



Shri Vile Parle Kelavani Mandal's
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Permanently Affiliated to the University of Mumbai)
Plot No. U-15, J.V.P.D Scheme, Bhakti Vedanta Swami Marg, Vile Parle (W), Mumbai - 400056, India



DO STR-IKE

2021-2022

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IETE-SF

of

Department Of Electronics And Telecommunication Engineering

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Shri Vile Parle Kelavani Mandal “SVKM” to the society at large grew out of a humble seed planted during India’s freedom movement namely by Shrimati Gokalibai Punamchand Pitamber High school – to nurture socially relevant education. Today SVKM has grown into a mega education nucleus with distinguished achievements. SVKM’s Dwarkadas J. Sanghvi College of Engineering (DJSCE), was established in the year 1994. In the span of more than 25 years, DJSCE has come a long way and has made its impact felt not only in the country, but also abroad. The college runs several undergraduate programs, such as Electronics and Telecommunication Engineering, Information Technology, Computer Engineering, Mechanical Engineering, Chemical Engineering, Electronics Engineering, Production Engineering and Biomedical Engineering and these undergraduate programs are accredited by the National Board of Accreditation. The Institute is NAAC accredited with an ‘A’ grade (CGPA: 3.18) and recently started programs, such as Computer Science (Data Science) Engineering, Artificial Intelligence and Machine Learning, Artificial Intelligence (AI) And Data Science, Computer Science and Engineering (IoT and Cyber Security with Block Chain Technology) and is an autonomous institution permanently affiliated to the University of Mumbai. Along with the undergraduate program, DJSCE also runs post-graduate and Ph.D. programs in Electronics and Telecommunication, Computer and Mechanical Engineering departments, affiliated to the University of Mumbai. Our students have performed exceedingly well in national and globally competent multinational companies and, also in the universities in India and abroad as they pursue their higher education. Today, DJSCE has grown into a premier institute of technical education and has a stimulating educational environment with distinguished faculties and state-of-the-art facilities.

Declaration

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**IETE-SF of Department of Electronics and Telecommunication
Engineering, DJSCE**

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Engineering, DJSCE**

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From the Editorial Desk

Electronics and Telecommunication Engineering has always played a major role in the advancement of the latest in the technology arena. As technology progresses rapidly, it has become essential for engineers and technologists to keep up with the changes in their respective areas of expertise. The IETE- Student Forum (IETE-SF) was formed in the year 2005 under the Department of Electronics and Telecommunication of D.J. Sanghvi College of Engineering, to not only facilitate the flow of ideas and information but also to encourage the advancement in the field of electronics and telecommunication engineering. To keep up with new technologies, IETE-SF conducts technical workshops and seminars to encourage them to work on their technical skills. This forum paves a way for students to gain knowledge apart from their academic curriculum. In addition to conducting workshops and seminars, IETE-SF runs the book-bank facility where students can avail a wide range of technical books. Two years a new initiative was taken by the student forum to run a component-bank facility, which enables students to avail themselves of various electronic components, which can be used for building technical projects. ‘DJ Strike’, a project mentorship program, which encourages students from the second, third, and fourth years to team up together to build technical projects was continued this year as well by the IETE-SF. Over the last eight years, the EXTC Department has organized various technical events like STTP on Microwave and Antenna, Image Processing, and Wireless Networks. The department also organized, National conferences like NCCT-2011 in the year 2011 and International Conferences like ICCT-2013 and ICCT-2015 in the year 2013 and 2015. Since, 2017 the department has been organizing the International Conference on Wireless Communication (ICWiCOM 2017, ICWiCOM 2019, and ICWiCOM 2021) where the conference addresses only narrow topics in the domain of Wireless Communication. Proceedings of the conferences are available on the Springer Digital Library.

For the last four years, IETE-SF has been organizing ‘DJ Strike’, a project competition. This competition aims to provide a platform for students to showcase technical skills as well as technical paper writing skills. After a vigorous review process, the research papers of the best projects are published in the ‘DJ Strike’ Journal, which has a recognized ISBN Number. Due to the overwhelming response received for DJ Strike, IETE- SF has been motivated to organize ‘DJ Strike 2022’. The best technical projects, in coherence with the field of Electronics and Telecommunication, built by undergraduate and postgraduate students, will be displayed during the competition.

We hereby appreciate the efforts taken by all the faculty members of the department of EXTC and the IETE-SF student committee members for organizing ‘DJ Strike 2022’.

Congratulations to all the participants of DJ Strike 2022!

Best wishes.

Dr. Amit A. Deshmukh

Professor & Head, EXTC, DJSCE

About DJ STRIKE

DJ STRIKE is a novel initiative of the Electronics and Telecommunication Engineering Department organized by the student's committee of IETE-SF. It is collaborative learning where students from various departments are working together, sharing their knowledge to develop a product. Product development is an essential and integral part of the competition. DJ Antariksh is a key outcome of the DJ Strike Mentorship Programme. It is the official rover challenge team of DJSCE and it was pioneered by the students of the Department of EXTC and aims to build next-generation Martian Rover. Students are encouraged to continue the development of the project to an industry level product by allowing them to continue it as the final year project as well as a project for the subsequent year of the competition, to ensure sufficient time for students to work upon it and develop it into an industry level product. DJ strike starts with floating projects in various domains, followed by forming groups of Second and Third-year students mentored by a final-year student and guided by a faculty member. Certain groups have also sought the guidance of the esteemed alumni; this has provided them a perspective of the current industry level demand for products. Each group gives three project topic preferences, exploring topics across a range of subject boundaries; this motivates students to pursue further knowledge in different subject areas that are part of the curriculum, thus motivating curriculum-based learning with practical exposure. One topic is allotted after discussion with faculty coordinators. After finalizing the topic, each group goes through various stages of the review process at regular intervals displaying their progress, and are evaluated based on different criteria by faculty coordinators. Each review consists of 25 marks. This review is executed over a span of eight to nine months. The structure of the review and guidance given by reviewers; helps in the timely submission and systematic approach in completing the project in all aspects. The first review which is a documentation review primarily focuses on the ability of the student to apply basic knowledge, analyze the problem and propose a model tool to execute the project. In the second and third reviews which are progressive reviews, each group is required to complete about 30% and 70% of the project respectively, and write the first draft of the technical paper based on the work done. Students are guided on how to write a technical paper; a video has also been shared for the same. In the fourth review which is a final review, each group is required to demonstrate the full product and submit the final draft of a technical paper. Each technical paper undergoes plagiarism check by Turnitin software and based on the report, the paper with minimum plagiarism is accepted for publication. Based on the marks after the final review, the top 5 groups are promoted to DJ Spark which is a national-level competition and their technical papers are published in DJ Spark magazine carrying ISBN number. The rest of the projects are presented during the DJ strike competition and their technical papers are published in DJ strike magazine with ISBN number.

DJ Strike is a yearlong academic activity where students share and apply their knowledge of engineering fundamentals and an engineering specialization to achieve success in product development. Strike provides an opportunity to further enhance the project in the subsequent academic year, which enables the prototype to turn into a product. Each student learns how to function effectively as a team member as well as a team leader. This project-based learning holds great weightage in any resume and can help boost the career of the student. It reflects their practical knowledge and enhances the prospect of the student not only to get a job or admission for higher studies but also benefits them while securing better internships of their choice having worked on projects of that calibre. It allows more in-depth exploration of topics, issues, and problems within and across subject areas and disciplines. It helps students to nurture themselves as an engineer, giving them a chance of finding the solution to a similar problem that they might carry out in their future profession. The projects made a great impact in the form of Industrial as well as from a social perspective.

Dr. Anuja Odhekar, Prof. Ameya A. Kadam, Prof. Yukti Bandi, Prof. Tushar Sawant, Dr. Venkataramanan V.
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CONTENTS		
	Disclaimer	
	From the Editorial Desk	iii
	Committees	v
1)	Raksha: A Wearable Smart Safety Device Aditi Kulkarni, Adrika Singh, Krittika Roy, Somil Shah, Khushi Sanghvi, Om Dave, Mrunalini Pimpale	1
2)	Intelligent Surveillance using Drone Devarshi Shah, Dhaval Ravat, Het Trivedi, Hitarthi Shah, Priti Poojary, Deep Bhanushali, Archana Chaudhari	6
3)	Geofencing Systems Muskan Jain, Pooja Sahney, Srushti Jain, Ruchi Abhyankar, Shailee Dave, Utsavi Lotia, Revathi.A.S	10
4)	AI Based Adaptive Traffic Signal Dwayne Gonsalves, Dev Ambani, Aayush Gandhi, Fihaan Solanki, Viraj Deshmukh, Shrey Shah, Mrunalini Pimpale	14
5)	Used Car Price Prediction Aarya Bagde, Divya Naidu, Manan Shah, Ankit Sawant, Meet Gosar, Dhruvil Shah, Ranjushree Pal	19
6)	Automatic Number Plate Recognition Nenshi Patel, Muskaan Mistry, Hetvi Shah, Taher Kapadia, Raj Mehta, Ayush Koul, Mrunalini Ingle	22
7)	Movie Recommendation System Using Machine Learning Aryan Shah, Krish Bilakhiya, Meera Dedhia, Ayush Tolia, V Venkataramanan	27
8)	Stock Market Closing Prediction Swapnil Raichandani, Yashank Dasrapuria, Priyam Shah, Saksham Patesaria, Atharva Arya, Vinit Shah, Shivani Bhattacharjee	30
9)	Smart Irrigation System Using Dc Motor With 8051 Digen Thosani, Viral Rathod , Nishant Borkar, Om Shah, Om Singh, Nithik Pandya, Sanjay Deshmukh	34
10)	Disease Detection System Deep Suchak, Divya Jain, Mokshesh Vora, Pranav Saraf, Prisha Singhanian, Pranali Kuran, Aarti Ambekar	38
11)	Internet Controlled Car Aditya Trivedi, Rohan Rawat, Akash Kataria, Rohan Kotian, V. Venkataramanan	41
12)	Online Examination Monitoring Sahil Sava, Vatsal Tolia, Lav Parmar, Nimesh Pandey, Krish Sampath, Revathi AS	46
13)	UV Sanitization System Aaryan Shah, Disha Kunjadia, Mansi Gopani, Rohan Parikh, Nimish Sabnis, Ishan Shrivastav, Anuja Odhekar	51
14)	Home Automation using IoT & Smartphone Saumil Shah, Vedant Shah, Vidit Shah, Kushal Katira, Krisha Ashar, Urvashi Bhushan, Shivani Bhattacharjee	56

15)	Smart, Wearable Posture Corrector Device Dhairya Vibhav Parikh, Dhruvin Rajesh Dungrani, Dhruv Jagit Mahabal, Krushang Dhawal Vakil, Disha Vijay Goel, Shrushti Anil Thakar, Sanjay Deshmukh	61
16)	Bank Management System Sidhant Rawal, Naman Sanghavi, Yash Sivramkrishnan, Kashish Mistry, Rishabh Shukla, Ameya Kadam	68
17)	Intelligent Laboratory Management System Akshat Somani, Kunal Razdan, Vrushali Mehta, Dhara Patel, Shreyas Tawde, Vidhi Nayak, Ameya Kadam	71
18)	Reverse Car Parking Circuit Sunil Talaviya, Abhay Bhosle, Mihir Dudhatra, Siddharth Nagaokar, Rahul Taware	75
19)	Home Security and Automation Aaditya Mehta, Ajay Jain, Arjun Pathak, Kenil Shah, Vishnu Pedhadiya, Sharmila Choudhary, Amit Deshmukh	78
20)	SMART MART – A Smart Shopping Experience Using Computer Vision Moulik Shah, Darshil Modi, Parth Shah, Neeraj Hegde, Sarthak Acharekar, Deivagna Vanani, Amit Deshmukh	81
21)	Smart Shopping Cart with Automated Billing System Anushka Kanabar, Khyati Morparia, Aashish Viridi, Chaitanya Sawant, Noopur Parmar, Nirali Hirpara, Parth Kurhade, Poonam Kadam	84
22)	Medicine Dispenser Aryaman Paigankar, Manthan Patnekar, Aditya Patil, Om Kumbhar, Shashank Salian, Vishakha Kelkar	90
23)	Object Detection in Image Processing Hetankshi Vora, Nensi Singh, Nupur Doshi, Dhruvin Chhadva, Harshit Jain, Shivam Udeshi, Vishakha Kelkar	94
24)	Audio Source Separation as applied to Vocals-Accompaniment Separation Vanshaj Agrawal, Soham Savant, Sharath Pai, Arsh Nirmal, Sunil Karamchandani	99
25)	Autonomous Fire Fighting Robot using OpenCV Jeet Patel, Darsh Vora, Harsh Lotia, Kevin Dedhia, Bhoomik Shetty, Hitarth Sharma, Shailee Gala, Aarti Ambekar	103
26)	Android Controlled Car Using Bluetooth Pankti Mehta, Rohit Jha, Hitakshi Shirude, Kashyapi Satra, Vedant Karlekar, Tanaji Biradar	107
27)	Energy Monitoring System Manav Shah, Arya Gada, Hrushil Patel, Gauri Harsule, Surbhi Kulaye, Archana Chaudhari	112
28)	Health Care Management Neeti Adhia, Sandeep Jala, Yukti Doshi, Vedangi Gupte, Harsh Kumbhat, Bhaumik Thakker, Tushar Sawant	115
29)	Arduino Based Accident Alert System Using GPS and GSM Abhijay Rane, Ishaan Thanekar, Manav Nikesh Shah, Bhavesh Dhote, Hemish Ganatra, Yash Joshi, Archana Chaudhari	118
30)	Robotic Arm using Arduino Smit Chheda, Shikha Punjabi, Urvashi Maheshwari, Asim Wahedna, Palak Koul, Vatsal Zaveri, Venkata Chavali	123

31)	Smart Drive Dakshit Shah, Darshan Mehta, Jaimin Shah, Dhanvi Choksi, Manavi Jain, Shweta Joshi, Yukti Bandi	128
32)	Agricultural Applications using Unmanned Aerial Vehicle Parshvi Doshi, Parv Khandelwal, Samyak Shah, Mrunmay Mhapankar, Prithvi Kollara, Rayaana Juvale, Yukti Bandi	133
33)	IOT based Autonomous Vehicle with Lane Detection, Traffic Signal Detection Using OpenCV Python Sohail Shaikh, Jay Makwana, Harshal Vaidya, Sanika Kanawade, Vrisha Shah, Adit Vakil, Aarti Ambekar	140
34)	Intelligent Transport Saiyam Doshi, Rishi Savla, Mokshit Gandhi, Shubh Pokarne, Akhil Nanavati, Rishi Mistry, Venkata Chavali	145
35)	Sign Language Translator Application Prayag Agarwal, Prithvi Krishna, Suraj Surendran, Pramit Bhatia, Ojas Karmarkar, Abdulla Anfaal Mir, Venkata Chavali	148
36)	Online Voting Software Jeet Shah, Kushal Shah, Shivam Dandale, Anuja Odhekar	152
37)	Android App for All Forms of Sensor Monitoring Over Bluetooth Mayank Subramanian, Om Kapadia, Deep Parmar, Revathi AS	157

Raksha: A Wearable Smart Safety Device

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Abstract—This documentation presents a women's security device named Raksha featuring location alerts, weapon detection and other avant-garde features. It is a cost-effective approach to reducing crime against women and making India a safer country. Our chief objective in making this device is to send out alerts in all domains when the user is in distress, this will be achieved through location alerts to the user's shortlisted contacts via SMS, a buzzer to apprise bystanders, a tilt sensor to perceive any sudden changes along with a recording device and camera module for subsequent evidence detection. In addition to these streamlined features, the device can also be connected to a mobile app for efficient control and alerts.

Keywords— *ML weapon detection, Pulse Sensor, NEO6M GPS Module, SIM 800 GSM, alert buttons via which police station gets alerted, SOHAS weapon dataset, buzzer to alert bystanders*

I. INTRODUCTION

India has grown to become the fifth-largest economy in the world as of 2020, and yet violence against women is still highly prevalent with more than 400,000 cases being reported in a year alone. Women in our country still feel unsafe when venturing out alone late at night or in sparsely populated areas, with safety still being one of the major hurdles they must think about at all times of the day. Thus, a device like Raksha, an efficient approach to lowering these ghastly statistics is the need of the hour. There are already many safety bands and smart watches present in the market, however these watches are still considered a luxury commodity, unattainable by the masses and more importantly hardly ever used for the purpose of safety. Being young women ourselves, we drew from personal experience of our idea of safety and security to formulate a device we could see in the hands of almost everyone. With this generation's women excelling in all domains, it is high time safety become a concern of the past.

A device any woman could wear day to day fulfilling their daily responsibilities without fear clouding their day in any form. Present-day safety devices are either marketed as expensive smartwatches or do not have enough features to be considered a sound investment. Keeping these points in mind we have contrived a balance between these two extremes to build Raksha, a wearable wristband for every woman. With features like a weapon detection model, location tracking, SMS alerts and a pulse rate monitor this device has potential to reach the masses and provide safety all over the country. The smart device paired with its app has potential to host a variety of customers on the site, with wide ranging future potential of reaching every rural and urban household.

II. LITERATURE REVIEW

Nalina et al [1] proposed "Smart Women Safety Device using IoT". Although this idea has a limitation that the webcam has to be manually operated for recording suspicious behavior, which may not be the safest option for women under scrutiny. We plan to implement an automatic ESP32-camera module to capture the video and detect weapons/dangerous activity using a convolution neural network of deep learning. ESP32-CAM can be widely used in various IoT applications. It is suitable for home smart devices, industrial wireless control, wireless monitoring, QR wireless identification, wireless positioning system signals and other IoT applications. It is an ideal solution for IoT applications.

Prof. Basavaraj Chougula et al [2] implemented "SMART GIRLS SECURITY SYSTEM." This study discusses a portable commodity that also resembles a belt. After witnessing a few applications and gadgets, such as VithUapp, which was inspired by the popular TV show Gumrah on channel [V], and ILA security founder invented a buzzer that may shock and disorient attackers, this device was created. An Arduino board, GSM shield, GPS module, buzzer, and tilt sensors are all included in this device. The Arduino board has everything needed to get the microcontroller up and running, and it can be powered up by attaching it to a battery. The GSM shield offers low-power data, voice, SMS, and fax services. It is a single-chip processor with high efficiency and speech quality that works with low-cost handsets and is compatible with practically all phone services. If the subject is travelling, the GPS module communicates the current date and time, as well as the matching longitude and latitude. It also conveys speed and travel direction. It aids in the tracking of the individual and makes it easier to access and locate them. In the preceding paper, the device could be made more useful by including any defense feature in order to protect oneself in the event that help is delayed, as a backup option.

Pragna B R et al [3] suggested "Women Safety Devices and Applications" This paper proposes an application called women empowerment. This program can be downloaded and installed on smartphones. There are three main modules in this application: Violence Against Women (VAW), Women's Health (WH), and Emergency Call System (ECS). The user simply needs to sign in once to use the above choices. VAW includes a number of laws that pertain to women. Users may readily see crime-related regulations and make suitable decisions to avoid crime, which allows women to be more aware. It contains the phone numbers of lawyers and non-

governmental organizations (NGOs), whom the victim can call to obtain justice. Women's health issues such as breast cancer, breastfeeding, fitness and nutrition, HIV/AIDS, mental health, pregnancy, immunizations, and other topics are covered by WH. Our country's women are largely employed. This program assists women in stressful situations or when they are threatened. The user will activate the Emergency Call System (ECS). A user must first create an emergency contact number and then save templates. When users are in danger, they simply need to click a specific button, and the system will make three consecutive calls and send a text message to the preset number. It also broadcasts the user's location through text message using the Global Positioning System (GPS). The benefit of this app is that it broadcasts the victim's location to his or her family members. Muskan et al [4] implemented "Women Safety Device Designed Using IoT and Machine Learning". The above research article has used body temperature sensors and pulse rate monitoring sensors which automatically reads and creates patterns and makes calls and sends messages to more than one person along the location. We have instead used an ESP-32CAM and incorporated the concept of using deep learning and IOT to detect potentially hazardous actions/objects and alarming the emergency contacts with the help of GSM and sending the location with the help of GPS.

III. OBJECTIVE

The main objective of our paper is to construct a wearable wristband for women, which can send alerts in case of emergencies. Our aim is to try to reduce the terrible statistics of violence perpetrated against women every year and empower women to live their lives free from the threat of bodily harm. This wristband will come equipped with a weapon detection model, which can identify most weapons like knives, guns, etc. in the immediate vicinity. When it does detect a weapon, it will send a message alert to a list of emergency contacts predefined by the user. This message will also include the user's location, and the camera will start recording the surrounding environment immediately. In addition, we will augment the wristband by building a connected app where the user can add and edit the list of emergency contacts, and access the videos recorded by the wristband. This product will be an extra line of defence between the modern woman, and the ever-looming shadow of violence.

IV. PROPOSED DESIGN

The wearable wristband is interfaced using an ESP-32 development board for controlling the peripherals. The primary function of the band is to send location alerts via SMS to emergency contacts both manually and automatically. A tactile push button activates the buzzer thereby alerting the people nearby. A distress message with the user location is sent to a user-defined list of emergency contacts and the nearest police station. For this we make use of the NEO-6M GPS receiver which has a built-in ceramic antenna, providing a strong satellite search capability. The module communicates directly with the development board via serial communication using the TX and RX. The positional data is received in NMEA format which is de-structured to obtain the latitude and longitude coordinates. The module is coupled with the SIM 800 GSM which then sends the obtained coordinates along with an alert message via SMS. We have also

incorporated a pulse sensor. The pulse sensor working principle is very simple. This sensor has two surfaces, on the first surface, the light-emitting diode & ambient light sensor is connected. Similarly, on the second surface, the circuit is connected which is accountable for the noise cancellation & amplification. The LED is located above a vein in a human body like ear tip or fingertip, however, it must be located on top of a layer directly. Once the LED is located on the vein, then the LED starts emitting light. Once the heart is pumping, then there will be a flow of blood within the veins. So if we check the blood flow, then we can check the heart rates also. If the blood flow is sensed then the ambient light sensor will receive more light as they will be reproduced by the flow of blood. This small change within obtained light can be examined over time to decide our pulse rates. Another tactile button provides an option to discreetly record the perpetrator if required. The recorded data is stored in the cloud and can be accessed via the mobile application. This provides the necessary evidence to help catch the culprit in case of an attack. Precautionary alerts are sent to the user by identifying potential threats. This is done with the help of a Convolution Neural Network based Deep Learning model. Here we have used the YOLOv5 model since we wanted a balance between speed and accuracy. YOLO is the model consuming the least memory in both two-phase training and testing. YOLO just needs about 0.3 ms to 0.4 ms to process an image in comparison to more than 0.1 s and 0.2 s with Faster RCNN and RetinaNet. This allows us to pick up these models on devices which own the modest memory. The model takes the ESP-32 CAM feed as input in real time. If a weapon is detected by the network, the recording is automatically initiated. The user is made aware of the danger through a mild vibration allowing them to take the necessary action in time. The Bluetooth and Wi-Fi provided in the ESP32 would be connected to a mobile application running on an android operating system. The app will allow the user to modify the emergency contacts, view the camera feed, access video recordings and control the device.

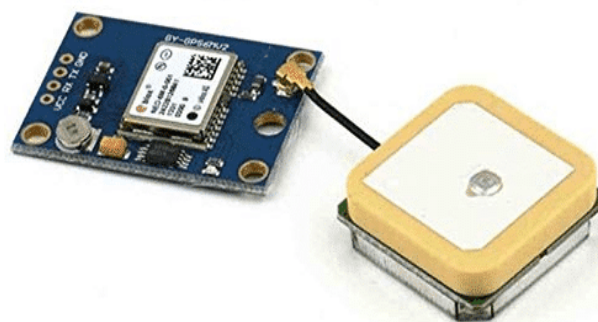


Fig.1 GPS MODULE NEO 6M

This is a complete GPS module that is based on the NEO 6M GPS. This unit uses the latest technology to give the best possible positioning information and includes a larger built-in 25 x 25mm active GPS antenna with a UART TTL socket. A battery is also included so that we can obtain a GPS lock faster. It is an updated GPS module that can be used with Ardupilot Mega v2. This also gives the best possible position information, allowing for better performance.



Fig.2 SIM800L GSM/GPRS

SIM800L GSM/GPRS module is a miniature GSM modem, which can be integrated into a great number of IoT projects. It can accomplish almost anything a normal cell phone can; SMS text messages, make or receive phone calls, connect to the internet through GPRS, TCP/IP, etc. The module supports quad-band GSM/GPRS network, meaning it works pretty much anywhere in the world. Low cost and small footprint and quad-band frequency support make this module the perfect solution for any project that requires long-range connectivity.



Fig.3 ESP 32

The ESP32-CAM is a full-featured microcontroller that also has an integrated video camera and microSD card socket. It is inexpensive and easy to use and is perfect for IoT devices requiring a camera with advanced functions like image tracking and recognition. The ESP32-CAM is a small size, low power consumption camera module based on ESP32. It comes with an OV2640 camera and provides an onboard TF card slot. This can be widely used in intelligent IoT applications such as wireless video monitoring, Wi-Fi image upload, QR identification, and so on. We have utilised the ESP 32 camera module to



Fig.4 Pulse Sensor

A pulse sensor works on the principle of light modulation by blood flow; it monitors the volume change in the pulse wave, which is the change in the volume of a blood vessel that occurs

when the human heart pumps blood. Herein, the LED present in the pulse sensor flashes in unison with each heart beat. This digital output is then connected to our ESP 32 to measure the BPM (Beats Per Minutes) rate.

V. IMPLEMENTATION

Raksha has been implemented using both an app interface wherein the user can create an account and login and set up their device at the click of a button. This personalised system will then lead them to enter their emergency contacts and their preferred police station where the device will send message alerts whenever the user presses the buzzer, or the pulse sensor shows an abnormally high pulse rate. The app will then notify the authorities of the location of the user immediately. Further to make our safety device intelligent, the system makes use of a weapon detection model. The model is trained using transfer learning with the yolov5 architecture on a custom dataset. The SOHAS^[5] dataset consists of weapons such as pistol and knives along with other small handed similar objects viz. wallet, smartphone, currency and credit card. The dataset consists of 5680 training and 1170 testing images having a nearly equal distribution over the six classes. The YOLOv5 architecture provides optimum performance in case of small object detection with higher mean average precision (mAP) in comparison to other popular models such as SSD-inception and R-CNN. Yolo is a single-stage object detector which makes uses of convolutional neural networks (CNN) to make real-time predictions. The name Yolo (You Only Look Once) stems from the fact that the algorithm only requires a single forward propagation for detection of objects. Our trained model has an accuracy of 60% percent which can be fine-tuned further by training for longer epochs. The model performs well when tested in live conditions. Video data stream from the ESP-32 cam module is sent over Wi-Fi to the python backend. The model uses this data to make predictions in real time. In a situation where the model identifies a weapon, the hardware buzzer is triggered, and live location is sent to all emergency contacts.

