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Editorial Note

Thomas Edison told "I haven't failed, I have just found 10,000 ways that won't work". Research is a systematic search or investigation of knowledge through scientific methods for formulating hypothesis and making deductions based on data. An open minded good researcher usually adopts a critical way of analysing problems and should possess the skills of perseverance and tenacity. A good research which comprises classification techniques using probabilistic modelling and machine learning can lead to a decision support system which can help solving societal problems.

The objective of Technology and future is to publish up-to-date high quality and original research papers and reviews. As such, the journal aspires to be vibrant, engaging and accessible and at the same time integrating and challenging.

This issue features a series of innovative articles such as Evaluation and identification of traffic bottlenecks through orgin and destination study, Credit card fraud detection, Boon: bully off of the net, Road cleaning car, Frontline support rover, Smart hybrid bike, Rodent activity detector for motion detection and analysis, College enquiry chatbot, Automated weed controller.

We would like to take this opportunity to thank all the authors for submitting their papers to Technology and Future journal of Science and Technology and to the esteemed peer reviewers who ensured the articles were of the expected quality.

Editor

Chief Editor

EVALUATION AND IDENTIFICATION OF TRAFFIC BOTTLE NECKS THROUGH ORGIN AND DESTINATION STUDY

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ABSTRACT

Road traffic in India is heterogeneous in nature. It includes both fast-moving motor traffic and archaic modalities like animals driven by vehicles. Automobiles, small vans, various commercial trucks, buses, scooters, auto-rickshaws, motorcycles, etc. make up the majority of the motor traffic. Urban streets have a lot of pedestrian traffic because of the dense population. Due to the low speed of certain vehicles, the road capacity is adversely affected and severe congestion occurs. Bottleneck identification is one among the best methods that could be employed by traffic engineers for the judicious allocation of resources for transportation improvements. The reported study is conducted in Kondotty Town, Kerala, India, which already suffers from congestion; and that is predicted to turn worse with the imminent developments planned over the next fifteen years. The traffic problems within the town are too complicated to offer any simple solution. But a great deal can be achieved by the proper application of traffic engineering techniques. The growth of traffic flow and the scarcity of shortfalls in the existing traffic system resulting in traffic chaos and congestion demand proper traffic studies and transportation planning for the town. The results of the study provide an insight into the complexity of vehicular interaction in heterogenous traffic. The objective of the study is to assess the existing road network and identify and evaluate the traffic bottlenecks using the origin-destination characteristics.

Key words: *Traffic bottle necks, Traffic volume and speed, origin and destination matrix*

I. INTRODUCTION

Traffic congestion is a condition on transport networks that occurs when use increases; that results in slower speeds, increased vehicular queuing, and longer trip times. When the communication between vehicles moderates the speed of the activity stream, congestion occurs. When vehicles are fully stopped for periods of time, it is colloquially known as a bottleneck. A traffic bottleneck may be defined as a localised disruption of vehicular traffic on a highway. A bottleneck may occur due to a specific physical condition such as the design of the road, sharp curves etc., and of temporary situations, like vehicular crashes. Owing to the study area's enormous traffic attractions, it is necessary to prepare a long-term transportation plan for Kondotty so that traffic problems and transportation demand in the study region can be addressed for the next decade. The specific issues of the region have been identified and could be solved by proper management of traffic and transportation, relocation of certain land uses, regulation and control of vehicles and pedestrians, and improvement of junctions by properly

designed channelizers, dividers, and traffic islands. Technical problems associated with road cross sections, the vehicle transport network, pedestrian facilities, parking, and traffic control are discussed, and practical remedies are suggested in this reported study. This study was done in association with the "Transportation Planning for Kondotty Town" conducted by NATPAC.

II. PREVIOUS RESEARCH WORKS

Hyunmyung (2018) investigated the estimation of origin-destination trip tables and proposed an O-D estimation model based on multiple field data sets. Recently, a wide range of traffic data has been made available. This study takes advantage of emerging technologies, car navigation systems, highway toll collecting systems, and link traffic counts to determine O-D demand. The proposed method is unique since these multiple data sets are combined to improve the accuracy of O-D estimation for an entire network. It is suggested that the model is a feasible means for more reliable O-D estimation.

Pranamesh Chakraborty and Partha Chakroborty (2017) studied short-period traffic counts and their efficiency in the case of Indian traffic, which uses Indian traffic volume data to methodically and extensively study the effect of four aspects related to the design of SPTCs. Madhu Errampalli and Ravinder Kayitha (2016) formulated a study on "Traffic Management Plan for Port Blair City, India" with an objective to work out a traffic management plan to ease the existing traffic problems in Port Blair and optimise the use of existing infrastructure, focusing on short-term remedial measures to improve traffic conditions. Ognjenovic (2015) conducted a study on traffic systems in urban environments that indicated that the traffic system performs a great extent in connection with the environment. The study accentuates the need to adopt an interdisciplinary approach for planning traffic networks, as each city and has its own specific traffic layout. The study also reports that it is not possible to arrive at universally applicable solutions, but rather it is essential to research and test the possible solutions.

Penmetsa (2015) conducted a study on "Evaluation of Performance Measures for Two-Lane Intercity Highways Under Mixed Traffic Conditions," which examines the applicability of various performance measures for two-lane highways under mixed traffic conditions and assigns threshold values for different levels of service based on the best performance measure observed. Graphical and statistical analyses were carried out among the six most popular performance measures and traffic volume, but none of the considered measures were found to be reliable. A new parameter, the number of followers (NF), which is defined as the number of vehicles travelling with a gap less than 2.6 s, was found to have a good correlation with traffic volume, though it does not reflect the true congestion conditions of a roadway.

NATPAC (2014) conducted a research study on "Transportation Planning for Harippad," which includes various traffic studies and surveys within the study area. The limits of the study area were identified with secondary data collection, and Indian standard codes were used for reference. Based on the study, the traffic problems were analyzed, and the worsening traffic over the past decade was identified. The study also included improvement proposals with short, medium, and long-term development schemes. Udit and Mandar (2013) prepared a report on "Traffic Surveying and Analysis". Traffic analysis being basically the process of intercepting and examining the number of vehicles on the road and deducing the pattern of traffic movement, the paper dealt with the types of surveys conducted on specific road sections of Nagpur City. The study presented a comparison of traffic densities and average velocity of traffic between the year of study

and previous years.

III. METHODOLOGY

The methodology for undertaking the reported study consists of a set of tasks as discussed:

- Start-up activities, site appreciation, and reconnaissance survey
- Data from a review of past study reports or development proposals
- Collection of data from secondary sources
- Design and conduct of primary surveys covering road inventory, traffic surveys including O-D surveys, parking studies at major transport terminals, pedestrian surveys, speed and delay studies, etc.
- Compilation, analysis, and interpretation of data to prepare a database of the town, its traffic and transportation scenario, and to elicit traffic and travel characteristics of the study area
- Estimation of traffic and transportation demand for future years, as well as identification of road network and major travel corridor deficiencies

IV. DATA DESCRIPTION

This section contains information about the data utilised in the study as well as specific data details.

A. Speed and Delay Survey

Speed and delay survey helps to evaluate congestion, capacity, level of service, and the need for improvements in the road network. A "moving-car-observer" method was used to determine the journey speeds and delays. For carrying out this survey, the road network was divided into different homogeneous sections, and test runs were made on these sections during peak and off-peak periods of the day to determine the travel speed of traffic. Corridors for speed and delay surveys were identified after a detailed reconnaissance survey.

B. Traffic Volume Survey

Knowledge of the traffic volume in a road network is important to understand the efficiency at which the system works and the general quality of service offered to road users. Classified traffic volume counts give the count of vehicles entering or leaving the study area. The survey was conducted for a duration of 12 or 24 hours, depending on the importance of the road. A summary of the classified traffic volume count at the outer cordon locations is shown in Table 1. The survey was conducted at (i) outer cordon points, (ii) mid-blocks on major corridors, and (iii) major intersections.

(i) Outer cordon volume counts:

Link volume counting on outer cordon points was required for establishing intercity goods as well as passenger movement covering external-internal, internal-external, and external-external trips. Outer cordon points on MDR, SH, and NH were considered for the volume count survey. The survey was carried out continuously for a period ranging between eight hours and 24 hours on a normal working day, depending on the importance of the road and intensity of traffic.

(ii) Mid-block volume counts:

The link volume survey was carried out at carefully selected locations on major and minor arterials of the road network. The traffic classification to be considered for volume count was based on a reconnaissance survey. The link volume survey was carried out continuously for a period ranging between eight hours and 24 hours on a working day, depending on the importance of the roads and the intensity of traffic.

(iii) Intersection turning movement counts: The capacity of intersections strongly influences the capacity of urban roads. As a result, the intersections are crucial for guaranteeing effective and smooth traffic movement across the network. To determine the morning and evening peak hour traffic

demands, the volume count at selected intersections was conducted for four hours each in the morning between 7.30 AM and 11.30 AM and in the evening between 3.30 PM and 7.30 PM. Total volume, composition of traffic, and turning characteristics were recorded for different types of vehicles for each intersection separately. The Indian Roads Congress (IRC) 64: 1990 conversion factors were used to convert the traffic flows into equivalent Passenger Car Units (PCU). The traffic composition of NH 966 during peak hours is depicted in Figure 1 below.

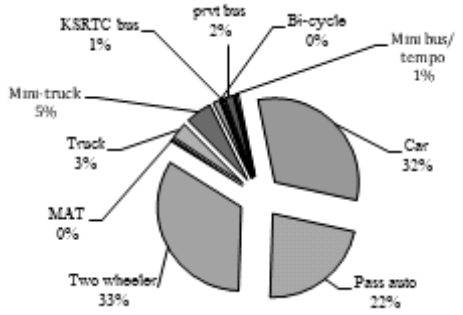

Fig. 1: Traffic composition of peak hours NH 966

C. Origin-Destination (OD) survey

The objective of this survey was to determine the origin and destination of external-external, external-internal, and internal-external passenger and goods movements across the external cordons. An analysis of these traffic movements will give the proportion of bye-passable traffic along with the major external interaction areas.

An OD survey at all the entry/exit points of the town was carried out continuously for a period ranging between eight hours and 24 hours on a working day, depending on the importance of the roads and the intensity of traffic. During the survey period, vehicles were stopped at random with the help of police at the major entry/exit points to collect information on trip origin and trip destination. Further information on the purpose of the trip and occupancy for passenger vehicles, as well as the commodity type and load carried by goods vehicles, was gathered.

D. Traffic Volume at Outer Cordon Points

A classified traffic volume count gives the count of vehicles entering or leaving the study area. The survey was conducted for a duration of 12 or 24 hours, depending on the importance of the road. A summary of the classified traffic volume count at the outer cordon locations is shown in Table 1.

Table 1: Summary of Traffic volume count at the outer cordon location

Peak hour traffic			
IN	OUT	Total traffic	
		Vehicles	PCU
1533	1236	2769	2544
1346	1331	2677	2650
580	417	997	939
659	594	1253	1005
817	878	1695	1483
1470	1780	3250	3076

V. DEVELOPMENT OF OD- MATRIX

From the OD matrix showing passenger movements in town, it is observed that maximum trip production and trip attraction are seen around the CBD of the study area (within Zone 3), followed by the northern and eastern sides of town.

According to traffic projections for the CBD region, the existing road network is not expected to be able to handle the volume of traffic in the upcoming year without updating the transport infrastructure facilities. Given the dramatic increase in traffic volume, strengthening and widening the existing road network, as well as the construction of alternate link roads, are essential.

VI. EVALUATION OF BOTTLE NECKS

The major intersections under the purview of this study have poor geometrics at present, and detailed junction improvement studies are

required for their rectification. An initial visual and physical analysis of the town itself reveals the following impediments encountered in the transport sector of the town:

- Inadequate width and capacity of roads
- Absence of scientific design for the intersections
- Poor geometry of the highways and roads
- Poor surface condition of the roads
- Haphazard on-street parking
- Inapt location of bus stops, auto stands, and taxi stands
- Lack of facilities for pedestrians and NMT users
- Encroachments by shops and vendors
- Ribbon Development: Concentration of all the public amenities and trip attraction centres like offices, hospitals, commercial centres, bus terminals, bus depots, etc. in a geographically small area of the town centre.
- Inter-mixing of local traffic with through traffic

VII. IMPROVEMENT MEASURES

The proposals to be considered in this regard are:

- Junction Improvement
- Provision of Parking Facilities
- Pedestrian Facilities
- Segregated bus bays and bus shelters
- Road signage and traffic control devices

A long-term transportation development plan is one of the strategies required to address the town's transportation needs in the ensuing 10 to 20 years. The long-term improvement proposals will include the development of missing links in the network of highways and transportation hubs that connect activity centres.

VIII. CONCLUSIONS

Traffic congestion occurs when a volume of movement or modular split demands more produces space than the accessible road limit. There are various specific conditions that cause congestion; some decrease the limit of a street at a given point or over a specific length, or increase the quantity of vehicles required for a given volume of individuals or goods. To analyse the current situation in the study area, various traffic studies and surveys were formulated. The structural conditions of road networks were found to have many defects, and they need to be improved for the better movement of traffic. The present capacity of the road networks is insufficient to handle the actual volume of traffic that is passing through them, especially during peak hours when it creates lots of bottlenecks. These improvement measures would reduce the number of bottlenecks, enhance the ease of transportation in the town, and hence make the lives of the people in the town easier.

