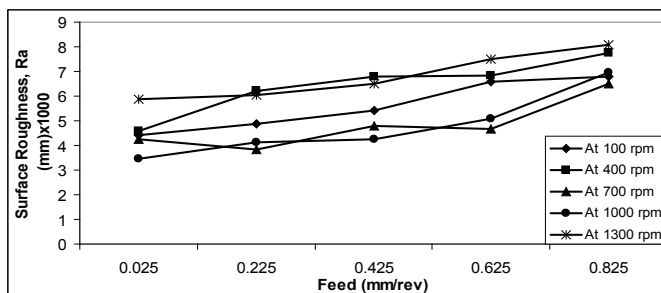


Fig. 1: Feed rate vs surface roughness height at different spindle speed using carbide tipped drill

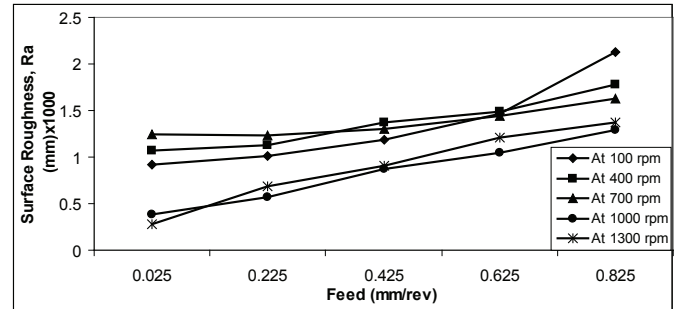


Fig. 2: Feed rate vs. surface roughness height at different spindle speed using carbide drill

From the figure 3, it shows that the surface roughness height value increases with increase in feed rate.

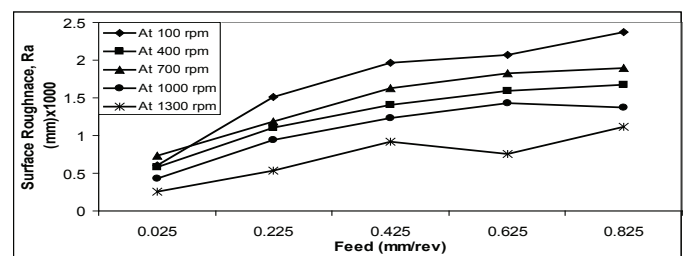


Fig. 3: Feed rate vs. surface roughness height at different spindle speed using nitride coated drill

From the figure 4, it shows that the surface roughness height value increases with increase in feed rate.

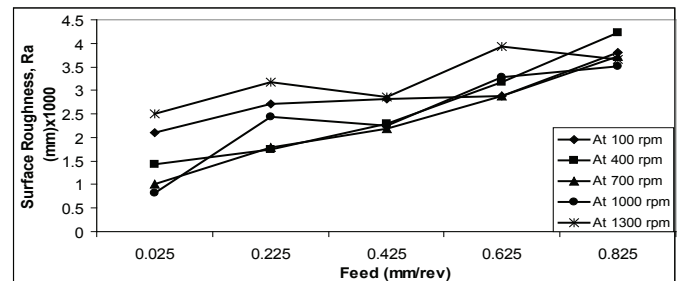


Fig. 4: Feed rate vs. surface roughness height at different spindle speed using Co-Ti coated drill

From the figure 5, it shows that the surface roughness height value slightly increases with increase in feed rate.

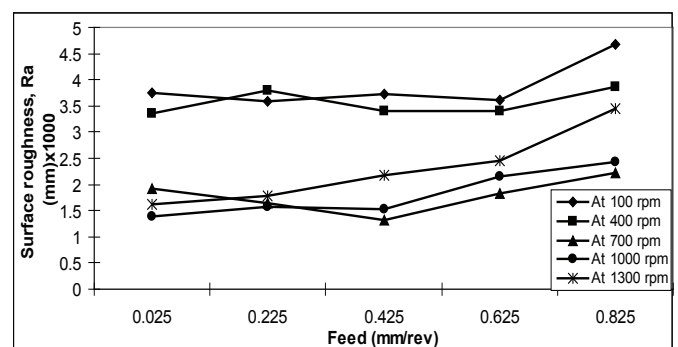


Fig. 5: Feed rate vs. surface roughness at different spindle speeds using HSS drill

3.5 Signification by ANOVA Test and Effectiveness of Parameter for Drilled Hole Surface Quality

3.5.1 ANOVA for Carbide Tipped Drill

Table 7 shows the ANOVA and “F” test shows values with percentage of contribution i.e. effectiveness of the individual drilling parameters on surface roughness height (R_a , μm).