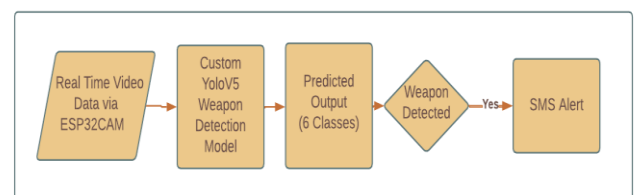


Fig.5 Flowchart of the proposed design

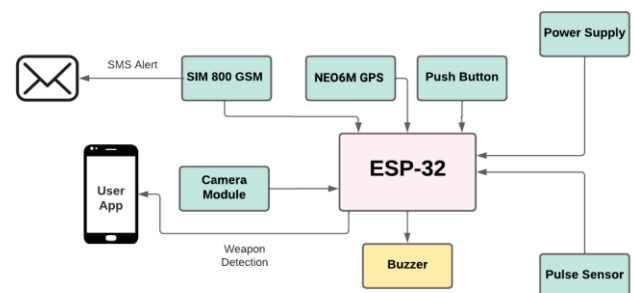


Fig.6 Block diagram of the project and its features

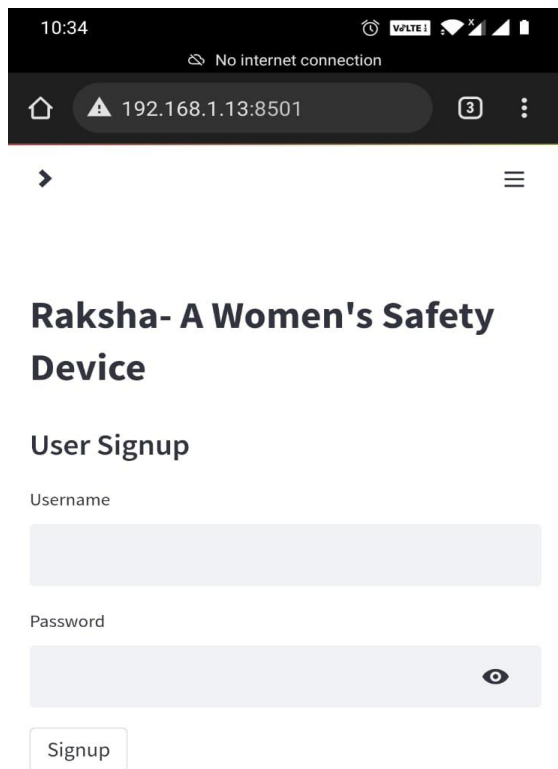


Fig.7 App Interface User Sign Up

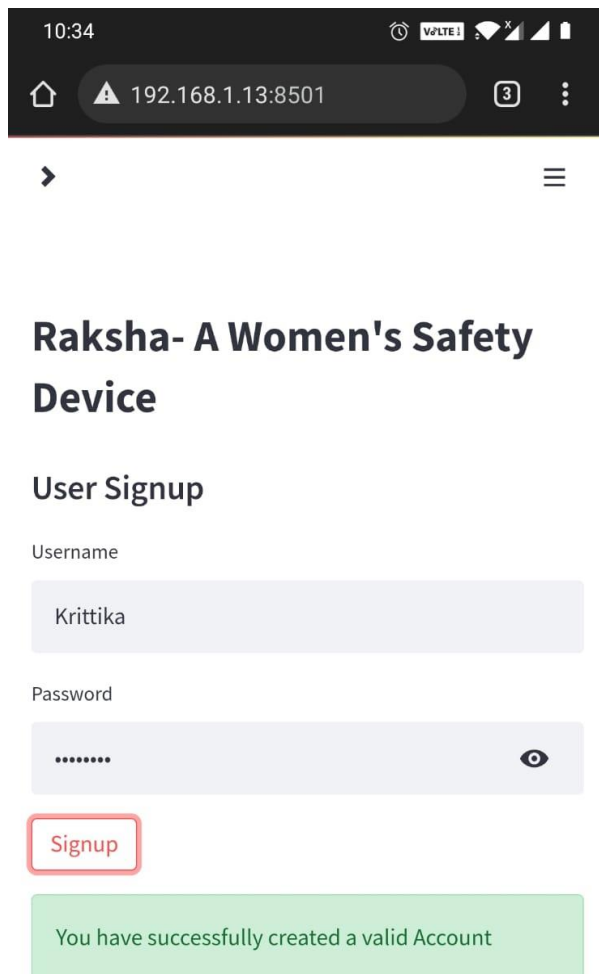


Fig.8 App Interface User Sign Up

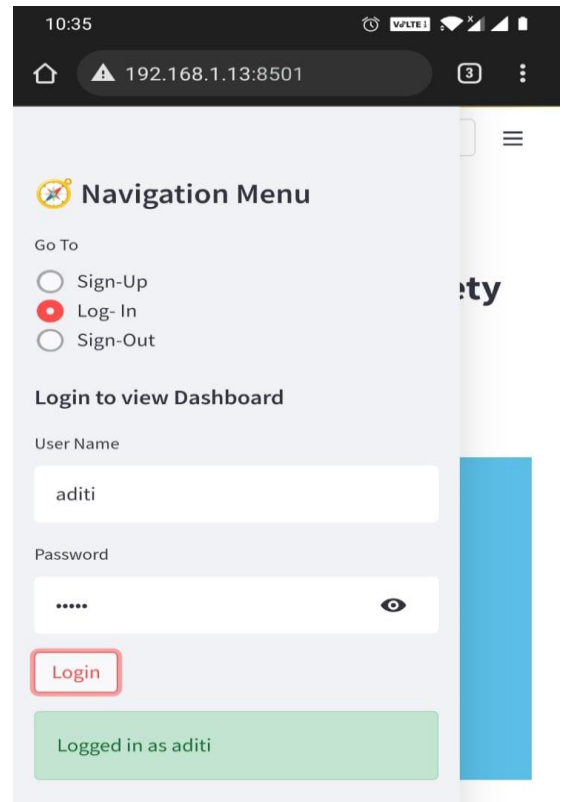


Fig.9 Login Dashboard

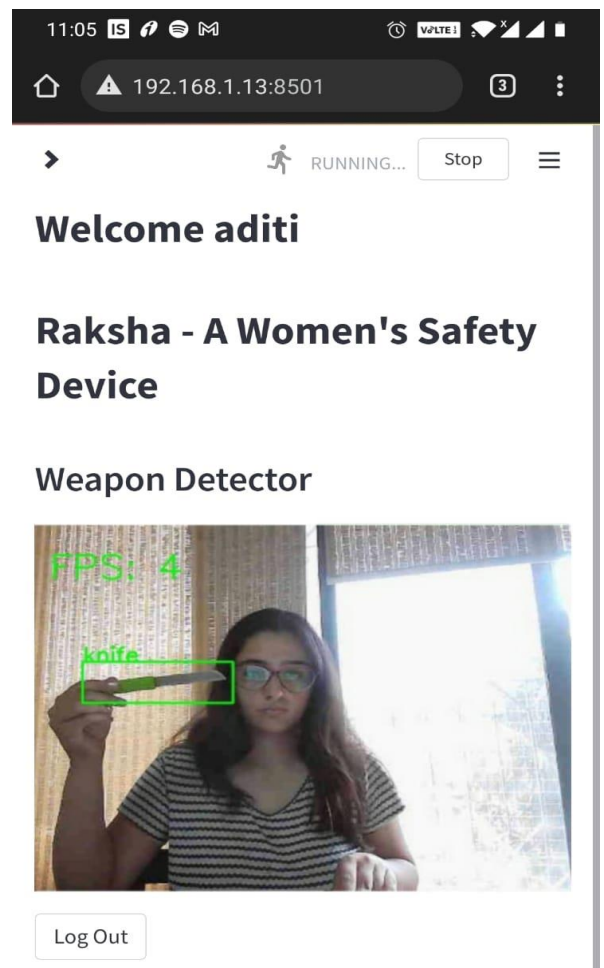


Fig.10 Weapon Detection Model

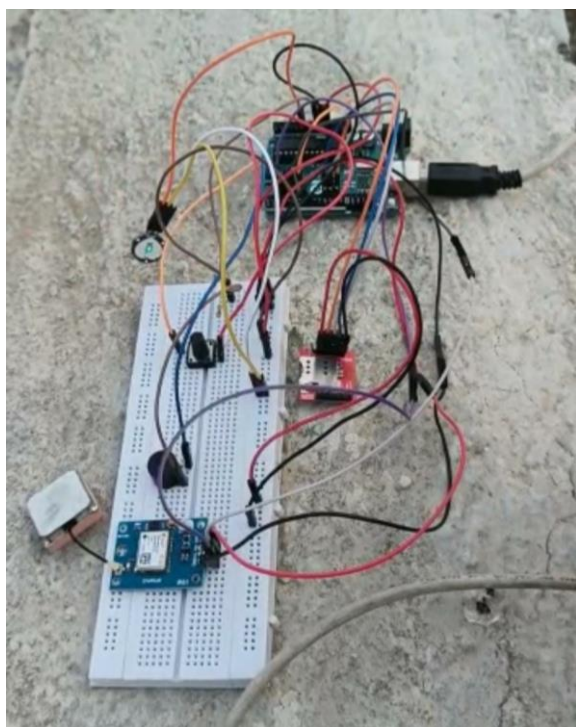


Fig.11 Prototype Image

VI. SOCIAL IMPACT

Crimes such as molestation, harassment and even rape at times go unreported, with statistics showing that this happens more than 90% of the time. A major reason for this is the lack of evidence the victim is left with once the crime has occurred. Our device not only alerts the authorities in charge as soon as the buzzer is pressed it further goes on to record the perpetrator, their weapon of choice and the exact location wherein the crime occurred. Along with these present features, a shock generator can be added so that the victim can take immediate action before help arrives from elsewhere. Further we can also link the device with smart glasses for better identification of the suspect adding in features like facial and emotional recognition, thus helping the police in arresting the perpetrator at a faster rate without needing the cooperation of the suspect when identifying. A solar rechargeable battery can be added, thus making the device self sufficient and long lasting, a high priority need when it comes to devices like these being used in rural areas where electrical ports are present far and wide, with women travelling long distances for their day-to-day chores. Keeping the urban lifestyle in mind as well, the device could be improved on by adding a night vision camera, thus helping women go about their lives freely at any time of the day without safety being a concern as soon as the sun sets. With society showing a slow rate of progress when it comes to their attitude towards the women in India, it is time women take matters into their own hands with a device like Raksha.

VII. CONCLUSION

Our system is a user-friendly device which provides a sense of security during an emergency and is helpful during critical times. With its weapon detection model using YOLOv5 we have brought in a new facet to the already present safety

devices, adding to their features and cost efficiency. The current mechanism is not robust enough to keep women from being criminalised, and thus newer methods are the need of the hour. Our device thus proposed a mechanism wherein women in danger can alert their contacts and the police, record the perpetrator, the assailants weapon of choice and the location of the crime. This design will thus help women take matters into their own hands, providing security utilising technology for the greater good. With its high flexibility, cost effectiveness and modification scope Raksha aims to be a device that bring about much needed change in India's society.

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Intelligent Surveillance using Drone

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Abstract—Necessity is the mother of all inventions. The need of today's times is ease of work and decreasing manual labor in any which way possible. As the importance of materialistic things have increased in the world, a great concern is about securing them and preventing any kind of trespassers, people, or viruses. The aim of human mankind is to create a world where people can live without any kind of fears or inhibitions in mind before stepping out of their houses. A feeling of security brings with it contentment. The five major elements or aspects of security namely, confidentiality, integrity, authenticity, non-repudiation, and availability, are to be ensured to create an ideal security system. Security system with majority of these elements can be considered as a job well done. This project revolves around the very same security requirement without the need of a person physically monitoring it. Due to the increase in crime and robberies, increased vigilance is needed in commercial and industrial areas. A drone is a flight robot that can fly remotely or autonomously using software-driven flight plans in an embedded system. The eyes of these patrolling drones do not miss an opportunity to discover, detect, observe, and interdict unusual events. The main purpose of this project is to survey a huge area from one place without needing the security person to physically monitor it.

Keywords—Drone, Quadcopter, Surveillance, camera, BLDC Motors, Speed Controllers, CC3d, OpenCV, Open Pilot, Wireless AV transmission, Lipo.

I. INTRODUCTION

Reliable security systems are those which provide security, are easy to use, and are relatively inexpensive. In addition, it is flexible and extensible, with excellent alert and reporting capabilities. Although the rules, regulations and laws have been quite some help in decreasing and getting a control over criminal activities, but also it is necessary to act carefully and take required precautions. Public surveillance helps you stay safe while you're on the go. Public security can monitor and deter crime. For example, if a suspicious person is found in an area, authorities may anticipate the situation and keep bystanders away from harm. According to statistics, crime rates decrease when security measures are taken. As mentioned earlier, taking security measures acts as a deterrent because you don't want to risk getting caught by criminals. And thus, surveillance systems are gaining popularity these days. None of the technically rich innovations could be a full proof solution and overcame all the limitations; physically, technically, economically as well as socially. The CCTV camera can record events throughout the day, but it has the major drawback of recording only a limited range of events. Limited range means less than 20 feet. Therefore, it's an easy

way for a villain to do business without being caught by the camera. A vague image of a criminal silhouette is captured alone with an unclear face and shape.

Drones are essentially flying robots, combined with computer vision, face recognition, object recognition, and other tracking techniques. Drones provide an ideal solution to the problems and limitations of other monitoring methods. Drone monitoring provides an easier, faster, and cheaper way to collect data. As a result, there are many other important benefits. Drone aircraft penetrate tight spaces, minimise noise, and are equipped with night-vision cameras and thermal sensors. For this reason, we deliver images that are invisible to the human eye. Drones can quickly cover vast, difficult-to-reach areas, reducing personnel and costs. Moreover, they don't need a lot of space for their operators. The drone will be fitted with a camera and lights that provide night vision. The drone's ability to fly, be small, and withstand harsh environments means that it can frequently inspect subjects that may otherwise be inaccessible and does not have access to the first-person view (FPV) normally available to photographers.

II. OBJECTIVE

In everyday life, a lot of thefts takes place around us. With increasing number of robberies, constant surveillance is needed in industrial and commercial areas. A night surveillance patrolling drone does not fail to detect, spot, discover any strange, abnormal activity happenings. The drone surveys areas where physical monitoring is not possible due to reasons like unfavourable terrains or harsh condition. Surveillance is also possible with CCTV cameras which are majorly installed most of the industrial places, but the drone has an edge over it. With patrolling drone one can capture the footage of the unusual activities in user required angles and elevation. Also, the cost of n number of CCTVs in a particular perimeter can be replaced with the cost of single drone. The footage that is captured and recorded through the camera module undergoes this OpenCV detection and alerts any kind of unusual movements. The guilty can be easily identified using the footage and appropriate measures can be taken to avoid crimes.

III. PROPOSED DESIGN

The drone is made up of a DJI F450 frame made of Polyamide materials that are strong enough to provide the drone with stability and robustness. The major components of the drone

are the Raspberry Pi module with a camera module attached to it. Also, the CC3D flight controller is an essential component of the design as it provides is connected to the 4 ESCs which control the drone and by powering the A2212 1400KV Brushless DC motors. The drone is powered by a 11.1V (3s) 5500mAh Lithium Polymer (LiPo) battery. OpenCV is an open-source library that is immensely used in computer vision applications, for example, video analysis, CCTV footage analysis and image analysis. Thus, it is such an aid for the use of cameras that helps us for the object detection as well as face detection. Object and face detection is necessary for the surveillance purpose to capture the criminal activities and every minute detail regarding the act including the witnesses and evidence involved. A surveillance recording is great evidence in the criminal cases and are play a pivotal role in coming to conclusions. The block diagram of the proposed deign is shown below:

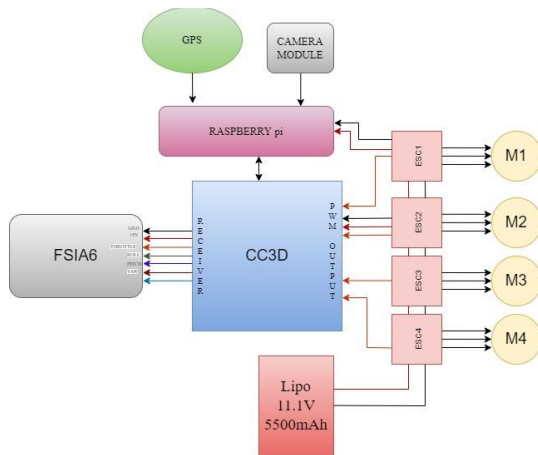


Fig.1 Block Diagram for CC3D connections

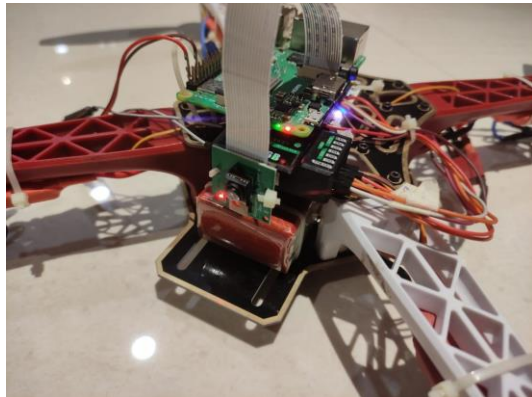


Fig.2 Hardware for drone

IV. IMPLEMENTATION

Human detection:

The human detection and tracking are used by computer vision system to identify the objects and humans in a footage. The algorithm uses the captured image and compares the tiny portion of the image with the known templates and patterns. The use of human Detection becomes handy when it comes to surveillance and tracking. The thought behind implementing OpenCV was to analyse the images and detect the human and objects in an area. The Human detection is enabled in our

design by using a raspberry pi Module in correspondence with a camera module. The human detection can be implemented by using in two ways: a) Using an image or b) Using a live video feed from a camera module.

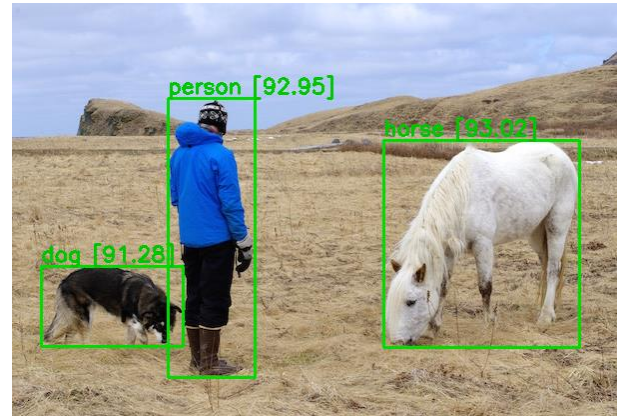


Fig.3 Block Diagram for CC3D connections

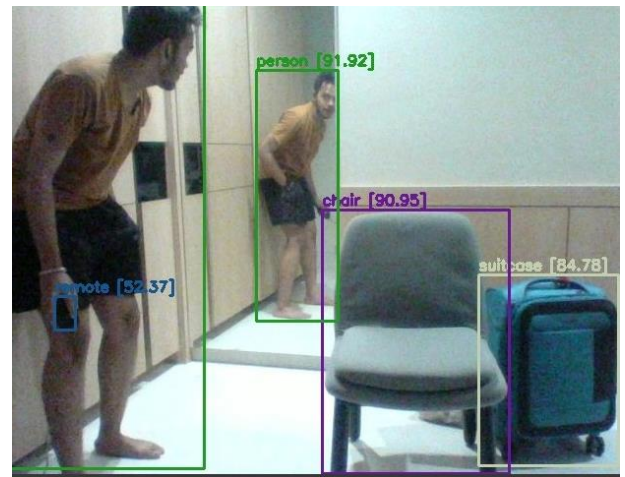


Fig.4 Block Diagram for CC3D connections

Drone design:

The drone uses a DJI F450 Frame which is sturdy and quite durable. The BLDC motors used are A2212 1400kV each motor can generate around 500g of thrust hence a total of 2kg of thrust is offered by four BLDC motors. The ESC used with the motors is SIMON K 30A ESCs which are recommended by the datasheet of the motors. We have gone with the X configuration type of drone due to its stability and mounting the camera in a forwarding direction is comparatively easy in X-configuration rather than in +- Configuration. We calculated the average flight time of the drone by assuming certain parameters such as the continuous current supplied by the battery.

The average flight time is given by:

$$t_f = \frac{\text{Battery Capacity}}{I_{\text{max}}} * 60\text{minutes}$$

C = Battery Capacity (in Ah)

I_{max} = Maximum Current drawn by the Quadcopter (in Amperes)

The Flight controller used is CC3D Evo which is a powerful STM32 based 32-bit microcontroller running at 90 MIPS with 128kB flash and 20kB RAM. It has a 3-axis high-performance

accelerometer and gyroscope which can be calibrated with the help of a Ground Control Station (GCS) thanks to its powerful Open pilot Architecture. We used Libre pilot GCS and after upgrading the boot loader and updating the firmware of the CC3D flight controller board we were finally able to calibrate each ESC and configure the board. The libre-pilot GCS was also used to set up the FLYSKY FSiA6 2.4GHz 6 Channel transmitter and receiver with the CC3D board. The PWM output to the ESCs was later manually calibrated using the GCS so that each motor is spun at the same time.



Fig.5 Final quadcopter model

Libre pilot ground control station is used to calibrate and program the CC3D board. After upgrading the bootloader and installing the correct firmware, we were able to calibrate the on-board sensors and ESCs such that the neutral state of the motor can identify for starting up the motors. The software can also be used to get the telemetry data from the drone i.e. its 3 axis acceleration, 3 axis gyroscope and altitude in 3 axis. We can get this data using a telemetry system to keep track of all these data. The libre pilot GCS was used to setup the FSi6 2.4GHz 6 Channel transmitter. During initial runs we could see that not all four motors were running at the same time, but this issue was overcome thanks to the Libre pilot's easy to understand user-interface.



Fig.6 Final quadcopter model

V. RESULTS AND CONCLUSION

The main purpose of the project was to design and develop drone from scratch for surveillance purpose. The project successfully demonstrated the operation of drone and video footage transmission from it. The purpose of Surveillance is successfully fulfilled by developing the drone and testing in different conditions. Great effort is required to build this project using locally procured resources, but it can be optimized as per the industry requirements. The patrolling drone can not only be an amazing option to surveillance but also for other applications mentioned above. The construction, working, implementation, efficiency, advantages, and uses of an advancing technology like drones can never be enough described or elaborated.

VI. SOCIAL IMPACT

Over the last decade, emotional expression recognition. Any kind of idea, experiment or project starts from the very thought of its use in real life and what else is that if not how it will affect the society, in good or bad. Some of the ways a surveillance drone can altered its use in wide domains of life are listed below:

Getting Help in an Emergency

Because of the scale or severity of the disaster, it's not always safe to send humans into a rescue situation. This is where drones come into play. Officials can launch an autonomous underwater vehicle (AUV) into the ocean to help in the rescue of a capsized boat or a drowning person. Drones are used to search for those trapped in the snow if there is an avalanche. The use of unmanned aerial vehicles (UAVs) is improving airport operations.

The development of unmanned aerial vehicle (UAV) technology can assist airports and airlines, with uses ranging from airport inspections to bird control and drone deliveries. Drones can help airports run more efficiently and save money by conducting maintenance and inspection tasks. Airlines are testing what a drone can do to speed up the inspection process. Instead of manually inspecting the planes, the UAVs can hover all over them, producing HD videos and images that engineers can evaluate.

Law Enforcement & Police

Drones have a lot of potential when it comes to law enforcement. These devices can fly around invisibly, garnering little attention from onlookers. As a result, it could be beneficial to public safety or monitoring. If there is an outbreak, groups of people can be tracked, and illegal activity can be recognized. Law enforcement officers can also employ these for crime investigations when a thorough perspective may reveal more information about the situation. Furthermore, most border patrol personnel who try to monitor criminal activity along the border, particularly drug smuggling, employ drones.

Inspection & Sensory

Quadcopters are becoming useful in inspections, just as they are in other industries.

They're changing the way individual physical inspections and expensive to operate choppers are used. It includes routine inspections of equipment, roads, water, and electrical lines, among other things. Drones can collect information in congested locations, such as inside construction walls where intricate pipes are placed. These have built-in LEDs for visibility in the dark and a flexible outer cage that lets it to bounce back from obstacles. It is expected to reduce downtime, lower inspection costs, and increase worker safety.

ACKNOWLEDGMENT

This project and technical paper were greatly bolstered up by Professor Archana Chaudhary. Her constant support and valuable suggestions helped us to accomplish our goal. This would not have been possible without her pearls of wisdom. A special thanks to our lab technician, his willingness to give us his time so generously has been very much appreciated. Lastly, we are grateful to our seniors who contributed their knowledge and experience throughout the project.

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Geofencing Systems

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Abstract— Geo-fencing uses a global positioning system to define a virtual fence/ barrier demarking a geographical area. Geo-fencing is an innovative technology that has numerous applications ranging from child safety to advertising and marketing. The Global Positioning System (GPS) is a system that uses the notion of the Global Navigation Satellite System to detect the location of a given object (GNSS). The objective of this research is to demonstrate the working of a device that creates this virtual barrier and illustrate the multiple uses for it. The system will use tracking and monitoring based on worldwide navigation services to improve location tracking efficiency. Engineers working in the fields of automation and grid computing face a difficult task when it comes to geo-fencing. This project will provide a detailed design of a device that can be configured for all of the possible applications of this technology.

Keywords—*protection, GPS Geo-fencing System, GSM module, geo-location, OLED, Arduino, tracking, monitoring*

I. INTRODUCTION

Advanced location-based systems employ geo-fencing to determine whether a tracked device has entered or exited a geographic border. A human's life has always necessitated the use of security systems and navigators. Advances in advanced electronics have ushered in radical transformations in several domains. Theft of equipment is a serious problem in many industries, including transportation and construction, particularly for larger companies. There is no way to track the vehicle's movement, and we have no idea what the present state and location of the vehicles are. One of the most obvious ways to keep track of automobiles is to use a GPS-based vehicle monitoring system. One of the most obvious ways to keep track of automobiles is to use a GPS-based vehicle monitoring system. The Global Positioning System (GPS) is a satellite-based system that gives accurate position and timing information at all times and in any weather condition on the planet. We wish to solve the problem of vehicle tracking by deploying a GPS-based monitoring system with geo-fencing capability. This system consisted of a few primary components that worked together to convey the vehicle's location to a distant user via satellite communication. Remote monitoring of geographic areas encompassed by a virtual barrier (geo-fence) and automatic detections when mobile objects entered or exited these areas were made possible by geo-fencing.

Employers may be notified when a worker enters or quits a certain region, as well as monitor when and how long a worker stays at a specific location, thanks to geo-fencing. There's also a geo-fencing app that notifies management

when a driver deviates from the planned route. Advanced location-based systems employ geo-fencing to determine whether a tracked device has entered or exited a geographic border. The geo-fencing app uses the tracked device's real-time location data to perform this function. The data is usually in the form of latitude and longitude coordinates obtained from a GPS-enabled gadget. The coordinate is compared to the geo-fence boundary and a trigger event is generated depending on whether the coordinate is inside or outside the barrier. Alternatively, the event can carry out a task such as turning on the lights or cooling the geo-fenced zone.

The purpose of this paper is to investigate GPS-based location monitoring systems with geo-fencing capabilities. This system provides a high-security system that guards against car theft or loss. It also sends a notification to the user based on the location's boundaries, using the Internet of Things idea (IOT). In this study, the system was able to readily monitor and track the vehicle's location, as well as provide an alarm when it left the geo-fence area. There are two types of geo-fencing systems: hardware and software. The admin may watch the vehicle via computer, and a notification alert could be issued to the admin's registered phone number when the vehicle left or enters the Geo-fence region. The prototype systems were put to the test by driving around the geo-fence region. The system displays a positive outcome, including the vehicle's correct location and a message notification alert when it exits or enters the boundary. When compared to the real-map on the phone, the location accuracy is around 95%. As a result, this system appears to be extremely beneficial to humans and has the potential to make global life much simpler and smoother. Advanced location-based systems employ geo-fencing to determine when a tracked device is inside or outside of a geographic border. A human's life has always required the use of security systems and navigators. These sectors have seen radical transformations as a result of advances in advanced electronics. Theft of equipment is a serious problem in a variety of industries, including transportation and construction, particularly for larger companies. There is no way to track the vehicle's movement, and we have no idea how the cars are currently performing or where they are. One of the most obvious ways to keep track of automobiles is by using a GPS-based vehicle tracking system.

II. LITERATURE SURVEY

The numerous geo-fencing constructs and concepts are discussed in several works. Concepts, models, or schematic

ideas are constructs: They are the conceptual structures of the Geo-fence as a Security Strategy Model in this situation. Some theories regard location-based services and radio frequency identification (RFID) as critical components of wireless network security. As a result, location-based services and RFID technology emerge as critical elements. An company can become a highly secure network by utilising the Geo-fencing application architecture. The Geo-fencing application framework was created with the expectation that applying these concepts to wireless network security will encourage enterprises at risk of hacking to use wireless networks as a secure mode of communication.

To satisfy various practical purposes, several geo-fencing systems have been created. The most important techniques are listed below.

Geo-fenced Region- This technology monitors mobile objects moving around or inside a geo-fenced area automatically. When mobile phones enter or exit the barrier, alarms are heard. According to the developer's wishes, the area can range in size from a few metres to several hundred kilometres. Geo-fencing can take the form of a simple geometric figure, such as a square or rectangle, or a more intricate figure, such as a complex polygon.

Proximity to a centrally specified point- This technique is used to detect a vehicle's proximity to a fixed location. In reality, geo-fencing takes the form of a circle, with the fixed point being the centre.

Because it only requires two parameters, centre and radius, this approach is the easiest way to establish geo-fencing. The distance between the moving object and the predetermined location is calculated by the algorithm. The object will be regarded inside or outside the geo-fencing depending on whether this distance is smaller or higher than the radius specified.

Route adherence - This technique entails tracking a mobile object throughout a journey, from the point of departure to the point of arrival. Geo-fencing allows you to ensure that a vehicle does not wander from its pre-determined path. Geo-fencing technologies are used to create a pre-determined route, and the moving device is tracked to ensure that it does not deviate from it.

Infrastructure for wireless fidelity-

The idea behind Wi-Fi is that the received signal strengths (RSS) from at least one access point can be utilised to locate a mobile device, such as a laptop. Signals containing information in the form of packets are known as beacons. Transmission can take place via access points that receive signals within their sphere and determine the position of the mobile device (laptop) or by signals from access points that carry information such as their ID. The service area for indoor Geo-location applications is limited to a building's interior and surrounding neighbourhood, and the building floor plan is usually available as an electronic document nowadays. Applications that focus on this can take advantage of this. Indoor location monitoring applications can take use of this. When tracking a mobile object in a closed structure such as a building, for example, building floor plans might be useful in circumstances involving crossing walls or levels. Indoor regions are smaller than outdoor regions, making it easier to

track location with the greatest accuracy possible and facilitating sensor placement and operation. Because of this one-of-a-kind capability, Wi-Fi infrastructure has become a key component of location monitoring.

Infrastructure for Radio Frequency Identity:-

The use of RFID technology is based on the fact that it is both low-power and low-cost. The frequency spans from 100 to 500 kHz, moderate (10 to 15 MHz), and high (2.4 to 5 GHz). The reader and the tag are the two components of RFID technology, with both being capable of exchanging radio signals in a two-way communication path.

The technique works by connecting an RFID reader to a server and using it to communicate with an Active Tag (which has its own power and can scan up to tens of metres), allowing the RFID tag's proximity to a reader to be determined. This approach can be carried out in a variety of ways, including: first, by employing a microchip to store the serial number that identifies the mobile device on the RFID.

III.OBJECTIVE

With the rise in popularity of mobile devices, geo-fencing has become commonplace for many organizations. After a geographic area has been specified, the possibilities for what corporations can accomplish appear to be limitless. Some retail and hotel businesses may build up geo-fences around their competitors, enticing you to visit the other institution when you approach the boundary. Alternatively, you may enter a store and find a coupon delivered to your mobile. If you download a supermarket app, it's likely that it'll detect your passing and send you an alert, urging you to stop in. Here are other common geo-fencing applications:

- **Audience engagement:** At scheduled events such as concerts, festivals, and fairs, geo-fencing is utilized to engage large crowds of people. A concert venue, for example, could utilize a geo-fence to crowd source social media posts or transmit venue or event information.
- **Smart appliances:** As more of our appliances become "smart," with Bluetooth capabilities, programming your fridge to warn you that you're out of milk the next time you pass by the grocery store is easier than ever. Alternatively, you can use a geo-fence to ensure that the thermostat is set to the ideal temperature when you get home from work.
- **Human resources:** Some firms use geo-fencing to track personnel, particularly those who work off-site in the field. It's also a simple way to automate time cards, allowing you to clock staff in and out as they arrive and depart.

IV.PROPOSED DESIGN

Hardware and software components will make up the system design. Arduino Pro Mini or Nano, Sim800l (GSM Module), Neo 6M Module (GPS Module), and an OLED Display are the hardware components we're looking at right now. The data collected by the GPS will be sent from the GPS to this platform. The NEO 6M GPS Module will continuously collect the 020014-2 data. Geo-fencing will be used to monitor the vehicle by marking the geographical borders of a certain location. The geo-fence area's bounding is usually defined by the admin or developer. So, if a vehicle or object is within this geo-fence, it may be determined to be at a certain position in this system.

Step1: Arduino installation and setting up the necessary libraries.
 Step 2: Start coding, define the position of pins, then set base location for geo-fencing system,
 Step 3: connect Arduino to GPS module neo 6m and OLED display and ensure smooth communication Step 4: after completion of code, do connections
 Once circuit is complete do the testing



Fig.1 Components

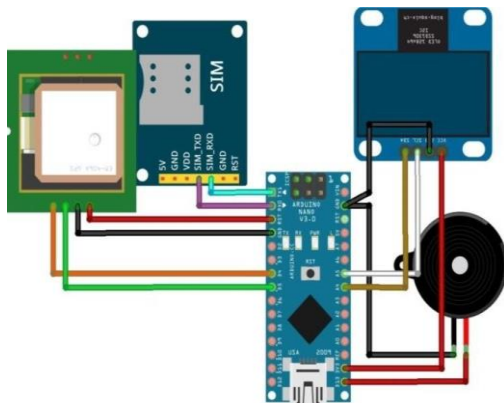


Fig.2 Schematic Diagram

V.IMPLEMENTATION

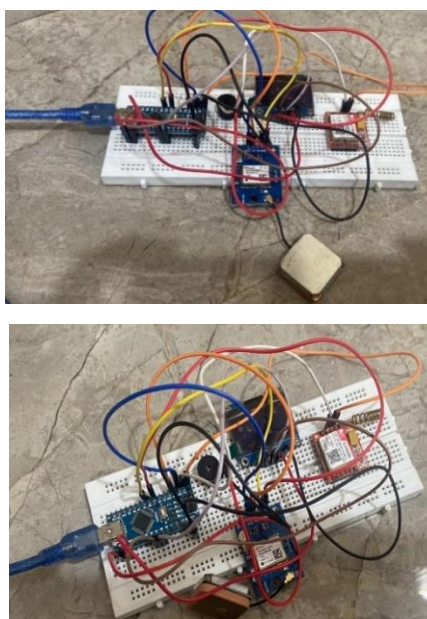


Fig.3.Implementation of Hardware

For the Distance Alert and warning system, we will use the SIM800L module and a Buzzer. We'll utilise a NEO 6M GPS module for geo-location. An I2C OLED Display will also be connected, which will display the distance between the base and the present position. We'll specify a base position and a threshold distance in this gadget. When the device senses that it is travelling beyond the given distance, the buzzer connected to pin 13 will begin to sound an alarm, and the Sim800l will send a message to the specified numbers notifying them to the crossing of the set distance.