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CREDIT CARD FRAUD DETECTION

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ABSTRACT

Today, as the majority of us use credit cards as a form of payment more regularly, CCF is a typical occurrence. This is a result of technological advancements and a growth in online transactions, which have led to frauds that have resulted in significant financial loss. Consequently, there is a need for efficient ways to lessen the loss. The user's credit card information is also stolen by scammers through the use of phone SMS and calls, as well as through phishing, masquerading, and other attacks. Using deep learning, the suggested approach assists in identifying credit card fraud. The system takes credit card transaction information as input and it results whether the given information is fraudulent or not. The various steps include Data Pre-processing, Feature Processing, Model Creation, Training, and Prediction. Data Preprocessing: here the unwanted columns and the non-values in the dataset are removed, Feature Processing: in this step the features are selected using Principal Component Analysis (PCA) and balances the unbalance dataset using SMOTE analysis, Model creation and Training: this step involves creation of CNN model and trains the model using the dataset, Prediction: Here the input data are predicted with the help of trained model. With the help of CCF detection system suspicious events or transactions are easily identified.

Key words: *Principal Component Analysis (PCA), SMOTE, CNN (Convolutional Neural Network)*

I. INTRODUCTION

Cyber security is becoming an increasingly important aspect of everyone's life as society moves toward the digital sphere. Finding unusual behaviour perhaps the biggest security challenge in modern life. Nowadays, most online purchases are made using credit cards. The credit limit on credit cards can occasionally enable transactions even when the whole amount is not immediately available, but on the other hand, cybercriminals abuse these characteristics. The challenge is to recognize fraudulent credit card transactions so that the customer of credit card companies is not charged for items that they did not purchased. To overcome this problem a system is required that can detect fraudulent transaction. Here, a system that can monitor all transaction patterns is required. If any pattern is irregular, the transaction should be identified and classified as fraud or not. There are numerous machine learning methods available now that can aid in classifying unusual transactions. The sole requirements are historical data and an algorithm that can fit the data more effectively.

II. LITERATURE SURVEY

In [1] Emmanuel Ileberi et al. proposed a system. Due to the development of new technologies and paradigms, including those in the e-commerce and financial technology (FinTech) industries, there has been an increase in financial fraud in recent years. Credit card transactions have increased as a result of these technologies' development. The number of cases of financial fraud involving credit cards has consequently

experienced a sharp increase. When a criminal uses a credit card in an unauthorized or undesired way, that behaviour is known as credit card fraud. This occurs when the authentication information for a credit card is taken via a variety of dishonest methods, such as intercepting an e-commerce transaction or cloning an existing card. Additionally, institutions including card issuers, merchants, and small companies are impacted by credit card fraud. Global losses from credit card theft were predicted to total $21.84 billion in 2015. Credit card losses were $28.65 billion in 2019. Implementing credit card fraud detection systems that can ensure the security and integrity of all systems involved in processing credit card transactions is therefore essential. Understanding the user's emotional response is essential to enhancing his enjoyment or sense of learning while playing interactive games. The instant gratification signals of identifying the player's emotions are frequently used in modern techniques. This method uses the player's heart rate (HR) signals and facial expressions to determine how they are feeling (FE). In this study, ongoing evaluation of emotional perception drives the continuous detection of HR and FE with films acquired by Kinect2.0. A convolutional neural network (CNN) is trained to read FE data, and bidirectional long and short-term memory (BiLSTM) is employed to learn HR features.

The SOM-BP network has been employed to combine HR and FE features, which are able to better visualize the player's emotions, in order to continue to satisfy real-time needs. For the four senses of "joy", "anger", "sadness" and "calmness" in different sports, experimental results demonstrate the model has excellent accuracy and low computation time. Additionally, HR value can be used to gauge emotional toughness. Here, it proposes a FE and HR-based non-communicative way of emotional recognition. The measuring method is unaffected, and player performance is unaffected because the video is recorded as video in the first place. Since HR cannot be constructed, unlike other brands, we are convinced that we will obtain accurate statistics. The camera further records FEs. In order to obtain more accurate findings, it also identifies player emotions within 30 seconds. Last but not least, employing HR values to gauge emotional strain might aid game designers in creating titles that heighten player awareness. Improvements will be done in the future with the aim of recognizing new emotions and designing, despite the system only being trained to see four fundamental senses and having higher lighting and temperature needs.

In [2] M. R. Dileep et al. proposed a system. When a firm takes precautions against whipped cash, goods, or amenities obtained through an unlawful credit card business, credit card scam detection is taking place. Customers and third parties can both commit CCF. Numerous approaches have been developed in order to prevent such frauds. If such scams occur, then methods for locating the improperly executed transactions are also devised. To protect digital data transfers against unwanted access, a number of creative and distinctive algorithms are presented. However, there are certain negative aspects in one way or another. This essay discusses techniques for identifying CCF.

There are several technologies available for identifying credit card scams. CCFD structure utilising Markov model is one of the early systems. Other widely used algorithms in the system for detecting credit card fraud include the cost SVM, the CSDT, the RF, etc. Additionally, proposed is the use of neural networks for CCF detection (CCFD). In the meantime, there are numerous different algorithms and techniques for carrying out the CCF detection system, as it is a highly explored topic. The current whale swarm

optimization approach is used by the neural network CCF detection system to arrive at an initial value. To correct the values that are discovered to be incorrect, it makes use of a back diffusion network. All of these processes face significant challenges, including deteriorating accuracy levels, competence gaps, and the inability to consistently distinguish between legitimate transactions and fraudulent ones. This CCF detection system uses the whale algorithm and smote approach to overcome these challenges.

In [3] Ashwini. M. Zinjurde et al. proposed a system. As a result of rapid advances in science and technology, potential technologies are being set up with solid protection. But there is always a justification to crack this security system on the other side. The customer must tap the ATM card as their first step. A webcam attached on the ATM automatically captures a live image, which is then matched to photographs previously stored in the database. An OTP will be delivered to the associated registered cellphone number if it matches. The customer must enter this randomly generated code in the text area. If customers enter a genuine OTP, then the transaction OTP will be issued to the corresponding registered mobile phone when this applies. This randomly generated code must be entered into the text area by the customer. Customers will proceed with the transaction after entering a valid OTP. The conversation can go on and on. As a result, the danger of theft is greatly reduced when a face-recognition algorithm and an OTP are used together, and the user is also relieved of the additional stress of having to remember complex passwords. The customer will first submit their credit card information, which will then be verified against the bank database. OTP is generated and sent to the customer following the verification process. The user will be prompted for facial authentication if the OTP has been verified. The camera face image will be gathered and transmitted in encrypted form to the bank servers for authentication. The image would be used for authentication after being decrypted in the database. Images are encrypted and decrypted using the RSA method. The Open-CV library file is integrated into Python and is used for scripting and other manipulations. The LBP algorithm is then employed to authenticate the face. The user's credit card will be examined to see if it meets the requirements, and if it does, the user will be able to make a charge or the payment will be cancelled, unless the identity matches the image kept in the database.

In [4] Sahil Dhankhad et al. proposed a system. In today's environment, both the use of credit cards and the scams associated with them have increased significantly. The technique used for detecting the fraud should be fast acting and monitoring concurrently. In this paper, five different learning techniques with predefined criteria that are supervised are compared. There are lots of challenges that comes along with machine learning. Initially, the imbalanced data set should be converted to comparatively balanced data set by using techniques like over sampling, under sampling, intrinsic method and network based method. Machine Learning is used where the computer learns to perform tasks from the experience provided.

In supervised machine learning, a training set of previous frauds is utilised to forecast future frauds. The numerous metrics used to compare the effectiveness of the models include sensitivity, precision, and time. In this paper, different supervised learning models like Decision Tree, KNN, Logistic regression, Naive Bayes and RF are used. DF is tree like predictive models which uses past input vectors to predict output for multiple classes. In k-Nearest Neighbour model, the similarity is calculated based on Euclidean distance. Logistic regression is a probabilistic predictive model that is used to resolve binary

classification issue. Random forest is used to solve regression and classification by combining multiple decision trees and taking the majority. Naive Bayes is a conditional probabilistic model that requires only small dataset for efficient working. In conclusion, Decision tree model is evaluated as the best model amongst the available models. The better classification was acquired by reducing the imbalance in data. Unsupervised Machine learning techniques should be used in future to get better results.

III. PROPOSED SYSTEM

To detect fraud in credit card transactions, the proposed method employs an artificial neural network. Based on pre-diction, performance is evaluated and accuracy is computed. Data preprocessing, feature extraction, model building, model training, and prediction are all included. The suggested solution makes use of an artificial neural network to identify fraud in credit card transactions. Based on prediction, performance is evaluated and accuracy is computed. It includes, data preprocessing, feature extraction, model creation, training and finally the prediction.

In the preprocessing stage, the dataset is collecting then removing the null values from it. After that removing the unwanted columns from the dataset. The dataset is imbalanced; it is important to balance it. So, SMOTE analysis is used to balance the dataset for better accuracy and correct prediction of the model. Feature selection is done by using principal component analysis. Here, 1D convolution network is used to create the model, and train the model using the training dataset. The model is saved after training it. Then this model file is loaded in prediction phase to predict the fraud detection.

A. Dataset

We obtained the dataset from Kaggle. The information includes cardholder's credit card transactions from September 2013. The dataset is seriously out of balance, with frauds making up 0.172 percent of all transactions in the positive class. It only has numeric input variables that have undergone PCA transformation. Unfortunately, the original characteristics and any background information regarding the data cannot be supplied owing to confidentiality concerns. There are numerous characteristics; the feature "Time" includes the number of seconds between each transaction and the dataset's initial transaction. The transaction amount is represented by the feature "Amount," which can be utilised for example-dependent, cost-sensitive learning. The response variable, feature" Class," has a value of 1 in cases of fraud and 0 in all other cases.

B. Feature Processing

It is crucial to use attributes that enable effective categorization when building a CCF detection model. The dataset's 31 columns contain the features V1, V2, V28. The only features that have not been altered by PCA are" Time" and" Amount." V28 are the main components discovered using PCA. There will always be a glaring imbalance between minority (fraudulent) and majority (legal) class samples in whatever data that is captured. Any learning algorithm finds it challenging to pick up the characteristics of the minority class due to the uneven distribution of training data among classes. SMOTE is used to balance the training data's classes (Synthetic Minority Over-sampling Technique). SMOTE is one of the methods for increasing sample rates. SMOTE is one of the oversampling methods that generates synthetic samples to enhance the number of positive classes. The number of fraud incidents in our training dataset after applying SMOTE is equal to the number of typical transactions.

C. Training

Training enhances results using Convolutional Neural Net- work by detecting outlier transactions, which can be fraudulent

credit card usage, and adding features to the dataset using SMOTE sampling approach. We will include both valid and fraudulent past transactions as input throughout the training phase. The SMOTE method will be used to create synthetic frauds during the training phase in order to address the issue of unbalanced data.

We have presented a few features that can be produced from unprocessed features. We must convert features into a feature matrix in order to apply the CNN model. The CNN model will then be trained. Over fitting occurs during training, removing outliers and flattening the input data to create a single-dimensional layer on top of which the classification logic is created.

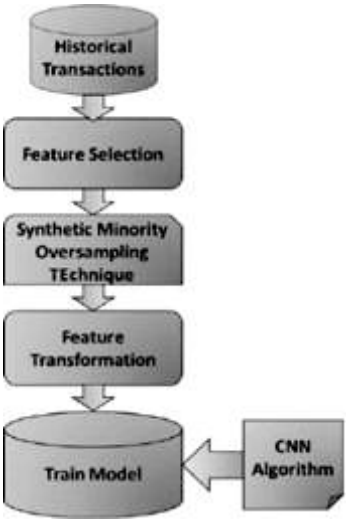

Fig. 1: Training Diagram ting and Prediction

To give the trained dataset to the neural network, the dataset has to be reshaped. Then the neural network model is loaded to predict. Testing is to validate the generalization performance of the trained neural network. To validate a classification technique, we need to compare the values provided by this technique to the observed values. We can use the ROC curve as it is the standard testing method for binary classification projects. ROC and AUC values are calculated. Comparison is done on the basis of random forest.

IV. RESULTS

The dataset is collected from the website Kaggle and the ROC and AUC values are calculated. Accuracy is obtained from the ROC curve. Here as shown in figure the accuracy of neural network classifier (1.0) is more than that of random forest classifier (0.979).

Accuracy = (T N + T P)/ (T P + T N + F P + F N) where

TP = True Positive.

TN = True Negative.

FP = False Positive.

FN = False Negative.

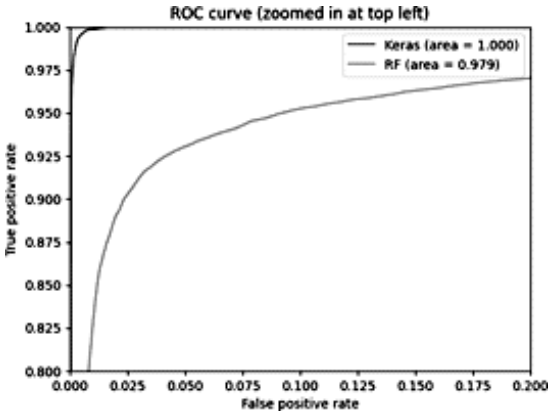

Fig. 2: ROC Curve

V. CONCLUSION

In this study, we put forth a deep learning-based technique for identifying credit card transaction fraud. The best method for detecting CCF in our model is to use an ANN, which provides accuracy close to 100%. It offers greater accuracy than unsupervised learning systems. From our proposed method the results obtained leads us to the

conclusion that Keras-based Deep Learning Neural Networks are a fantastic replacement for other classifiers. The suggested approach is quite effective in spotting fraudulent credit card transactions

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BOON: BULLY OFF OF THE NET

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ABSTRACT

Ever-increasing growth of social media, cyber- bullying has proliferated tremendously and its impact on people is detrimental. Real-world bullying is ephemeral. Cyberbullying, on the other hand, persists for a long time and is uncontrol- lable. Hence, it is more menacing than conventional bullying. Bully Off of the Net (BOON) is a mechanism that aspires to detect and tackle cyberbullying. The state-of-the-art methods for cyberbullying detection scrutinize messages solely on the basis of their contents. Our perspective is to take into account the context of a message and not just assess messages based on their contents. BOON takes as its input a compendium of messages exchanged between two users engaged in a conversation pertaining to a certain subject. The input conversation goes through a series of processing steps starting with data pre-processing which transforms raw data into a comprehensive format to accentuate the quality of data. It is followed by feature extraction in which Bag-of-words (BOW) and TF-IDF (Term Frequency - Inverse Document Frequency) algorithms are used for extracting appropriate features from the dataset. In addition, the polarity of each message is determined and stored in the database. Polarity is a manifestation of whether the message is bullying or not.