From the ANOVA table 7, it shows that both the parameters e.g. spindle speed and feed rate has significant effect on the surface roughness height. Also shows that, The feed rate has most significant effect on the surface roughness height and spindle speed has significant effect on the surface roughness height with 48.6386% and 38.0377% contribution respectively during generation of drill holes on Al/SiC-MMC.

Table 7: ANOVA for Surface Roughness height, R_a by utilizing carbide tipped drill

Parameters and their symbols	Sum of Squares	Degree of Freedom	Variance	F_0	$F_{0.05, v1, v2}$	% of Contribution
A : Spindle Speed (rev/min)	51.47865	4	12.86966	70.66421	3.5	38.0377
B : Feed Rate (mm/rev)	65.82541	4	16.45635	90.35785	3.5	48.6386
A x B	8.925465	16	0.557842	3.062973	3.5	6.5951
Error	9.106211	50	0.182124			6.7286
Total	135.3357	74				100.0000

Correlation coefficient, $R^2 = 0.866763$

3.5.2 ANOVA for Carbide Drill

From the ANOVA table 8, it shows that spindle speed and feed rate both the variables has significant effect on the surface roughness height. Also shows that, The feed rate has most significant effect on the surface roughness height and spindle speed has significant effect on the surface roughness height with 55.4311% and 35.8605% contribution respectively during generation of drill holes on Al/SiC-MMC.

Table 8: ANOVA for Surface Roughness height, R_a by utilizing carbide drill

Parameters and their symbols	Sum of Squares	Degree of Freedom	Variance	F_0	$F_{0.05, v1, v2}$	% of Contribution
A : Spindle Speed (rev/min)	4.463008	4	1.115752	25899.54	3.5	35.8605
B : Feed Rate (mm/rev)	6.898664	4	1.724666	40034.03	3.5	55.4311
A x B	1.081642	16	0.067603	1569.235	3.5	8.6911
Error	0.002154	50	4.31E-05			0.0173
Total	12.44547	74				100.0000

Correlation coefficient, $R^2 = 0.912916$

3.5.3 ANOVA for Nitride Coated Drill

From the ANOVA table 9, it shows that spindle speed and feed rate both the variables has significant effect on the surface roughness height. Also shows that, The feed rate has most significant effect on the surface roughness height and spindle speed has significant effect on the surface roughness height with 57.6894% and 37.1350% contribution respectively during generation of drill holes on Al/SiC-MMC.

Table 9: ANOVA for Surface Roughness height, R_a by utilizing nitride coated drill

Parameters and their symbols	Sum of Squares	Degree of Freedom	Variance	F_0	$F_{0.05, v1, v2}$	% of Contribution
A : Spindle Speed (rev/min)	8.403282	4	2.10082	29178.06	3.5	37.1350
B : Feed Rate (mm/rev)	13.05455	4	3.263636	45328.28	3.5	57.6894
A x B	1.16761	16	0.072976	1013.55	3.5	5.1598
Error	0.0036	50	7.2E-05			0.0159
Total	22.62904	74				100.0000

Correlation coefficient, $R^2 = 0.948243$

3.5.4 ANOVA for Co-Ti Coated Drill

From the ANOVA table 10, it shows that spindle speed and feed rate both the variables has significant effect on the surface roughness height. Also shows that, The feed rate has most significant effect on the surface roughness height and spindle speed has significant effect on the surface roughness height with 74.3546% and 13.5077% contribution respectively during generation of drill holes on Al/SiC-MMC.