Assuming that the Arduino IDE is already installed on your computer, we'll need to do some basic library setup. Now after installation of library we can proceed to the coding part. To do so, go to Sketch menu→click the manage library option →in Library manager window search the library ("Adafruit FONA","NMEA GPS" and "SSD1306 ASCII") one by one and install them.

We must first initialise the essential libraries ("Adafruit FONA," "NMEA GPS," and "SSD1306 ASCII") before defining the pin numbers for Serial Communication with SIM 800l Module. After that, we'll set up the base position, or the Geofencing centre point, from which we'll begin the geo fencing. Next, we'll write a setup function in which we'll set the baud rate for the Sim800l Module to 4800, which is our GSM Module's default baud rate.

Next, we'll set the GPS Module's baud rate to 9600. We've used the Arduino's hardware serial port for both serial debugging and connection with the GPS module. After that, we'll configure the OLED Display and establish up communication with it.

Next, we'll develop a loop function that checks the GPS location and updates the location on the OLED Display on a regular basis. We built an If condition in the same loop where we defined the threshold distance or, to put it another way, the maximum distance one can travel from the base point. If someone breaches this boundary, the device notifies the user and also sends a message to the specified phone numbers, telling them of the geo-fencing breach.

Now, after completing the code, select the Right Port and Board of Arduino and upload it to the Arduino board. After successful upload of code connect all the components as shown in Circuit Diagram.

VI. RESULTS AND CONCLUSION

Connect the Arduino board to a 5-10 V battery and wait a few minutes after inspecting all of the connections. The GPS Module can then use this information to locate the device by looking for satellites. After the GPS Module receives the location and establishes a connection with the satellite, the red light on the board will begin to flicker. Insert a 2G sim card into the SIM800l module and wait for it to register with the network for a few minutes. The device will now notify you and send a message to your phone if you get too far away from the base location and cross the threshold distance.

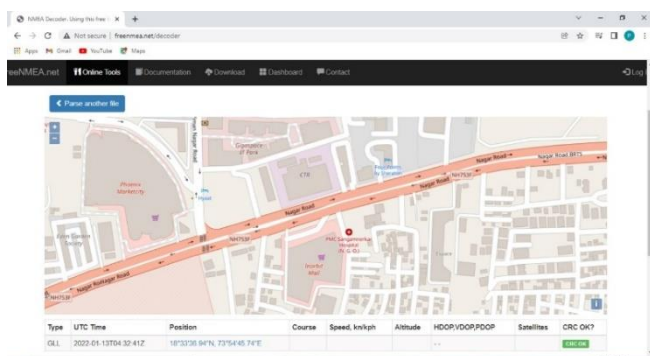


Fig.4 Geofencing Location Tracking

VII.SOCIAL IMPACT

From marketing and social media to workplace time management, geo-fencing offers a wide range of applications. Retailers, for example, can employ geo-fencing to notify nearby shoppers of a fantastic deal. Restaurants might inform passers-by about the special of the day. Passengers can be notified when a driver is nearby via ride-sharing services. Geo-fencing technology may be used by many businesses to customise and improve the customer experience. Businesses can utilise geo-fencing technology to provide special offers to local customers. Businesses can target consumers at events, campuses, trade exhibits, and other locations using a mobile device for marketing. These geo-fencing notifications have been shown to be effective in trials. According to a 2018 geo-fencing survey, 53% of consumers have gotten a geo-fence notice featuring a special offer or discount and have taken advantage of it. Another 67% believe smartphone alerts are always or occasionally useful.

At a workplace this technology can help managers with employee time tracking by taking a note of their arrival and exit time. Hence, helping employee survey at a work force.

This technology can assist managers with employee time tracking in the workplace by recording their arrival and departure times. As a result, assisting an employee survey at a workplace.

Geo-fencing has personal applications as well, such as allowing parents to set geo-fences around their homes. Parents receive real-time alerts when their children enter and exit such venues. Set a geo-fence around your house if you don't like coming home to a gloomy house. The geo-fence can control lights, stereos, and more when used in conjunction with home automation apps like If This Then That and Google Home.

Geo-fencing has also been used to protect dementia sufferers, help those with drug and alcohol addictions, and much more. When patients or loved ones leave a geo-fenced "safe zone," location tracking solutions such as Angel-sense, GPS Smart-Sole, and Mind-Me can inform caregiver.

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AI Based Adaptive Traffic Signal

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Abstract—Due to the rising population we have seen an exponential growth in the purchase of private vehicles by people. This has caused the problem of traffic congestion that has been there for several years and only seems to be getting worse. Tackling such a problem might not be easy but could start with the efficient flow of traffic through a signal. Usually, metropolitan areas due to the traffic there are very long signals that not only cause the loss of time but also fuel and other resources. On many occasions one might be stuck in a signal while the road open might have very few to no vehicles. Developing an AI based Adaptive Traffic Signal could aid the flow of traffic through camera surveillance. The current stagnant time signal can be replaced with a signal that can change the time left base on the density of traffic and other factors that are present on the road. Our proposed system solves this very problem through the use of hardware and software. Through the CCTV cameras we are able to use any live image of stagnant traffic and match it to a pre-defined density picture of traffic. This matching is done through image processing techniques coupled with the signals received from the ultrasonic sensors. This data is relayed to the Raspberry Pi where, based on our own algorithm formed for reduction of time we can implement an adaptive traffic signal. The use of our system could definitely bring about a change in the problems of traffic faced by people around the country.

Keywords— *Traffic congestion, Image processing, RGB to Gray conversion, image resizing, image enhancement, edge detection, image matching, timing allocation, SURF algorithm, Raspberry Pi, CCTV cameras, Vehicle Density*

I. INTRODUCTION

In today's fast-paced world, traffic congestion has become a serious issue in our daily lives. It reduces individual productivity and, as a result, societal productivity because many work hours are wasted in signaling. It indirectly contributes to the increase in pollution level because engines are left running in most cases, consuming a large amount of natural resources in the form of petrol and diesel with no fruitful outcome.

As a result, in order to eliminate or at least reduce these issues, newer schemes incorporating sensor-based automation techniques in this field of traffic signaling systems must be implemented. This is exactly what we have aimed to do with the help of careful calculations and considerations of human as well as other factors taken into consideration. Our project is a combination of hardware and software to provide a one-stop solution to automating traffic system regulation and management.

II. METHODOLOGY

Existing Methods

We have come across several traffic systems that have proposed to efficiently reduce the time taken by vehicles at the signal. However, most of these are either manual or lack the sense of taking many real-time factors into consideration. However, the new implementations in a few cities focus on the implementation of the 'Adaptive TrafficControl System' (ATCS). In this system sensors and detectors are used to find the density level at any selected intersection in junction. The traffic light control time-dependent system has a fixed period to switch traffic between different directions. The traffic lights turn ON and OFF by itself based on the timer value. Ultimately, the traffic has to wait back on the road due to the density of traffic being too less to sense on an empty road. There are also VANET systems being suggested on the basis of a smart traffic signal that can send messages to the control room based on the traffic statistic.

Issues in Existing Methods

All of the current systems have the infrastructure that is required to monitor the roads and trigger a change in the traffic signal to help effective flow of traffic. However, one important thing these methods fail to take into consideration are the human factors and other anomalies that cause a sense of randomness. Some systems might only use sensors which could give inaccurate data while some require manual intervention. Having an all-automated system might not be practical with all the solutions that are currently available.

Proposed Method

CCTV Camera: CCTV camera form the input of our entire setup which is crucial to the adaptation proposed. The camera module that we are going to use is already present on roads as part of the infrastructure. We can use this to operate our system and set it up easily in a practical environment.

Raspberry Pi: It is a development board that is used for advanced applications. We have used the Raspberry Pi 4 for our project because of the faster processing speed and enhanced features. This forms the controller which will trigger all the signals that are going to alter the time taken in the traffic lights. The Raspbian software is implemented through a virtual screen and can be used to control this Raspberry pi remotely.



Fig.1 Raspberry Pi

Ultrasonic Sensor: Ultrasonic Sensor is very important in measuring the distance from an object. It can also be used to measure the distance from transparent objects. Here, we simply are using the ultrasound sensor to detect the presence of a vehicle at that distance from the signal.



Fig.2 Ultrasonic Sensor

Circuit Diagram: We have depicted here a 4-way junction that is represented using 3 LED's made up of Red, Yellow and Green signifying the traffic lights. All of the above are connected with the help of resistors and jumper wires to the Raspberry Pi.

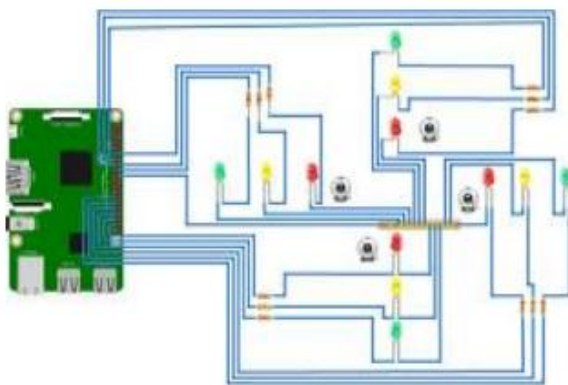


Fig.3 Circuit Diagram

Ultrasound Sensor Setup: This setup describes the connection of our sensor to the Raspberry Pi and an LED which glows and a buzzer that beeps when there is a vehicle stationary there for longer than 3 seconds.



Fig.4 Ultrasonic Sensor Setup

System Architecture: The system that we are proposing is a level-based system that makes use of hardware and software combined to effectively adapt signal timings. Our system is made up of CCTV cameras which serve as the camera module that will click images to be used as input. These images will then be loaded onto a database and accessed remotely. Our software will then use image processing techniques along with a matching algorithm to determine the density of the traffic that is present on the road. We also have ultrasonic sensors placed on the road that will help us calculate the density of the traffic more accurately. A combined result is then relayed to the raspberry Pi which is connected to the signal. Based on the algorithm combined with other factors and conditions the pre-defined time will be subtracted from the signal present.

Functional Architecture: We take the reference image of a certain road that has been tagged according to the density that it may pertain to. These are stored on the database. Once we receive a real time image of the traffic, this image undergoes image processing techniques like RGB to Grayscale conversion, Image enhancement, Edge Detection and Image resizing. All this is applied to the image and finally based on the SURF algorithm we can match this image to the reference image to allow for an accurate density output. The output that we receive combined with the result from the sensors is relayed to the Raspberry Pi which then executes the same onto the traffic lights

List of Modules:

1. Capturing Real-Time Images

Here we require to capture images of the stagnant traffic in order to process them and match them as per our algorithm. This will further be used to deduct time from the traffic signal when required. To get an optimum understanding of the traffic density we need to take pictures throughout the stoppage time. This is why we have set up an optimal limit of 5 seconds as the interval between consecutive iterative pictures.

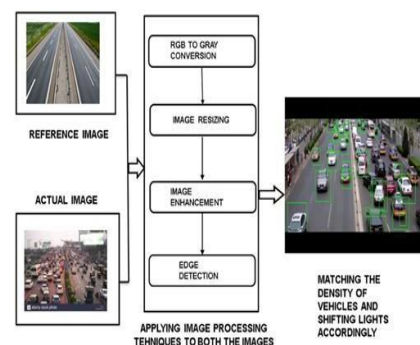


Fig.5 Block Diagram to apply image processing techniques

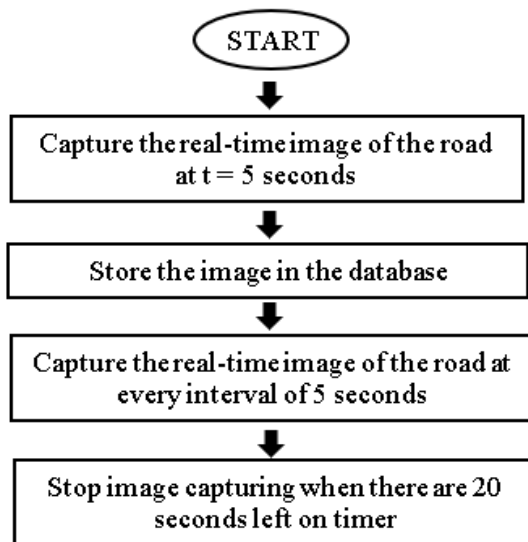


Fig.6 Flowchart to capture images in real-time

Extraction of images

The images once stored will be accessed in order to be worked upon which is done by the following module.

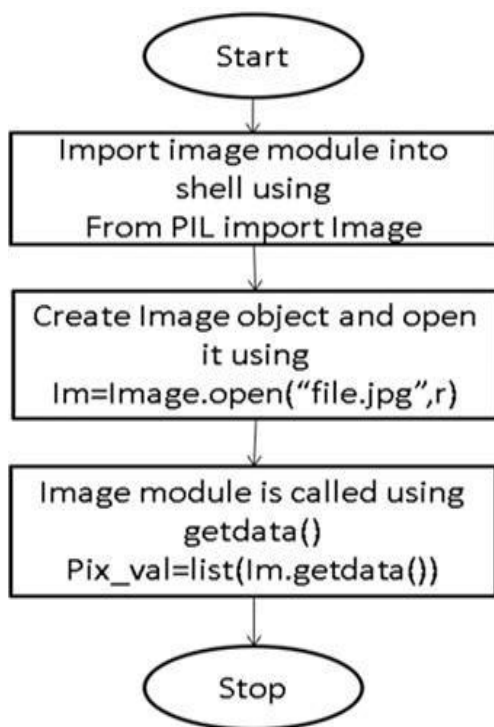


Fig.7 Flowchart for image extraction

2. Image Processing Techniques

Having the image properly worked upon by adding filters and various other techniques we can get a clear picture that could be used as an input in the SURF algorithm. The below module allows us to essentially preprocess the image.

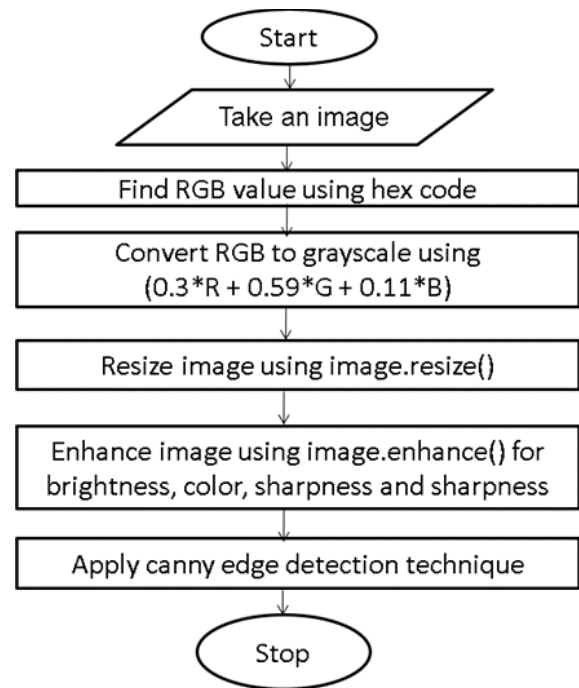


Fig.8 Flowchart to apply edge detection

3. Image matching using SURF algorithm

This algorithm is the final step that will allow us to calculate the density of the traffic that is present on the road with respect to a reference image. Undergoing all the following preprocessing and other techniques we compare the images to the other reference images and see which one matches best. The tag placed on the best matching image is used as reference to output the final density used ahead.

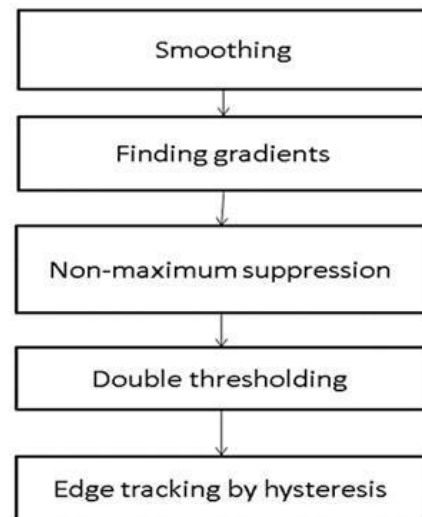


Fig.9 Image Matching

4. Calculation of Density using Ultrasonic Sensors

To allow us to better understand the limit of density that we are going to be looking at we simply create a distance from the signal that would mark the boundary for density calculation. This distance has been set to 5 car lengths of approximately 20 meters. Our ultrasonic sensor beeps when there is a car in front of it.

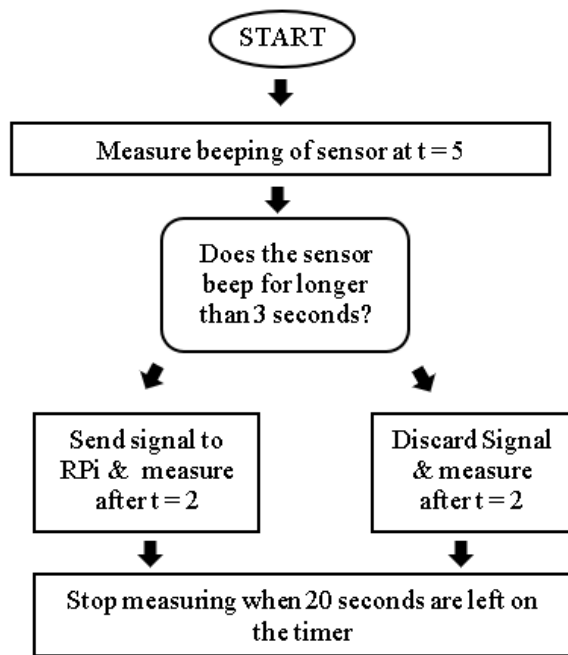


Fig.10 Density Calculation

5. Navigation and control of signals using time allocations

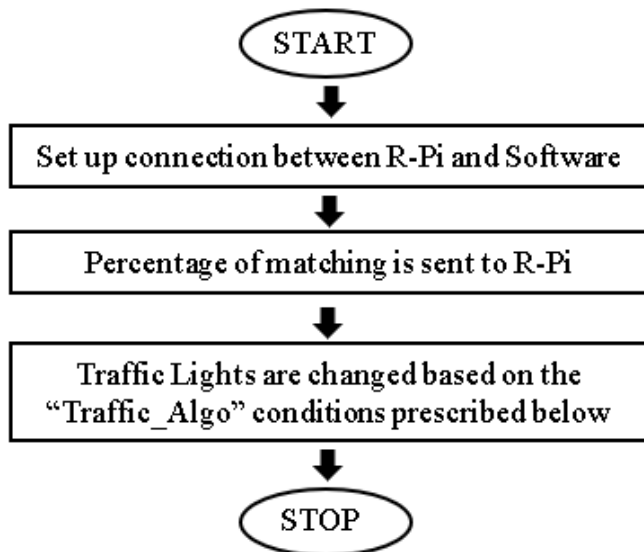


Fig.11 Navigation and Control System

- i. Traffic Algorithm

We divide this section into 2 parts where we use sensors and the data from the camera module in order to conclude if time has to be subtracted and added onto a particular signal. If there is time required, how much time must be added or subtracted. To set this up there are a few different conditions that must be fulfilled for this algorithm to be functional or accepted at all.

1. The algorithm will only run for signals having a time of all signals at the junction greater than 30 seconds.
2. The camera will take a picture of the stagnant traffic every 5 seconds from $t = 0$
3. The algorithmic conditions will only be executed 5 seconds after the image has been taken.
4. The last image will be taken when there are 20seconds left on the timer

5. Preference will be given to the set order of signal operation unless any signal in the chain has a traffic density less than 20%

Once the pre-requisite conditions are satisfied, we use time allocation base on the following traffic density values.

1. If Density: $70\% \leq d < 80\%$ then we reduce the signal time by 20% of the total time left on the timer
2. If Density: $80\% \leq d < 90\%$ then we reduce the signal time by 30% of the total time left on the timer
3. If Density: $90\% \leq d \leq 100\%$ then we reduce the signal time by 40% of the total time left on the timer

The time left on the clock is thus calculated by reducing 5 seconds from the time at the instant the picture of the iteration was taken.

j. Minimum Stopping Time

Our main aim while developing a system that allows traffic to move more efficiently is saving time. However, a factor that holds utmost importance is that of road-safety. Due to the sudden change in time, there is a possibility that lack of time could cause accidents.

Hence to mitigate this condition we have calculated a minimum distance that would help us calculate the time that is require for a car to slow down and stop at a signal comfortably. This is based on a few factors given below.

1. Driver Reaction Time
2. Average Deceleration Time of a Vehicle
3. Visibility of traffic signal over horizon

We can use the visibility factor in order to calculate the minimum distance that is required for us to start retardation of the car without any sudden breaks. For this we can consider a constant retardation that would indicate comfort.

To understand this better we can do so with the help of a diagram. This is basically the triangle made by the eye level of the average driver in India along with the standard measurements of each vehicle on average. The vehicle of choice that we are using is a car due to the low sight of vision as well as the faster speed at which it travels.

Facts:

1. Avg. seat to ground level in a car = 18 inches = 0.45 m
2. Avg. waist to eye level in car = 760mm = 0.76 m
3. The height of a traffic signal has to be above 2.8 meters (regulation), hence we consider : $h = 3.00$ m
4. Avg. Engine size of a car = 1.47 m
5. Avg deceleration rate = 6 m/s^2

While moving through a signal the maximum average speed at which vehicles travel is = $60\text{km/hr} = 16.66 \text{ m/s}$

Now we will visualize the eve level of the vehicle.

(The Diagram Below has not been drawn to scale but is simply a representation of a person sitting in a car seat while looking ahead. The values have been entered in the image corresponding to the length/ heights that they represent.)

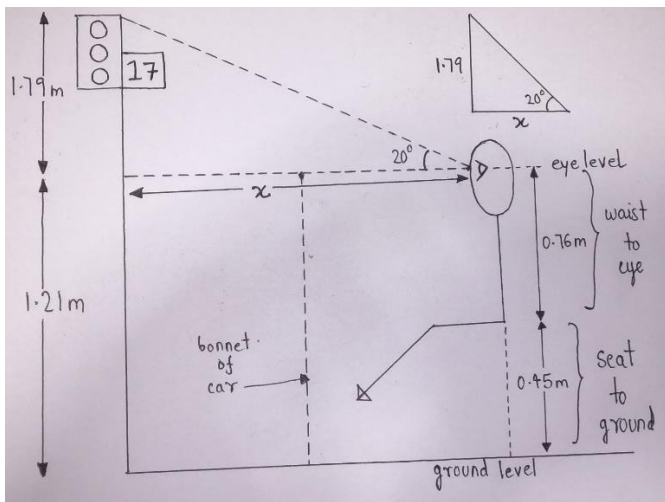


Fig.12 *Eye Level Diagram*

From this we can calculate the value of X

$$\tan 20^\circ = 1.79 / X$$

Hence, $X = 1.79/0.363 = 4.93\text{m}$

X = 5m

Calculation of retardation:

Retardation = Decrease in Velocity / Time taken

$$6 = 60 / \text{Time Taken}$$

Hence, **Time Taken = 10 s (Fastest Speed)**

What we can conclude from this calculation is that from a top speed of 60km/hr an individual needs over 10 seconds while adding 2 seconds for the highest reaction time. For the sake of comfort and mitigating the chance of an accident to almost 0 we have concluded that a time of 15 seconds would be appropriate for a person to be able to comfortably stop. Due to the time being 15 seconds and the working of our algorithm we hence have our last iteration and camera picture taken when 20 seconds are left on the clock.

III. CONCLUSION

This paper develops a framework that uses the image processing technique to avoid traffic congestion and delays effectively. The system could primarily focus on the image captured using a CCTV camera. This proposed system attempted to identify traffic density and control the signals. The implementation of the SURF algorithm helped us to obtain higher accuracy. Installation of this system is simple and eliminates human and complex machinery, therefore it is cost-effective. Overall, this system gives higher accuracy.

With better calculations and more precise factors in place this system could be better upgraded. The technological advancements could improve the processing speed to a very high extent. Camera quality and better image processing could ensure the best results for the future scope. The system can be enhanced with ambulance notification and accident detection.

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Used Car Price Prediction

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Abstract— Machine learning is a technology that has seen a rapid increase in popularity and usage over the last few years. It is rapidly progressing with vast capabilities and applications in automating processes that do not require human participation or explicit programming. The power of machine learning is so strong that its applications may be found practically everywhere in our daily lives. Many previously unsolved problems have been solved by machine learning, and businesses around the world have advanced significantly. In this paper, we'll look at one such real-world scenario and use machine learning to create a model. The price of the car begins to decrease as soon as it is purchased, and continues to depreciate with every passing year. The value of a car drops to 1/5th of its price in the first year. Our goal is to create a machine learning model that estimates the value based on characteristics such as total kilometres driven, overall vehicle condition, and several other parameters that influence the car's resale value in the Indian market. As we advance with this project, we'd like to train our model to not only anticipate the price, but also to assist the seller in obtaining the best possible price.

Keywords—Neural Network, linear regression, frontend, flask, Machine learning

I. INTRODUCTION

The prices of a second hand vehicle on the market are influenced by numerous elements, it's quite difficult to test whether the restated price of the car is precise or not. This project's main aim is to form machine learning models which might accurately predict outcomes and to anticipate the worth of a second hand car betting on its qualities to form well-learned decisions. A neural network is nothing but set of algorithms that make a trial to spot underlying connections during a bunch of knowledge employing a method that imitates working of the human brain. The systems of neurons which will be organic or artificial in nature is stated neural networks. In order to make us accustomed to the technology, the industries are taking help of learning algorithms. Computer science, ML, big data, and ANN are the terms used to describe these technologies.

Supervised learning and Unsupervised learning these are two basic advances to AI (AI) and machine learning. The foremost crucial distinction is that one predicts the result that's employed by the labelled data, while the opposite doesn't. Supervised learning is nothing but the way of developing AI that comprises of modeling a computer or machine with algorithm supported computer file that was labelled for a precise output. If supplied with dataset which is new or never seen before type, we are able to find new

interrelation between our inputs and also the output by continuously training the model, which is able to allow it to come up with accurate labeling outcomes. Supervised learning is used generally for classification and regression issues, like categorizing the news story or forecasting the long run date of number of sales. It is employed to form sense of knowledge within the perspective of a given problem. We supply labelled data during its training. Labelled data tells us the output accompanying all the input values. Then the data is segregated as test data and training data. Test data is some part of the data that is provided to the model with labels veiled. We employ this method in order to see the efficiency of our model on data with no labels.

The supervised learning operation is boosted by continuously by calculating the output and then refining the output so that it can reach the targeted accuracy. We can obtain this precision by setting 2 parameters: the data available and the algorithm to be used. Further, the data should be processed (cleaning) before providing it to the model for training. The duplicate and null values can decrease the accuracy if the data analysts are not cautious enough with the data that is provided to the model. The variety in the information impacts how the model will perform when provided with new data. If the training data collection does not consist of sufficient samples, our model might malfunction, and its outputs cannot be trusted.

It is quite surprising that sometimes higher accuracy is not always a good signal. The condition of overfitting might rise, or that it's over tuned to its specific training data set. this sort of an information set may perform well in test settings but fail catastrophically when it involves real-time world issues. To steer beyond overfitting, the test data must show a discrepancy from the information which used for training the model. this may make sure that the model does not draw answers from its previous experience instead make a generalized inference. On the opposite hand, the algorithm decides how to utilize the data. Deep learning algorithms, for instance, could also be trained to extract many parameters from data and procure good levels of accuracy, as OpenAI's GPT-3 demonstrates.

II. OBJECTIVE

The goal of our project is to estimate the cost of a second hand used car, depending on the many vehicle characteristics given in the data. There is a theory that if you drive a car too

much, it loses 10% of its value compared to the original price. In view of that, we can expect the number of kilometres driven by a car to be one of the most important indicators, and it is clear that too much driving damages the car. In addition, we can expect the car manufacturer's product to contribute to the value of the used car, as other types of cars are more expensive and may be better built. We expect to address concerns about multicollinearity because some car features may be too interconnected.

The ability to measure the market valuation of second-hand cars, which will not only help customers but also the sellers. Traders who have used cars: One of the most targeted groups who have a very keen interest in the findings of the study are the traders. Dealers who better understand the customers and what car they desire will be able to use this information and choose the best possible car on the basis of the features of the used car.

Websites which provide resources for predicting value include: giving the predicted price, they do provide a decent statistical model. But cross verifying from a second model, leverages accurate predictions for their customers. The market value of the used second-hand car can be determined by the model developed which are available.

Independent buyers or sellers: At some point in many people's lives, they are interested in the used second-hand car market to sell their car or buy a new one. It is very easy to fall into a trap by paying more or selling the used car and getting less than market price point process.

III. PROPOSED DESIGN

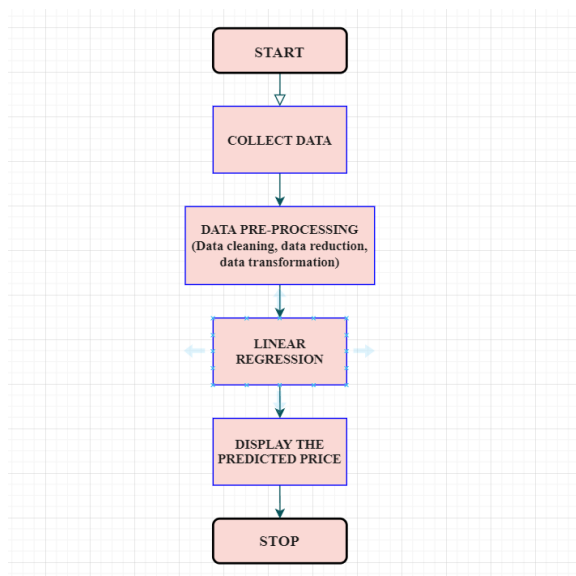


Fig.1 Flowchart

The model's design begins by gathering the dataset, as illustrated in the diagram above. Data Pre-processing is the next phase, which involves data cleansing, data reduction, and data transformation. The price will then be predicted by using Linear regression algorithm.

On the basis of the user's input the price is estimated and can be viewed on the display. Users can provide the

machine learning model input for used car price prediction via the website.

IV. IMPLEMENTATION

Our implementation was broken down into three major steps.

Data Analysis:

Summary of our selected data: The data has 819 rows and 6 columns with no null values. Following was also implemented in data analysis.

Data cleansing: We have verified that in the data sheet there exist no null values. We have also seen that variables are in the correct order, except "symbol", which should rather be a categorical variable (so that dummy variables are created for the categories). Data pre-processing: The data for model building, we have Split the data into X and y. And the Final Train-Test split of data.

Model building and evaluation:

The model which will predict the price is based on Linear regression algorithm.

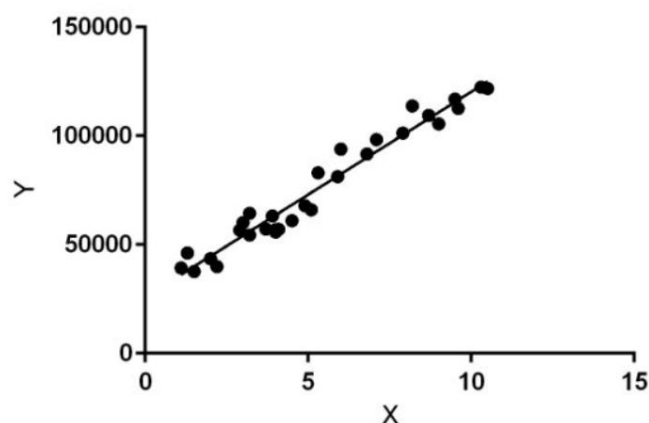


Fig.2 Linear Regression

For estimation of the value of a dependent variable with relation to the value of an input non-dependent variable, linear regression is apt. In the figure shown, X (input) shows the used car's parameters and Y (output) represents analysed price. We tried various regression algorithms on Azure. But For our model, the suitable algorithm is linear.