Feature extraction is followed by classification. Supervised ma-chine learning classification algorithms are applied. Multifarious classes are defined to segregate between different types of messages such as profane, age-based, gender-based, religion-based, ethnicity-based, cyberbullying, and cyberbullying-free. The output specifies whether the input conversation indicates cyberbullying or not. In the case of a cyberbullying incident, it also computes the severity of the incident as well as the nature of cyberbullying.

Keywords: *Boon, cyber- bullying Naive Bayes*

I. INTRODUCTION

Cyberbullying appertains to an act of inflicting pain on an individual or group, deliberately and incessantly, using social media. Contrary to real-world bullying which is a short one- to-one affair, cyberbullying involves hurtful messages that are long-standing. These messages can be read by anyone from every pocket of the world and are often irremediable.

As the digital sphere has expanded, cyberbullying has become increasingly common, in particular, among teenagers. Social media platforms are highly susceptible to cyber bullying since bullies may take advantage of the anonymity that these platforms offer. Bullying behaviour may include posting rumors, threats, profanity, sexual remarks, a victim's personal information, defamatory labels, and so on. Victims of cyberbullying are likely to experience diffidence, suicidal thoughts, and negative emotional responses, like being sad, scared, frustrated, angry, annoyed, and so forth. Unfortunately, there are no up-to-the-minute methods that can effectively tackle cyberbullying.

II. LITERATURE SURVEY

For the initialization of the work, a literature review was con- ducted by collecting and referring to some standard papers on sentiment analysis. A three-phase algorithm was proposed by Srinath et al. [1] called BullyNet, for unmasking cyberbullies on the Twitter social network. A robust method of exposing cyberbullying behaviour was proposed which revolves around the construction of a cyberbullying signed network (SN). A bullying score was assigned to each of the tweets based on their contents as well as the context. A centrality measure was used to identify cyberbullies from a signed network. This measure outperformed all the other existing ones.

A dataset comprising 5.6 million tweets was used for the experiment. The results reveal that this method could detect cyberbullies with high accuracy and at the same time, it was scalable with respect to the number of tweets. For the detection and prevention of bullying on twitter, a software was developed by Dalvi et al [2]. They have used SVM [8] and NB [9] model to predict the nature of the tweets. For this, they collected datasets from various sources like Kaggle, Github, etc. The primary step for the prediction was the collection of data. 55% of data set were used for training and 45% for testing.

For the experimental setup, Twitter API was used to fetch the tweets of the person. Fetched tweets then underwent pre-processing and for feature extraction TF-IDF vectorizer [12] was used. The processed tweets were then passed to the model and their probabilities were calculated to predict whether the tweet contained cyberbullying or not. The model was then evaluated based on different metrics. The experimental results showed that the accuracy for detecting cyberbullying content was greater for SVM with 71.25%. A technique was implemented by Islam et al. [3] to detect offensive messages. DT [10], NB, SVM and RF [11] were the machine learning algorithms used to classify the comments. The datasets were collected from Kaggle and contained Facebook and Twitter comments. In the first phase, datasets were collected and prepared for the machine learning algorithms using natural language processing. For feature extraction BoW [13] and TF- IDF [14] were used.

The processed text was then trained using the machine learning algorithms. The experimental results showed that TF-IDF outclassed BOW. Among the machine learning algorithms, SVM outperforms others. Jain et al. [4] used an approach for the detection of cyberbullying on social media using machine learning. Two major forms of cyberbullying were detected- hate speech on Twitter and personal attacks on Wikipedia, which were then classified as cyberbullying or not using classification. The approach includes four steps; selection of the dataset, pre-processing the data, feature extraction, and finally classification. Firstly, the letters were converted to lowercase and then contractions were expanded to their normal forms. Using the string library, all the punctuations were removed. Python NLTK [15] was used for performing tokenization, stemming, and removal of stop words. Tokenization results in meaningful tokens or words. Stemming converts, the tokens into their root words or stems. The irrelevant words were removed. Before going to the classification, the raw data is transformed into numerical features. Feature extraction is relevant for processing the natural language. For feature extraction BOW, TF-IDF, and word to vector were used [16]. After the formation of the feature vector, the classification process was done using classifiers like SVM, LR [17], RF, and Multi-Layered Perceptron [18]. The Twitter dataset showed F-measures above 0.9 for BOW, TF- IDF, and Word2Vec. TF-IDF combining Linear SVM showed the best

results. A survey was done by Salawu et al. [5] on approaches to the automated detection of cyberbullying. In the survey, they have discussed the search to locate the studies and the data abstraction used for categorizing them. The detection of cyberbullying is defined as the identification of bully-like online abuse, exchange of offensive materials through the online media, etc within an electronic medium and it includes four steps. Initially, the individual messages which are bullying are identified. Then the authenticity or severity of the bullying action was calculated, which is followed by the identification of the roles of each individual involved. The cyberbullying incident is classified after the incident occurs. Content-based features, sentimental-based features, user-based features, and network-based features are used for detecting cyberbullying. To sum it up, the paper encapsulates the research efforts on automatic cyberbullying detection.

III. METHODOLOGY

Fig. 1 illustrates the detection of cyberbullying from text using machine learning.

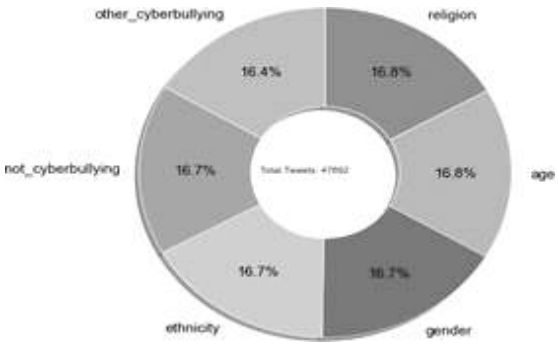

Fig. 1: Architecture Diagram

A. Data Acquisition

The dataset [6] used for constructing the machine learning model and evaluating model performance was obtained from Kaggle. The dataset specifically focuses on discerning what particular trait of the victim is the bully targeting namely age, ethnicity, gender, and religion. It comprises 47692 labelled tweets among which 70% are used for training the model and 30% for testing the model's accuracy.

B. Data Pre-Processing

Data pre-processing pertains to any kind of processing per- formed on raw data to transform it into a format that is more easily and effectively processed in data mining tasks. It is the most important and preliminary step in the data mining process.

In the pre-processing step, the following actions are per- formed. Fig. 2 illustrates this.

a. Punctuations are filtered out.

b. Duplicate tweets are removed.

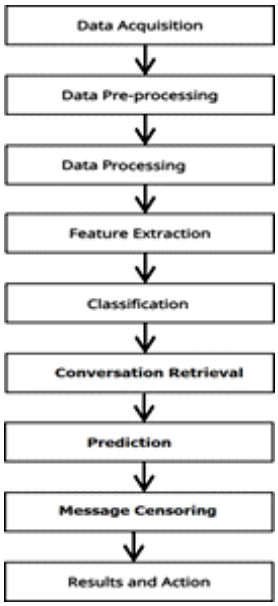

Fig. 2: Distribution of Tweets in the Dataset

c. Hyperlinks in texts are gotten rid of.

d. Stopwords in the documents are done away with. Stop- words are frequently used words in a language that carry paltry useful information.

e. @mentions, hashtags, escape sequences, special charac- ters, and multiple sequential spaces are removed.

f. Contractions are expanded.

g. Letters are converted into lowercase.

h. Lemmatization is performed. It is the procedure used to cluster the inflected forms of a word together so that they can be studied as a single entity, identified by the dictionary form of the word called its lemma.

C. Data Processing

3000 Duplicate tweets found after cleaning, were removed. The class 'other cyberbullying' was removed since it was unbalanced in comparison with the other classes. Afterward, the following operations were performed;

a. Tweet length analysis: An analysis of tweet lengths was performed and tweets that are too short (less than four words) or too long (longer than 100 words) were filtered out from the tweets.

b. Sentiment Column Encoding: The values of the sentiment column were designated with numbers (religion: 0, age:1, ethnicity: 2, gender:3, not cyberbullying:4).

D. Feature Extraction

In this step, the raw data is transformed into numerical features that can be processed while conserving the information in the original data set. The BOW approach is used for feature extraction. In this approach, a text is expressed as a collection of words and we consider each word count as a feature. The organization or the anatomical structure of words is not scrutinized

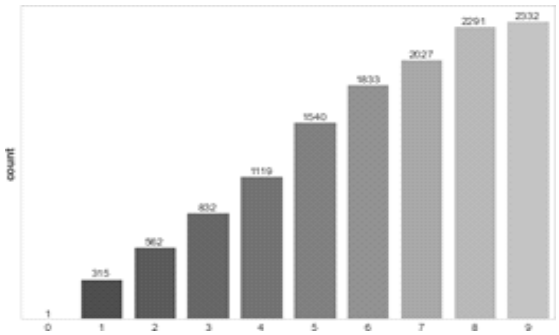

Fig. 3. Count of Tweets with less than 10 words

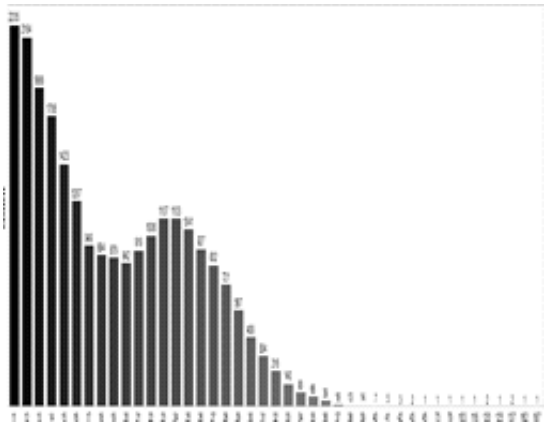

Fig. 4. Count of Tweets with High number of words

TF-IDF Vectorizer is used to vectorize the words. The key intuition that inspires TF-IDF is the fact that the relevance of a term is inversely related to its frequency. TF gives us information on how routinely a term appears in a document and IDF gives us information about the relative scarcity of a term in the collection of documents. TF-IDF Vectorizer helps us to cope with the most recurrent words. TF-IDF Vectorizer weights the word counts by a measure of their periodicity of appearance in the documents.

E. Classification

Before classification, oversampling is performed since the dataset is unbalanced. Oversampling involves duplicating examples in the minority class so that the class distribution of tuples is uniform. Hence, oversample the training set such that all classes have the same count as the most populated one. Subsequently, the dataset is subjected to a number of classifiers namely NB, SVM, DT, RF, and KNN.

F. Prediction

The conversation is fetched from the database. Using the aforementioned machine learning algorithms, the message type is predicted which can be profane, age-based, gender- based, religion-based, ethnicity-based, cyberbullying, and cyberbullying-free. Then, obscenity is censored. The censored

message, predicted class label, and a Boolean value 'Profane' indicating the presence of profanity (1- profane, 0 – not profane) are stored in the database.

G.Front End

The front-end of BOON is similar to that of any social-media chat application where users can create an account and indulge in conversations with another user. If cyberbullying is detected in a message sent by the user, a warning will be given to the user to discourage his action. If the message received by a user contains cyberbullying content, he/she is indicated the same. Obscene words in messages are censored. The victim is provided with the option to report the bully while anonymous.

IV. RESULTS

The performance of different classification algorithms is tabulated below. The Naive Bayes classifier yields the best results.

Table 1: Comparison of Results

Algorith	Accu	Precis	Rec	F1 Sco
K Neigl Classi	67.0	67.0	67.0 %	67.0 %
Multin NB	86%	86%	86%	85%
Decisio Classi	79.8	79.8	79.8 %	79.8 %
Random tClassi	81.6	81.6	81.6 %	81.6 %
Linear	81.0	81.0	81.0 %	81.0 %

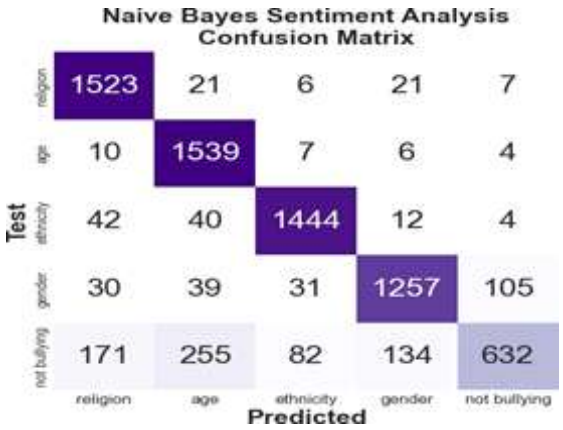

Fig. 5. Confusion Matrix

V. CONCLUSION

Cyberbullying poses a grave threat to the social media community. In this paper, we have presented a novel cyberbullying-detection mechanism, entitled BOON, which can be employed for unmasking cyberbullies. The primary motivation for BOON is the overwhelming potential of sentiment analysis. It identifies bullying messages within a communication exchange. It also estimates the severity of the bullying incident such as flaming, exclusion, defamation, and harassment in four content areas namely age, ethnicity, gender, and religion. BOON also recognizes the roles played by the individuals involved such as bully, victim, and reporter.