Table 10: ANOVA for Surface Roughness height, R_a by utilizing Co-Ti coated drill bit

Parameters and their symbols	Sum of Squares	Degree of Freedom	Variance	F_0	$F_{0.05, v1, v2}$	% of Contribution
A : Spindle Speed (rev/min)	7.89783	4	1.974459	39711.6	3.5	13.5077
B : Feed Rate (mm/rev)	43.4747	4	10.86866	218597.	3.5	74.3546
A x B	7.09436	16	0.443398	8917.89	3.5	12.1335
Error	0.00248	50	4.97E-05			0.0043
Total	58.4693	74				100.0000

Correlation coefficient, $R^2 = 0.878623$

3.5.5 ANOVA for HSS Drill

From the ANOVA table 11, it is shows that spindle speed and feed rate both the variables has significant effect on the surface roughness height. It also shows, The feed rate has significant effect on the surface roughness height and spindle speed has most significant effect on the surface roughness height with 12.3723%

and 80.4506% contribution respectively during generation of drill holes on Al/SiC-MMC.

Table 11: ANOVA for Surface Roughness height, R_a by utilizing HSS drill bit

Parameters and their symbols	Sum of Squares	Degree of Freedom	Variance	F_0	$F_{0.05, v1, v2}$	% of Contribution
A : Spindle Speed (rev/min)	58.1989	4	14.54974	840.739	3.5	80.4506
B : Feed Rate (mm/rev)	8.95024	4	2.237561	129.295	3.5	12.3723
A x B	4.32673	16	0.270421	15.6259	3.5	5.9810
Error	0.86529	50	0.017306			1.1961
Total	72.3412	74				100.0000

Correlation coefficient, $R^2 = 0.928229$

IV. RESULTS AND DISCUSSION

Table 12 represents the performance study report for different drill bits during drilling on Al/SiC-MMC without use of coolant.

Table 12: Table represents the comparative performance study report for different drill bits

S. No.	Drill bits	Type and cutting angle	Drilling performance
			Drilled hole surface roughness height
1	Carbide tipped	Twist drill; 118°	Carbide tipped drill provides very poor surface finish at all parametric combinations e.g. the value of surface roughness height, (R_a , μm) is only 3.44 μm at spindle speed of 1000 rev/min and feed rate of 0.025 mm/rev where as R_a is high as 8.1 μm at spindle speed of 1300 rev/min and feed rate of 0.825 mm/rev.
2	Carbide	Twist drill; 118°	Carbide drill provides very good surface finish at all parametric combinations, e.g. the value of R_a is only 0.284 μm at spindle speed of 1300 rev/min and feed rate of 0.025 mm/rev but at spindle speed of 100 rev/min and feed rate of 0.825 mm/rev the value of R_a is high as 2.126 μm .
3	Nitride coated	Twist drill; 118°	Nitride coated drill provides very good surface finish at all parametric combinations, e.g. the generated R_a , the value of R_a is only 0.257 μm at spindle speed of 1300 rev/min and feed rate of 0.025 mm/rev where the value of R_a is high as 2.37 μm at spindle speed of 100 rev/min and feed rate of 0.825 mm/rev.
4	Co-Ti coated	Twist drill; 118°	During using Co-Ti coated drill, it provides poor surface finishing at all parametric combinations, e.g. the value of R_a is only 0.825 μm at spindle speed of 1000 rev/min and feed rate of 0.025 mm/rev where as at spindle speed of 400 rev/min and feed rate of 0.825 mm/rev the generated surface roughness height, R_a is high as 4.237 μm .
5	HSS	Twist drill; 118°	HSS drill provides poor surface finishing at all parametric combinations, e.g. the generated surface roughness height, the value of R_a is only 1.318 μm at spindle speed of 700 rev/min and feed rate of 0.425 mm/rev where as generated R_a is high as 4.68 μm at spindle speed of 100 rev/min and feed rate of 0.825 mm/rev.

V. CONCLUSIONS

Based on experimental results of drilling on Al/15%Vol.SiC-MMC using different carbide tipped drill, carbide drill, nitride coated drill, Co-Ti coated drill and HSS drill, the following conclusions are as follows:

By using Carbide drill and nitride coated drill, its provides minimum surface roughness height at all parametric setup as compared to the carbide tipped drill, Co-Ti coated drill and High Speed Steel drill.

By using carbide drills, the feed rate and spindle speed has most significant factors and these are significantly effect on the surface roughness height with contribution of 55.44 % and 35.85% respectively.

By using nitride coated drill, the feed rate and spindle speed has most significant factors and significant effect on the surface roughness height (R_a) with contribution of 57.69 % and 37.13 % respectively.

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