Linear Regression Hypothesis Function:

$$y = \theta_1 + \theta_2 * x$$

The following model was given to train:

(Univariate - input variable) x: input trainer data y: the labels of the data. It suits the best line to display y value for a given x value when educating the build model. By finding the suitable θ_1 and θ_2 magnitude, the prototype gives the suitable regression fit straight line.

1st: interception

2: coefficient of x variable

For procuring the suitable fit line, we obtain the corresponding θ_1 and θ_2 values. So, by using our model to

obtain the value of y for any value of x , that will correctly give us the correct price.

Cost Function (J): The prototype predicts y value with the minimum error variance between output of algorithms and true value by attaining the best-fit regression line. It is very important to revise the 1 and 2 values to find the idealistic value that minimises the variance with the predicted y value and the true y value .

$$\text{minimize } \frac{1}{n} \sum_{i=1}^n (\text{pred}_i - y_i)^2$$

$$J = \frac{1}{n} \sum_{i=1}^n (\text{pred}_i - y_i)^2$$

The forecasted y value and the true y value , the Root Mean Squared Error (RMSE) is the cost function(J) of Linear Regression (y).

Gradient Descent: The best fit line is achieved by the model that employs Gradient Descent to revise θ_1 and θ_2 values in order to bring down the Cost function. We start with random θ_1 and θ_2 numbers and iteratively revise the magnitude till the price is minimum. We have built this final model with features like 'name', 'company', 'year', 'kms_driven', 'fuel-type'. R^2 score measures how closely the data is to the regression line. This is known as the coefficient of determination. 100% indicates that all the line is best fitted for all the data points. We got a R^2 score of 0.8897843788081868. So the model has accuracy of 88.51% on test data.

Model Deployment

This is the rearmost stage of any artificial intelligence model. We have designed a user-friendly interface. We used flask software for making an HTML file for predicting or estimating used second hand cars, which takes the input for each parameter and predicts the sale price for a used car.

Below is the photo of the working model.

Fig.3 Working Model

V. RESULTS AND CONCLUSION

We are hoping to get a better result with the highest accuracy by employing different ML models. On the basis of the 'name,' 'company,' 'year,' 'kms driven,' and 'fuel type' criteria, we stipulated the charge of preowned automobiles. We first performed data cleaning in order to remove null values and discrepancies from our data. We then employed various ML models to predict the automobile prices and selected the one with the best accuracy. Then by using matplotlib, we visualized the data and investigated it.

VI. SOCIAL IMPACT

According to a basic economic principle, consumers should generally "get what they pay for and pay for what they get" unless subsidies are specifically justified. Markets (a transportation system can be considered a mobility market) are efficient and justified if the prices paid by the consumers reflect the costs of producing that good. Perspective argues that public policies should favor the poor over the wealthy. Transportation options should be made more inexpensive, especially for accessing critical services and activities (healthcare, essential services, education, jobs, etc.). Society gains a better understanding of price before acquiring a car thanks to the automobile price prediction system.

ACKNOWLEDGMENT

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Automatic Number Plate Recognition

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Abstract—Highly growing rush of site visitors and growing frequency of avenue injuries appeals computerized automobile tracking gadget inside which document of automobiles is maintained in the database and mechanically disregarded via way of means of site visitors admins. The proposed studies is based on Automatic Number Plate Recognition the use of neural networks. the technique is in three steps, first one is comprised on Image Processing that is Enhancement of photo contrast, Morphological operations, and Segmentation of labels; 2nd is constructed from Pattern Recognition. Trained Neural Network is hired and additionally the remaining one is verification from Database. For all processes, Python is hired and proposed Algorithm offers most reputation rate.

Keywords—License, recognition, segmentation, real time, automatic

I. INTRODUCTION

Due to the tremendous integration of records era into all components of present-day life, there may be a want for records structures to manner records in terms of motors. These structures require that records be saved in an archive or with the aid of using a unique man or woman or group who's capable of pick out motors with the aid of using their range plates in actual time and show actual statistics with inside the records gadget. In many cases, motors are diagnosed with the aid of using their registration code numbers, which can be without difficulty study with the aid of using humans however now no longer with the aid of using machines. In machines, the registration range is a darkish vicinity inside a place of sturdy imagery and light. For this reason, it's miles vital to layout a strong mathematical gadget which could stumble on and extract what we need from a captured image. These features are used or mathematical styles with inside the so-called "ANPR Systems" all of those records. The layout of these structures is one of the areas of research in fields including artificial intelligence, computer vision, pattern recognition, and neural networks. Computer license plate processing systems are hardware and software devices for converting signs into graphic illustrations containing still pictures or sequences of them and for understanding the characters within license plates.

Automatic wide variety plate popularity systems (ANPR) offer a method to conquer the drawbacks and deficiency of a hit surveillance of the CCTV cameras. The ANPR machine is nicely advanced in positive international locations consisting of USA and Dubai, and existed from a protracted time, however most effective with inside the past due 90s it has become an essential software due to the big growth with inside the wide variety of automobiles. The records extracted from the license plates is specially used for site visitors monitoring,

get right of entry to control, parking, dual carriageway street tolling, and border control, making vehicle logs for parking systems, adventure time dimension for toll sales space etc. with the aid of using the regulation enforcement agencies. The popularity trouble is commonly sub-divided into five parts: (1) photograph acquisition i.e. shooting the photograph of the registration code (2) pre-processing the photograph i.e. normalization, adjusting the brightness, skewness and assessment of the photograph (3) localizing the registration code (4) man or woman segmentation i.e. finding and figuring out the character image photographs at the plate, (five) optical man or woman popularity. There can be in addition refinements over these (like matching the automobile license wide variety with a specific database to music suspected automobiles etc.) however the simple shape stays the same. A guiding parameter on this regard is country-precise site visitor's norms and standards. This facilitates to exceptional music the machine i.e. wide variety of characters with inside the registration code, textual content luminance level (relative index i.e. darkish textual content on mild historical past or mild textual content on darkish historical past) etc. So, the problem can be narrowed down to country-specific software. For example, in India, it is customary to print the registration number on a black background on a white background for personal vehicles and a yellow background for industrial vehicles. A sophisticated registration code format is an observable letter (for country code) along with an area code and a four-digit code that corresponds to a specific vehicle.

II. OBJECTIVE

The ANPR automatic license plate recognition system is a necessary step in automating transportation systems. Recently, the use of vehicles is increasing and it is difficult to control. It is difficult to manually save and maintain vehicle records. The automatic license plate recognition system is used to better control the vehicle and automatically store and maintain the vehicle's records. Traffic management systems use standard "timing" to regulate traffic at predefined times in each lane. As this technique doesn't consider, the density of traffic, it results in congestion especially in urban areas during the height hours. Although an experienced traffic warden may be appointed to house congestion, technology has always been about minimizing manual effort. With the sphere of Computer vision being vast and proficient nowadays a density-based system over the standard system are a progressive opportunity. A Vision based system will improve the controlling mechanism, detection of events and organizational information in an efficient and intelligent manner. Moreover,

when implemented on an outsized scale, these systems are going to be installed on all the traffic light point of a crossroad and traffic density are often analysed by a central server for possible cases of emergencies like accidents. ANPR not only aims to form life easier it also aims to require the initial steps in automation of traffic management which might mitigate the above-mentioned risks.

III. PROPOSED DESIGN

OpenCV in Python:

OpenCV became released at Intel in 1999 with the aid of using Gary Bradsky and the primary launch became launched in 2000. Compared to different languages which includes C / C ++, Python is slower. Python code is prolonged backwards the use of C ++. And NumPy guide makes the activity easier. NumPy is a fairly optimized library of numerical overall performance. All residences of the equal OpenCV participants are transformed to and from the equal NumPy participants. Whatever overall performance you may do on NumPy, you may combine it with OpenCV, which will increase the variety of guns to your arsenal. Besides, many different libraries which includes SciPy, Matplotlib that helps NumPy also can be used for this. OpenCV-Python is consequently an excellent device for a fast instance of laptop imaginative and prescient problems.

TensorFlow in Python:

The real YOLO algorithm was used in Dark net. Dark net is a Framework for open-source neural network written in C and CUDA. YOLO stands for “You Only Look Once” real-time Object detection algorithm. YOLO appeared in the 2015 seminal paper by Joseph Redmon and soon received much Attention from other computer vision researchers. It can be used to find a single image frame or multiple objects within a Single frame. Yolo has high accuracy while doing real-time Tests. It requires one forward movement of the neural network And Performs predictions based on algorithm and objects are highlighted / detected by binding boxes. It sees the whole frame at once and predicts the number and category of all objects in the image. YOLOv3, with research into in-depth Reading has made it much faster than other methods of discovery

Digital Image Processing- Digital photo processing is that using a digital pc to procedure virtual via an algorithm. As a subcategory or subject of virtual sign processing, virtual photo processing has many blessings over analog photo processing. It lets in a much wider variety of algorithms to be carried out to the enter record and can keep away from troubles just like the build-up of noise and distortion throughout processing. Since pixels are described over dimensions (possibly more) virtual photo processing may also be modelled inside the fashion of multidimensional structures. Digital photo processing offers with manipulation of virtual pixel via a fact processing device. It is a subfield of indicators and structures however recognition mainly on pixel. DIP makes a speciality of growing an ADPS it truly is equipped to carry out processing on a photograph. The entrance of that device can be a virtual photo and additionally the device procedure that photo the usage of green algorithms, and gives a photograph as an output. The most not unusual place instance is Adobe Photoshop. it is one in all of the broadly used software for processing virtual pixel.

This refers to a digital photo of a sphere in the world using a computer. It is a very big subject explored in physics,

mathematics, technology and engineering. Describes the conceptual basis of photo acquisition and use, as well as the theoretical and algorithmic processing of itself. It also aims to improve the seams of your photos and make them stand out more with certain information that you absolutely must be aware of.

This bankruptcy doesn't will offer an exhaustive clarification of virtual picture processing, however sure a precise of these standards and techniques greater essential for the concept of this venture. Digital picture processing strategies are commonly categorized into 3 classes. These classes consist of picture generation, enhancement, and restoration. Generation strategies assist venture and understand a scanned picture, even as the approach of improving a picture includes enhancing contrast, brightness and hue. Capture of image or capturing is a method of capturing a digital image using an electronic capturing device such as a camera, camcorder, scanner, or satellite. Pre-processing includes techniques such as noise reduction, contrast enhancement, and enhancement of specific details and features of the image. Description is a way to give practical characteristics to distinguish an object from another type. Example: shape, size, area, etc. Segmentation is the process of dividing an image into objects to be investigated. Recognition identifies objects such as keys, screws, money and cars. Interpretation is the process of associating a target with a set of recognized objects (keys, screws, tools, etc.) and trying to mimic recognition.

It researches the conceptual foundations of the purchase and deployment of photographs and nicely the theoretical and algorithmic processing in and of itself. It additionally targets to boost the seams of the photographs and cause them to greater glaring in sure info which you certainly need to note.

The license plate is an object with a heavy contrast variation. If the license plate has no distinction to the background, it is difficult to pinpoint the location. As the incident of light changes, the brightness and contrast change. Morphological manipulations are used to extract contrast features into multiple parts of the plate.

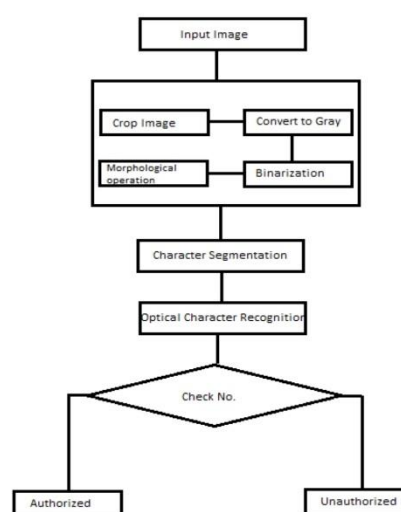


Fig.1 ANPR Block Diagram

Neural Network- A neural network might be a series of algorithms that endeavours to relationships in a completely set of statistics through a way that mimics the manner the human

mind operates. during this feel, neural networks see structures of neurons, both herbal and artificial in nature. Neural networks, also referred to as synthetic neural networks (ANNs) or simulated neural networks (SNNs), are a subset of gadget gaining knowledge of and are on the centre of deep gaining knowledge of algorithms. Their name and shape are stimulated through the human brain, mimicking the way that organic neurons signal to at least each other.

The Neural Network artificial is part of a computer system designed in such a way that the human brain analyses and decides. Ann is an in-depth learning structure and solves a problem that seems impossible or very difficult for humans. Artificial networks function as the human brain. The human brain is made up of trillions of neurons and each neuron is made up of a body cell that is responsible for processing computer information by transferring information to hidden neurons and providing final output.

The sensory networks (ANNs) encompass the node layer, which incorporates the input layer, one or extra hidden layers, and the output layer. every node, or synthetic neuron, connects otherwise and has a corresponding weight restriction. If the output of any node exceeds the desired cost, that node is lively, sending the statistics to the following layer of the community. If now not, no information is transferred to the subsequent layer of the community.

Computer Vision is predicated closely on picture processing methods. Prior to in-intensity take a look at, the pleasant pc imaginative and prescient set of rules primarily based totally on traditional system getting to know and picture processing detected a blunders charge of 25%. However, while the deep neural community used for picture processing, the mistake charge dropped to sixteen percent, and now with the improvement of in-intensity getting to know algorithms, the mistake charge dropped to much less than 4%. Pattern popularity computerized sample identity and generalization of statistics.

The kind of statistics can extrude something from text, snap shots to sounds or sounds. A non-public vehicle is best for amassing environmental statistics from a whole lot of sensors, defining it, and primarily based totally at the description pick what steps want to be taken. In-intensity take a look at permits us to discover ways to do paintings successfully as humans. The leader distinction among unsupervised and supervised getting to know is in how the set of rules learns. In unsupervised getting to know, the set of rules is given unlabelled statistics as a education set. Unlike in supervised getting to know, there aren't any accurate output values; the set of rules determines the styles and similarities inside the statistics, in place of concerning it to a few outside measurements. In different words, algorithms are capable of feature freely so that it will research greater approximately the statistics and discover thrilling or surprising findings that humans were not searching for. Unsupervised getting to know is famous in packages of clustering (the act of uncovering corporations inside statistics) and association (the act of predicting regulations that describe the statistics).

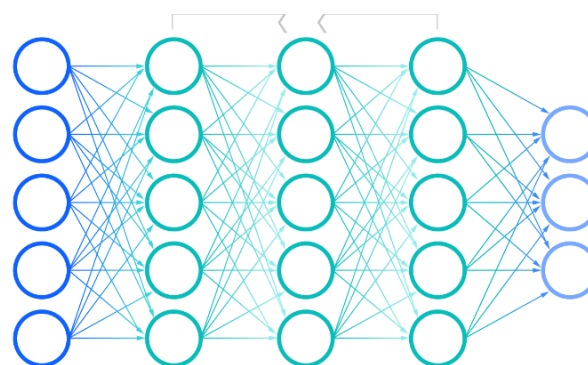


Fig.2 Deep Neural Network

Image Processing Algorithms-

When we examine an image, we're capable of have exceptional objectives:

- Detection of objects: The required object is identified from the give image
- Position as well as scene and angle data are extracted in 3D
- Next step includes the segmentation of the data where the data is separated
- Locates the different of factors among images. Denoising, restoring the image and image enhancement takes place

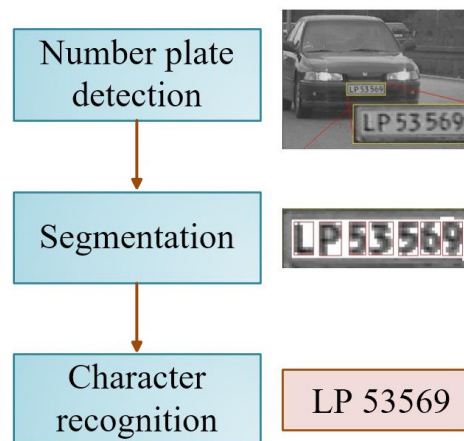


Fig.3 Steps of OCR

Visualization or OCR recognition is the electronic or mechanical conversion of images typed, handwritten or printed into text, whether from a scanned document, an image document, an event image (e.g.) or in the caption at the top of the image (example: from television broadcasts).

It is widely used as a source of data from printed paper data records - whether passport documents, invoices, bank statements, computer receipts, business cards, e-mail, printable data, or any other relevant text - is a common way to make printed documents digital. for electronic editing, search, archiving, online retrieval, and use in machine processes such as computer comprehension, machine translation, (extruded) converting text into speech, important data and text extraction.

OCR is a field of research on pattern recognition, practical wisdom and computer vision.

Early versions required extensive training in the use of individual characters, and processed one font at a time. Developed systems that are able to produce a high degree of accuracy for the recognition of many fonts are now commonplace, and have support for various input of digital image formats.

IV. IMPLEMENTATION



Fig.4 Number Plate

System modelling is the process of creating an abstract render of an environment, where each render represents a unique angle or perspective of the system. System modelling usually means using rational graphical notation to represent a system. It is currently most often supported by the Unified Modelling Language (UML). Models are utilized during the requirements engineering stage to derive system requirements, during the measurement process to explain the system to the engineers implementing the system, and after implementation to note down the format and operation of the system.

We might also additionally increase unique fashions to symbolize the machine from unique perspectives. For Example,

1. An outside angle, in which we version the context or surroundings of the machine.
2. An interplay angle in which we version the interactions among a machine and its surroundings or among the additives of a machine.
3. A structural angle, in which we version the organisation of a machine or the shape of the facts it's processed through the machine.
4. A behavioural angle, in which we version the dynamic behaviour of the machine and the manner it responds to event toevents. Different fashions describing the proposed machine

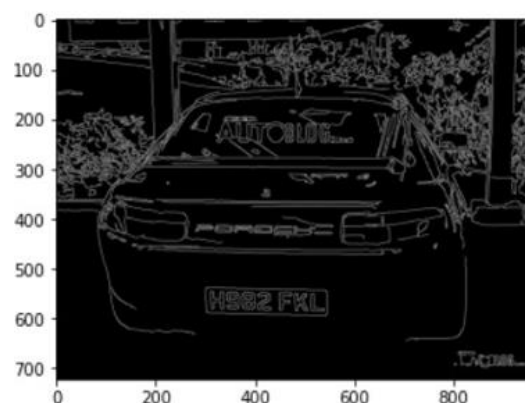


Fig.5 Thresholding and Filtering

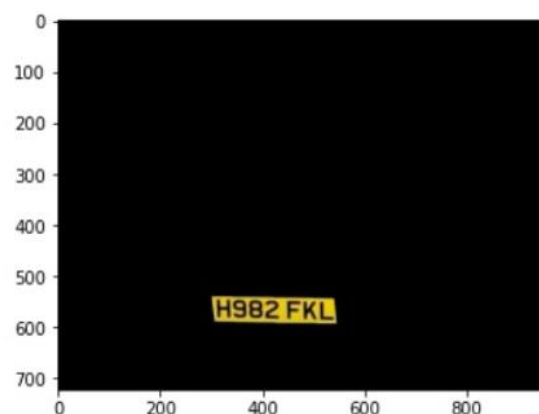


Fig.6 Masking



Fig.7 Detected Number

V. IMPACT

Recently parking has turn out to be a sizable difficulty or even worsen, way to the growing range of vehicles everywhere. throughout this paper we endorse an IoT primarily based totally steerage for consumer to take a look at and book the automobile car parking lot automobile car parking lot} for the car and for dealing with and tracking loose parking lot, it gives an intelligent solution. It targets at imposing smarter and higher parking steerage mechanism which drastically reduces trouble in traditional parking gadget. The gadget can screen the nation of each parking slot

via way of means of deploying a sensor node at the slot. Accordingly, sensor senses the reput of parking space and ship reput to primary. The Node accumulates the statistics from all sensor node and add to the server in which consumer can test the reput from everywhere the usage of net and any browser. User can also additionally book a parking grapple crating their profile at the server.

Applications of proposed system: No want to waste time on searching out parking. Reduction in time and gasoline spent with the aid of using street consumer trying to find parking. Less queues as motorists can be guided to parking areas. Proper choice of automobile in step with the supply of parking space. Online parking outcomes in better sales and profitability for parking facilities.

The project proposes a number plate locating system mainly for vehicles in West Bengal (India) and segmenting the numbers to identify each number separately. This report presents a perspective based on a simple and efficient morphological approach and edge detection method. It also shows a simple method to perform segmentation of all the letters and numbers shown in license plates. After denoising the input image, we try to increase the contrast of the image by using histogram equalization method.

The ANPR machine has huge ranged programs including site visitor's surveillance for crook detect, toll sales space collection, parking control, distance journey control etc. The ANPR machine for site visitor's surveillance may be established on a bridge to tune down the complete avenue manner and file the movement of each and every automobile. If a suspected automobile is detected the proposed machine seems for the entries with inside the database furnished with the aid of using the worried authority including nearby RTO to without delay locate the info of the suspected man or woman and tell the nearby police. In this manner range of crime instances may be decreased with the aid of using a exquisite quantity and additionally many such instances may be averted wherein the deriver runs off in the course of an accident.

The Camera itself includes an infrared detecting digital digicam, a trendy optical satiation detecting digital digicam and an infrared emitting mild array of LEDs. The LED array beams infrared mild with inside the path of the infrared digital digicam, which then captures the mild meditated via way of means of the white historical past of the wide variety plates of passing via way of means of vehicles, which seems white at the image.

VI. RESULTS AND CONCLUSION

The growth of the Internet of Things has given rise to new possibilities for smart cities. Smart parking and traffic management systems have always been at the heart of smart city construction. In this article, we solve the difficult problem of parking and introduce an IoT-based web application smart parking system. The system we provide provides real-time information about parking availability when parking. Users from any location can reserve a parking space for them using our web application. The efforts made in this paper are aimed

at promoting the parking facilities of a city and thus improving the living standards of its residents. In our system, users can view the key parking location view of unregistered buildings, shopping malls, hospitals and colleges and should have multiple public parking areas than. Thanks to this feature, the integrated user chooses the transport system he should use to get to this place.

There is a great need for an effective vehicle management system in our country, as India faces 384 road accidents daily. To reduce these unnecessary congestion and time delays in traffic, an improved system has been developed for this project. The system also allows pedestrians to move without being vigilant. The system is designed to be inexpensive and provide low-cost efficiency, and can maintain its calculation as long as it is connected to electricity. With the application of the field of this technology, complex traffic disturbances can be effectively controlled by distributing time spaces depending on the amount of vehicle load on specific crossing routes.

ACKNOWLEDGMENT

This project and technical paper were greatly supported by Professor Mrunalini Ingle and Professor Archana Chaudhary. Their expert coaching and comprehensive support are invaluable to us at all levels of the project. We are grateful to our colleagues, who contributed their knowledge and experience to the research and supported us throughout the process.

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Movie Recommendation System Using Machine Learning

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Abstract— Information overload is a primary hassle for plenty of net customers which takes place because of overwhelming quantities of records made to be had to a person. To address this hassle filtering device, like Recommender System is needed for offering applicable statistics for the customers which personalize the quest in step with personal options. The Collaborative Filtering Recommender System reveals the closest neighbor set of a living person through the use of similarity measures at the score matrix. This paper proposes unique versions of the K-nearest neighbors (KNN) set of rules with unique similarity measures, particularly cosine, mind, and Pearson baseline for the Movie Recommender System. For actual lifestyles utility, the Movie Recommender System filtering device can be used as a plugin by customizing the net browser. Many offerings offer suggestions for customers so as for them to without problems discover applicable statistics. Thus, the improvement of recommender structures is vital for those offerings to continuously enhance. With the combination of recent technology, it's far not an unusual place to put in force recommender structures with using device getting to know algorithms. This document investigates a way for recommender structures primarily based totally on the device getting to know the set of rules K-nearest pals, or KNN. Specifically, the set of rules become used to are expecting that customersâ€™ might see films earlier than they'd rated them. In addition, the approach becomes compared with using a baseline approach taking the suggested fee of all person scores as predictions. The goal of this has a look at becoming to investigate the usefulness of KNN. The end becomes that the implementation of a film recommender device primarily based totally on KNN obtained higher consequences than the use of a baseline approach.

Keywords— *Movie recommender, KNN set of rules I., flask*

I. INTRODUCTION

With the fast improvement of the Internet, society has entered the group of Web 2, and statistics excess has to grow to be a certainty. How to discover the specified statistics within the build of records has grown to be a warm studies topic. The film is one of the important non-secular performances and additionally has the hassle of statistics overload. To clear up this hassle, this paper recommends a suggesting of a personalized film advice device. Recommender structures or advice structures are a subclass of statistics filter devices that are looking to are expecting score or choice that a person might provide to an object (inclusive of music, books, or films) or social element (e.g. humans or organization) that they'd now no longer but taken into consideration, the use of a version constructed from the traits of an object (content material primarily based totally tactics) or the personas social

environment (joint filtering tactics). Although many unique tactics to recommender structures had been evolved within the beyond few years, the hobby in this place nevertheless stays excessive because of developing call for sensible packages, which can be capable of offer personalized suggestions and address statistics overload. These developing needs pose a few key demanding situations to recommender structures and to address those troubles many superior strategies are proposed like content material boosted collaborative filtering, clustering primarily based filtering, combining object primarily based totally and the person primarily based similarity and plenty of greater. A personalized advice device is a sort of statistics filtering technology. It is an incorporated device that's an aggregate of loads of records mining algorithms and person-associated statistics, to fulfill the hobbies or ability hobbies of customers. The not unusual place advice device is categorized as content material primarily based advice device, collaborative filtering advice device, and hybrid advice device. Each advice set of rules has unique use variety and use condition, its consequences within the use of various advice sets of rules for the identical statistics advice. In the real utility of an advice device, the device tends to be a hybrid advice device. That is, to combine the gain of every advice set of rules to the advocated method to correctly enhance the advice effect. Despite those advances, recommender structures nevertheless require development and therefore turn into a wealthy study place. In this paper, the important thing studies contents are to assist customers to reap person-involved film mechanically within the big film statistics records the use of KNN set of rules and collaborative filtering set of rules, and to broaden a prototype of film advice device primarily based totally on KNN collaborative filtering set of rules. Before discussing the most important obstacles to advice methods, a complete survey of advice tactics is provided. The dialogue of numerous tactics and their obstacles in the right way thereby affords the destiny studies opportunities in advice structures.

II. OBJECTIVE

In the present-day virtual global wherein there are countless sorts of content material eaten up inclusive of books, videos, articles, Films, etc., locating the fabric of one's desire has grown to be a complete evidence challenge. Digital content material then again Providers need to interact increasingly more customers of their carrier for the optimum time. Where is it the recommender device comes into image wherein content material vendors endorse customers through content material User desire on this paper we've got proposed a film

advice device? Usually, primary advice devices to make suggestions don't forget one of the following factors; User choice called content material primarily based Filtering or the choice of comparable customers called collaborative filtering. Recommendations aren't a brand-new concept. Even while e-trade become now no longer that prominent, the income team of workers in retail shops advocated objects to the clients for the motive of upselling and cross-selling, and in the long run, to maximize profit. The intention of advice structures is simply identical. Movie advice structures offer a mechanism to help customers in classifying customers with comparable hobbies. This makes recommender structures biconical a part of websites and website packages. Another goal of the advice device is to obtain client loyalty through offering applicable content material and maximizing the time spent through a person on your internet site or channel. This additionally facilitates growing client engagement.

III. IMPLEMENTATION

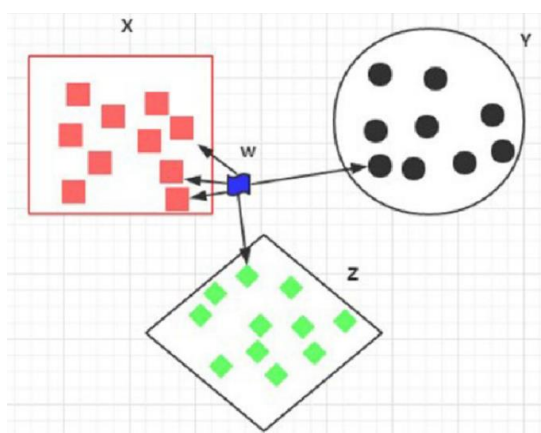


Fig. 1

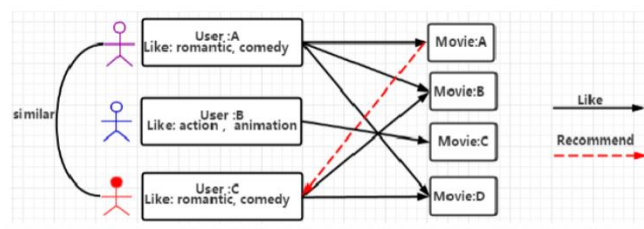


Fig. 2

In an instance of UserCF set of rules, User A loves films A, B, and C, and person C likes films B, and D, so we will finish that the options of person A and person C are very comparable. Since person A loves film D as well, so we infer that person A may additionally love object D, consequently object D might be the advocated person. The primary concept of the set of rules is primarily based totally on statistics of records the rating of person Find the neighbor person who has the same hobby with goal person, after which suggest the objects which the neighbor person cherished to goal person, they are expecting ratio goal person u may also provide at the object is acquired through the rating calculation of neighbor person up at the object. The set of rules includes 3 primary steps: person similarity calculation, nearest neighbor choice, and prediction rating calculation.

The dataset offers the Kaggle and it has 3 records documents customers, films, and scores. Using the NumPy, pandas, sklearn, and Matplotlib library they separate the uncooked

records frames and processing. Squared strategies are used to discover the ideal quantity of clusters so that K-way clustering may be useful to the books. After making use of K-way clustering a clustered matrix factorization is constructed which describes the common score the person offers to every cluster. Python libraries import: NumPy, Pandas, Matplotlib, and sklearn. The dataset carries 3 excel documents. The dataset of customers consists of scores of the films. The shape becomes carried out in python programming languages utilizing the K-Means cluster library and K-NN. The manage device achievement includes a couple of post-sections which might be additionally everyday strategies to be followed even as resolving any deep getting to know the issue. There are fellows: The first segment withinside the improvement approach is the compilation of the statistics. A suitable set of records is selected for this segment in phrases of accomplishing extra calculations. The database is accrued from both the Kaggle legitimate internet site withinside the context of films. With that sort of knowledge, extra calculations have finished the use of software program package deal Python The 2nd degree withinside the deployment segment is the approach of making ready statistics. Pre-processing of the statistics is done at this stage. It is used to transform the uncooked records right into an easy record set as records accrued in an uncooked layout aren't possible for the analysis. It depicts the extra strength vector that informs which person has labelled that film. This is achieved by dividing person statistics and film records inside and out of a couple of records blocks, first. Then, the vector factorization is generated simply by the use of the statistics points. The 2nd alternative withinside the deployment segment is the processing of the statistics. Then records visualization is finished which affords a good, prepared pictorial illustration of the film records which makes it less complicated to understand, observe, and examine the films with scores beneath 10. -11112463500 The grouping approach of K-Means is carried out on this segment. The right quantity of clusters is selected. Using the K-Means Segmentation device, earlier than deciding on the ideal no of organization films are separated into groups.