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ROAD CLEANING CAR

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ABSTRACT

Wastes are generally cleaned by traditional method. It involves sweeping using broom and collecting the waste. It involves human work. Sometimes large areas are needed to be cleaned daily. This will lead to many health problems to the workers who are cleaning and it is also time consuming. The introduction of Road Cleaning Car can reduce human effort on manually cleaning surroundings. Road cleaning car is used for cleaning the places covered with dust and wastes. It can be used to collect waste products from the surroundings. It is a car with a vacuum pump below it. When the car moves over the waste, it will suck the waste into a container inside the car. Wastes will be collected into the container and will be removed from it. The car can be controlled using a mobile phone. It will reduce time and will clean surroundings efficiently. It is easy to use and less time consuming.

Keywords- *Arduino UNO, Vacuum pump, Atmega328p, HC-05 Bluetooth module, SMF battery.*

I. INTRODUCTION

Technology has made human life simpler. With the introduction of various machines for different purposes, the speed of doing work has increased. Wastes are one of the biggest problem which today's world faces. Cleaning of wastes which occur gradually is an important factor. Methods for proper disposal of wastes are needed to be taken into consideration. With the introduction of technology, waste cleaning is simple.

Wastes are substances that are needed to be cleaned. If they accumulate in large quantities, it will lead to many health problems, rough smell etc. Technology helps mankind in a better way. It can change their lifestyle and save time. One such important product is the Road Cleaning Car. They are always exposed to dust. Health problems caused by these factors are of major concern. By using Road Cleaning Car, cleaning of wastes is simple. When the device runs over the waste, it will collect it and it can be disposed properly. The vacuum cleaner attached with the device is allowed to be turned on. It sucks the waste that is lying on the floor or ground. The wastes are then collected into a container in the vacuum cleaner. Since the Road Cleaning Car is controlled by using a mobile phone, we can control the device from a distance. Therefore, we will not be exposed to dust. The time spent in cleaning waste is reduced and help the workers in a better and efficient way. By using a machine for cleaning purposes, time is reduced on cleaning wastes.

The usage of this device can reduce time in cleaning waste and also help cleaners to clean wastes effectively and efficiently. We can see people cleaning wastes in our college, municipal buildings, parks, schools etc. The wastes they usually collect are leaves, paper, plastic etc. They usually use a broom for cleaning waste. They take much and more time for completing job.

II. HARDWARE DESCRIPTION

The Road Cleaning Car is a device that is controlled with the help of a mobile phone through a Bluetooth module located at the front of the rover. The Road Cleaning Car consists of an arduino, a relay, a 12V SMF

battery, a vacuum cleaner, two motors and a Bluetooth module. The 4 channel relay is connected to the arduino. The relay is used to switch functions for the rover to take forward, backward, left and right movements. Onto the relay, two motors M1 and M2 are connected. These two motors are attached with the two wheels at the front. These motors are used for the movements of the front tyres. The Bluetooth module is also connected with the arduino. The Bluetooth module is used to establish a connection with the mobile phone and the rover.

A 12V supply is used to provide energy to the whole setup. An SMF battery is used for this. The vacuum cleaner is connected with the battery. Vacuum cleaner is used to suck wastes from the ground.

The wiper motors are used for the two tyres at the front to make movements to front, back, left and right. The wiper motors move linearly only. In order to convert its function into rotary motion, additional shaft is provided and its function is altered.

A 4-channel relay is connected with the arduino. The relay is used to provide instructions to the two motors to take a turn or to move front and back. While taking turns, for example if we are taking a turn to the left, the left tyre is stopped and only the right tyre rotates and vice-versa. Certain programming is provided to the device through the arduino. The movement of the device is controlled with the help of a mobile phone through a Bluetooth module.

A. Processing Unit

a) Arduino Uno

The Arduino Uno is an important part of the road cleaning car. It is connected to all other components. It consists of 14 digital I / O pins and 6 analog I / O pins. The Arduino Uno has a built-in voltage regulator. Arduino Uno pins connect to relays and other parts to give each part the necessary instructions.

b) Wiper Motor

A wiper motor is a motor that can produce high torque and low speed. Inside the motor, there are metal gears that can generate rotational motion. There are additional gears used to move the car wipers. Additional gear is removed and the wiper motor function is converted to rotary motion.

For the movement of the wheels of Road Cleaning Car we have slightly modified the working the Wiper motor. The back and forth motion of the motor is converted into rotary motion. The wiper motor that we use here is of low speed and of high torque. The motor is of 12 volts and 3 Ampere capacity. The function of a move the rover slowly. The wiper motor can be used to

c) HC-05 Bluetooth Module

The HC-05 Bluetooth module is used for wireless communication. It is based on a master or slave configuration. Usage is simple. It can be used to pair a mobile device with the rover. The nominal frequency of the module is approximately 2.45GHz. Data transmission is about 1 Mbit/s. The range of this module is about 10 meters.

d) 4 Channel Relay

4-channel relays can be used to control high voltage and high current loads on motors, valves, etc. It can be combined with a microcontroller such as Arduino or PIC. The 4-channel relay module consists of four 5V relays. The relay can be connected to the Arduino and various switching commands for the rover part are provided via the relay.

e) Vacuum Pump

A vacuum pump is a device that sucks dirt from the floor. When powered on, the device creates a vacuum space and sucks up all the waste on the floor. The pump used here is 12V and sucks up dirt on the ground.

The pump is under the rover. As the rover moves over the debris, it sucks the debris off

the ground. The vacuum pump is turned on manually and can be turned on via a relay in the future.

f) SMF Battery

Sealed maintenance-free (SMF) batteries are also known as Valve Regulated Lead Acid (VRLA) batteries. These are heavy batteries and expensive. They are rechargeable. A sealed maintenance-free battery can be charged when the battery is low. The battery is heavy. They are impact resistant and heat resistant. The SMF battery is sealed. Therefore, no acid will spill during transportation. These batteries are used in UPS, rail communications, security systems, etc.

B. Software Unit

a) Arduino IDE

Open source Arduino software (IDE). Use it to write code and upload it to the board. Works on systems such as Windows, Mac OS X and Linux.

The rover motion program is coded in Arduino Uno using Arduino IDE software. The program language used is 'C'.

III. BLOCK DIAGRAM

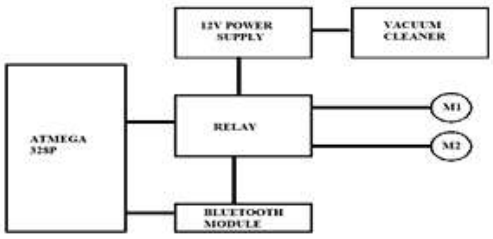

Fig. 1: Block diagram of the proposed work

The working of the product shown in fig.1 is explained below:

The forward, backward, left turn and right turn motion are controlled through the 12V DC motor with the help of a 4 channel relay. The switching of each relay can control the motor direction according to the controlling signal generated from the smart phone.

The command signal to switch the relay will be obtained from smart phone which is connected to Arduino with Bluetooth module. F, B, L, R and S are the command signals that are pre-programmed to perform the forward movement, backward movement, left turn, right turn and to stop the rover respectively. Input of the 4 cannel relay IN1, IN2, IN3 and IN4 are connected to the digital pins of Arduino 5, 4, 3 and 2 respectively. VCC and ground are connected to the +5V and GND pins of Arduino respectively. First two relays are used to control motor 1 (M1) and the rest of the two relays are used for motor 2 (M2). Motor terminals are connected with the common terminal (COM) of the 4 relays and the positive of 12V battery supply is given to the NC (Normally Closed) and negative terminal of battery is given to the NO (Normally Open).

The rover is controlled by using mobile phone. On enabling the Bluetooth of the mobile phone, we can connect the rover with the phone and start using it for the movements. With the use of an application named 'Arduino Bluetooth Terminal' we can control the device by assigning certain switches for the forward, backward, left and right movements.

A vacuum pump basically creates a vacuum by moving gas molecules from one region to the next, changing between high and low pressure conditions. When the molecule is removed from the vacuum space, further removal becomes exponentially difficult and the required vacuum power increases.

The pump is turned on and the rover is controlled with a mobile phone. As the rover moves forward it collects the waste on the ground and collects it in a chamber.

Arduino Bluetooth Terminal is an application that can be used to pair our mobile phone with the Bluetooth module on the rover. We are able to download this application on our android mobile phones from play store. Various buttons are present on this and we

can assign duty to each buttons like forward, backward, left and right. Therefore, we can move the device accordingly.

V. RESULTS

The Road Cleaning Car is a prototype model and all the devices are functioning properly. It was find out that, system works properly and all the features response according to their functions. The device is controlled by using an application on an android mobile phone.

We ran our device and it works properly in all aspects. The wiper motors, vacuum cleaner, tyres, arduino, relays, Bluetooth module, everything works properly and we got a good output. At first, there was a difficulty in choosing motors for the movement of our device. Motors were changed and suitable motors were assembled and used for the movement function. We first bought high torque motors with small pins. As their pins were of small size, it was not able to get connected with the tyres. At the beginning we used RF transceiver for the controlling of the rover. But later we realized the advantage of controlling the rover with the help of an android mobile phone.

We faced many difficulties during the assembling section of the device. Many RF modules were not working at the beginning. Later we chose Bluetooth module. At first, we chose to give control to all the four tyres. Later it was decided to control two tyres at the front only. There was a difficulty in selection of the tyres.

The main confusion occurred during the selection of the device for the vacuum process. First, blower with inverted function was taken into consideration. But we changed into a DC vacuum pump.

Proper clamping of the rover body is an important factor. There was a need to change the design of our rover. The body is now made of plywood. Proper clamps are given at each joint. Motors are located at two corners along with two tyres. The vacuum pump is clamped at the middle of the rover with a small ground clearance. This makes the vacuum cleaner to suck all the wastes ling in the ground. The suction of wastes depends on the power of the vacuum pump.

After lots of struggles and trials, we came out with a best output. Road Cleaning car is controlled with the help of a mobile phone. It can be allowed to move forward, backward, left and right with the help of a mobile phone.

The Road Cleaning car now collects wastes when it moves over a waste. It stores these wastes inside a container. The floor or road gets cleaned after the movement of the device over the waste. The slow movement of our device is a necessary function to clean an area efficiently.

VI. CONCLUSION

Technology is progressing day-to-day. With the improvement in technology, changes are getting introduced into the world. New innovations are given more importance. Machines have changed the lifestyle of humans. Methods to perform a task have been changed a lot in the present. Anything that reduces human effort is called as a machine. With the introduction of new technologies at different fields human efforts have been reduced. Technology made life simple.

The cleaning of waste is a task that was performed manually in the past. By the introduction of new technologies, waste cleaning has changed a lot. Various machines have been implemented to clean waste. The Road Cleaning Car is such a one. Machines that have been implemented in the present must also be eco-friendly. Above technology, the protection of our environment is necessary. In today's progressing world technology is one step ahead from all other fields. Technology has changed our living style. It has influenced us in many ways. It has become a part of lives. Life is made simple.

Workers who clean wastes can use the Road Cleaning Car to improve their work. They can efficiently clean areas with the help of our device. Using of our product reduces time spent in cleaning a place. The usage of remote for the controlling of our device has made things easy. As our product is a prototype, we can make new improvements in the future to get more output. For example, now we are placed a switch for manually turning on the vacuum cleaner. But in the future it can be switched on with the help of a remote. A sweeper can also be placed in front of the rover to get more output.

We can see people cleaning waste and dust by the traditional method. It will increase time for cleaning an area. By continuously cleaning dust, they can have many diseases. So Road Cleaning Car will be a useful device for them. It requires less time for cleaning. Road Cleaning Car made cleaning of waste an easier task.

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FRONT LINE SUPPORT ROVER

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ABSTRACT

In modern warfare, advanced weapons and new military technologies play a very crucial role in determining the success of the military. And day by day these technologies are advancing and are getting perfected. The use of unmanned vehicles is increasing in the military field which focuses on the strengthening of the military. Such an example of modern military technology is the use of unmanned ground vehicles. This paper describes the FLS (Front Line Support) Rover, a type of Unmanned Ground Vehicle. It's a mini-vehicle that is designed for military applications and hazardous situations. The FLS (Front Line Support) Rover has an inbuilt weapon system that can be used for attacking, defending and for patrolling, and the inbuilt sensors are for hazardous situations. The can be controlled by a remote. Since the size is very small the FLS Rover attains more mobility and has applications in various fields of the military.

The FLS Rover also incorporates a camera module which can send live feed video from the rover to a remote user via the internet. The camera system is connected to a Raspberry Pi module, which processes the live video for human detection. Thus the user will be able to get the live visuals and can control the rover.

Keywords- *Raspberry Pi, Unmanned Ground Vehicle*

I. INTRODUCTION

This paper deals with the designing and fabrication of a Front Line Support Rover (FLS Rover) which is the upgraded version of the CUGV (Compact Unmanned Ground Vehicle). This work aims to develop a front-line supporting rover for soldiers during combat and hazardous situations. It is very useful mainly in the defense sector. It can be used for surveillance, and distraction purposes, as a lead vehicle and as a mini rover for analysing a hazardous situation. It is very simple in construction and easy to operate and has a more stable performance than the CUGV.

It consists of a live camera setup, a turret system and operation supporting sensors. So the cost, compared to a huge rover, is less along with its maintenance cost. Many types of machines are widely used for this purpose, but they are working under different principles and the cost is also very high. The size of the machine is small, so it's highly mobile. This system also includes a portable remote system.

It's an unmanned ground vehicle controlled by RF signal remotely. The FLS Rover also has a built-in camera system and with the advancement in image processing, it can detect humans and human faces. It's 2 DC motors wired in a wheeled wooden platform with a turret system and a camera system placed on top of it and with an RF receiver connected to it which is interfaced to a programmed microcontroller and a microcomputer for additional data processing, which can control by a remote. By using the internet, the live video can be transmitted to the user. It makes surveillance easier and simpler along with live human detection.