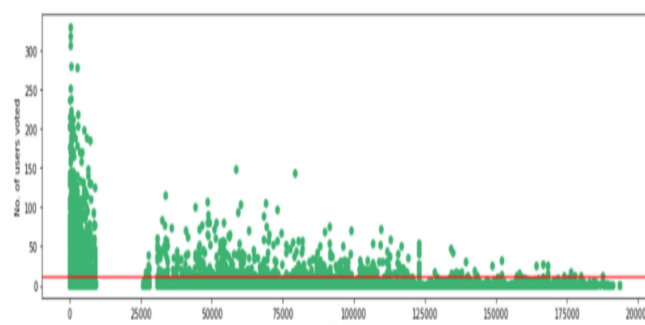
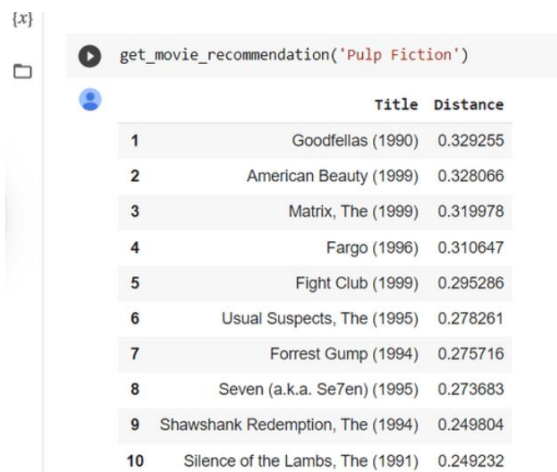


Fig. 3

V. RESULTS AND CONCLUSION

In this paper, a recommender device for film advice. It permits a person to pick his selections from a given set of traits which suggests to him a film listing primarily built totally on the cumulative weight of various attributes and the use of a K-way set of rules. -3809981915 By the character of our device, it isn't a clean challenge to assess the overall performance because there's no proper or incorrect advice; it's far only a

remember of ideas. Built on casual opinions that we finished over a minor set of customers we were given a high-quality reaction from them.



The screenshot shows a Jupyter Notebook cell with the following content:

```
get_movie_recommendation('Pulp Fiction')
```

The output is a table with 10 rows, each representing a movie recommendation. The columns are 'Title' and 'Distance'.

	Title	Distance
1	Goodfellas (1990)	0.329255
2	American Beauty (1999)	0.328066
3	Matrix, The (1999)	0.319978
4	Fargo (1996)	0.310647
5	Fight Club (1999)	0.295286
6	Usual Suspects, The (1995)	0.278261
7	Forrest Gump (1994)	0.275716
8	Seven (a.k.a. Se7en) (1995)	0.273683
9	Shawshank Redemption, The (1994)	0.249804
10	Silence of the Lambs, The (1991)	0.249232

Fig. 4

A comparable bigger record was set with the intention to allow greater significant consequences for the use of our device. Additionally, we would like to include a unique device getting to know and clustering algorithms and have a look at the comparative consequences. Eventually, we would like to put in force an internet-primarily based person interface that has a personal database and has the getting to know version tailor-made to every person. We intend to offer a film advice device primarily based totally on the aggregate of opinion mining and person similarity analysis. This device facilitates the suggestion of top-okay films for the goal person. In these paintings, we gather evaluations of customers for films and pre-method records with positive most important pre-processing steps. The pre-processed are given for specific and implicit component extraction. The component of a phrase is in addition labeled in step with the classes. Finally, top-okay films are advocated for the goal person. The consequences counseled through our proposed device are main and blockbuster films and the device is useful for hundreds of thousands and billions of customers across the globe. Here the accuracy of the category is progressed with the use of the NbSVM classifier and additionally meet the requirement of the customers. We have examined our proposed device on Movie Lens Dataset and additionally, our paintings indicate higher overall performance than ALS and SEHRS.

VI. SOCIAL IMPACT

Recommender structures may be a very effective device in a company's arsenal and destiny trends are going to grow enterprise fees even in addition. Some of the packages encompass being capable of expecting seasonal purchases based on suggestions, deciding on vital purchases, and providing higher suggestions to clients that may grow retention and logo loyalty.

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Stock Market Closing Prediction

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Abstract—Almost every other person in lockdown has started investing in Stock Market, be it a college graduate, a working professional, or even many new retired individuals. With this newly acquired skill, a year of experience, and a growing passion for this newly entered industry, we thought of combining this with our pre-existing skills learnt in the three years of engineering. Due to massive digitalization in the two years of COVID lockdown, with some efforts, we were successful in collecting the National Stock Exchange as well as stocks listed on the United States Exchange for the years 2013-2017. Based on the dataset obtained, we tried training a model using LSTM (Long Short-Term Memory) for the first half of the dataset, and then for the later years the same model was tested and a similar trend was observed.

Keywords—Python, CSS3, HTML, Machine Learning, DASH, Keras, LTSM, RNN, CNN

I. INTRODUCTION

We all know how much influence the stock market had on Indians during these two years of lockdown. A stock exchange is a marketplace where a trader or an investor can buy/sell or invest in stocks, bonds, or other physical instruments. A governing or authoritative body like SEBI (Securities and Exchange Board of India) regulates and legalizes this exchange of shares and regulatory control over the stock market. The two stock exchanges that majorly impact Indians are NSE (National Stock Exchange) and NYSE (New York Stock Exchange). Companies that are listed on stock exchanges are termed as public companies and people either buy their shares which essentially implies that are interested in investing in those companies or selling out their shares when they have made significant returns from their returns. The market prices of these shares are simply a game of supply and demand. When an entity is fundamentally strong, has solid plans for growth, has low debt, and is net profitable with increasing topline, people are interested in buying out their shares which thus increases the prices (cost of acquiring a share) of the respective entity. The price per share of a company many times does not depend solely on its fundamentals but also on the industry they belong to, the future growth of that industry, the existence of competitors, the risk associated with the investment, the effect of inflation, and many times even prices of stock fluctuate due to some news breaking out which could be directly or indirectly impact the industry or the company itself in terms of their deals, supplies, acquisitions. Thus, fluctuation in stock prices is not a linear curve. At the end of a trading day, the price of the stock is referred to as the closing price of the stock, which when collected over multiple periods gives a time series data. Thus, various

Machine Learning or Deep Learning algorithms can be applied to the dataset of the closing prices of the stock and a model can be trained which would then predict the future closing price of the respective stocks.

According to SEBI (Securities and Exchange Board of India) data, new DEMAT (dematerialized) account additions rose to an all-time high of 10.7 million between April 2020 and January 2021. Influenced by this wave, even we started investing in the listed companies, subscribing to different IPOs (Initial Public Offering), and trying to understand candlestick trading patterns. We are a firm believer that you learn something best when you try stacking the newly acquired upon your existing skillset and try building something out of it. With the advent of various Machine Learning and Deep Learning Algorithms, huge amounts of structured as well as unstructured datasets collected each second, heavy computational processing capable tools available, and massive cloud storage to deploy the datasets and your trained algorithms, we thought of using these skills learned in three years of engineering and thus created a web application wherein by monitoring the previous years' data of the closing prices of stocks, we tried constructing a model that would predict the upcoming market trends for the specific stock. This will help us in evaluating and predicting how the graphs of the company will vary to make well-informed, data-driven decisions concerning future buying/selling of the respective stock.

II. TOOLS AND TECHNOLOGIES

The web application was created using HTML (Hypertext Mark-up Language) and CSS (Cascading Style Sheets) for providing structure and designing a web application. Along with HTML and CSS, we have also used a python framework called Dash which is created by Plotly. It helps in creating an interactive web application. These were mainly for the front end of our application.

For the model training, the algorithm used was Long Short-Term Memory (LSTM) along with several other scientific Python libraries like NumPy for high-level mathematical computations and their flexibility for working with arrays, Matplotlib for data visualization and plotting various comparison graphs on the frontend. We have also used software libraries like Scikit-Learn and Keras to provide a Python Interface and their capabilities of processing various Machine Learning and Neural Network Algorithms.

III. OBJECTIVE

We all are aware of how frequently the market fluctuates and the irregularities that happen due to a piece of breaking news, the influence of foreign stock exchanges on the Indian listed companies and their respective industries, recession, tips, and even the big players with their heavy purchasing power trying setting the market trends. On the other hand, applying a combination of Data Science and Machine Learning/ Deep Learning Algorithms to the past year's datasets of any industry and training and at the same time continuously updating the algorithm by feedback mechanisms is the best way of predicting the future trends/performance of the studied industry. Thus, an effort was made in comparing these two, the observed closing pricing on a particular day concerning the predicted value for that day and infer how much a stock price varies due to external factors over its fundamentals. Therefore, we took didn't took datasets since the inception of COVID-19 as

- The first half of the lockdown had a sudden crash in the market due to the world stopping down.
- USA printing notes to cope up with this, which ended people buying stocks.
- And the second half of the lockdown, saw a huge population entering the stock market so sudden rise in the market value of the shares.

Since the past two years were full of extreme regularities, the chances of which happening are once in a decade, thus it didn't make sense to factor in the dataset of the closing pricing of the stocks post 2021.

IV. METHODOLOGY

As stated earlier, the fluctuations of the closing price of the stock are never linear, but when collected over a period, it forms a time series dataset. With increasing uncertainty, the formerly used linear time series models like AR (Auto-Regressive) Model, ARMA (Auto Regressive Moving Average) Model, ARIMA (Auto-Regressive Integrated Moving Average) model cannot be considered relevant as per the current scenario.

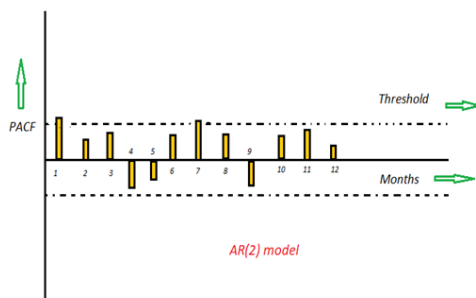


Fig.1 MA and ARMA models

Currently, the most relevant complex algorithm that can be used to accurately predict the future stock price is Long short-term memory (LSTM.). LSTM is an artificial neural network that is used mostly in artificial intelligence and deep learning. LSTM consists of feedback connections which is not there in standard feedforward networks. Due to this, we can process entire sequences of data rather than single-point data using the RNN.

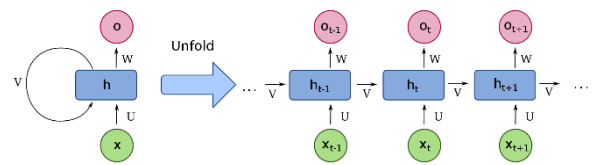


Fig.2 RNN model

Recurrent neural network (RNN) is a type of artificial neural network. In this, the connection present between the nodes forms a graph (either directed or undirected) along the temporal sequence. This results in temporal dynamic behaviour being executed. The variable-length sequence of inputs is processed using the internal state, i.e., the memory of the RNN. This makes RNN successful in speech recognition or voice recognition.

RNN (recurrent neural network) implies a class of networks consisting of an infinite impulse response. On the other hand, CNN (convolution neural network) refers to a class of finite impulse responses. While the recurrent network has a directed acyclic graph, which can be unrolled and replaced with a strictly feedforward neural network, the infinite impulse recurrent network has a directed cyclic graph and it cannot be rolled.

A basic LSTM consists of a cell and three gates (namely input gate, output gate and forget gate). The function of the cell is to remember values over arbitrary time intervals while the gates regulate the flow of information into and out of the cell.

Data consisting of lags of unknown duration between important events in a time series is one of the best datasets where LSTM can be used. For example, to classify, process, and make predictions based on time series data. LSTM is used to counter the vanishing gradient problem which is faced by the user while training the traditional RNNs. The vanishing gradient problem occurs when we train artificial neural networks with backpropagation and gradient-based learning methods.

While iteration of the training set, every neural network's weight is updated proportionally to the partial derivate of the error function concerning the existing weight. In selected cases, due to the gradient being very small, the weight will not change its value. This further may hamper the process by stopping the neural network from training.

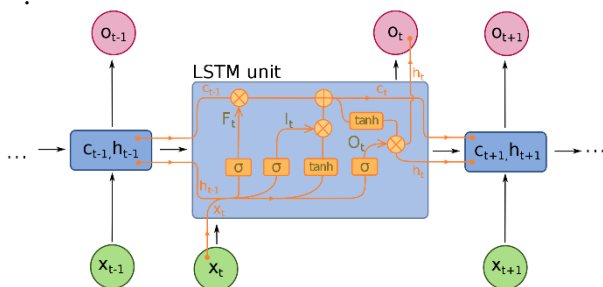


Fig.3 LSTM unit

V. IMPLEMENTATION

First, we start by importing the dataset of NSE Tata Stock so that we could train our model. After reading the dataset, we then analyze the closing price from the imported dataset. Then we try sorting the dataset on date time and closely filter the "Date" and "Close" columns. Post normalizing this new filtered dataset, we then train our LSTM model. To continuously retrain our model for continuously reupdating and building our model, we do 927 epochs.

927/927 - 35s - loss: 0.0010 - 35s/epoch - 38ms/step

Once we get our model with 95 percent accuracy, we then use Dash to build our interactive rich visualized dashboard.

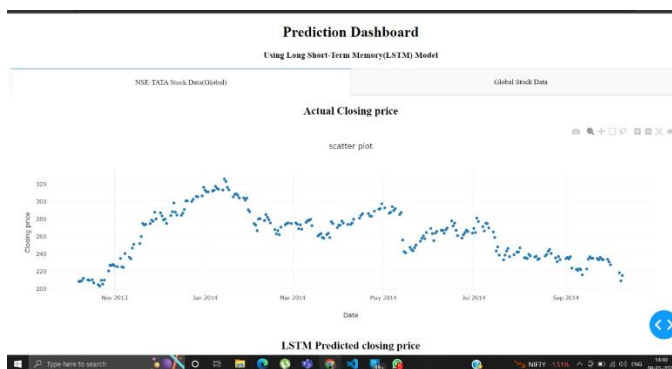


Fig.4 Prediction Dashboard

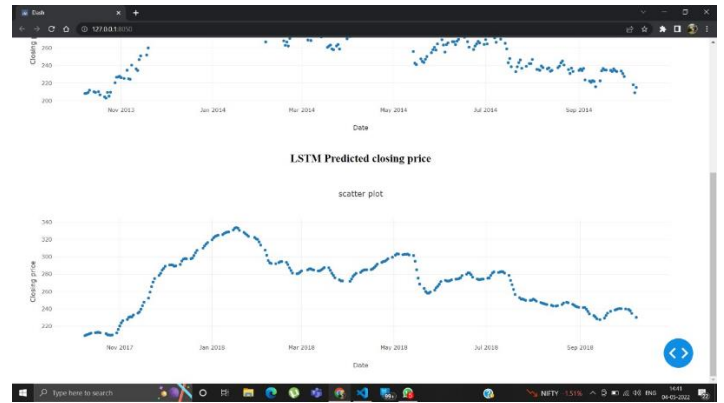


Fig.5 Predicted closing price dashboard

VI. RESULTS AND CONCLUSION

A web application has been designed in which we predict the closing prices of stocks by training the data collected from the closing price of that company in the last three years. We observe that the predicted graph does not completely match the actual graph suggesting that the market does not have a specific algorithm that will give a perfect value. Stock prices also depend on other various factors such as new rules and regulations coming into play, changes in the board of directors, inflation, or various other factors.

VII. SOCIAL IMPACT

This would further help young investors have a better understanding of the market, providing them with a reality check of how difficult it is to predict the moving prices of the stock. The sudden dips observed in the market trends further explain that the price of the stock is not entirely dependent on the sole fundamentals of the stock but also on the conditions prevailing externally. Lastly, it could be inferred that no matter how much dip a stock undergoes, it will eventually turn around and pick momentum so one should not panic at the time of market crashes. Investments should be made in companies with business models you could relate to and have strong faith in, so when the corrections happen, those companies would like to be the first ones to recover. Also, one should have a diverse portfolio and it is advisable to invest within your risk appetite and worst never put all your life savings solely in the market.

VIII.ACKNOWLEDGMENT

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IX. REFERENCES

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Smart Irrigation System Using Dc Motor With 8051

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Abstract— The goal of this project is to create an autonomous irrigation system that detects the moisture content of the soil. The project is powered by an 8051 microcontroller and designed to acquire changing moisture input signal soil conditioning through a sensor setup. The most important part of our project is to interface a DC motor with an 8051 microcontroller. Microcontrollers are used to control the motor's speed. The DC motor is an electrical machine with a. Consider a DC motor whose speed or direction of rotation may be controlled utilizing programming techniques that can be accomplished by integrating with 8051 microcontrollers. The scripting techniques are used to send appropriate control signals or devices or circuits in order to control any machine by interfacing with 8051 microcontroller which is configured with the appropriate commands. The benefit of doing so system that requires minimal human participation and only the minimum quantity of data which is supplied to the soil and crops

Keywords—Automatic irrigation, moisture content, Microcontroller, LCD Display

I. INTRODUCTION

Irrigation is the process of applying controlled amounts of water to land to foster plant growth. In today's era as agriculture is backbone of human life irrigation becomes one of most important aspect which helps to maintain landscape and rejuvenate soil in dry areas. At present, farmers use traditional methods of irrigation to cultivate crop. Using traditional method of irrigation, causes great loss of water which results in mass destruction of the crops and also affects economy of farmers. As a result, a suitable solution is a irrigation system with intelligence irrigation system eliminates the issue of water wastage. Here smart irrigation system can save up to 50 to 60 percent of water which was wasted due to traditional methods of irrigation systems. Smart irrigation system uses controller and a different sensor. Here as controller is used precision and accuracy of the irrigation system increases on a high level thus only adequate amount of water is only supplied. Here variation in the irrigation system is also achieved very quickly without any efforts depending on the type of soil and the manual work done earlier in traditional method is reduced.

Smart irrigation system also saves resources like fertilizers, reduces spending on manpower and gives better outcome to the farmers.

1.1 Need of Automatic Irrigation:

Automatic watering systems are particularly useful for travelers. Automatic irrigation systems can save you money and help with water conservation if installed and programmed correctly. Lawn grass and plants that have died need to be replaced, which can be costly. However, the cost savings from

automatic irrigation systems can be substantial. Water is wasted when you water with a hose or an oscillator.

Neither approach is particularly precise in its targeting of plant roots. Water conservation can be promoted by programming automatic irrigation system to discharge more exact volumes of water in a particular region.

II. DESCRIPTION OF COMPONENTS

Following are the major components used from which microcontroller based automated irrigation system has been fabricated.

1. DC Motor
2. 16*2 LCD Display
3. 8051 microcontrollers
4. IC L293N or IC L298N
5. Moisture Sensing Probe
6. Comparator Circuit
7. Relay

2.1 DC Motor:

The DC motor's main operation is to convert direct current to electrical energy and then to mechanical energy in the form of rotation. Here in this project it is used to show how much the water is supplied indirectly depends on the rotation of moto or the rpm of the motor here the motor used is 12V 400 rpm and 37mm geared dc motor.it has a very high torque and the speed. It has 100ma free running current. The total power required for this project is 26.52 watts. The speed of the dc motor can vary depending upon the range of supply voltage or the changing value of the current in the windings. Here the input to dc motor is fed by motor driver circuit.

The basic operating concept of a dc motor is that when a conductor carrying current is placed in a magnetic field, it experiences a mechanical force, which is nothing more than a torque. The direction of this mechanical force may be determined using Fleming's let hand rule. ^[1]

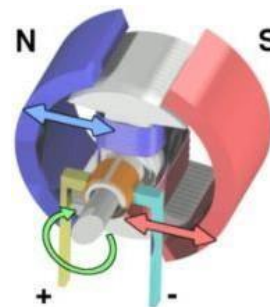


Fig.1 DC Motor

2.2 16*2 LCD display:

LCD stands for liquid crystal display. It has 16 pins, where it has 7 pins for data transmission and data receiving. It requires +- 5V power supply. It involves two rows where each row can display 16 characters and it has ability to generate custom generated characters. A liquid crystal display is a thin flat panel that can either let light through or block it. Each block is filled with liquid crystals that can be made clear or solid by changing the electric current applied to that block. Liquid crystals are commonly used in battery-powered devices.

When power supply is applied to the display the brightness level can be controlled by using potentiometer. ^[2]



Fig.2 LCD Display

2.3 8051Microcontroller:

8051 microcontrollers were designed and manufactured by Intel in 1981. This microcontroller IC has 40 pins. Depending upon the requirements user can use different resistor banks and port pins.

- ROM of 4KB
- RAM of 128 bytes
- 2 16-bit timers
- Register Banks
- Special Function Register such as PCON, TCON, TMOD, SCON, IP
- 2 External and 3 Internal interrupts. ^[4]

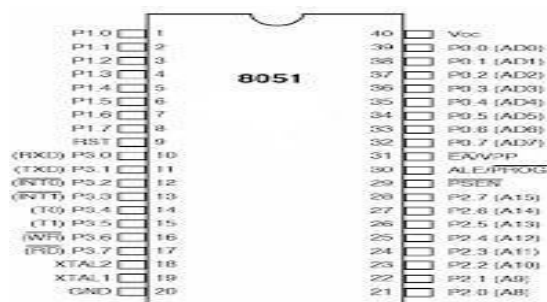


Fig.3 8051 Pin Display

2.3 IC L293N or IC L298N:

This IC is mainly connected between the dc motor and the microcontroller. The purpose of this IC is to amplify the current which is fed by microcontroller this is because the

output current of the microcontroller is very small and cannot drive the motor directly. It is a 16 pin IC it has two enable pins, four input output pins, 4 ground pins and 2 VCC pins enable pin enables the input. Output pin is connected to one end of the motor ground pins are connected to the ground of the circuit. Here the VCC is connected to the power supply where the supply voltage can vary from 4.6V to 36V. It can run two Dc motors at a time with the same IC. It can give a maximum continuous motor current of 600ma here the speed and direction control of the dc motor is also possible. The internal structure of L293D consist of H bridge. H bridge is used to enable the load in bidirectional way.

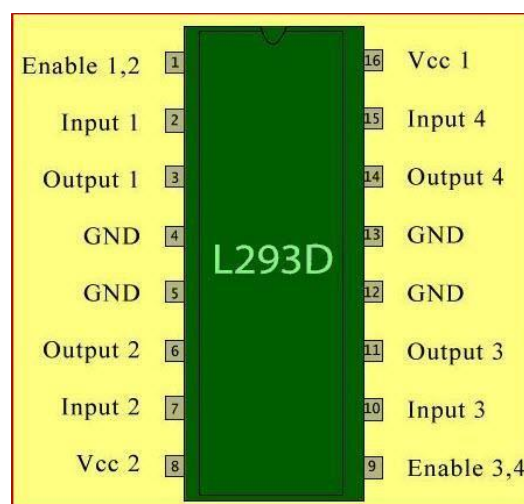


Fig.4 L293D Pin Diagram

2.4 Moisture Sensing Probe:

The moisture is detected using YL 69 moisture sensing probe. It's just a fork shaped PCB with semiconductor tracks going through both teeth. Place this probe into the soil to feel the wetness or the temperature. Image of the YL 69 moisture sensing probe is shown below.



Fig.5 moisture sensing probe

Moisture sensor probe/YL-69 shaped like a fork which has two teeth with tracks running on each of its tooth. This sensor is basically used for checking the amount of water content/humidity in the given area of the soil. Moisture sensor specifications.

1. Input power - 5V
2. Maximum detection depth - 1.5 inch
3. AO/DO analog digital output interference

YL-69 has one probe through which current will flow and current will travel to the second probe only if the soil is wet which indicates short circuit path (low resistance) for the current to flow. If the soil is dry which acts as open circuit (high resistance) then the current will not reach the second

probe. YL-69 had on chip potentiometer for the adjustment of AO/DO, sensor had two outputs HIGH or LOW depending on humidity. The threshold of YL-69 can be varied using potentiometer.

2.6 Comparator Circuit:

The comparator module compares the output of moisture sensor probe with the reference voltage and convert it appropriately for to read the microcontroller.

The output voltage of moisture sensing is directly connecting to inverting pin of the comparator. Because more current flows through the sensing probe when the soil is humidified, the voltage at the inverting pin will be higher as compared to the reference voltage. The reference voltage can be set or changed using potentiometer in the module. When this happens, comparator gives LOW and LED glows. When the soil has low humidity than the reference voltage, less current flows through the sensing probe, voltage at inverting pin will be lower than the reference voltage. If the voltage is lower than the reference voltage, this will drive the motor through 12V relay. [6]

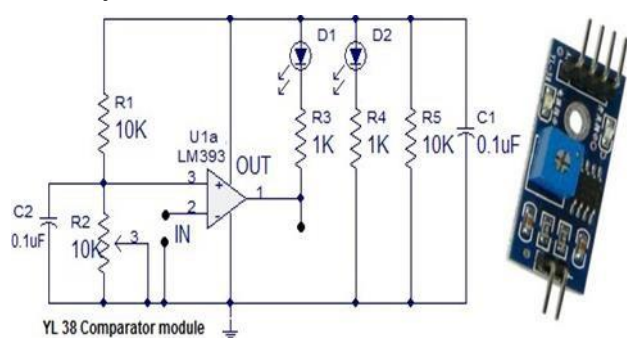


Fig. 6 Comparator module

2.7 Relay:

Relays are electronically operated switches which works on the principle of electromagnetic induction. Relay in our application is used for switching. Relay uses electromagnet to connect or disconnect the circuit. A magnetic field is created by current in the relay coil. Relay allows two different circuits for switching. So, in our application, DC motor will be connected at normal open port of the relay, at COMMON port 12V power supply will be given, and at NORMALLY CLOSED N will be left open. When the relay will be turned ON NORMALLY OPEN will get 12V (from COMMON) hence motor will be driven simulating the effect of water pump.

III. METHODOLOGY

The working of this project starts with the input which is taken from moisture sensor. The moisture sensor's input is then sent to the YL-38 comparator module, which features an OP-AMP circuitry with a non-inverting reference voltage. The inverting terminal of the moisture sensor receives the input. As a result of the OP-AMP, the input is compared to the reference. The OP-AMP produce voltage and matching output AMP. This output of OP- AMP is then given to the microcontroller. As per the output of the YL-38 microcontroller will drive the motor which is connected to port via relay circuitry. Here the motor driver circuitry acts as a current amplifier and provides sufficient current to the motor. As the current from the microcontroller is not sufficient to drive the motor, hence we have used motor driver circuitry.

Now if the reference voltage is lower than the input from moisture sensor probe it will give LOW output in OP-AMP, this output will drive the motor.

If the reference voltage is higher than the input from moisture sensor probe it will give HIGH output in the OP- AMP this will keep the motor in OFF position.

The use of LCD is to display the current status and information of the soil as well as the status of the pump. If the moisture level is over the threshold, the LCD will display "moisture controlled" and "OK Pump OFF", and if the level is below the threshold, the LCD will display "moisture controlled" and "LOW moisture Pump ON".

3.1 Working:

We use motor driver circuit to interface controller to motor. We mainly use L293D to interface 8051 with dc motor. A 16 pin L293D is represented in the figure.

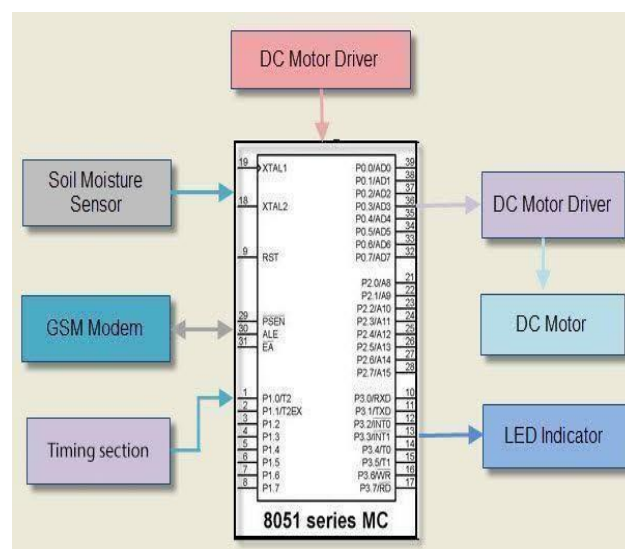


Fig. 7 Block Diagram

Per channel this IC has a current rating of 600mA. Here we can give dc voltage in the range of 4.5V to 36V. The higher speed clamp to protect this IC from inductive spikes internally connected diodes. For the IC L293D to work, the H-bridge principle is used. The motor direction can also be changed by changing the voltage direction. L293D works as an interface device for DC motors. The L293D IC's practical application is the gadget application where the speed and direction of DC motor can be controlled. This can be controlled by using an 8051 microcontroller. [3]

3.2 Future Scope:

This smart irrigation system uses less hardware as compared to traditional methods. It is more cost efficient, as it does not use heavy and expensive gear for implementation. As per Land Use Statistics 2016-17, 200.2-million-hectare land is gross cropped area, which is equivalent to 494.70 million Acres. Generally, 1 Acre of land requires 1.01 million litre of water per year, so the total consumption of water in a year in cultivation, amounts to 4.99×10^{14} litre. Smart Irrigation System approximately saves 40% of water compared to traditional method which is 1.99×10^{14} litre per year. It supports in ideal growth of crops and land by providing necessary amount of water whenever required. It saves time as well as maintains the time difference caused by environmental changes by providing adequate water

automatically. This mechanism can be changed in response to changing conditions. It is simple to use thus easier for the farmers to operate. This project can also be upgraded using IOT as the efficiency will be increased and farmer will get easy access to the system even while being far away from home.

IV. CONCLUSION

By combining both hardware and software, an irrigation controller that is both cost effective and user pleasant can be supplied to farmers. This system can be used for indefinite period of time even by working at a remote place. Regular and adequate watering of the crop helps to significantly increase its yield. This technique may be utilized for bigger regions because it simply involves dividing the entire land into number of sectors, which can then be controlled by single controller. The entire procedure can be used to create automated systems for farmlands and gardens. When combined with rainwater collecting, it can result in significant water savings. This smart approach can be successfully implemented to create remarkable outcomes with the most types of soil in agricultural fields with significant rainfall shortages. Collectively it saves human energy, time, cost, water and crops from getting spoiled.

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Disease Detection System

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Abstract— Human healthcare is one of the most fascinating topics of our day. It is seeking the greatest and most thorough disease diagnosis in order to receive the therapy it requires as soon as feasible. Other professions, such as statistics and computer science, are required for the health element, which is frequently very helpful in providing a general picture of disorders and their diagnosis while avoiding some specific parts. We recommend a detailed structured analysis of human diseases related to machine learning at the end. Machine learning can give a notable influence on the patient's healthcare delivery strategies. For example, machine learning can help a clinician to actually point out the disease, diagnose it and treat it. Some of the uses of machine learning in healthcare can also streamline healthcare processes and prepare surgery planning, execution. This study focuses on current updates to methodologies that deal with machine learning extension applied to the prediction of human disease in the medical area in order to discover new intriguing trends, conduct significant diagnoses of the disease and aid in planning of the treatment. To provide proper decision assistance, this project studies and installs distinct machine learning algorithms utilized in healthcare applications.

Keywords: Disease diagnosis, Machine learning, Health Care, Application.

I. INTRODUCTION

According to World Health Organization reports, there is only one physician available for every 1000 people. In the medical healthcare industry, India's healthcare system is experiencing a severe lack of physicians and clinicians. The COVID-19 epidemic exacerbates this scarcity of health-care resources, putting even more strain on an already overburdened system. Having said that, it is critical that individuals have a different way of examining their health and getting a rough diagnosis of the ailment they may be suffering from based on their own symptoms before contacting a physician. This software fills that gap by utilising Machine Learning to give users with fast and accurate medical diagnosis based on their symptoms and health indicators. This platform encourages early illness diagnosis, giving doctors more time to intervene and prevent sickness. At the conclusion, we give a systematic assessment of machine learning applications for illness detection. The paper focuses on new methods to machine learning's progress in illness detection, as well as new fascinating strategies for making insignificant diagnoses and planning effective treatment. Machine learning is widely employed in a variety of sectors, including academia and medicine, and it plays a vital role in human healthcare. For the massive volumes of data created by the healthcare industry, patterns are recognised and forecasts are formed. Images, patient data,

and other types of information can be included in this data. With the constant advancement and evolution of technology, machine learning has become increasingly important in the healthcare sector. Improved computer power and the availability of datasets on open-source repositories have further aided the widespread use of machine learning. Cancer, heart disease, malaria, pneumonia, and diabetes are the five major illnesses that will be discussed in this study. The data is entered into a web app, and the analysis is done in a real-time database with a machine learning model that has been trained on the same dataset. Finally, the app displays the illness diagnosis findings. Using the logic regression approach, the predictions may be simply obtained. Early detection can help to avoid many illnesses. The proposed technique, according to a comparative analysis, can aid doctors in prescription timely medications for therapy. Machine learning is used in healthcare to tackle a range of problems. Take for example, heart disease, it affects people in different ways, and the severity of heart disease differs from one individual to the next. As a consequence, building a machine learning model, training it on a dataset, and including specific patient data can help predict outcomes. The prediction outcome will be unique to that person since it will be based on the information supplied. This may be summarised by noting that machine learning algorithms can now be used to forecast all of these illnesses.

II. OBJECTIVE

Medical wellness is one of the most fascinating topics of our day. It is seeking the greatest and most thorough disease diagnosis in order to receive the therapy it requires as soon as feasible. Other professions, such as statistics and computer science, are required for the health sector, which is frequently digitised due to the difficulty of recognition. The objective of the new techniques is to push these disciplines beyond their traditional boundaries. The vast array of new approaches aids in presenting a comprehensive picture of illnesses and their diagnosis, but it also avoids some specific elements. At the conclusion, we suggest a fully structured analysis of human illnesses connected to machine learning. For example, machine learning may assist a doctor in identifying, diagnosing, and treating an illness. Machine learning may also be used in healthcare to simplify procedures and prepare operation planning and execution. This research focuses on the most recent improvements to approaches that deal with machine learning extension applied to the prediction of human disease in the medical field in order to uncover new fascinating patterns, perform important disease diagnostics, and help in treatment planning. To provide proper decision assistance, this project studies and installs distinct machine learning algorithms utilised in healthcare domains.

IV. PROPOSED DESIGN

The primary parts engaged in this project, according to the project specifications, are:

1. Create a Flask application
2. Using the dataset to train on a variety of illnesses
3. Creating a prediction machine learning model
4. Incorporating the model into our app
5. Heroku cloud deployment of the codebase
6. Creating a graphical user interface (GUI) for the programme to run smoothly and efficiently.

By completing these components of the project, we will be able to create a web application that takes patient information as input and predicts if the user is infected with the disease using machine learning models.

III. IMPLEMENTATION

In our model, to detect heart disease we follow a simple action plan. We gather the data and load our dataset in the notebook, then we preprocess the data and perform data cleaning in order to get rid of outliers and have maximum efficiency to detect any form of disease. We have used the disease dataset available with around 30 parameters for cancer, about 10 parameters for diabetes and heart disease, and 7 parameters for kidney and liver. Apart from these we also have implemented deep learning for our malaria and pneumonia disease classification. The accuracy of our model with respect to different diseases is different but upon testing we are rest assured that they are efficacious. When the user clicks on the website, a welcome page is encountered wherein the user gets a glance about the page, thereafter the user is shown tabs of disease to choose upon which he wants to verify as per his report. Except for malaria and pneumonia, the user needs to enter in the parameters of the report and in case of malaria and pneumonia, the user needs to put the cell image, in order to check whether they have that corresponding disease or not.

Health detection

Disease detection is useful for identifying a person's Health. Logistic Regression is used to detect parameters in the training dataset, and Jupyter Notebook is used to implement it. The different parameters were scaled to get optimum results, a minimum of 90% accuracy were obtained in all the selected disease

Feature Extraction

The feature is chosen. In a pattern classification task, the vector is the most significant component. Feature Engineering is an important component of a data science model development pipeline. holds true for the number of instances but not for the number of features.

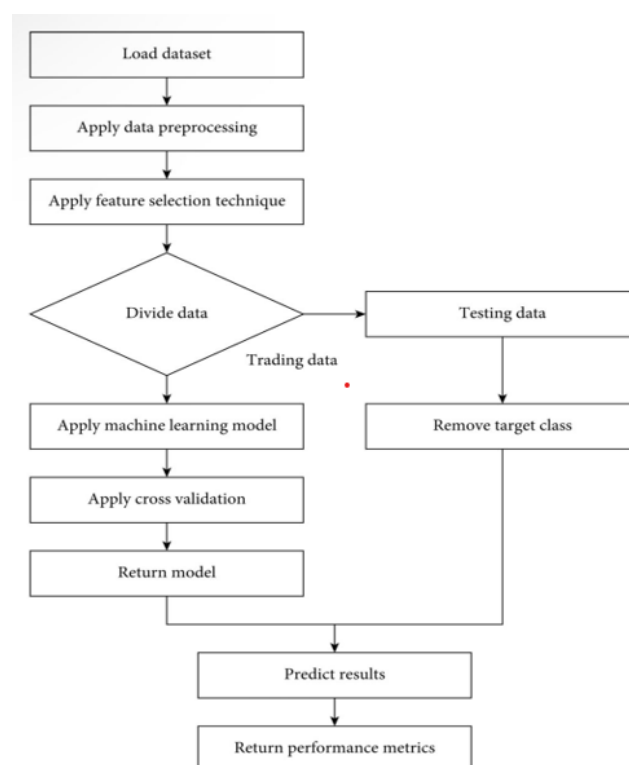


Fig.1 Flowchart of the workflow

Feature Extraction

The feature is chosen. In a pattern classification task, the vector is the most significant component. Feature Engineering is an important component of a data science model development pipeline. holds true for the number of instances but not for the number of features.

Artificial Neural Network

Artificial neural networks (ANNs), often called neural networks (NNs), are computing systems that are designed to match the biological neural networks rooted in animal brains. The weights of neurons and edges are routinely changed as learning advances. The signal power at a connection is increased or reduced by the weight. In a manner that computers cannot, human brains interpret the context of real-world situations. To overcome this problem, neural networks were first developed in the 1950s. An artificial neural network attempts to replicate the network of neurons that make up the human brain so that the computer may learn and make decisions in a humanlike manner. ANNs are made by programming ordinary computers to act as though they were interconnected brain cells. To make sense of the data provided to them, artificial neural networks employ many layers of mathematical computation. An artificial neural network typically consists of hundreds to millions of artificial neurons (called units) stacked in layers. The input layer gets data from the outside world in many formats. This is the information that the network intends to process or learn. The data is routed through one or more hidden units after leaving the input unit. The job of the hidden unit is to convert the input into something that the output unit can use.

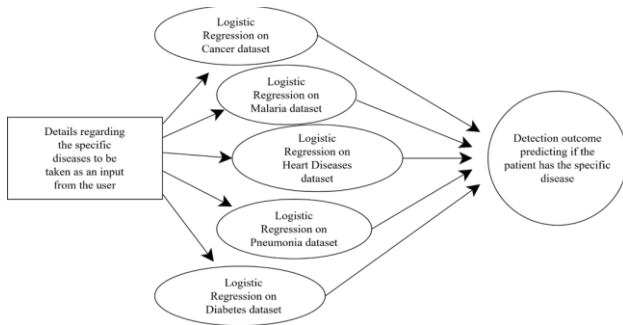


Fig.2 System Diagram

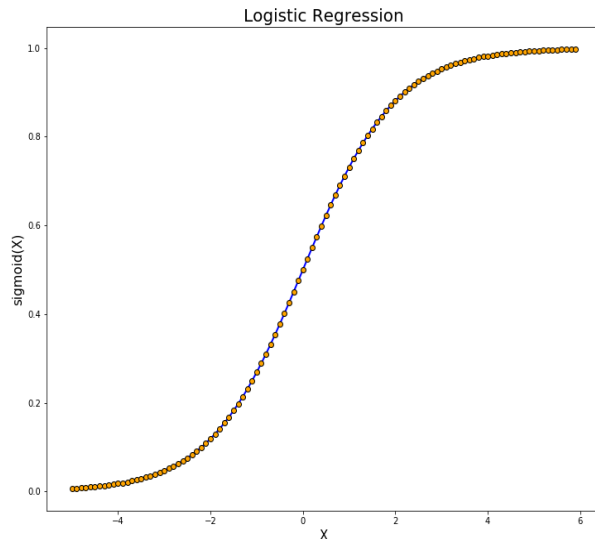


Fig.3 Logistic Regression

V. RESULTS AND CONCLUSION

This study used a variety of ANN and CNN algorithms to predict a person's real-time expression. The model has a 90% accuracy rate and can generate predictions with only a few parameters. However, in order to increase the model's accuracy, research is being done to incorporate subjective features such as parameters and computer vision into the model. The purpose of this research is to increase accuracy by using external factors. This is critical for those who are having difficulty understanding their health, as well as those who wish to analyze symptoms as part of their health treatment. Detecting patients as soon as possible and providing appropriate treatment in the lowest amount of time possible. In recent decades, the method of discovering fascinating patterns in datasets has been employed to achieve this identification. This research examines intelligent data analysis approaches in the medical industry in depth. The following is an example of an experimental demonstration: Seven different diseases from various datasets were examined in this experiment. The below is our website interface



Fig.4 Home Page

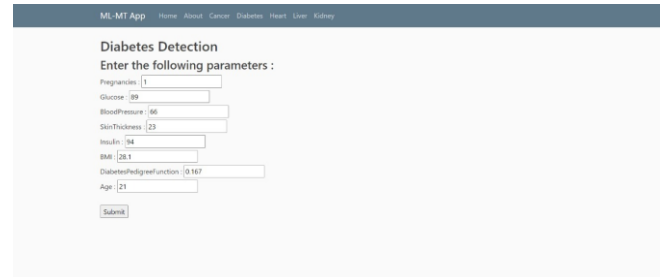


Fig.5 Parameter Page

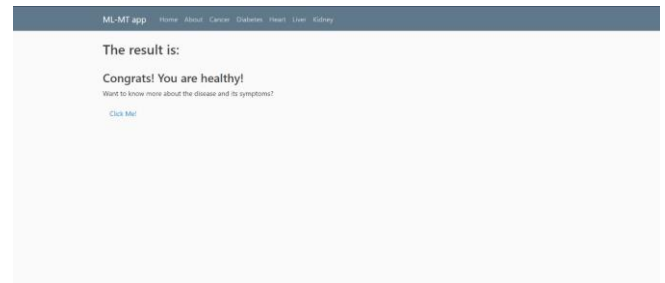


Fig.6 Results Page

VI. FUTURE SCOPE

Machine Learning's future in healthcare is still being researched. It can significantly aid in the treatment of ailments. It has the potential to be extremely cost-effective and efficient in the future. Machine Learning is being used in many studies to treat cancer, heart disease, and other illnesses. In the medical profession, machine learning will not totally replace humans. It will, however, be extremely useful in detecting and treating disorders. It has a lot of potential in hospitals. It's possible that we'll see it implemented in the future. Machine learning is now being used to assist hospitals optimize administrative operations, map and treat infectious diseases, and tailor medical treatments. It has the potential to improve hospital and health-care system efficiency while lowering the value of care. Future scope for this project involves standardizing parameters so that a single set of inputs can successfully detect if there's a possibility of any disease. We could also include various diseases and increase the effectiveness of the system. Another improvement could involve using deep learning to detect x-rays and sonographies. The project could also extend its scope and suggest to the user some local physicians nearby using GPS and location filtering techniques, based on rating, if there's a detection of any disease.

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Internet Controlled Car

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Abstract— A robot is a device designed to iterate one or more tasks and perform them quickly and accurately. There are as many types of robots as there are tasks that must be completed. A robot is a mechanical or digital composing agent controlled by an application or digital circuit, usually an electromechanical device. The robot can be self-supporting or semi-self-supporting. Robots perform repetitive and menacing tasks that humans currently do not want or cannot perform, either because of length limitations or because they occur in harsh environments such as areas behind the ocean of the human body or rocks. Wi-Fi stands for Wireless Fidelity and is intended for full use on all types of 802.11 networks, including 802.11b, 802.11a, and dual-band.

Wi-Fi networks include the transmission of unique radio waves to connect computer systems to each other wirelessly to the Internet or to other networks (components). Computer makers offer laptops with built-in Wi-Fi capabilities, and trendy pocket laptops can easily Wi-Fi by virtually connecting the appropriate Wi-Fi community card (also known as a PCMCIA card. This new era allows Internet customers to connect to nearly 50 instances faster than modern modem dialups. Combining the age of Wi-Fi with robotics offers amazing benefits. To improve the usability of current global content and improve its usage performance, current global content merging is via Wi-Fi and Bluetooth to remove drawbacks from current and digital global devices. In this project, the IoT will be run and you can use the Wi-Fi era to operate the electric vehicle with parameters such as acceleration, braking and guidance. The aim of our challenge is to layout and construct an Internet managed vehicle. The vehicle might supply an actual time digital digicam view to the person at the website. The use of Wi-Fi might permit lengthy distance communication. Arduino is an open supply prototyping platform. This is an easy remote manage vehicle, with an Arduino and Wi-Fi module.

Keywords— *protection, PS Geo-fencing System, GSM module, geo-location, OLED, Arduino, tracking, monitoring*

I. INTRODUCTION

We are more and more believing withinside the net in recent times and it has turned out to be an imperative part of our lifestyle. The use the Internet to locate many roles and make our lives easier. The devices we use might be related to the net. However, the Internet is frequently used for lots of functions aside from leisure and the possibility to spend a large amount of loose time. Recently, an opportunity generation referred to as "Internet of Things" has permeated our lives and has made it viable to carry out numerous obligations without feeling immoderate fatigue. Remote manipulation of numerous gadgets is one of the blessings of the Web of Things. This is frequently beneficial in positive

regions, along with the army and agriculture. For example, you need to ship a digital vehicle (or robot) to a hard-to-attain place, beneath neath the rubble of a residence destroyed via way of means of an earthquake. disaster. Or in case you need to request instructions for the army system to screen enemy activity. In short, the benefit of far off manipulating automobiles is that you may cross in which human beings can't, don't, or shouldn't. The reason for this undertaking is to create a system that may be bought remotely thru a website. A Wi-Fi module will offer the net connection, and DC vehicles are going to be wont to govern the steerage of the auto. Thus, the auto frequently moved to the 4 cardinal factors or the headlights frequently grew to become on to light up the street the usage of the net page. Additionally, you will be prepared to test the battery voltage degree in actual time at the net site, permitting you to work out when they were given to get replaced. Developing surveillance and tracking structures are frequently pretty tough from time to time for the reason that structures ought to be designed considerably of the surroundings to be monitored. Good surveillance structures were given to have dynamic features, e.g., tracking cameras which might be cell can pass spherical the place being monitored. Monitoring outsized regions may be a venture for safety employees as additionally, they must spend a terrific deal of time overlaying all locations. Other eventualities that require a dynamic tracking machine are risky regions, along with regions in which there's a threat of explosion or regions infected with toxic gas. Another use case is a place this is inaccessible to humans. Used for looking for disasters. It is found as an improvement to keep away from boundaries which might be invisible to the driver. To cope with those challenges, we advise a dynamic tracking machine supported by Wi-Fi far off the managed car. Users are frequently withinside the subsequent room, next building, or perhaps out of the country at the same time as controlling the motion of the auto thru the net. Some sensing mechanism is needed to help the consumer to discover the modern-day vicinity of the auto and efficiently navigate. This technique is using Wi-Fi because the only communication medium to attach the car to the server.

II. LITERATURE SURVEY

A mechatronics system is a mechanical-electrical system that uses a microprocessor to control the movement of the system. The rapid development of wireless communication has made it possible to control mechatronics systems almost anywhere in the world where smartphones, computers and internet connections exist.

The following is an example of internet-driven car design.

The first example is a wireless car that communicates over the Internet. Pressing a key on your computer keyboard provides left, right, forward, and fast movement controls. A mechatronics system can be a mechanical-electrical system that uses a microprocessor to coordinate the movement of the system. The rapid development of wireless communication has made it possible to control mechatronics systems almost anywhere on the planet where smartphones, computers and internet connections are located.

The following is an example of an internet-driven car design.

The first example is a wirelessly controlled car that communicates over the Internet. When you press a key on your PC keyboard, the numeric computer sends left, right, forward, and movement controls. High speed is usually used only for linear motion. While the engine is running, the emergency slip clutch protects the drive motor, but the vehicle cannot be steered. You can also press a key on the host computer's keyboard to activate the machine's braking system. A video camera is attached to the vehicle to provide visual input. The video image captured by the video camera is projected onto the computer screen. The arrows on the PC screen indicate the direction of the camera in front of the vehicle. Every device and computer has hardware that can connect to at least one wireless service. Computer and automotive network service providers do not have to be equivalent.

The second example is a rescue robot controlled by Bluetooth and Wi-Fi. This is the second example. A small robot with a camera was proposed as an efficient tool for finding survivors trapped in a shipwreck. Such robots, when manually operated by a person via a computer or mobile phone, can quickly locate the exact position of the body by sending a video to a server. The position of the human body is important because it provides an accurate location for digging and speeds up rescue by avoiding unnecessary ways to find victims.

A robot-controlled car with a Wi-Fi module is another example that has already been realized. Since there is only one gadget, you can easily move the robot vehicle from one place to another. With additional cameras, robotic vehicles are often used for security purposes. Program the car to try things like moving objects from one place to another without using physical force. The third example is a wirelessly controlled remote-controlled vehicle. This project proposes designing and developing a Wi-Fi-enabled remote-control car operated from a computer or mobile device. become a key component of location monitoring.

The performance of the controlled machine depends on the signal strength of the device. The maximum range of the device is only about 20 meters from the user's location. Sent from the host computer. High speed is usually used only for linear motion. The emergency slip clutch protects the drive motor when the engine is running but the vehicle is not moving. You can also activate the machine's braking system by pressing a key on the host computer's keyboard. A video camera is attached to the vehicle to provide visual input. The video image captured by the video camera is projected onto the computer screen. The arrows on the computer screen indicate the direction of the camera around the front of the vehicle. All devices and computers include hardware that allows you to connect to one of your wireless services. Computer and car network service providers do not have to be the same.

The second example is Bluetooth, and the Wi-Fi Controlled Rescue Robot is the second example. A small robot with a camera has been proposed as an effective tool for finding survivors trapped in a shipwreck. Such robots, when manually operated by humans via a computer or mobile phone, can quickly locate the exact position of the human body by sending video to a server. The position of the human body is important because it provides an accurate location for digging and speeds up rescue by avoiding the search for unnecessary victims.

A robot-controlled car with a Wi-Fi module is another example that has already been realized. With only one gadget, you can easily move your robot vehicle from one place to another. Additional cameras allow the robot vehicle for security purposes. You can program your car to do things like move objects from one place to another without using physical force. The third example is a wirelessly controlled remote-controlled vehicle. This project proposes the designing and developing-Fi-enabled remote control car that can be operated from a computer or mobile device. Some of the goals include using Wi-Fi technology to expand the range of cars with regular radio frequencies and developing ubiquitous technology for cars running in the daily life using a control system. The performance of the controlled machine is dependent on the signal strength of the device, which has a maximum test range of only around 20 metres from the user's location.

Robotics controlled via Android. The project's main goal was to communicate information wirelessly between a smartphone and the robot, as well as to create the robot and its communication system on a low-cost, open-source basis. With the use of parametrical modelling software, he styled the robot's construction using 3D design techniques. When submitted to a 3D printer, the style may print the robot's pieces one by one in a layered fashion, allowing the robot to be assembled quickly. In this robot, he employed an Arduino microcontroller and Wi-Fi technology.

A "Pick and drop" robot has been designed by Ranjith Kumar Goud and B.Santhosh Kumar. They intended to use it to safely diffuse a bomb remotely. They employed a pair of motors and another pair as the robot's wheels to control the movement of the robotic arm. Bluetooth is used to establish connectivity. The LPC2148 microcontroller was utilised. They'd also installed a wireless camera for monitoring from afar. They mostly worked on this project for industrial and military purposes.

In his work, M. Selvam proposes a design for a robotic system that includes a wireless camera for surveillance. In his project, Bluetooth was used to establish a connection between the robot and the smartphone. For remote surveillance, a wireless night vision camera was deployed. The video from the camera is subsequently transferred to the television through a radio frequency signal. For the robotic unit, he used an 8051 microcontroller. "Remote Control Robot Using Android Mobile Device" was the subject of Pavel Smutny's research. When using the graphical user interface, we can monitor the current distance of the obstacle from the vehicle, which allows the robot to direct interaction with the display or speech. Ultrasonic sensors are used to determine the distance between the obstacle and the vehicle.

"Android Phone Controlled Bluetooth Robot" was implemented by Rahul Kumar. This paper discusses the construction and operation of a vehicle that captures live

streams and videos at a specific area. Arduino Uno Board, DC Motors, Uart, and L293D Motor Driver IC are required for its execution. Adapter for power.

III. OBJECTIVE

The goal of this project is to style and manufacture online controlled vehicles. The idea is to build a car using Arduino Uno and a Wi-Fi module. The car provides users on the website with a real-time camera view. With Wi-Fi, long-distance communication remains. Using my knowledge of web development, I decided to create a simple and intuitive website that allows users to adjust their cars. This website displays real-time data such as speed, so you can see the current direction of the car. The website displays a live camera view of the car to help users navigate. The car has an automatic mode that allows you to continue to steer the car within the last directional input specified by the user. Because this project uses a website to regulate cars, it is often accessible from any device, including mobile phones and computers that use the Internet.

IV. PROPOSED DESIGN

The gadget has parts, namely - hardware and software. The hardware structure includes gadget NodeMCU because it has in-built ESP8266 as its centre which is a Wi-Fi module alongside thirteen GPIO pins. It additionally includes l293d which is a motor using IC.

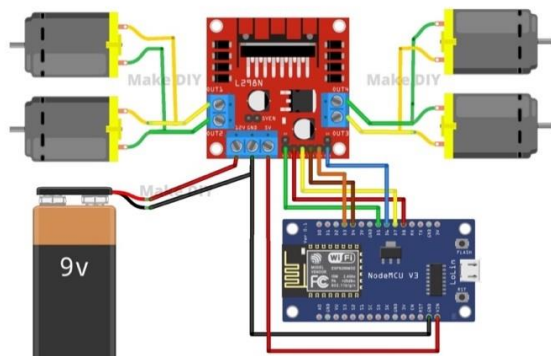


Fig.1 Circuit Diagram

Hardware Used :

NodeMCU:

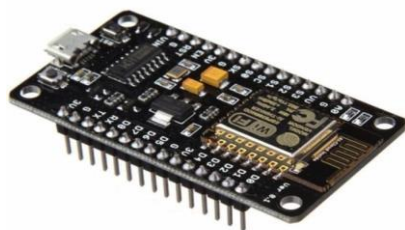


Fig.2 NodeMCU

NodeMCU is an open-source low-cost platform. The firmware used in NodeMCU is [Lua](#) language. The firmware of NodeMCU is based on eLua project.

L298n Motor Driver:

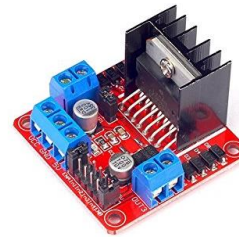


Fig.3 L298n Motor Driver

It is a dual H-Bridge motor driver that allows speed as well as direction control of two different DC motors simultaneously.

V. METHODOLOGY

The task “internet-controlled car” due to the fact the name indicates is aimed to assemble an effect machine that lets in the complete management of the interface on which it is based. the general targets of the task are described as: To coordinate home equipment and different gadgets thru wi-fi. To efficaciously get hold of and transmit information thru wi-fi. To cast off the need of being bodily found in any place for duties related to the operation of home equipment inside a household/office. Minimize electricity and time wastage.

VI. IMPLEMENTATION

We aim to keep the UI clean and simple with the help of HTML, CSS and JavaScript.

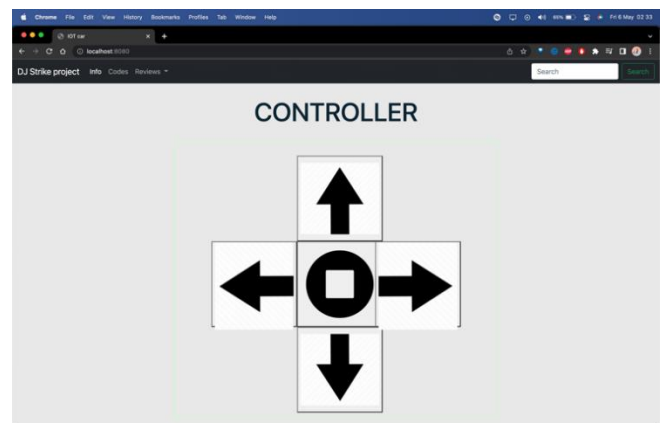


Fig.4 Controller on the Website

The real time action and display of commands are actually implemented by using NodeJs as our backend for the UI. It also consists of a window, showing current speed in rpm. It also consists of real time video sharing which is implement using wi-fi camera module connected on the circuit board. We endeavour to achieve wireless interaction between a robot and a distant user with uninterrupted connection, thus allowing one to handle real world problem discussed above in an easy way.

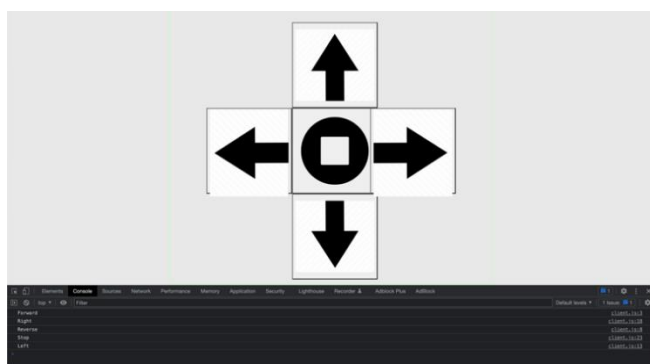


Fig.5 Giving commands using controller

This is just one way of implementing IOT with a robot: one can make use of this in multiple ways by using appropriate ICs and external MODULEs to enhance to the scope of this project.

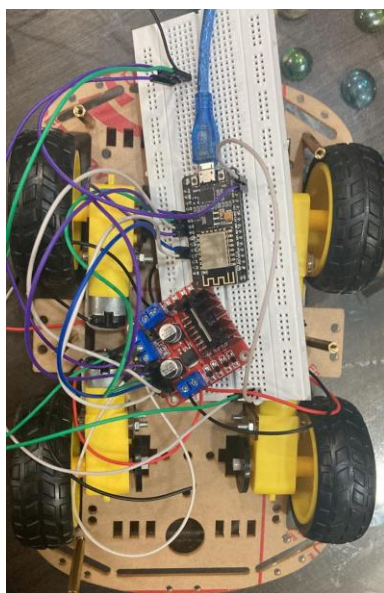


Fig.6 Implementation of Hardware

VII. RESULTS AND CONCLUSION

This article tried presented briefly how a laboratory vehicle is often controlled remotely via the Wi-Fi internet, of some orders received from an internet page. the size and sort of electronic components within the schematic (resistors, capacitors, diodes, transistors) were chosen consistent with the recommendations within the catalogue sheets and therefore the working frequency. Also, a comparison was made between the Wi-Fi and Bluetooth technologies, and it had been found that the Wi-Fi technology is suitable for this project.

ACKNOWLEDGMENT

This was completed under the support and guidance of Prof. V. Venkataramanan. His comprehensive assistance was invaluable to us at for this project, and this paper would not have been feasible without his efforts. We are thankful to our colleagues who contributed their knowledge and experience and assisted us through this process.

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Online Examination Monitoring

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Abstract: Because of its flexibility, availability, and user-friendliness, e-learning has become increasingly popular in countries over the last few years. With the present epidemic, there is no other way to conduct assessments but online. When it comes to online exams, the use of proctoring techniques is a major challenge for the research community. By developing a comprehensive multi-modal system, we provide a strategy for avoiding the physical presence of a proctor throughout the exam.

Keywords: Online Examination Monitoring, Face Detection, Face Recognition, Image Processing, Eye Tracker, Machine Learning, Window Monitoring.

I. INTRODUCTION

Students are now obligated to take online exams owing of pandemics. Because of the numerous malpractices committed by students during online exams, it is difficult for a proctor to watch each student personally. As a result, for the sake of the proctor's convenience and to ensure a fair environment for all worthy students, we intend to improve by including more anti-cheating methods into the current system, thereby assisting faculty in improving result accuracy.

Now a days e-learning has a vast role in the education system and everyday there's a development in the existing technologies and exam monitoring system, though there are still loopholes that makes the student to try different cheating ways or malpractices. The motive is to get rid of these loopholes and create an ecosystem that provides a fair environment for students that not only stops such malpractices but have intermediate actions after several warnings.

Distant education and distant course programs conducted by various Institutes also needs a stable and effective exam monitoring system, so that it becomes easy for the Institutes and students to have a seamless examination round.

Though covid-19 is partially gone, many universities and education firms have decided to stick with online mode of teaching and examination. This increases the scope of the project in the real world. Many national/international entrance examinations prefer to conduct their exams online and many of them prefers to have offline centres with offline monitoring but still the mode of examination is online, the online and offline monitoring makes a great combination and this portrait that the project has high scalability in future.

II. LITERATURE REVIEW

Importance of this project lies in the state in which today's online proctoring system lies. Which is still in the developing stage, so students are bound to take the advantage of it.

In the paper "Online Examination System with Cheating Prevention Using Question Bank Randomization and Tab Locking. 2019 4th International Conference on Information Technology (In CIT), Bangkok, THAILAND", we see that the research done by the international centre of academic integrity shows that from over 70,000 ungraduated students

68% of the student relied onto academic malpractices on examination. From the same paper, research done by Canadian broadcasting company on 54 Canadian University in (2011-2012) saw that 73% of the total student were committed to malpractice in examination. In UK according to the guardian's survey noted the increase in malpractices in examination by 42%. Even in The Harvard University 125 students were alleged to be working jointly in online examinations.