Wireless and radio technologies have been at the heart of many disruptive businesses and activities. The modern military technology of today wants hassle-free and compact products, which can be used at any time or any place. Wireless is the possible solution to meeting the needs or wants of the

military, rescue, surveillance and related support requirements. This project will discuss one of the applications of RF signal and image processing. This project gives an in-depth look at how the different technologies are being used today and how it helps the modern military.

II. RELATED WORK

The technologies used in the Military sector are rapidly increasing and the use of unmanned vehicles can be viewed as an example. The technologies and the related are growing in such a way that in future there will be robots, autonomous & remotely controlled machines and rovers that will be aiding the military to attack, defend and monitor the Warfield. The advancement of technology also helps in creating devices that are helpful in a hazardous situation. These rovers can be used to get a view of an area or place where the humans will not be able to get. By integrating dedicated gas sensors, the presence of any poisonous gas can be detected. So, this helps the rescue team to take correct measurements & procedures to proceed in a rescue operation.

There are papers that deal with rovers which are unmanned and can be used for military applications. Those proposed rovers vary in functionality and complexity. Another field is the difference between the hardware and the software. There are a lot of microprocessors, microcontrollers and many alternative devices available in the market. The selection and the usage of these components vary on the requirements and based on the processing power. The programming language also varies on the application or it can be determined based on the type of chips used.

A target recognition algorithm applied to the unmanned ground combat platform in curve driving rover in a hazardous situation. A target algorithm that was a work proposed by J. Li et al. [1] which deals with an unmanned ground vehicle, which mainly focuses on the area of target recognition and positioning. They have used a powerful algorithm for the performance of the system with the help of a preloaded GPS module and powerful high-precision radar. This algorithm was able to solve the problem related to target missing and target misrecognition.

Designing and control of autonomous Unmanned Ground Vehicle is work done by S. Hassan et al. in their paper [2], that deals with a small UGV for military application. The system consists of APM 2.6 module, GPS module and basic electronic components for the driving and signals transmission of the rover. This rover also contains a camera module for live video transmission.

Advanced Anti-Terrorism Unmanned Ground Vehicle was another paper which was referred for this project. It was proposed by V. Gupta et al. [3]. It deals with a rover for controlling a large mob of protesters using a microwave beam named “Heat Ray”. So it helps to get rid of protesters. And their proposed rover was also able to diffuse an EMP.

Land Mine Detection Using Unmanned Ground Vehicle, was a paper presented by P. G. Shivani at al. [4]. Their paper deals with a wireless rover for land mine detection along with relocating them without any human interference. This is also a military-oriented rover, whose operations are controlled through Arduino UNO.

Mine detecting GPS-based unmanned ground vehicle was a paper by M. Yagimli at al. [5]. It is also a military rover dedicated to mine detection. With the integration of a GPS module, the rover can be tracked remotely.

III. PROPOSED WORK

Our project aims to create a prototype rover rover in a hazardous situation. A turret system is added to the rover which contains a demo weapon system, to show that the proposed system can be used for any attack and defense situations. The rover also contains a camera module and a Raspberry Pi module for video transmission, and human detection. The rover has a Metal detector which acts as a mine detector, and a gas

detector. The gas detector can be used to detect the various poisonous gas present in a place. The rover also has a smoke bomb. It is to distract the enemy soldiers in an open war field, or to provide a camouflage opportunity. The rover is controlled by a remote, and the live feed from the camera module is given to a smartphone.

IV. BLOCK DIAGRAMS

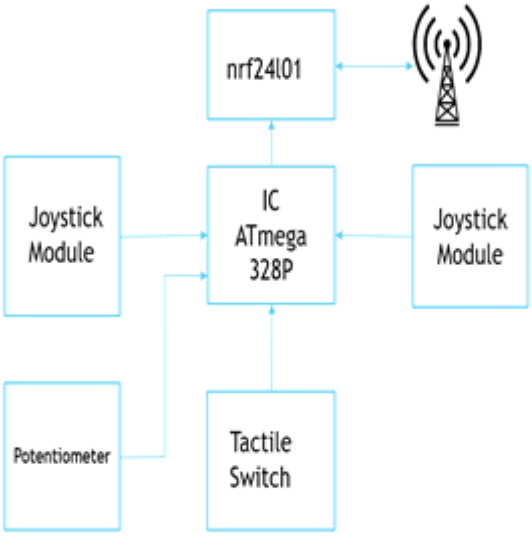


Fig. 1: Block diagram of remote

move according to the magnitude of push given to the joystick module. The other joystick is used to control the movement of the turret, and it can be controlled in X and Y directions. The turret system is two servo motor setup. The turret system holds the demo weapon of the rover. The Smoke bomb is built into the rover, so when the smoke trigger button is pressed on the rover the smoke bomb will explode with low heat and create smoke. The gas sensor senses the gas present in the area of operation of the rover and it will be notified on the screen of the user's smartphone. Since the rover is a prototype, for indicating the landmine detection.

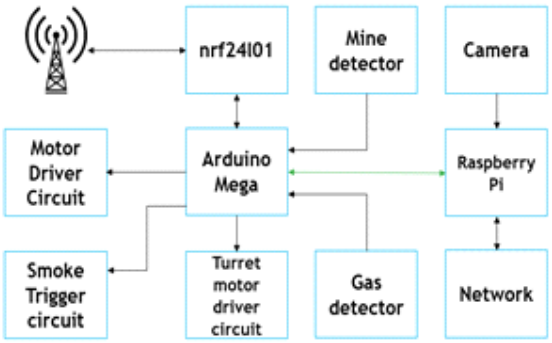


Fig. 2: Block diagram of remote

V. WORKING

The rover is controlled by a remote. The Remote contains 2 joystick modules, 1 potentiometer, and switches for providing the control signal of the rover. All these components are connected to the AT mega 328p microcontroller. The Communication is made with the rover via the nrf24l01 transceiver module, which works on microwave frequency. The microwave signals from the remote are accepted by the rover which has this same transceiver module, which is connected to the Arduino Mega development board. The Arduino Mega is the microcontroller board which controls the rover, which includes its motion, the motion of the turret and the working of various sensors that are interfaced with it.

When the throttle joystick of the remote is pushed, the rover will move. Since the speed controlling feature is implemented so the rove a metal detector is used for simulation.

The main part is the Raspberry Pi module and the camera module. It is for the live video transmission from the camera module and also for human detection which is able achieved through image processing. The video is transmitted over the network, with required security measures. The whole rover is powered by a Lithium Phosphate battery, which can provide enough power to all the modules and devices in the rover.

VI. HARDWARE & SOFTWARE

A. Hardware

- Raspberry Pi module
- Arduino Mega
- DC motor driver
- DC Motor
- Gas Detector
- Metal Detector
- Camera Module
- Servo Motor
- Buck Converter
- At mega 328p
- Joystick Module
- Battery Management system
- Battery
- MOSFET
- Op to-coupler
- Miscellaneous Components, that include resistors, capacitors etc.

B. Software

- Python for Raspberry Pi
- Arduino C for programming the Arduino mega and At mega 328p chip.

VII. CIRCUIT DIAGRAM

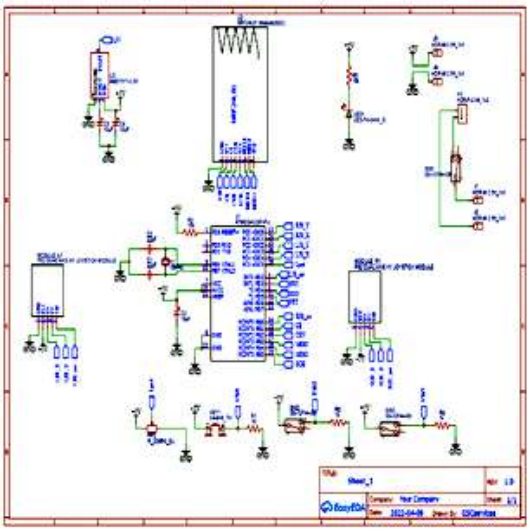


Fig. 3: Circuit diagram of remote

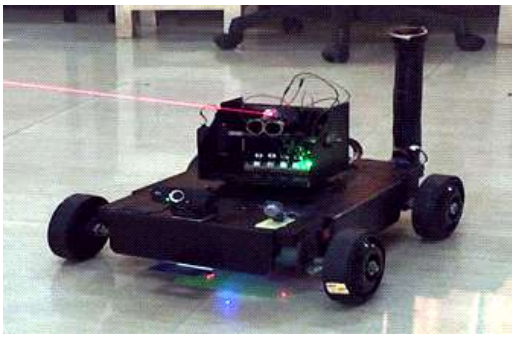
VIII. RESULTS

The Front line support (FLS) rover was developed and tested successfully. The live feed from the camera is processed in Raspberry pie using OpenCV and displayed with Sensor data and rover status in a smartphone display using VNC viewer.

IX. CONCLUSION

The modern military needs advanced and futuristic technologies that enhance the performance and efficiency of the military. The military protects our country from all internal and external enemies. So they need to transfer from traditional methodologies, and strategies and even from traditional weapons. If a country's military is technologically weak, then a small group of the technologically advanced battalion can easily defeat them. The advancement in unmanned and autonomous rovers and weapons can become a boon to the military. The application of currently available technologies will benefit the rescue team in a hazardous situation. So these technologies can be used to protect and save people from many dangerous situations.

The idea is to research, develop and perfect the modern technologies and pave the way for futuristic technologies, thus motivating young others to create and utilize technologies to save human lives. As a future enhancement, the rover system can be redesigned and reprogrammed to have autonomous capabilities with the integration of powerful and secured Artificial Intelligence. The robustness of the rover can be improved. The use of powerful, secured and efficient communication systems can be



used to transfer data between the remote and the rover.

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SMART HYBRID BIKE

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ABSTRACT

A Smart Hybrid Bike is proposed in this paper. The objective is to design and fabricate a two-wheeled hybrid two-wheeler from an old convention IC engine scooter and to switch between the two modes with the help of programming via a microcontroller. Thus, to inculcate both electric as well as IC engine and bring out a significant change for the society in terms of cost, pollution and quality of life by making use of green technology of electric BLDC hub motor and IC engine.

Keyword-*Automatic Hybrid Two-wheeler*

I. INTRODUCTION

The HEV stands for Hybrid Electric Vehicle means its battery could be recharged by means of plugging into an electric power source, as well as by its on-board charging. By the end of 2020, there were over 60 models of series production highway-legal plug-in hybrids for retail sales [1].

The First hybrid electric car was the Lohner Porsche Hybrid produced in 1899 [2]. The term "plug-in hybrid" has come to mean a hybrid vehicle that can be charged from a standard electrical wall socket. The term "plug-in hybrid electric vehicle" was given by UC Davis professor Andrew Frank called as the "father of the modern plug-in hybrid" [3]. Through the proposed system, establishing more modern and efficient bike. There is no cheap Hybrid bike so far. Even the available ones are too costly, so to cut off the cost think to make all these from scarps and converting into a smart hybrid bike.

II. LITERATURE REVIEW

Chyuan-Yaw Tseng et al. [4] proposes that a belt-driven design provides the CVT can be changed to allow the engine to turn at the RPM at which it produces the greatest power. Sheldon S. Williamson et al. [5] presents, Lithium-ion batteries use lithium compound as one electrode material, compared to the metallic lithium used in a non rechargeable lithium battery. The batteries are of high energy density, no memory effect (other than LFP cells) low self-discharge. The Chemistry, performance, cost and safety characteristics vary across LIB types. Lithium nickel manganese cobalt oxide (LiNiMnCoO2or NMC) offer lower energy density which brings up the need of PEM fuel cells in Electric Vehicles.

Van-Trang Nguyen et al. [6] proposes that the Hub motor is assembled to the front wheel of the scooter in such a way that all the task in the front side is done in such a way that the scooter doesn't undergo any imbalance while the motor runs at low or moderate speed. The motor controller is so adjusted in such a way that the initial torque does not cause any imbalance to the rider on the scooter. The hub motor is of a 48V 500W power with an initial rated torque of 7Nm and can go up to 20Nm which is around 300% of its rated torque while climbing uphill or similar activities. The advantages are high power to weight ratio, high speed, and electronic control.

III. DESIGN AND FABRICATION OF SMART HYBRID BIKE

The scooter was finalised according to the need and the transmission and this selection justified as it has a CVT technology which allows a smooth transition and also there is no return of power to the engine if the wheels are

spinning. The Hub motor is assembled to the front wheel of the scooter in such a way that all the task in the front side is done in such a way that the scooter doesn't undergo any imbalance while the motor runs at low or moderate speed. The motor controller is so adjusted in such a way that the initial torque does not cause any imbalance to the rider on the scooter. The hub motor is of a 48V 500W power with an initial rated torque of 7Nm and can go up to 20Nm which is around 300% of its rated torque while climbing uphill or similar activities. The screwing ad the materials used should be carefully planned to make equal weight distribution on both sides as it will cause instability while the scooter is taking a turn. The problem with stability while mounting the electric motor on the front side was eliminated by customizing the fork according to the centroid of the scooter.

The high torque doesn't make much of a problem as there is enough weight to balance the scooter as a turn is taken. The function of the motor controller is to be programmed in such a way to control the motor and its torque and rotation rpm while the throttle is given the motor controller is programmed to be fit for the motor that is mounted on the front side of the scooter. The motor controller is acting as a link between the battery and the motor and gives the input amperage to the motor according to the turning of the throttle. Specifications of the motor controller are the same as that the motor can carry as it is built to be in the same frequency and allowing the maximum amperage that the motor can carry.

The Lithium-Ion battery is mounted at the boot of the scooter. By doing so we can easily save space as well as there is space for both front and back passengers not compromising their leg resting space. Mounting the battery is of much concern as the lithium battery need much cooling as it is prone to explosion when it undergoes excess usage so proper cooling is needed for the lithium-ion batteries. A Battery Management System is used to prevent from over current, prevent overcharging and also overheating which can lead to electrical failure. The boot of the conventional scooter is modified to enhance ventilation and also prevent the battery from heating up. The lithium-ion battery is a 48 V 20ah battery which just adds up to 5kg instead of a lead-acid battery with the same specifications which can add up to a weight of 32 kg which reduces the load factor up to a factor of 0.9. The battery is a high-tech lithium-ion battery with lithium-ion cells stacked together to form a large battery. This battery was chosen because the weight of the vehicle was a very important factor in choosing the battery. The future of battery lies in the hand of the rare metal called lithium. The future scope of lithium batteries is lithium-air batteries which can run up to a range of 200kms with a single charge from the present capacity battery. Configuration of proposed system is shown in fig. 1.

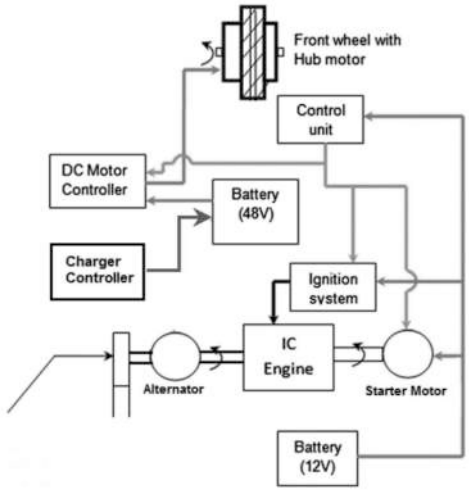

Fig.1: Configuration of Smart Hybrid Bike

There are four different modes in which to operate this system, based on the flow of power:

1. Only the electric motor provides power directly to the front wheel.
2. Only the gasoline engine provides

torque to rear wheel through CVT.

3. Both engine and motor operate simultaneously
4. Neither engine nor motor operates

IV. RESULTS

A. The calculation for revolution per minute of the wheel (rpm)

The size of the front wheel on which the motor is mounted = 10 inch

Radius of the front wheel = 5 inches = 0.127m

The optimum required speed from the electric motor = 28km/hr = 7.77m/s

To calculate the revolutions per minute of the motor

The total distance that is covered by the vehicle in one hour = 28000m (since the maximum speed by the electric motor is assumed to be 28km/hr)

The linear distance that is travelled for one complete rotation of the wheel= $2\pi r = 2\ \pi \times 0.127 = 0.797$

RPM =Total distance covered per hour/linear distance

= 28000/60/0.797=585rpm

B. The calculation for the power of the electric motor

Mass of the vehicle, m = 220kg =220×9.81= 2158.2 N

Coefficient of rolling resistance, Cr (Asphalt road) = 0.004

Acceleration due to gravity, a = 9.81

The density of air, Þ = 1.23

Velocity of the vehicle = 28Km/hr = 7.77m/sec

Coefficient of drag in two-wheelers, CA = 0.88

The area of the two-wheeler, AF = 0.71m2

$F_{rollingb}$ = Cr x m x a

= 0.004 x 220 x 9.81

= 8,6328 N

$F_{gradient}$ = m x a x sin Ø

= 220 x 9.81 x sin (0.86) =32.39 N

$F_{aerodynamic\ drag}$ = 0.5(Þ×v2× CA×AF)

= 0.5(1.23×7.772×0.88×0.71)

= 23.198 N

Power = Total resistance force × velocity of the vehicle

[Total resistance force= $F_{rolling}$+ $F_{gradient}$+ $F_{aerodynamic\ drag}$]

∴ Power = (8.6328 + 32.39 + 23.198) × 7.77

=498.995 W

The power of the electric motor to be purchased was finalised and was 500W

C. Calculation of Torque for the electric motor

Assuming the efficiency of the electric motor to be = 85%

Efficiency=output power/input power

Where Output power = Torque x Angular velocity

Torque x Angular velocity = Efficiency x Input power

Angular velocity =2×π×N/60 =2×π×585/60= 61.26 rad/sec

∴ Torque= 0.85 x 498.995/61.26 = 6.92Nm ~7 Nm

From the theoretical calculations the motor chosen should have the following specifications: Rated Power: 500W

Revolutions per Minute: 585 rpm

Rated Torque: 7 Nm

Max Speed of Motor: 28km/hr

V. ANALYSIS AND TESTING

A 100 ml bottle was taken and then connected to the engine and the engine was a test run for a particular distance till the 100 ml bottle was empty. The range was recorded on the GPS-tracking software and the noted down. The

hybrid technology was then put into use, in the same way, the 100ml bottle test was carried out on the hybrid technology with an unspecified or not noted running time driven on either electric or engine or both and the mileage bottle was emptied during the testing and the distance travelled was taken using the same software and noted down.Since both were tested using 100ml bottle testing the engine mileage could not be determined so the engine was run on 1 litre of fuel and the mileage was noted and then compared with the hybrid technology which was only tested using the 100ml bottle test. The results were compared and provided in Table 1 and also a conclusion had to be drawn not only on the basis on mileage but also based on the efficient and optimum usage of the present usage of the technology.

Table 1: Mileage of Hybrid with Conventional setup

Vehicle Type	Average Speed	100ml Bottle Test Result	Mileage
Conventional Setup	22 kmph	1.7km	17kmpl
Hybrid Setup	24 kmph	2.3km	23kmpl

The above table shows that there is a substantial increase in the mileage of the vehicle as the vehicle runtime is very low due to the 100ml bottle mileage test. This better mileage feat can be achieved if the auto-switching technology was more efficient and accurate using high-end sophisticated microcontrollers. The use a more sophisticated transmission could be used for the better performance and also better mileage The overall engine emissions from the vehicle have reduced drastically as the electric run time increase widely during the city run time and also the electric power is regenerated using an alternator which is used as a regenerative technology to charge the battery while the scooter is running. The hybrid technology could be inculcated inside a conventional vehicle without increasing the weight and also by using the minimum space and completely hybridizing it into a futuristic vehicle. The term “futuristic” is given more emphasis as a hybrid electric technology was bridged and inculcated into a conventional vehicle without aesthetically changing no/least material from the vehicle.

VI. CONCLUSION

The Automotive industry from the beginning of itself in the 18th century was the best popular in the market in terms of selling and overall appreciation it gets all over the world. Till today no change has happened to the enthusiasm and love people are having towards the automobiles. They are everywhere and they could go anywhere. The conventional automobiles used engines which can cause environmental pollutions which are becoming a great problem nowadays. The changing environmental conditions could affect the climate, weather and the living conditions of humans and other living beings. So, the government and other NGOs are taking serious steps and laws to reduce and finally ban the IC engine-based automobiles. Automotive manufacturers worldwide are coming up with different solutions day by day to reduced pollution caused by vehicles. Most common these days is the Smart Hybrid System which is going very well in the market as the people are also concerned about the future and the environment. In this project, done the same by converting an IC engine based Activa scooter into a smart Hybrid version.

The project is completed successfully and the vehicle is found to run smoothly offering better riding comfort and handling and the vehicle is super-efficient, less polluting and more economic.

The vehicle gives more torque and power than before because the motion is controlled by a powerful motor at startup reducing the load om the engine and the engine wakes up only after a speed of 32 kmph is passed. The mileage test was also conducted and it found

that the vehicle gives more mileage than before and also the emission test conducted gives the result that the emissions were made considerably lower than before. If needed the vehicle can also run as either conventional scooter or as an electric scooter or as a hybrid electric two-wheeler according to the need of the user which gives it an added advantage from the commercial point of view.

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RODENT ACTIVITY DETECTOR FOR MOTION DETECTION AND ANALYSIS

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ABSTRACT

Physical activity in rodents is an important variable in many behavioral research studies and quantification is needed. However, there are limitations on existing methods for measuring physical activity, including high cost, special cages or equipment, and demands computational effort. To overcome these limitations, low-cost open source supported devices for observing rodent activity have been proposed. The project is battery-powered and designed to be placed in a vivarium home cage for long-term, high-throughput operations with minimal investigator intervention. The main purpose of this study was to assess the feasibility of collecting physical activity records using camera-based devices in rodent shelter cages. This design aims to generate accurate, reliable and quantifiable results from the analysis of rodent movements in the cage and to draw conclusions. Overhead cameras provide a wide field of view inside the cage, and the use of image processing improves device accuracy compared to commonly used PIR sensors, microwave-based sensors, or capacitive sensors. increase. The feed from the camera is sent to the computer where the image processing takes place. The results of the analysis are saved in an Excel spreadsheet for later reference and modification. The camera setup provides accurate and reliable results compared to other means. It also does not emit radiation like PIR or microwave sensors that can ultimately disturb the environment in which the rodents are located. It's cheaper, but more efficient and easier to maintain. Cleaning and maintenance of the cage is easy.

Keywords- *component, formatting, style, styling*

I. INTRODUCTION

Physical activity is an important component of healthy lifestyles and has been linked to reductions in the risk of several major disorders including type 2 diabetes, obesity, and cardiovascular. An excellent model system for gaining insights into these questions can be provided by Rodents. However, accurate measurement of rodent physical activity remains a challenge. Commonly used methods can be broadly divided into two types.

(1) A special arena that tracks mouse activity using an infrared "beam break" or a video camera

(2) A home cage device that counts wheel rotation or sensor activation.

The first approach requires expensive equipment and dedicated laboratory space, which often results in lower throughput. The second class of home cage methods allows continuous monitoring throughout the day using either wheels or sensors. Using a running wheel is not always ideal, as the wheel itself can change the activity pattern, move the mouse more, and ruin other factors that affect activity. Other groups use passive infrared (PIR) sensors, capacitive sensors, and microwave-based activity monitors to

measure home cage activity.

Here we wanted to complement and improve these existing methods by developing devices that are easy to build, inexpensive, and open source. The ideal solution for measuring physical activity is compatible with home cages, continuously collecting activity data without human intervention and extensible to large cage installations. In line with these requirements, we introduce Rodent Activity Detector (RAD), a simple camera-based activity logger. The low cost and simple design of RAD makes it ideal for activity monitoring in high-throughput experiments and multi-site studies. We make device design files and code freely available to the research community for construction, use, and improvement.

With less video tracking hardware requirements compared to photocell-based systems, building your own custom video tracking system for mouse motion analysis will be more attractive to the laboratory. There are Several open source programs which could be used as alternatives to OFT systems. All of these programs allow you to determine the distance traveled and the time spent within a predefined region of interest (ROI). Still, their performance differs in terms of ability to track multiple animals simultaneously, speed of execution, data output, and capacity for batch analysis [1].

The device currently used to measure rodent activity is the actophotometer. As the name implies, we use photodiodes and LEDs to capture rodent activity. Current methods and methods for measuring rodent activity do not provide concrete and quantified data on rodent activity [2]. What needs to be changed is an inaccurate method of measuring rodent activity. Photodiode ping is considered a step, but not always. Also, false pings caused by rodent tails and mustaches are not considered. Therefore, a camera surveillance system has been introduced to improve accuracy and area coverage [3].

This proposed system could be operated without advanced hardware and can be run on a PC with MATLAB. However, users will have to create their own open field recorders and film recorders. These are as easy as placing a rectangular chamber with an overhead webcam. The script is presently written to analyze only rectangular open fields, but you can easily change it to analyze open fields of other shapes [4]. Another limitation found in the Mouse Activity is that it cannot analyze more than one mouse in a single open field and cannot distinguish between the head and tail of an animal.

II. PROPOSED SYSTEM AND DESIGN

The device currently used to measure rodent activity is the actophotometer. As the name implies, we use photodiodes and LEDs to capture rodent activity. Current methods and methods for measuring rodent activity do not provide concrete and quantified data on rodent activity. What needs to be changed is an inaccurate method of measuring rodent activity. Photodiode ping is considered a step, but not always. Also, false pings caused by rodent tails and mustaches are not considered. Therefore, a camera surveillance system has been introduced to improve accuracy and area coverage.

Activity surveillance cameras placed on top of the cage have been proposed. This provides wider area coverage and can be implemented in cages of multiple sizes. The cage can be made of any material and does not necessarily have to be opaque or transparent, so using artificial lighting without lighting will not affect the results. Cages do not have strict standards regarding the building materials used, which also reduces construction costs.

The open field consists of one, two, or four 12 x 12 x 12 inch clear acrylic chambers oriented horizontally or vertically, each chamber containing one mouse to be analyzed. We

have tested the system to analyze one or two mice at a time, but you can easily change it to analyze more mice at once. If desired, you can also include regular mouse scraps. The video was recorded in AVI format at a resolution of 1920x1080 pixels at 30 frames per second.

The Mouse Activity code is designed to detect the mouse in bright light. Mouse Activity processes the movie file frame by frame continuously or step by step, recognizes the mouse within each frame, positions the mouse and saves the data.

III. WORKING OF THE RAD

The input video has a couple of frames for correct evaluation and sufficient readability to truly calculate the records required. The video is a bit over one minute lengthy and may be used for picture processing. After the video report is chosen, a threshold is chosen via way of means of the person. The area of hobby is chosen for the operation of the code. The device then analyses the frames of the feed after changing them into binary images. The distinction among each body is taken and recorded into the excel sheet. After the thresholds are selected, the area for every mouse is chosen for the evaluation. The area is ready via way of means of the person and the software program tracks and acquires records from the video inside the area only. This enables maintain the consequences dependable and correct.

Fig. 1: Input Video

The code for the activity analysis for the rodent has been simulated. The activity of the rodent has been fairly analyzed by using MATLAB Image Acquisition and Processing toolboxes. The activity time of each rodent has been attached as well. The results have been presented as spreadsheets, with an individual worksheet for each rodent. The results show the x axis position, y axis position and the distance covered at regular time instants. The total distance traveled by the rodents was also calculated. The activity time of each rodent was also calculated.