So, we see that the students can cheat in the current proctoring system, as the system is not that strong enough to prevent it. The main drawback that we found lacking in many system was that most of them were not trained with facial features as well as the eye detection and movement detection of the student. We observed from the paper "Secure Online Examination System for e-learning, 2019 IEEE Canadian Conference of Electrical and Computer Engineering (CCECE)" and "The Research and Design of Online Examination System" that most of the proctoring systems are concerned with the set of questions being asked in the examination i.e(random set generator/random question generator)and also it requires a proctor to be present all the time on the window to be checking the other students.

These are the areas we focus to improve our current project.

III. DESCRIPTION OF THE PROJECT

The project's goal is to improve the online exam monitoring system by developing a continuous monitoring site that will handle all anti-cheating safeguards. The portal is a web app-based platform where exams will be performed while being monitored by a proctor and an anti-cheat technology.

We came across various project works and research papers with the same goal in mind, namely, to give a level playing field for all applicants. However, most of them just have facial recognition as an anti-cheating mechanism; here, we combined eye detection with face recognition to prevent

malpractices such as dual monitor setup or the use of an external device.

The project becomes more efficient and reliable for real-time activities thanks to the alert notification that is provided to the student as well as the proctor if any movement or activity occurs. There is a need for a single proctor to monitor along with the automatic system in other already available systems, but there will be no need for the proctor to be present in our system because our system will be sufficient enough to distinguish between malpractice and punish the student accordingly. There are three different kinds of online proctoring systems.

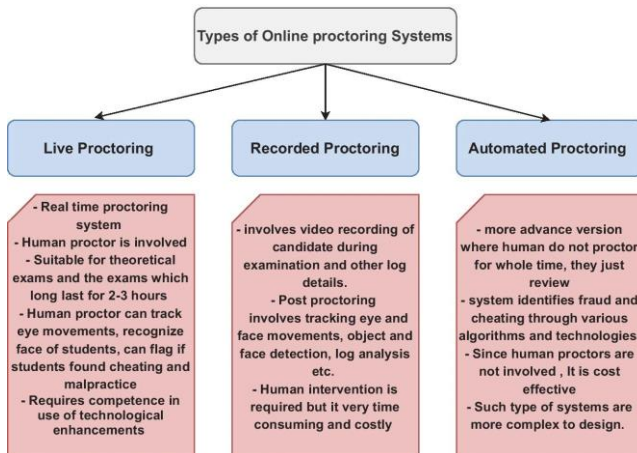


Fig.1

Where Live and Recorded Proctoring both are dependent on humans for further monitoring whereas we will be providing our system with automated system.

Registration:

Registration is a step that helps our system keep track of students' activities throughout the exam by storing crucial information about students who are taking exams. The information gathered will be kept secure and utilised solely for the sake of improving the situation. HTML and CSS will be used to design the registration page, and MYSQL will be used to store the collected data. Name, username, email address, password, unique ID number (if provided by institute), and contact information will be collected, followed by face capture using OpenCV to guarantee the identification of the person registering and taking the exam is the same. It is necessary for students to have a camera set up as well as have the necessary permissions in order to continue.

Fig.2

Face recognition will be performed, and the image will be translated to bytes and stored in the database. There will be two sorts of registrations: one for administrators and one for students. Admin registration will be followed by a unique Admin key, which will allow them to complete their registration. Because all fields are required, incomplete registrations will be returned to the registration page. After completing registration, students must log in using the same credentials they used during registration.

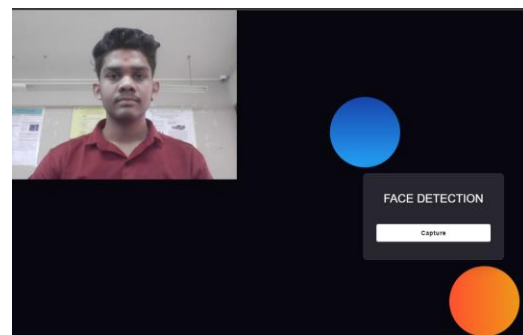


Fig.3

Login:

You'll be directed to the login page once you've registered. Students and administrators must pick the appropriate user type when signing in, and administrators must use the correct username, password, and admin key; otherwise, they will be denied access. Students will be blocked from logging in for the next 10-15 minutes if they use fraudulent credentials multiple times.

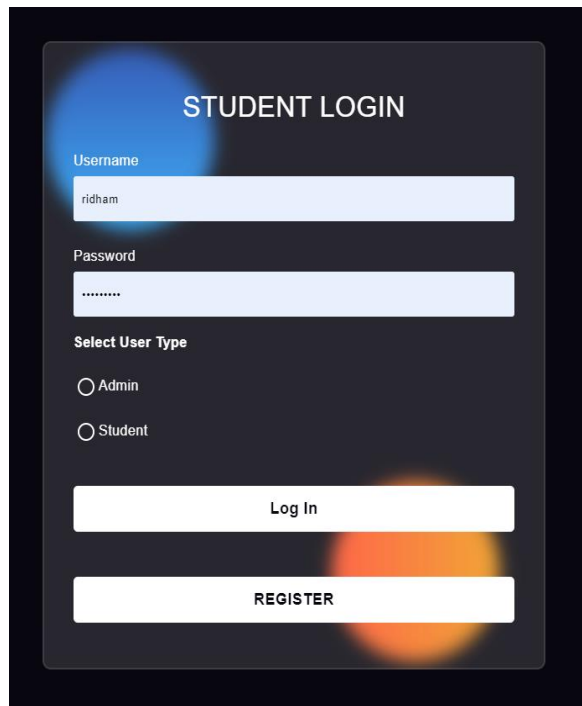


Fig.3

The database will be used to verify the students' credentials, and if the id and password have been verified, they will proceed to Identity Verification. Face detection has been made necessary to ensure that no one other than the student is taking the exam. The photograph given during registration will be used to verify each student's face. The student will be sent to a closed format E-exam window after the verification process is completed.

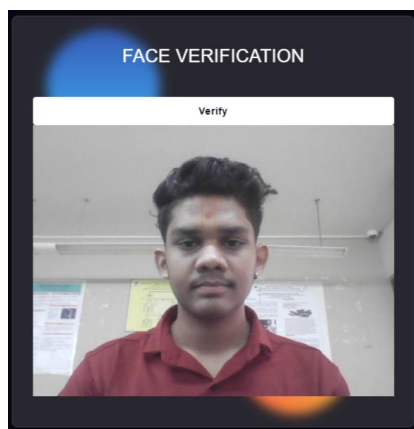


Fig.4

```
127.0.0.1 - - [22/Mar/2021:12:12:12]
127.0.0.1 - - [22/Mar/2021:12:12:12]
127.0.0.1 - - [22/Mar/2021:12:12:12]
True
0.022155585161566682
User Verified
1
127.0.0.1 - - [22/Mar/2021:12:12:12]
```

Fig.5

E-exam window:

A format that is enclosed e-exam window is a pre-defined window with questions and room to answer them. The student will not be able to minimize, swap, modify, or resize the window due to the closed format. If a student tries to aggressively shrink, switch, modify, or resize the window, the system will alert the student with a pop-up message as well as a warning. Candidates must complete the questions within a set time limit. When the exam is over, the test window closes, and the institutes receive real-time reports. Evaluators provide a score to each response depending on their assessment. In the case of long-answer questions with no automatic outcomes, evaluators examine the responses and assign a grade. The candidates are then notified of the exam results through email or the website. During this time, each candidate will be monitored by a technology that detects cheating.

Image Processing –

Image processing includes the following three steps:

- 1) Importing the image via image acquisition tools.
- 2) Analysing and manipulating the image.
- 3) Output in which result can be altered image or report that is based on image analysis.

The most imperative motive is to detect the face and eyes of the student during the exam.

For that we can make use of the following steps below.

Details: -

Reading an Image:

Reading an image is a process of providing the live image of the student during the exam to the system to read the information provided in the image and to make necessary changes in it. We will be using this in the various section of the project.

To read an Image we can use different modules in python such as matplotlib, Image, DIL, Open CV, etc.

Detection of Face and Eyes.

We use OpenCV and DEEPFACE model for image processing, which is used for face verification during user logging. The DEEPFACE model takes two inputs as input: the image saved during person registration and the live image collected during exam logging. The photos are taken from the SQL database and the live capture function. Images are cropped using a Haar cascade, or Frontal-Face-Haar-cascade from OpenCV, which takes the Gray-scaled version of an image to determine the co-ordinates of the face and then crops

the original image so that there is no background and only the user's face is visible.

During the exam we would then be again using the Frontal-Face-Haar-cascade for detecting the face and if the face is not detected for a threshold amount of time, then the students will be given the warning message first still if the face is not detected then the student will be kicked from the E-exam Window and the actions will be taken accordingly.

But also, if the face is detected, the Eye moment of the student are also monitored using the Eyes-Haar-Cascade from OpenCV, If the student is not looking at the E-exam screen (in case of student is trying to use dual screen) for a certain amount of time then first the warnings will be given if still this continuous then the student will be kicked, and actions will be taken accordingly.

In short, the system fetches the information of face and eyes, and we will know the area of importance in the image, to remove the unimportant part of the image.

Resizing Of an image

Image interpolation occurs when you resize or distort your image from the one-pixel grid to another. Image resizing is necessary when you need to increase or decrease the total number of pixels, whereas remapping can occur when you are correcting for lens distortion or rotating an image. Zooming refers to increasing the number of pixels so that when you zoom an image, you will see more detail.

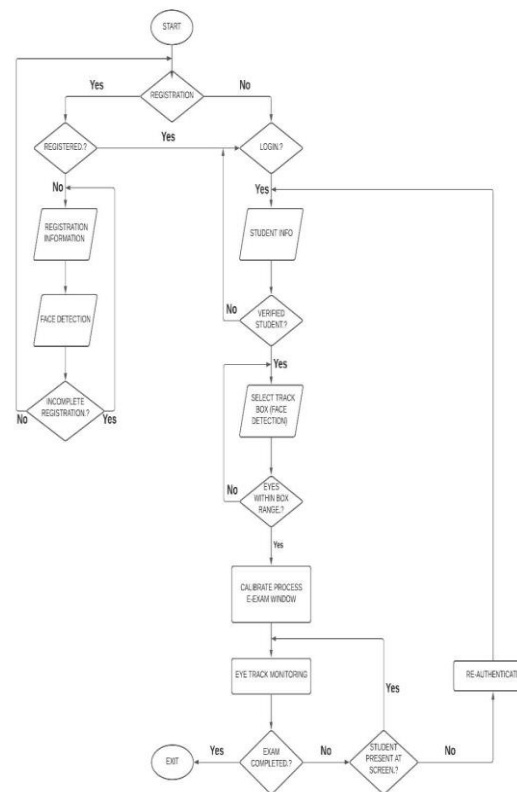
Cropping Image:

Cropping the image to take only the important part from the image (cropping the image to get the face from the image). It in turn also reduces the noise from the image and reduces the weight of the image which will turn out to be very beneficial in the later part.

Cropping is done based on (B).

Submission –

Once the student submits the paper/time-period of exam gets completed the system will save the examination answers securely in an un-editable format to prevent any biased malpractices. Only the faculty will be able to read and evaluate the exam answers. After submission, the student will be automatically logged out of the portal.



IV. METHODOLOGY

Every student appearing for exams using the portal will need to register themselves by providing the information asked by the administrator. Registration will include face recognition to make sure of the identity of the student while examination. Once registered students will need to authenticate themselves /login by using the email-id and password used while registration.

Login:

Login credentials will be verified with the database to ensure no false logins are attempted for cheating. If Login type is selected as Admin, then the user needs to enter admin key to access teacher's dashboard. Else if student login is selected then, if credentials are correct, identity verification will be conducted by means of face recognition.

Identity Verification:

Identity verification will be conducted using face detection using the saved identity data in the database, collected while registration and the live image from user's camera. Once verified user will redirect to the E-exam Window. For identifying identity of users digitally we have used DEEPFACE face recognition model which gives about 83% of accuracy for the work.

E-exam Window:

An electronic exam window is an administrator locked window that only allows users to navigate through the exam-specific window and alerts the administrator if the user/student tries to change or minimize the exam window or even tries to open a new window

Eye Tracking:

During Examination using eye tracing students will be continuously monitored. If the student leaves or gets disappeared from the camera's field of view multiple times, then it will redirect the user to the login page (the user will be logged out and the administrator will be notified). The time when the student completes the exam and submits the paper user will be automatically logged out from the portal.

V. RESULTS

Registration and login is successfully done, and data is stored into the database accurately.

Face is captured and converted into bytes for image processing and face recognition.

Eye detection module is working efficiently.

Exam window is opening after verification and successful login.

Alert notification and other anti-cheat tools are working perfectly.

VI. CONCLUSION

Thus, all the mentioned features are added and working with great efficiency and the response time of the project is also very minimal. The user face detection during login works with accuracy of 91%. The examination page is quite secured to prevent user from using console/elements to attain answers. After examination the marks are displayed on the screen as well as gets stored in the database as the user submits the test. Therefore, to conclude all the features add to overcome the flaws in other globally provided system are either solved or been minimized by our system.

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UV Sanitization System

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Abstract—The motive behind using UV light is because it is an effective sterilization measure against a wide range of different microorganisms that are present within the environment. The use of UV sterilizing equipment is becoming more widespread, particularly in reaction to the ongoing COVID-19 pandemic. However, Ultraviolet rays are harmful to human beings, so this robot will be armed with a Human Detection System using OpenCV with the help of a camera module. The system will be directly linked to UV lights so whenever the camera module will detect human beings it will turn off the UV lights for human safety. The camera module will be installed on a servo motor which automatically rotates at regular intervals to avoid blindspots and to detect human beings. Since OpenCV is used, it is easy to integrate with Raspberry Pi instead of Arduino UNO. A 6 wheeled mechanism chassis will be implemented. This automation will be done using Ultrasonic sensors.

Keywords— Sanitization, Autonomous, UV light, Covid-19, Human and Object detection system, Rocker Bogie Mechanism.

I. INTRODUCTION

These past several months have shown us how much healthcare providers go through to offer us with appropriate medical care, and it has been difficult for us all. We must regularly wash our hands, wear masks, and keep social distance. But, first and foremost, we must avoid travelling to locations where the virus can be highly infected, such as schools, colleges, hospitals, banks, business offices, government offices, and so on. However, our frontline personnel who sanitize public spaces are unable to avoid entering severely contaminated areas. Because their job is dangerous and life-threatening, the major goal of this project is to provide them with a system that automatically sanitises the infected area with the same level of efficiency as a human.

UV lights can help us sustain in the current situation and are helpful if similar situations like the pandemic arrive. UV light can stop the transmission of many contagious diseases. It can disinfect surfaces. Upon researching an article showed us a detailed study on the ultraviolet light benefits. It has a large-scale success rate against the spread of novel coronavirus and the SARS CoV-2. There are different types of ultraviolet light. UV-A and UV-B are a natural gift to the Earth for these UV lights purify the air and the water. UV-C has proven to be the most efficient for sanitization purposes. To make the UV sanitization system efficiently work in households, colleges, schools, and other domestic purposes we need to assemble the system in such a way that anyone can operate it from a distance. Therefore for the convenience

of using open CV, raspberry pi would be utilized to its best. The system should also be able to climb and surpass a wide variety of terrains. The Rocker Bogie mechanism can climb a slope of 45° thus has the capacity to sanitize a corridor and stairs as well. UV lights are harmful to humans and risk melanoma of the skin. UV light-emitting devices are carcinogenic to humans. This mandates us to have a system that protects humans from exposure to UV light. The system should be automated in such a way that it can detect humans and also stop emitting UV light when there is any human in the vicinity. Faster R-CNN is the algorithm to utilize for person detection. For object detection, a deep convolutional network is used, which appears to the user as a single, unified network from beginning to end. The network can predict the positions of various objects with high accuracy and speed.

II. UV-SANITIZATION SYSTEM

The emergence of COVID-19 has affected everyone's psychological and mental health, especially of our healthcare workers and cleaning and disinfecting staff. Sanitizing highly contaminated zones such as schools, colleges, hospitals is a tedious job, moreover, it's a highly precarious job. And with the increasing development in the field of robotics, such tasks are eased out immensely. Therefore, the objective of the proposed project is to develop an Autonomous UV sanitization system using Raspberry Pi. Using this system, the aim is to assist our frontline workers and clean and disinfect staff, and ease out their health-risking job. This project will aid them with a system that will automatically sanitize using UV light. Disinfection with the help of UV light makes the process much easier with equivalent efficiency. This robot will be equipped with a Human Detection System using OpenCV. It will be accompanied by a 4 wheel chassis keeping stability and easy maneuverability at priority. Nowadays every field is working towards automation and increasing its reliance on robotics, decreasing human efforts needed and averting many risks for first responders, staff supporting them, and making our lives easy. Therefore, this complete system will be made Autonomous with the help of Ultrasonic sensors.

III. PROPOSED DESIGN

Since UV light is used for sanitizing the surroundings and is harmful to human beings, human detection is done using OpenCV with the help of a camera module. The model will be trained using neural networks by showing many positive and negative images and increasing its accuracy for live

human detection.

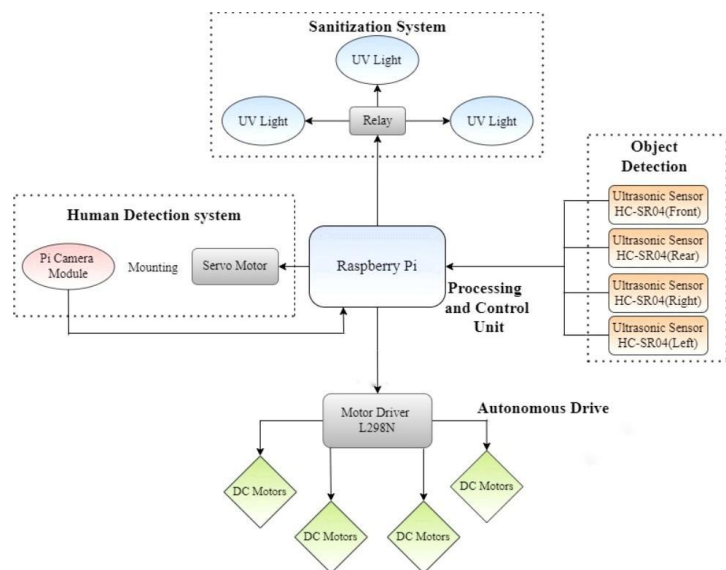


Fig.1 Proposed System Block Diagram

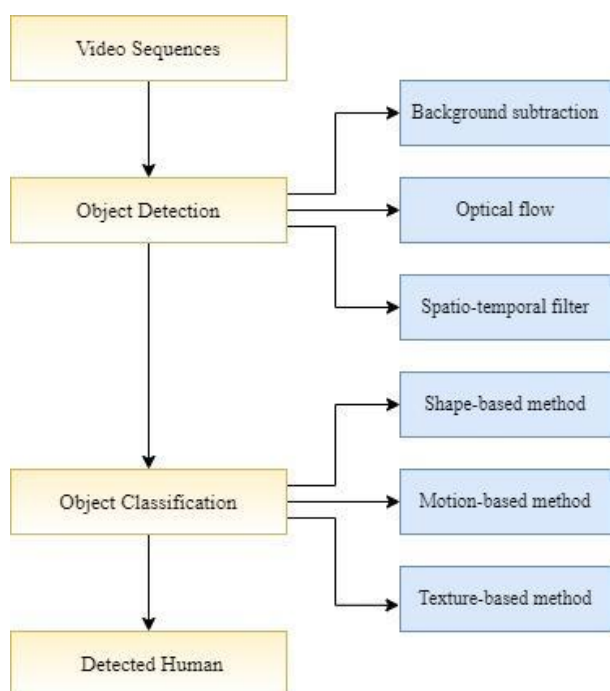


Fig.2 Flowchart for object and human detection

IV. IMPLEMENTATION

Chassis

The main objective of using the Rocker bogie mechanism in our project (Autonomous UV Sanitization System) is to make our system armed with a mechanism that can also climb stairs and also not affect its maneuverability. This mechanism is capable of climbing an inclination of up to 45 degrees. This will help our system to sanitize the stairs area. This

mechanism also doesn't affect the maneuverability of the system while sanitizing the indoors.

Design and Calculations:
The important factor in the manufacturing of rocker-bogie mechanisms is to determine the dimensions of rocker and bogie linkages and angles between them. The lengths and angles of this mechanism can be changed as per requirement. In the work, the aim is to manufacture the rocker-bogie mechanism which can overcome the obstacles of 150 mm height (like stones, wooden blocks) and can climb over stairs of height 150 mm. Also, another target is to climb any surface at an angle of 45°. To achieve the above targets we had to design the rocker-bogie model by assuming stair height 150 mm and length 370 mm. Using Pythagoras theorems, find the dimensions of the model. It has both angles of linkages at 90°.

To achieve proper stair climbing the dimensions of linkages should be proper. Assume the stair height and length are 150 mm and 370 mm respectively. To climb stairs with higher stability, it is required that only one pair of wheels should be in a rising position at a time. Hence to find the dimension of bogie linkages, the first pair of wheels should be placed at the horizontal position at the end of the rising as shown in Fig. And the second pair should be placed just before the start of rising. There should be some distance between the vertical edge of the stair and the second pair of wheels to the striking of the wheels.

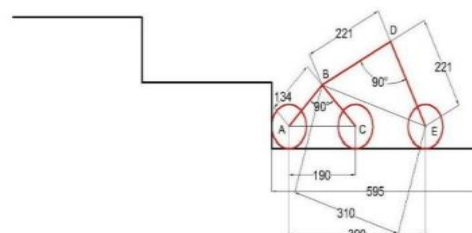


Fig.3(A) Rocker Bogie Mechanism

Now, to obtain the distance between the first and second wheel through CAD software (190 mm). Considering the right-angled triangle ABC,

Using Pythagoras in $\triangle ABC$ (Fig. 3(A).) assume lengths AB and BC are x.

$$AC^2 = AB^2 + BC^2$$

$$190^2 = x^2 + x^2$$

$$190^2 = 2x^2$$

$$x = 134 \text{ mm}$$

Hence, AB = BC = 134 mm

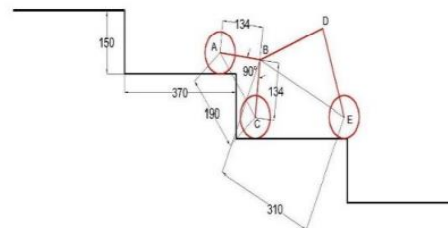


Fig.3(B) Rocker Bogie Mechanism(2)

Similarly, the first two wheel pairs should be positioned horizontally to establish measurements for rocker linkages. Before starting the first pair of wheels, the third wheel pair should be virtually finished rising. We acquired the dimension of connection BC by positioning the wheel in this manner (311mm).

$$\begin{aligned} \text{Now consider } \triangle BDE, \\ BE^2 &= BD^2 + DE^2 \\ 311^2 &= 2y^2 \\ y &= 221 \text{ mm} \\ \text{Hence, } BD &= DE = 221 \text{ mm} \end{aligned}$$

By considering all these lengths and angles we have drawn the whole mechanism. Above Fig. 3, shows all dimensions of the robot. At a speed of up to 0.5 m/s, a wheel design is necessary. Assume a motor speed of 60-100 rpm. The assumed speed is derived using the velocity relation. The diameter of the wheel is 95.35 mm, according to the estimated velocity value. As a result, we choose a wheel with a diameter of 100 mm (standard wheel). The rubber tread glued to the wheel is light and durable, and it provides good traction and friction.

To determine the wheel's diameter,
Required velocity (v) = 0.5m/s.
Motor rpm (n) = 100 rpm
We know that,

$$\begin{aligned} \omega &= (2\pi n) \div 60 \\ &= (2 \times \pi \times 100) \div 60 \\ \omega &= 10.471 \text{ rad/sec} \end{aligned}$$

For circular motion,

$$v = \omega \times r$$

$$\begin{aligned} \text{So, } r &= v / \omega \\ &= 0.5 / 10.471 \\ r &= 0.04775 \text{ m} = 47.75 \text{ mm} \end{aligned}$$

$$\begin{aligned} \text{So, our diameter will be,} \\ d &= 2 \times r = 95.5 \text{ mm.} \end{aligned}$$

On flat terrain, a typical robot needs to accelerate to about half of its maximum velocity. The robot's top speed is 0.5 metres per second. As a result, the robot's acceleration will be 0.5/2, or 0.25 m/s². This indicates that reaching maximum speed would take 2 seconds. Due to gravity, increased acceleration is required when the robot is travelling up inclines or through rugged terrain. We needed to increase the tilt to 45 degrees. Hence,

$$\begin{aligned} \text{Acceleration of inclines} \\ &= (9.81 \times \sin(\text{angle of inclination}) \times \pi) / 180 \\ &= (9.81 \times \sin(45^\circ) \times \pi) / 180 \\ &= 0.121 \text{ m/s}^2 \\ \text{Total Acceleration} \\ &= 0.25 + 0.121 = 0.371 \text{ m/s}^2 \end{aligned}$$

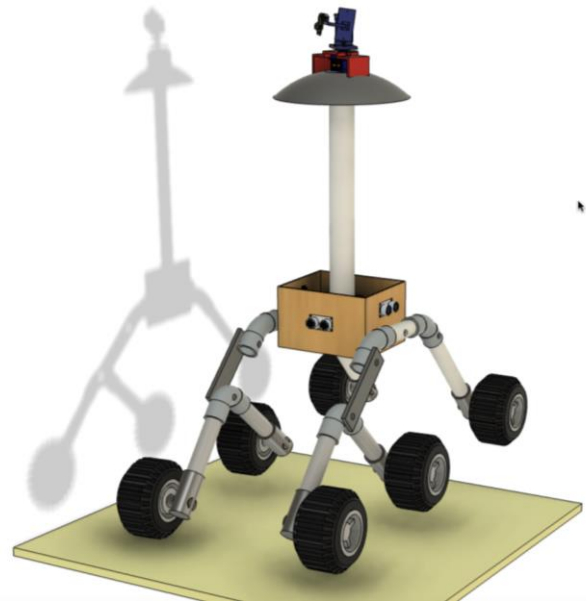


Fig.4(A) CAD Model

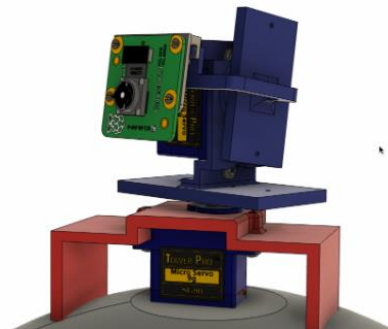


Fig.4(B) CAD Model for Pi Camera

Hardware

UVLight:

Ultraviolet (UV) is already used in industrial processes and in medical and dental practices for a variety of purposes, one of them is killing bacteria. Light exposure is a direct antibacterial method with a lengthy track record of success against many strains of airborne viruses. A low-pressure mercury-vapor arc lamp generating around 254 nm is the most often utilised form of UV light for germicidal purposes; more recently, xenon lamp technology has been utilised, which provides a broad UV spectrum. A single UV-C LED with a power output of roughly 2.5W can cover a 5cm surface with 99.9% irradiation. UV light serves the project's aim while also lowering the weight and human intervention associated with spraying sanitizers.

RaspberryPi:

Raspberry Pi is a cheap computer that runs Linux, while it also provides a set of general purpose input/output pins known as GPIO. It gives us flexibility and allows us to control electronic components for physical computing and explore the Internet of Things (IoT). The features that helped are the vast peripheral support with the 26 GPIO pins (very useful for embedded projects and interfacing hardware). These pins are useful in learning about component

interfacing and interfacing multiple sensors at a time. Connection of various displays, modules, sensors, etc...to it. It came in handy while interfacing the pi camera module and the 4 ultrasonic sensors. Different types of codes and different languages were used while interfacing all the electronic devices. The Linux desktop environment is friendly to all languages, be it C, C++, Ruby, Java, Python, etc.

UltrasonicSensors

They measure the distance to the target by measuring the time between the emission and reception. This helped us determine the distance between the obstacle and the bot and make it fully autonomous. Ultrasonic sensing serves the best purpose for us, as it senses the proximity and detects levels with high reliability. The sensor measures the distance to an object using ultrasonic sound waves. The ultrasonic sensor works with using a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. Distinct echo patterns are produced by high frequency sound waves that reflect from the boundaries. The distance is measured to the target by the sensor by measuring the time lapses between the sending and receiving of the ultrasonic pulse. The ultrasonic pulse is sent which bounces back to the sensor, if there is an object or obstacle, Distance is calculated by the calculation of the travel time and the speed of the sound. Ultrasonic sensors can detect the presence of an object, human, irrespective of the color, surface or material until it is a very soft material(one that can absorb sound. Ultrasonic is more reliable than others because other optical technologies can fail to detect transparent objects but ultrasonic sensors can detect those too. HC-SR04 ultrasonic distance sensor has an ultrasonic transmitter, a receiver, and a control circuit.

Human Detection and Object Detection

Computer vision will be used to extract features to quantify the human body. These characteristics can be fed into machine learning models, which can then be used to detect and track humans in pictures and video streams after being trained. When this device identifies a human, it sends a signal to the UV light, which turns off immediately.

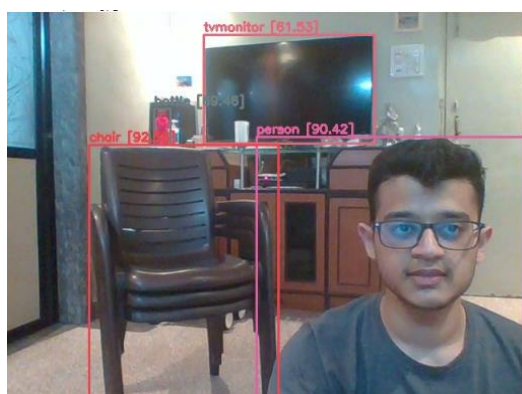


Fig.5 Human and Object Detection

The Chamfer distance transform of the edge map of the target picture region is represented by C. Template T is a binary image that is 0 everywhere except for the silhouette pixels, which have a value of 1. The distance between the target

image area i and a template T can be found by the equation mentioned.

$$D(I, T) = \frac{1}{|T|} \sum_i C_i T_i$$

The number of silhouette pixels in T is |T|, the pixel number I in T is T_i , and the Chamfer distance value at pixel number I in I is C_i . For our human detection, we used RCNN. Convolutional neural networks with rectangular regions (R-CNN) combine rectangular region suggestions with convolutional neural network characteristics. The R-CNN algorithm is a two-stage detection method. The first stage finds a selection of image regions that could contain an object. The modified version of Fast RCNN is Faster RCNN. The main distinction is that Fast RCNN generates Regions of Interest via selective search, whereas Faster RCNN employs Region Proposal Network.

During implementation the detection is done through 3 mediums. 1st an image is uploaded and then the object type and humans are detected. The 2nd kind of testing is done on images captured by the webcam. 3rd is when humans, pets and other multiple objects are detected by the algorithm in a live feed.



Fig.6 The Final Implementation

It entails building a neural network that processes an image's individual pixels. To "train" these networks how to detect comparable images, we feed them as many pre-labeled images as possible.

Invoking the detection algorithm is the responsibility of this module. The detection algorithm should ideally be run on each input frame. However, the system will be unable to meet its real-time needs as a result of this. Instead, in our

approach, the detection algorithms are called every two seconds. A queue of pointers to frames is shared data between the frame capturing module and the human detecting module.