After completing the tracking process at every frame, the program saves the tracking data (for example, the position coordinates and area of each mouse) in a MATLAB file and begins analyzing the data. This will give you several outputs, including a summary diagram showing the mouse trajectory and distance traveled, a diagram showing the distribution of each mouse region, eccentricity, and length of the major axis (such as distance and thigmot axis). When both tracking and analysis are complete, the user looks like this: You will be asked if you want to check the tracking results. If you select Yes, you will see a dynamic image showing each frame analyzed, and the mouse will display colored ellipses and numbers. When this process is complete, the tracking movie will be a saved orbital accuracy survey.

Color video as in fig. 1 is first converted to grayscale and then to a binary image. These binary images with different thresholds represent the accuracy of the calculation, and there is an inverse relationship between accuracy and threshold. After the threshold is selected, the video will be processed.

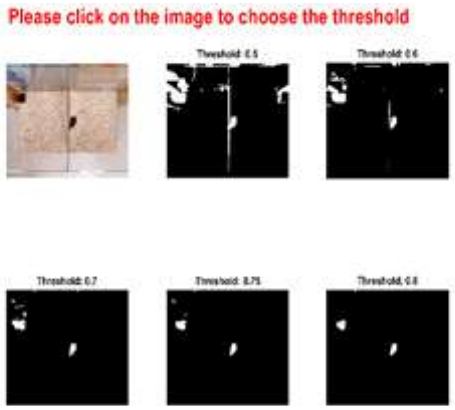

Fig. 2: Binary Images and Threshold Selection

After the threshold is selected as shown in fig. 2, each mouse arena is selected for analysis. The arena is user-configured and the software tracks and collects data only from the videos in the arena. This allows you to maintain the reliability and accuracy of your results. Once the arena is set up and all inputs are made, the software will start the tracking process and display the progress on the screen. When the tracking is complete, the results will be displayed and saved.

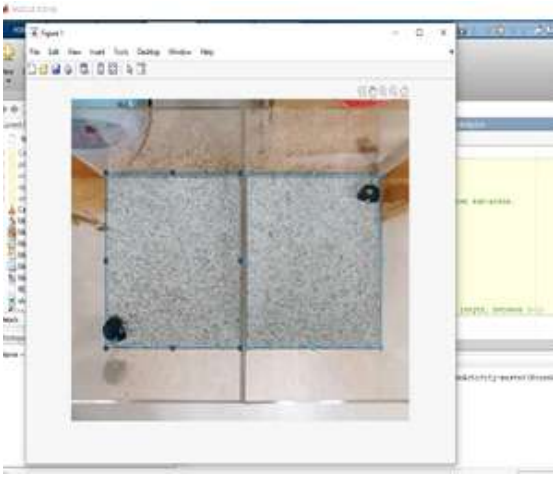

Fig. 3: RoI Selection

After the arena is set up and all inputs are made, the software will start the tracking process as shown in fig. 3 and display the progress on the screen. When the tracking is complete, the results will be displayed and saved.

IV. RESULTS

The code for the activity analysis for the rodent has been simulated. The activity of the rodent has been fairly analyzed by using MATLAB Image Acquisition and Processing toolboxes. The activity time of each rodent has been attached as well. The results have been presented as spreadsheets, with an individual worksheet for each rodent.

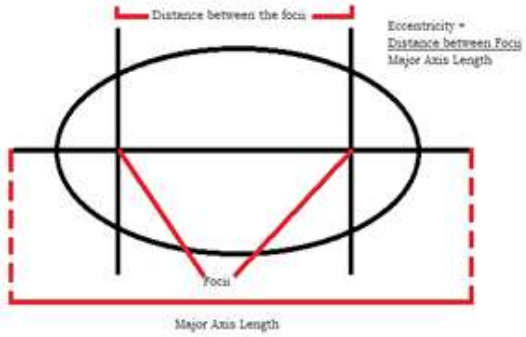

Fig. 4: Eccentricity

The rat's eccentricity as shown in fig. 4 is defined as the ratio of the distance between the rat's assumed elliptical focal point and the length of its main axis. Its value cannot exceed 1. Eccentricity is used to determine if a rat has contracted or stretched, improving the resolution and accuracy of the step counting method.

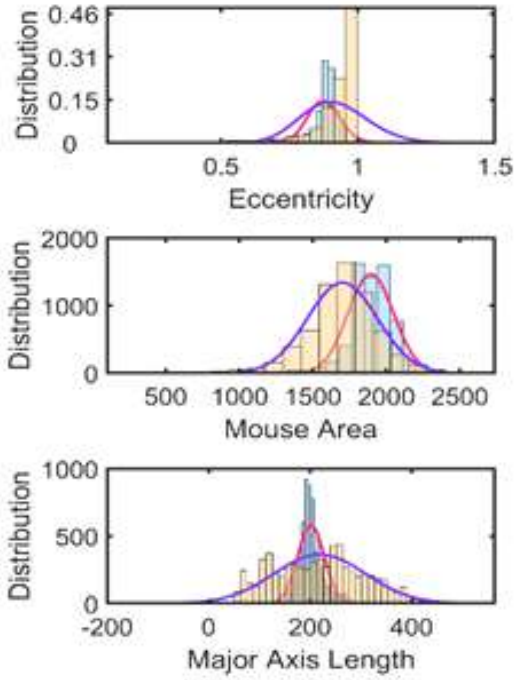

Fig. 5: Graphical Representation of Rodent Dimensions

Fig. 5 is a graph of rodent dimensions. The plot shows the eccentricity. This is the ratio of the focal point to the length of the rodent's spindle (indicating whether the rodent is stretched or shrunk), the area distribution of the mouse, and the length of the mouse's spindle.

Fig. 6 represents then rodent`s activity time, and the discern strains the route of every rodent with inside the digital digicam view. This is illustration of the way the rodent movements in the span of the cage.

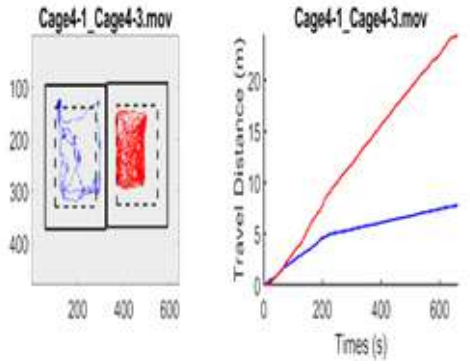

Fig. 6: Summary of Rodent Movement

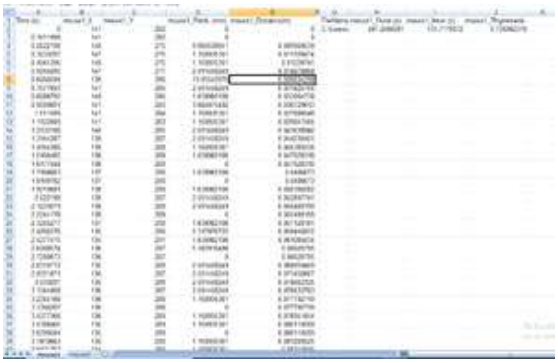

Fig. 7: Data obtained using the proposed system

Fig. 7 shows a sample screenshot of the spreadsheet using which the results are being shown. The results show the x axis position, y axis position and the distance covered at regular time instants. The total distance covered by the rodent has also been calculated. The activity time of each rodent has been calculated as well.

Fig. 8 shows the processing of the video and the tracing of the rodent. Here, two small black mice are used as samples. The mouse area and the eccentricity of each mouse is shown on screen at all times. This is how the tracking of the mouse is done on MATLAB.

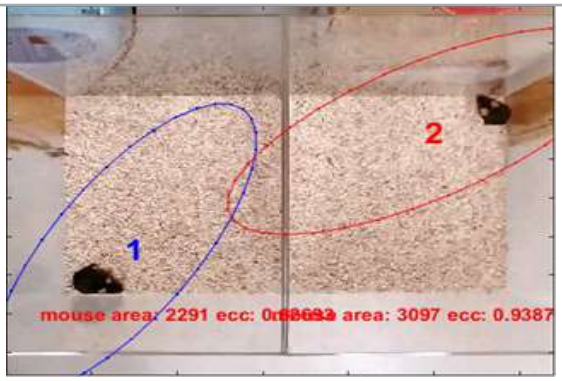

Fig. 8 Processing of Video and Tracing

V. ADVANTAGES

1) Low Cost

The system has low hardware requirements, drastically reducing the costs

2) Simple Design

The system has no complex circuitry; therefore, understanding the innards of the system is simple and easily graspable.

3) Less Components

Since the requirement of components is low, the number of components also decreases considerably.

4) Easier Maintenance

Simple design and fewer components make the maintenance and repair easier.

5) Accurate

The avoidance of abstract measuring sensors and inclusion of camera for the data acquisition improve the accuracy of the system.

6) Reliable

The system is robust and can work under almost any conditions, and therefore, the system is reliable and safe.

7) Data analysis easier

The results obtained are tabulated and presented graphically, so, understanding the data and deriving conclusions is simpler.

VI. CONCLUSION

The existing design is inaccurate and lacks availability of concrete data. The proposed design overcomes the present difficulties by implementing the system using a camera. We will be performing image processing on the live feed from the camera and analyzing the rodent activity. This provides more accuracy and area coverage, making it more reliable and accurate. The environment is least interfered with and therefore, accurate and quantifiable.

This design aims to generate accurate, reliable and quantifiable results from the analysis of rodent movements in the cage and to draw conclusions. Overhead cameras provide a wide field of view inside the cage, and the use of image processing improves device accuracy compared to commonly used PIR sensors, microwave-based sensors, or capacitive sensors. increase. The feed from the camera is sent to the computer where the image processing takes place. The results of the analysis are saved in an Excel spreadsheet for later reference and modification. their guidance and valuable suggestions and encouragement in this topic.

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COLLEGE ENQUIRY CHATBOT

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ABSTRACT

Everyone is learning education online in this epidemic condition. Students can pose a question in text format, which is subsequently analyzed using natural language processing (NLP). Finally, the Chabot can provide precise replies to the students. If a certain person, that is, he or she has a question, he or she will have to personally visit numerous departments. A simple login System was also implemented to the system to prevent unfamiliar users from gaining access to sensitive data, which could lead to security issues. Using Natural Language Processing, the software would also ask other questions in order to obtain accurate responses to the query.

Key Words: *– Chatbot, NLP- Natural Language Processing.*

I. INTRODUCTION

A Chabot is a computer programme that uses voice instructions, text dialogues, or both to simulate human conversation. Businesses are increasingly migrating from traditional to digital channels, thanks to ongoing technological advancements. Businesses are utilizing AI to provide convenience through technology. This project analyses user's queries and understand user's message. The chatbot that is utilized only requires the students to ask questions. There is no required structure for users to follow; students are free to speak in any format they choose. The System responds to the question using built-in artificial intelligence. The responses are pertinent to the user's inquiries. The technology allows the User to query any college-related actions. The consumer does not need to visit the college in person to inquire. The system evaluates the query before providing the user with a response. The algorithm responds to the question as though it were being answered by a person. The technology responds to the pupils' question with artificial intelligence.

A chatbot is an automated programme that communicates with clients in the same way that a human would, yet it costs very little to use. Chatbots are available to help customers at all hours of the day and week, regardless of time or location.

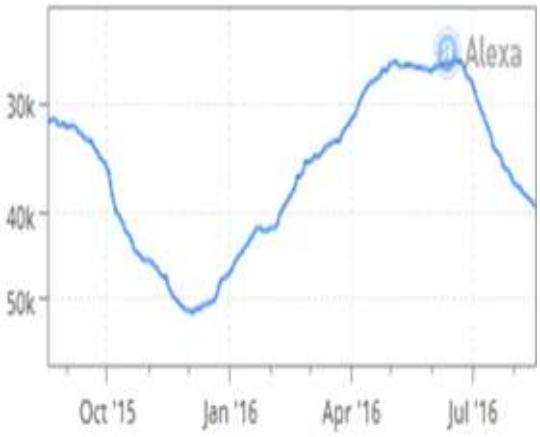

Fig. 1: Usage of Chabot's

II. RELATED WORK

A. Cleverbot

Cleverbot is an online service that allows users to speak with humans using a machine intelligence algorithm. After looking through its saved dialogue, it responds to the input by detecting how a human would respond to that input when it was requested by cleverbot, in part or in full.

The ability of a distributor to provide a chatbot

with a 360-degree perspective of the buyer will limit its success. Despite their need for immediate and personalized experiences, consumers will be wary of new technology unless they are confident in its security.

B. Alice Chatbot

ALICE's primary knowledge domain is stock on dispersed AIML files; ALICE is freely available to the public under the GNU license. In comparison to other chat robot languages, AIML appears to be simple. In AIML, a grouping is the fundamental unit of knowledge. An input or query, an output or answer, and a non-compulsory context make up each grouping. The pattern is the name of the query. The template refers to the response or reply. The study focused mostly on ALICE, which was utilized as a simple informal agent. The study yielded unexpected results, since the majority of users did not enjoy the chatterbot's response and left unpleasant remarks on the system.

III. SYSTEM OVERVIEW

The proposed method combines a variety of innovations such as reviewed literature, specialist belief, participant observations, and material authentication. The suggested system will include the following modules:

A. Digital Inquiry

People can ask inquiries regarding their abilities, as well as assessments, academics, and cost systems, among other things. Students are given the opportunity to ask questions concerning the technical requirement as well.

B. Chatbot for the Internet

The outcome as text format. The query will be replied based on the questions asked. The following is the basic algorithm:

The following is the suggested system:

IV. SYSTEM DESIGN AND EXECUTION

Start with the first step.

Step 1: Start

Step 2: Find out what the user wants to know.

Step 3: After that, the chatbot's inquiry is pre-processed.

Step 4:Retrieve the query's remaining keywords.

Step 5: Compare the retrieved keywords to the knowledge base keywords and respond appropriately.

Step 6:The Db component is then used to locate appropriate data by calling effective Assistance depending on object information.

Step 7: The keywords are matched with the algorithm.

Step 8: The user receives the response.

Step 9: The chatbot organizes the information into a proper response for the client to see.

Step 10: Come to a halt.

A. Chatterbot

A Python package called chatterbot was created primarily to create chatbots. This algorithm creates various responses to users' requests using a variety of machine learning algorithms. The development of conversational chatbots is made simpler by Chatterbot.

ChatterBot creates automated responses to a user's input simple. ChatterBot operates in the following way: it employs a variety of machine learning techniques to generate responses. As the number of interactions with the user grows, ChatterBot allows an agent instance to improve its understanding about. The ChatterBot begins with no understanding of how to communicate. The library saves the text that the user supplied as well as the text that the statement was in response to each time they enter a statement. As ChatterBot receives more data, the number of responses it can provide increases, as does the accuracy of each response in relation to the input statement.

The Python-based conversational dialogue engine ChatterBot uses machine learning to generate responses based on collections of pre-existing conversations. ChatterBot may be taught to speak any language thanks to its design that is independent of language.

B. spaCy

spaCy is a Python NLP library that is free and open-source. The process of analysing, comprehending, and deriving meaning from human languages for computers is known as natural language processing (NLP). It's designed for production use and has a simple and easy-to-use API. It includes multi-task learning using pre-trained transformers like BERT. SpaCy is made to assist you in carrying out real tasks, such as developing really goods or gathering real insights. The library values your time and works to not squander it. Its installation is straightforward, and its API is functional and easy to use.

V. RESULTS

We recommended this as a means of disseminating information about the college. It's a chatbot for frequently asked questions about the university with a closed domain. Through the Attention mechanism, the system employs a Recurrent Neural Network-based Encoder-Decoder model. Long sequences were used to tackle the problem of attention, which is also a difficulty in most other NLP tasks. Inquirers who want to know information tailored to their own needs can use the chatbot to get it. The overall model accuracy isn't great, and we still need to work on improving the model and data processing. To process the system's implementation, we employed the Python language and the Tensor Flow framework.

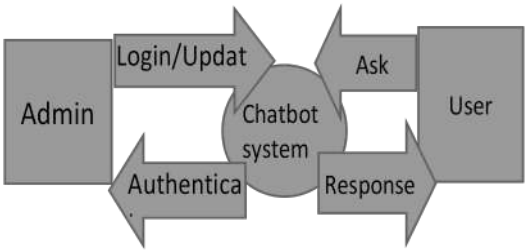

Fig. 2: Chatbot system

VI. CONCLUSION

We might say that chatbots can cover a significant vacuum in the teaching and learning environment. Furthermore, because natural language processing is still in its infancy, the employment of chatbots in education is a promising prospect. These chatbots, in particular, might illustrate some of the operational and diverse challenges that a typical classroom might encounter. On Discord, our chatbot communicates from server to client using VOIP (voice over internet protocol) for data transfer. So, just like the signal app, Discord is safe to use, allowing us to employ our chatbot. They can be proactive or reactive in their approach. Their reactions are always the same. They are able to communicate with users right away.

The chatbot that is utilized only requires the students to ask questions. There is no required structure for users to follow; students are free to speak in any format they choose. The System responds to the question using built-in artificial intelligence. They can be utilized in a number of ways, including live chat and social networking.

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AUTOMATED WEED CONTROLLER

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ABSTRACT

One of the most time-consuming aspects of growing vegetables is controlling weeds. Weeding by hand is inefficient because of the time, effort, and boredom involved. However, these drawbacks have been alleviated because to the development of chemical weed management techniques. However, research on other weed control strategies has been prompted by the rise of herbicide-resistant weeds, ecological harm, and rising demand for chemical-free foods. The concept and first iteration of a mechanical weeding actuation system were developed. To combat the problem of weeds growing in between rows, this actuator was created. The mechanical weeding actuator was made from a belt drive system driven by an incorporated servo motor and a spinning tine weeding mechanism driven by a brushless DC motor. A significant hurdle that needed to be overcome in this study was the prototype of the actuator and its weeding mechanism for efficient intra-row weed management. To evaluate actuator performance and establish the necessary actuator force and speed, a prototype actuator was built and put through a battery of tests. Using the actuator in tandem with a machine vision system would allow for precise mechanical weeding without harming agricultural plants.

Key words: *weeds, herbicide-resistant, chemical-free foods*

I. INTRODUCTION

Weed controlling is paramount importance when it comes to farming. In olden days weed detection was done by employing some men, especially for weed removal purpose. They will detect the weeds by checking each and every plant field. Then they will pluck them out manually using their hands or spades. Herbicides were once used to control weed growth, but technological developments eventually rendered their use unnecessary. However, in many regions of the globe, weed detection is still performed manually. Weeds are organisms that have invaded their intended habitat and are now creating problems for farmers by competing with their crops for resources like water, sunlight, and soil space. Pests and illnesses that live in weeds may then infest nearby crops. We use an image processing method to identify weeds, and from that image we retrieve characteristics that let us tell crop leaves from weed leaves.

The amount of weed that grows on the cultivation lands directly affects the corps in terms of deprived nutrients, sunlight and root spaces. The cost of weeding, herbicides and the difficulty of managing the land free from weeds has hindered individual farmers from taking up large scale farming. Approximately 30k is spent on human labor cost and herbicide cost as a part of the weeding process. This project entitled automated weed controller is aimed at helping such cultivators in controlling weed, both economically and efficiently. As weeds thrive on the existence of roots, for both growing and germinating to a new herb, it is essential and paramount important that we remove the root of the plant. The conventional hand weeding allows the broken roots to be left in the soil, whose grains allow the plants to regrow. Thus by destroying the roots we successfully reduce the total exponential growing factor weeds to a controllable level. Also it desired that the weed control is an energy convenient process and an independent one. For this purpose, the development of an automated system for

guidance, identification and cutting is essential. Also solar rechargeable battery is desirable to reduce cost in the long run. The success or failure of your harvest may depend heavily on how well you manage weeds. Although herbicides are crucial for weed management, their overuse and associated side effects have led to criticism of their utility.

Numerous scientific reports show that patch spraying can cut down on herbicide use. Because of the high cost and impracticality of doing so, manual scouting for patch spraying is not an alternative. Using tools like remote sensing and machine vision, several scientists have studied the practice of Patch spraying. While remote sensing is best used on a plot level, machine vision systems may be used at a plant level. Both technologies rely heavily on capturing and analyzing visual data. Processing time is on the order of minutes to hours, depending on picture quality, crop and weed type, algorithm utilized, and device specifications. Machine vision-based methods employ factors such as form, texture, color, and position to differentiate between weeds and crops. Almost all methods that aim to identify and categorize weeds rely on image sensor. The use of either spectral or color imaging for plant identification has been proved to be effective. Spectral methods often do not have good enough spatial resolutions for detecting individual plants or leaves [1,2,3].

II. LITERATURE SURVEY

This compares the relative efficacy of different weeding systems or tools with the manual weeding hours required to obtain a 'weed [U+2010] free crop' (i.e. where there are no large weeds that produce seeds, and seed production by small, late [U+2010] emerged weeds is low at harvest time). Time spent for hand U+2010] weeding intra [U+2010] row weeds is normally linearly related to intra [U+2010] row weed density between 10 and 100 plants m−2. as shown in fig. 1. Hours required for hand weeding is a practical measurement, which can be used for economic analyses.

Mechanical weed control may damage crop plants; therefore, our review of current and future intra [U+2010] row weeding technology is based on the assumption that crop damage should be acceptably low to the farmer and should be in the same range as damage from conventional chemical weed control.

In this work, the collected data is preprocessed and different features are extracted to create a soil and crop database. A train dataset and test dataset is extracted from this DB. The train dataset is classified using different algorithms and class labels are predicted after which the predicted and actual class labels are compared with each other. If they are same, then the suitable crop suggestions are given for the correctly classified labels [3].

III. DESIGN OF AUTOMATED WEED CONTROLLER

The frame is the base of the prototype in discussion. The primary objective of the frame is to provide rigidity to the moving parts while having optimized weight for robust movement and stability. The frame design was generated from brainstorming and functional require ments. The frame was made hollow to aid reduction in weight. Also, space was to be left for the movement of the cutter positioning system.

Filters, rectifiers, and power converters make up power supply circuits. Beginning with an alternating current (AC) voltage, a continuous direct current (DC) voltage may be generated through rectification, filtering to a DC level, and regulation. In most cases, a regulated dc voltage is produced via an integrated circuit (IC) voltage regulator unit, which accepts a higher DC voltage as input and outputs a somewhat lower DC voltage that stays constant regardless of changes to both the input DC voltage and the output load. In fig. a,

we can see a block diagram of the components of a standard power supply together with the voltage levels at different places in the unit.

Fig. 1: 3D-image of frame

To get the dc output, the ac voltage (usually 120 V rms) is linked to a transformer. After being converted to DC by a simple capacitor filter, the alternating current (AC) voltage from a diode rectifier may be used directly. Some ripple or ac voltage fluctuation is often produced in addition to the desired dc voltage. This DC input is used by a regulator circuit to produce DC voltage that is not only substantially more stable than DC voltage obtained directly from the input DC voltage but also stays constant DC voltage regardless of DC voltage fluctuations at the input or DC voltage fluctuations at the load. Most often, this is accomplished by using a voltage regulator IC.

Various sensors are used for detecting obstacles in path (infra-red, Ultrasonic sensors). It controls the entire mechanisms. The ECU receives the processed image instructions from the Machine vision processor and rotates the encoder wheel so as to guide the arm plate to the precise location. It is used for the absorption of solar energy. (1 kWh off-grid). In each module its maximum power current is 0.70A and max power voltage is 17.1V. Motors are used for the motion of the lead screws, cutter and tyres. Two 5A Wiper motors are used to control the movement of the two lead screws. A 5V DC motor is used to provide rotation to the cutter. A two stepper motors are used to drive the two rear tyres.

Fig. 2: Automatic weed controller

IV. WORKING METHOD

The Auto bot differentiate the weeds from the crops by the help of a colour sensor. The colour sensor detects and records the intensity of light. The detected values are continuously transferred to the microcontroller. If the intensity of the light is different from the pre-fed value, the microcontroller identifies it as a weed. This helps in the positioning of the arm to destroy the weeds.

The arm mechanism uses two lead screws for its motion in the x and z direction. The motions of the lead screws are actuated by two DC motors which is controlled by the microcontroller. The auto bot moves forward in a step-wise manner the vertical moves from one end to another. The end of the arm is provided with the colour sensor. Half the colour sensor detects a value which is other than the pre-fed value. The arm moves downwards and the cutter or the drill bit will be forced against the weed. Hence the weed will be destroyed.

Navigation is the process of guiding the bot across the field with respect to crop rows. The main technologies involved are dead reckoning and Image sensing. Navigation is done through the following steps.

1. Row Each rear wheel is attached to a stepper motor, which has predefined steps. Steps are angles through which each motor

rotates in response to each electrical pulse. Each row is defined as a finite number of steps.

2. Turning from one row to another One wheel gets locked and the other rear wheel rotates, which pushes the front wheels to turn and which in turns the vehicle in the desired direction.

V. RESULTS AND DISCUSSION

Sensor systems for plant identification and distinction are needed for targeted weed management. Research shows that there is a need for low-cost, field-ready sensor systems that can distinguish between young weeds (those with just two or four leaves) and crop plants in order to make spraying choices in real time. Free cascadable and programmable true-color sensors form the basis of the system disclosed herein for the instantaneous detection and identification of weeds and agricultural plants. This sensor technology allows for precise dosing of herbicides in both cropped and uncropped municipal areas and agricultural fields.

Algorithms and decision models based on this information should be used to identify agricultural crops and weeds. They include things like the typical color spectrum and the way that places with and without vegetation reflect light. Between the extremes of high-priced spectrometers and low-cost RGB sensors, true-color sensors provide a reasonable compromise. The purpose of this research was to examine the viability of this kind of sensor for identifying crop plants from weed plants in suburban and rural settings. Our paper's primary goal is to lessen the demands placed on agricultural Herbicides and labor forces. Considering the intensity of light, the filtering picture is discussed in this study. To get rid of the weeds, we may use robots, sprinklers, or motors to spray them with herbicides. Microcontrollers like the Arduino uno make it possible to connect the results of image analysis to things like robots and other hardware. The proposed model has an increased scope in applicability in the immediate and distant future. The need for Automated food cultivation has skyrocketed to a new level in the recent years. The solution is to be automated through robotic services like machine learning and Artificial Intelligence. Considerations of texture, genetics, and other factors have been shown to greatly improve accuracy in previous studies. Recognizing weeds are crucial in controlling and eradicating them. To protect the crop plants from harm, it is necessary to use an adequate weed identification algorithm. Typical edge detection techniques are considered in the suggested system. The suggested system may have accuracy issues but will not be lacking in productivity.

VI. CONCLUSION

While there is equipment available to control weeds in between the rows, weed control in the rows (intra-row weeding) still requires a lot of manual labour. An autonomous weeding robot replacing this labour, could mean an enormous stimulus for organic farming. This system also detects obstacles present in the path of the vehicle by infrared sensor. Because of no man power required and high speed operation, it has scope for future expansion. The automated weed controller will have in decreasing alone office side used and it will also help in using unconventional herbicides pictures organic herbicides and other lesser polluting chemicals in controlling weeds. The automated wheat controller helps in maintaining a large agricultural land for an individual farmer helping them increase the out and using that the financial income thus raising the standard of the Agricultural society.

It also reduces the dependence on conventional forms of energy sources such as gasoline as used in the conventional weeding measures and the automated weed controller is subjected to further improvement in the form of in the form of seed implantment equipment

and also automated watering system by modifying the arm mechanism in the above machine since the machine uses Machine Vision Technology pest control and field observation is possible in the distant future.

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