V. RESULTS AND CONCLUSIONS

A cost efficient and a portable sanitization system is the need of the hour due to the pandemic. Since the schools, colleges, entertainment centers and offices have opened a sanitization system that is easy to manage is a must. Our UV sanitization system is just the missing piece in the puzzle. It is easily portable, can climb stairs and sanitize the lobby easily, cost effective and a great help to the cleaning, nursing staff. The risk faced by the front-line workers is reduced to a great extent. The system can be used in every domain, domestic, hospitality, commercial, etc. The system also has broad scope of optimization.

VI. SOCIAL IMPACT

These past few months have made us realize how much the healthcare providers go through an ordeal to provide us with apt medical care, and it has been challenging for all of us. We need to wash our hands regularly, wear masks and maintain social distance. But, at the top of the list, we need to avoid unnecessarily going to places that can be highly contaminated with the virus for e.g. schools, colleges, hospitals, banks, corporate offices, government offices, etc. But our frontline workers who sanitize public places cannot avoid going to the highly contaminated zones. This makes their job dangerous and life-threatening and therefore the main aim of this project is to aid them with a system that automatically sanitizes the infected area at the same level of efficiency that a human does.

ACKNOWLEDGMENT

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Home Automation using IoT & Smartphone

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Abstract— Smart home systems, which make use of smart devices, are intended to improve customers' lives by automating home security and safety and adding new functions like remote home surveillance and environmental control. The document analyses the use of the Internet of Things, which is used for remote verification of surrounding physical parameters and other types of things using sensors designed to remotely capture continuous information and shape it into the desired form and send the captured information through the system Cloud via 'Web Connection' [1]. Also, it has an adaptable home monitoring and control framework that uses a small installed web server with an IP network to remotely poll and control appliances and devices via an Android-based smartphone app called Blynk. This process uses Wi-Fi modules that process the detected information and exchange it with Thing Speak Cloud and control the devices via App.

Keywords—IoT, Home monitoring, Thing Speak, Blynk, Wi-Fi modules.

I. INTRODUCTION

Home mechanization alludes to controlling home machines by utilizing miniature regulator or PC innovation. Mechanization is liked as of late on the grounds that it is simpler, secure, and productive. In this framework, a sensor is utilized for really looking at the situation with apparatuses. Client is refreshed on the situation with the machines in any event when he/she is away from home. This framework can be worked from the client's cell phones through an application. The robotized "keen" home can give a more secure, more agreeable, and affordable approach to everyday life.

Today inside the advancement of Automation headway, life is procuring less jumbled and less serious. Nowadays Automatic frameworks are being liked over manual designs. No miracles, home mechanization in India is now the fervor word, especially on the grounds that the rush of second-age home house proprietors develops, they require very asylum, water, and power. the essential and most obtrusive benefit of good homes is solace and comfort, as a great deal of contraptions will wear out additional activities (lighting, temperature, and afterward on) that thus opens up the occupant to perform elective assignments. great homes loaded down with associated stock are stacked with possibilities to make our lives simpler, a ton of helpful, partner degreed more agreeable. there's no lack of opportunities for brilliant home IoT gadgets as home robotization seems, by all accounts, to be the rush of things to come. the need for home robotization emerges thanks to the appearance of IoT, in an exceptionally immense technique in homes and work environment space.

These shrewd robotization gadgets end up possessing a connection point with IoTIn a canny home mechanization framework, there are numerous potential answers for how and where to control the computerization framework. One potential arrangement is utilizing an online UI is the organization of items. The equipment utilized for this task incorporates a NodeMcu Wi-Fi module-ESP 8266 and different sensors including a gas sensor for recognizing dangerous gases, PIR sensor for location of development and a bell. Programming utilized in this undertaking is an Arduino IDE, Blynk stage and ThingsSpeak.

II. OBJECTIVE

The primary point of this venture is to make a Full Home Automation framework constrained by any gadget equipped for Wi-Fi, for example, our cell phones. Through this framework, we can screen and control everything in the house, for example, temperature, mugginess, measure of releasing gas, home security, the water level in the water tank, and other electrical apparatuses. The above framework will likewise be productive concerning low energy utilization, harmless to the ecosystem development, and in expanding the help life of advanced gadgets.

The principal goals of the Home Automation are:

To distinguish the presence of unsafe gases and fumes

To guarantee home security

Programmed filling of the water tank

The underpinning of this framework depends on IoT innovation. Web of Things licenses us to oversee associated gadgets from any spot and trade data over the gadgets. Hence, we have some control over and screen all elements through the web. While controlling up this framework, the Nodemcu board, which is coded by means of Arduino Integrated Development Environment (IDE), is associated with the Blynk application through the Blynk cloud. By then, the sensors start to get values. From there on, those values are sent by the Nodemcu board to the Blynk application. Every one of the sensors are coordinated, and the perceived information is sent by means of ThingSpeak. The versatile application gets the measurements continuously from the cloud, and all triggers are copied by it. Then we can likewise turn the transfers and PIR security framework ON/OFF with the buttons on the Blynk application interface.

Hence, clients have some control over their home from anyplace, making it more straightforward, exceptionally helpful, and adaptable. It additionally gives a way to IoT

engineers and specialists to find, digitize and control homes for the eventual fate of IoT.

III. PROPOSED DESIGN

Node MCU

NodeMCU is an open-source stage in view of ESP8266 that can associate items and empower information move over Wi-Fi convention. By giving a portion of the critical highlights of microcontrollers like GPIO, PWM, ADC, and so forth, it can settle a significant number of the venture needs without help from anyone else.

The general elements of this board are the accompanying:

Easy to utilize

Usable in occasion driven API applications

With inward receiving wire

Contains 13 GPIO pins, 10 PWM stations, I2C, SPI, ADC, UART, and 1 link

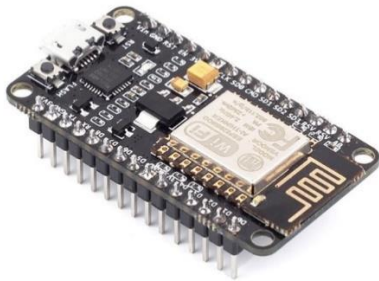


Fig.1

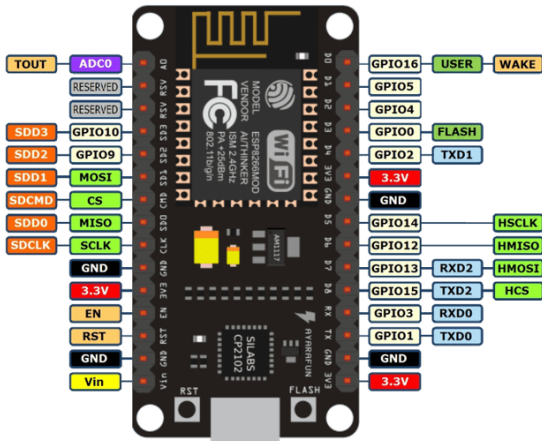


Fig.2 Internal design

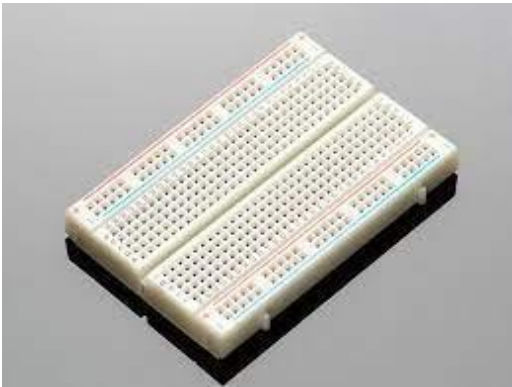


Fig.3 Breadboard

MQ2 Gas Sensor

The MQ2 gas sensor is an electronic sensor for recognizing the gathering of gases in the air, e.g., hydrogen, smoke, alcohol, carbon monoxide, etc.



Fig.4 MQ2 sensor

MQ2 sensor contains a detecting component, essentially ceramic considering alumina covered with tin dioxide, encased in a tempered steel network. Six connector pins are joined to the sensor component. These voltage readings are dispensed to find the gas obsession. The voltage readings are higher when the gas center is high.



Fig.5.PIR sensor

PIR sensors license you to identify development, frequently used to recognize whether a human has moved in or out of the sensor range. Along these lines, they are typically found in devices and contraptions used in homes or associations.



Fig.6.Ultrasonic sensor

An ultrasonic sensor is a mechanized instrument that activities the space of something objective with the aide of using releasing ultrasonic sound waves and converts the pondered sound into an electrical sign. Ultrasonic sensors have fundamental parts: the transmitter and the collector.

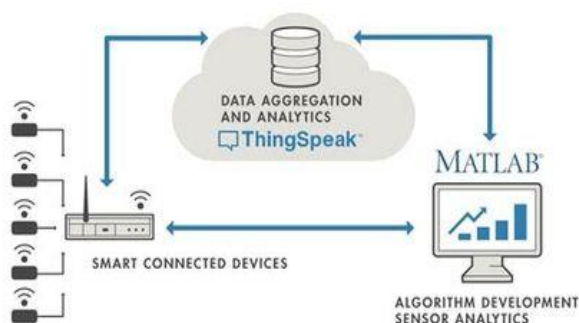


Fig.7.ThinkSpeak application

ThingSpeak is an open data stage for the Internet of Things. ThingSpeak gives a web-based content instrument to perform data assessment and portrayal using MATLAB®. ThingSpeak can develop IoT frameworks without setting servers or creating web programming



Fig.8.Blynk

Blynk is an open source IoT based Platform
Blynk is allowed to use for individual use and prototyping
The point of convergence of the Blynk stage is to make it super-easy to encourage the wireless application
It is planned, created, and tried the structure squares of a total IoT arrangement

IV. IMPLEMENTATION

Hardware

For implementation of the project basically a breadboard was needed and on breadboard all the components were to be attached. So before assembling the whole setup, we needed to test the sensors individually to avoid obstructions in the advance process of project. So, a suitable code was written on the software Arduino ide for testing the small circuit which included a single sensor and buzzer. Once the testing of all the sensors was done and the desired results were obtained the whole circuit was created on the breadboard with the following sensors connecting the following pins of NodeMCU on the breadboard.

PIR sensor: Vcc pin - +5V, ground pin – ground, out pin – D3 port

Gas Sensor: Vcc pin - +5V, ground pin – ground, A0 pin – A0 port

Ultrasonic Sensor: Vcc pin - +5V, ground pin – ground, Trig pin- D5 port, Echo pin- D6 port

Buzzer: Positive terminal – SD2 port, Negative terminal – ground

After the whole connection an external power supply of 5V was provided with the help of a DC power supply. This was needed because to maintain a constant power supply from the Vcc pin of NodeMCU was difficult and the PIR sensor works in the range of +5V-12V, so if a constant voltage wasn't supplied then the sensor might not work correctly.

After the whole circuit was made the code for whole circuit was written, verified, and uploaded on the Arduino ide with the suitable range of values.

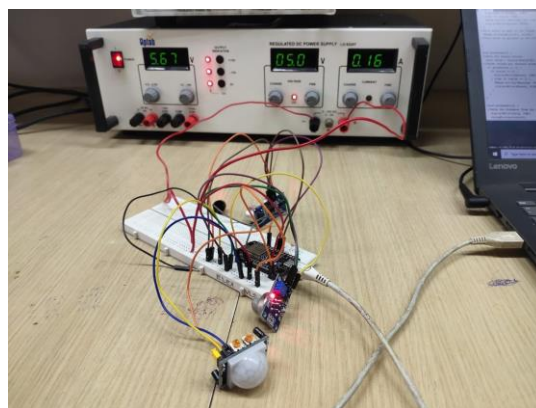


Fig.9.Implementation

Software

For controlling the whole circuit through a smartphone, we needed a mobile application which would switch on and off the suitable sensor whenever required and provide us with real time data and warn us whenever a certain level recorded by sensors was breached. Blynk application was chosen for this purpose which satisfies all our requirements.

First, we go to the Blynk official App and download it. Then login using email and password.

Next, we click the template button and create a new template. Also, we select the hardware as ESP8266 and the connection as WIFI.

Then, we click the “Datastreams” tab and create two Datastreams as VirtualPin. Also, we set the first pin and the second pin to V0 and V1. Then, we select the data type as an integer.

Now, we click on the Web Dashboard tab. Then, drag and drop two buttons to the dashboard. Next, we click the setting icon in the button and select the data stream we created earlier. That is, V0 for button one and V1 for button two. Finally, we click the save button.

Next, after clicking the Search Icon button. Then, click the New Devices button and after clicking the “From template” button. Finally, we select the template that we created earlier. We copy and paste the Blynk auth token. After entering all the required details.

We connect the 5 VDC external power supply to the Nodemcu board and run the program.

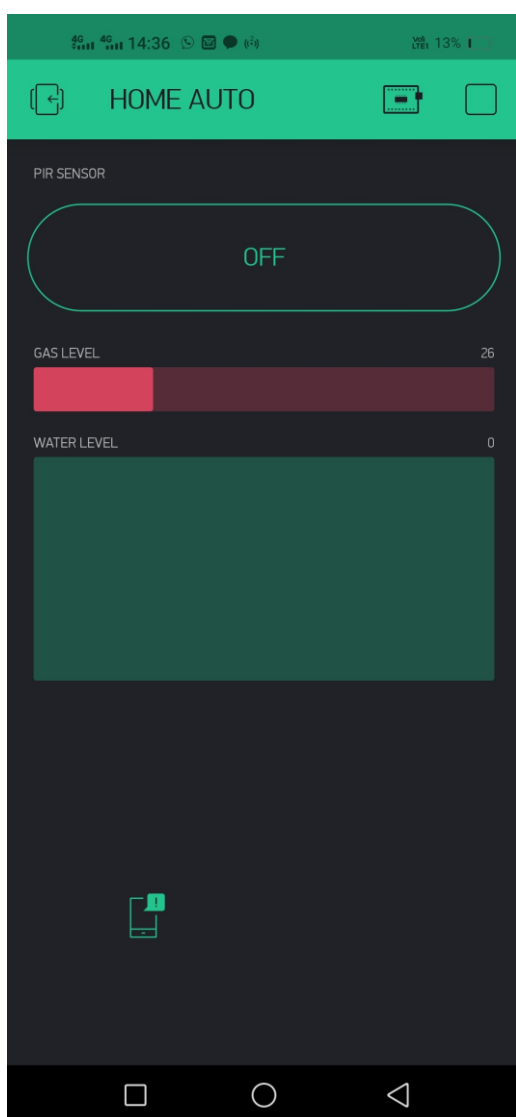


Fig.10.Blynk application

ThingSpeak is used to calculate and store the data. Blynk is used to operate and run the system whereas using Thingspeak we gather data, we get graphical data about for

example of Gas level in the area which gets stored and can be accessed at anytime from anywhere and can be used in future for various purpose.

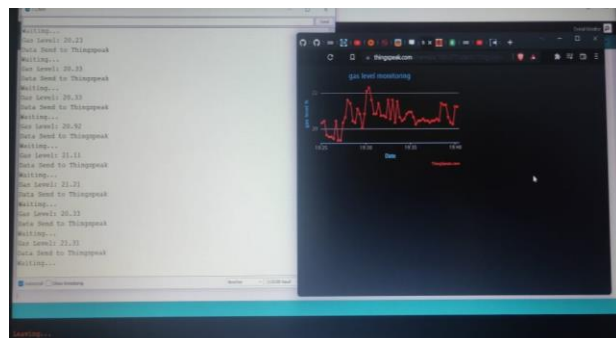


Fig.11 ThinkSpeak result

V. RESULTS AND CONCLUSION

Various sensors were used in the project and home automation as well as safety was insured. The motion sensor can be placed along the main door and can be activated when the house is empty so if there is any movement then the buzzer goes on thus safety is insured. Gas sensor is useful in kitchen as well as other rooms as it can detect various gases and if there is a high concentration of any specific gas then the buzzer goes on as well as a message is received on the blynk app. Water level can be measured using the ultrasonic sensor. Moreover, a huge circuit can be constructed using different boards such as arrduino uno, arduino mega so that much more sensors can be connected, and home automation can be achieved on a larger domain.

VI. SOCIAL IMPACT

Increased security

Data gathered from associated gadgets and portable sensors permits the framework to recognize when interior and outside clients, lock entryways and doors, and leave different gadgets sitting tight for you. Yet, man-made consciousness can likewise be utilized to naturally identify a danger and maybe further caution us assuming something looks off-base, like temperature sensors and camcorders that set alerts and call firemen in case of a short out. By utilizing face acknowledgment calculations via online entertainment, the actual framework can recognize when somebody outside your circle of associates is attempting to get to your space and make an impression on your PDA inquiring as to whether you maintain that the entryways should remain locked or not. This kind of innovation can work on the proficiency of safety frameworks and lessen deceptions.

Work on the existences of individuals with decreased portability

Robotization can be useful for individuals with handicaps and the older. Individuals with Parkinson's sickness or other immune system illnesses can initiate the switches without contacting them, and the tangible nerves can consequently turn on the wellbeing lights. Moving sensors can likewise flag a latrine breakdown and trigger salvage assets. Indeed, even

circulatory strain sensors and glucose levels can be remembered for these projects, giving inner harmony to direct relations.

Asset Saving

Despite the fact that framework establishment might be the main significant venture, it might set aside you cash after some time in light of the reserve funds it can give. Advances, for example, indoor regulators and shrewd lighting associate with transitional controls that can work all alone or be modified to control power utilization and decrease squander. Similarly, as the light and wellbeing of a home can be constrained by a solitary machine, so water obligation can be impacted. For instance, shrewd water system frameworks work likewise to stop stream and set aside cash, and in any event, adapting to weather patterns to carry the perfect proportion of water to the ground.

Make day to day existence and structures more brilliant

The capacity to utilize housekeeping consequently can save time for the main things. For instance, an internet-based cooler can investigate non-existent things and shop on the web. With savvy gadgets, most domestic devices can be designed from a distance and will work naturally or by contact. You will actually want to enact practically in the capacity to consequently perform rehashed house support can save time for the main things. For instance, an internet-based cooler can review non-existent things and shop on the web. With shrewd gadgets, most domestic devices can be arranged from a distance and will work naturally or by contact. You will actually want to begin nearly everything with a cell phone.

ACKNOWLEDGMENT

This task and specialized paper were enormously maintained by Prof. Shivani Bhattacharjee. Her adroit mentorship and extensive direction helped us through each progression of this task and this record could never have been conceivable without her priceless commitments. We thank our partners who gave data and skill that enormously added to the exploration and helped us all through the interaction.

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Smart, Wearable Posture Corrector Device

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Abstract— The Covid-19 epidemic has accelerated the advent of technology in our lives. With work from home and academy from home getting the new normal, we sit on lounges, bottoms, beds, dining tables any place that we can find to work, and indeed after investing in plant effective chairpersons and divisions, utmost of us complain about stiffness in the shoulder, back, and neck. There is a reported 50% decline in musculoskeletal health of office job goers. 90% of backaches and soreness in upper bodies can be treated with correct sitting postures and back supporting mechanisms. With the adding involvement of problems in our day-to-day lives, we are frequently abandoning our good posture and sitting hunkered for hours, and limping. Bad posture not only affects our constitution but also has severe repercussions like a curved spine, back pain, headaches, poor sleep, and disintegrated digestion. This design aims to produce a posture correcting device. The original prototype will warn the wearer whenever they are not the best with a vibration using a buzzer. It has been found that low reverse treatment costs are extremely expensive. We are indulging in this design because the pace at which technology is moving forward is phenomenal but not a lot of advancement is seen in posture correction. In the period of IoT traditional belts used for posture correction look obsolete and are frequently uncomfortable and unable of furnishing corrective measures in real-time. We plan to build a device that is easy to use for everyday people who live in a world dominated by problems and divisions and help them better their posture and not be left at the mercy of a crawled and hunkered back.

Keywords: Covid 19; muscular and skeletal health; posture corrector; slouch; buzzer; IoT; flex; Arduino UNO; HTML; CSS3; JavaScript; python; embedded C; Machine Learning; Data Analysis;

I. INTRODUCTION

In these modernized times, people are constantly neglecting their health issues just because of all the traditional priorities set by society due to which certain back-related issues tend to come habitual in the future. Back pain is one of the world's biggest health problems that utmost people will witness during some stage in their lives. Due to adding work pressure and lack of mobility among Workers worldwide, there has been a significant rise in the number of people suffering from habitual reverse pain due to their incorrect posture. According to the Indian Association of Chiropractic Croakers, 80% of Indian's gestic back pain. More than 10% of the world's population suffers from lower reverse pain and it's the number one cause

of disability worldwide. The paper shows the development of a low-cost, smart wearable posture corrector system. The device is directly attached to a garment using a tenacious or can be darned on the garment or can be used as a neckband. It'll be connected via Bluetooth to a smartphone. In this manner, the stoner can switch on and off the device through the smartphone and admit a summary of monitoring exertion. Poor posture comprises of unnatural bend in the spine, head leaning either too forward or too backward, and backaches. But to overcome these heads, people suffer precious surgeries which in turn may not be doable as it isn't a one-time result, and the problem may do after that also. Having a good posture is veritably important not just for a charming look but also helps to ameliorate our overall health and well-being. It is said that when one is entrenched over something, he becomes sensitive to its flawlessness, meaning, in this case, is that the person will act fastidiously and be critical of his posture when he is aware of it. He will strive to make continuous improvements as he realizes the benefits of the excellent posture. Some of them include reducing back pains, and lesser strain on joints and muscles of your body. It also makes one's personality look more refined. There are several back support belts available in the request but they're veritably uncomfortable to wear and can beget vexation, rashes, or lesions on your skin if not worn duly. To break this problem, we've created a posture correcting IOT device which won't only alert you if you have a bad posture but also dissect your diurnal posture movement and recommend suitable exercises. Original stages of reverse pain diseases can be treated with our device. The main goal of our wearable gadget is to assist people in correcting their posture in order to alleviate back pain and live a healthy lifestyle. Wearable bias technology has given us the means to modify our posture and avert serious effects in the future. Wearable biases are intelligent electronic biases that may be implanted or worn as an accessory on the body. A natural investigation of several sorts of terrible postures was done while finishing this design to gain a better understanding of where our detector should be situated and how the device should be calibrated.

II. OBJECTIVES

This pandemic introduced us to the concept of work from home and online teaching. This led to numerous health problems like

back pain and thus led bad posture. To beat this problem, we aim to form a Posture correcting device. The most objective of this device is to enhance the posture with the assistance of a wearable device that is worn around the lower back. This device will detect this posture of the wearer with the assistance of a flex sensor and send a symptom to the user through a vibration motor to assist the user to correct the posture.

To assist the wearer to enhance the posture and thus prevent them from long-term effects.

Creating a social awareness of how a poor posture could affect the day-to-day life of people.

To make a compact and cost-effective device that's easy to access and may be used anywhere, anytime.

To assist people to live a more sustainable life.

ADVANTAGE OF OUR DEVICE OVER TRADITIONAL POSTURE CORRECTORS

Help Improve Posture: With the assistance of this device, it was found that folks felt that their posture had improved. The study did find that forward shoulder posture and head posture was slightly improved while wearing the corrector.

Help Can Improve Postural Awareness: Furthermore, they may help improve your awareness when it involves bad posture since the device warns when our posture is bad making us correct it ourselves.

Very Comfortable: Irrespective of how effective something is, if it's too uncomfortable, patients will struggle to wear it. Since the device is going to be smaller than a MasterCard and it can slot in a shirt's front pocket also because it is going to be pretty light, it'll not be a trouble when attached to the rear. Thus it'll be extremely comfortable to wear.

Body Friendly: Traditional posture braces generally cause problems like skin marks and slight pain thanks to wearing them tightly, tightness on the skin prevents blood circulation. It is also found that it doesn't improve head posture. Our device doesn't have any of its disadvantages.

Smart System: The device may be a rechargeable wearable device you merely persist with the middle of your back or behind your neck. After you slouch, it'll provide you with vibration to remind you to straighten. And, with the app, you'll be able to track what quantity of time you spend slouching daily and even monitor your improvement. The app will show the progress in posture correction.

Ease of Use: People always like easy-to-use things. Our device is extremely simple to use. The device is self-adjusting so patients don't must depend upon having another person around to assist them to put it on, taking it off, adjusting the strain, etc. it's also advantageous when it's something that may be worn under or over clothes.

III. LITERATURE SURVEY

Despite the broad consensus that work-related spinal diseases and back discomfort may be prevented with user-friendly solutions like adjustable seats, there is a paucity of reliable and precise techniques for continually monitoring posture in any context for postural correction. Wearable sensor systems for posture monitoring have recently gotten a lot of interest. In this way, posture will be monitored and measured in real-time without being restricted to one location. Research into the mixing of wearable computing devices and sensors into textiles is underway assuming to track postural activity. Although there are not any existing datasets and knowledge available on the sensor development done via prior research, the most effort continues to be dedicated to the development of measuring methods and their accuracy because of the novelty of the sector. During the integration of sensors into a whole platform, features like ergonomics, aesthetic appeal, and durability, are sometimes disregarded during the process. In terms of the strategy of collecting measurements, previous studies may be categorized into three categories – sensory fiber optics are the primary category of labor. The sensors monitor the voltage intensity traveling through them, which is equivalent to the sensor's bend. Sitting spinal posture was also measured by fiber optic sensors. Nevertheless, this is often limited to bending back postures while seated. Using non-invasive pressure sensors is the s category of labor. The sensor's response to motions of different ranges was not tested. Accelerometers are employed in the third category of works. The wearable vest presented by Lin et al. uses accelerometers to observe multiple postures. Furthermore, with the use of a gyro, one commonly available tool, the Lumo Lift, can monitor and train upper body motions. However, it is more concerned with the aesthetic incorporation of postural input into wearable devices than with accurate measurements. It is insufferable to use a number of the techniques mentioned above to develop a wearable measuring device. This might be due to the sensor's weight or the illogicality of positioning it on the user's shoulder. To detect the spinal angle, we utilize the same technique as Wang et al, in which two sensors are affixed to the clothing surrounding one another. Despite the fact that our method is more computerized, their technology requires a professional to calibrate it for each user using a variety of postures. Furthermore, because the monitoring system relies on dynamic readings, accelerometers cannot provide the same degree of precision as in the static scenario. Gravitational acceleration must be considered together with inertial acceleration.

MATERIALS/DESCRIPTION:

FLEX SENSOR:

The Posture Corrector device will use a sensor to check the bend in posture. To hunt for the most suitable commercially available flex sensors, which are available in 5.6 cm (2.2 inches) and 11.4

(4.5 inches) lengths. A flex sensor is a resistive device that detects bending by changing the resistance across the sensor in a proportionate manner to the amount of bending. The most optimal flex sensor for us is the 4.5-inch flex sensor. We also checked Mercury Tilt switches or normal tilt switches. We found them quite effective, but we were against it as they could not provide bend angle output. It could only tell whether any bend was present or not. In the end, we found flex sensors the foremost suitable still as budget friendly.



Fig1. Flex Sensor

BUZZER:

A buzzer will be employed in the device to alert the user of a bad posture.



Fig 2. BuzzerBOLT IOT:

For developing the software components of the project, we are visiting using Bolt IoT. Bolt is also an integrated IoT platform for developers that helps them build IoT projects and products quickly and easily. It is a platform designed for makers and developers to create IoT projects. Bolt IoT platform gives you the aptitude to manage your devices and collect data from IoT devices safely and securely irrespective of where you're. With a few clicks to detect anomalies additionally as predict sensor values.



Fig 3. Bolt IoT

ARDUINO UNO:

Arduino being a microcontroller board, can be interfaced with other Arduino boards and can control sensors, and motors as output.

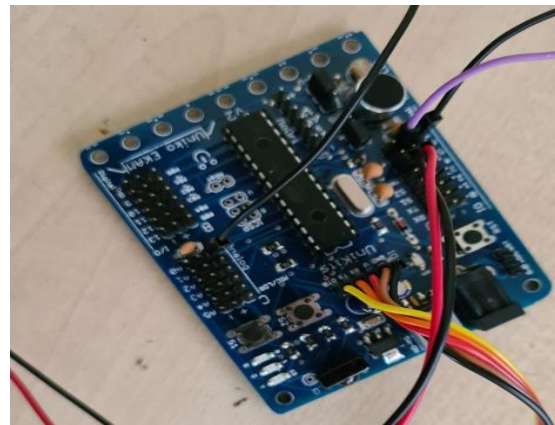


Fig 4. Arduino UNO

V. METHODOLOGY:

The proposed device works on a 5-V power supply. The flex sensor is mounted on the back, preferably on the upper back. This is the optimal location for the device to pan out the best result as this is where the spine curves, just below the neck. The device operates on a 5-V power supply. Then the user will sit in a straight posture to calibrate the device. Then the microcontroller (Arduino) starts measuring the angle made by the flex sensor according to mentioned routines Once it finds that the angle is more than the set threshold value, the device will wait for 10 seconds to give some buffer to the user and then will utilize, the pre-stored data set of ideal postures to check whether the user is bending or leaning due to some reason, or the posture is incorrect. After the 10 seconds are over, the

microcontroller will send a signal to the buzzer, the buzzer will ‘buzz’ for 10 seconds or until the posture is rectified. If the user still does not correct his posture, the buzzer will again vibrate with a higher frequency. The microcontroller will also send all the inferred data from Arduino including the amount of time with correct posture to the application with the Wi-Fi module. The notifications for poor posture will also be sent to the user via email or messages or notifications of application. The graph would display the posture of the user concerning time. According to the status of the user, it would also provide advice to the user.

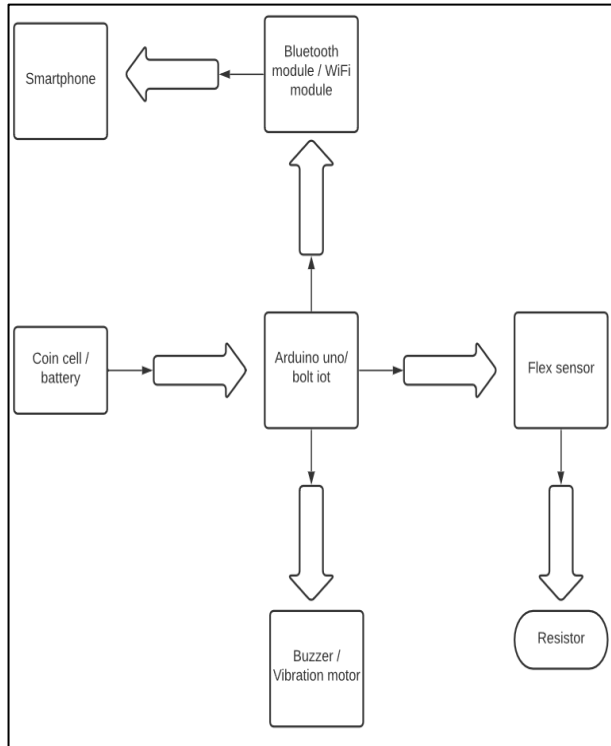


Fig 5. Overview Flowchart

SETUP AND USE:

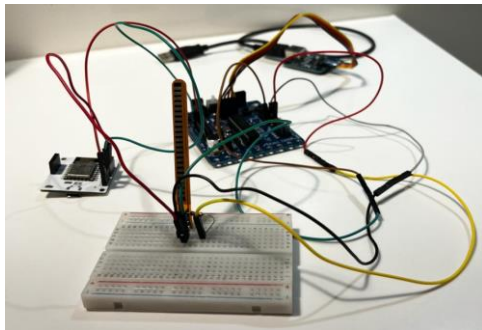


Fig 6. Complete Circuit

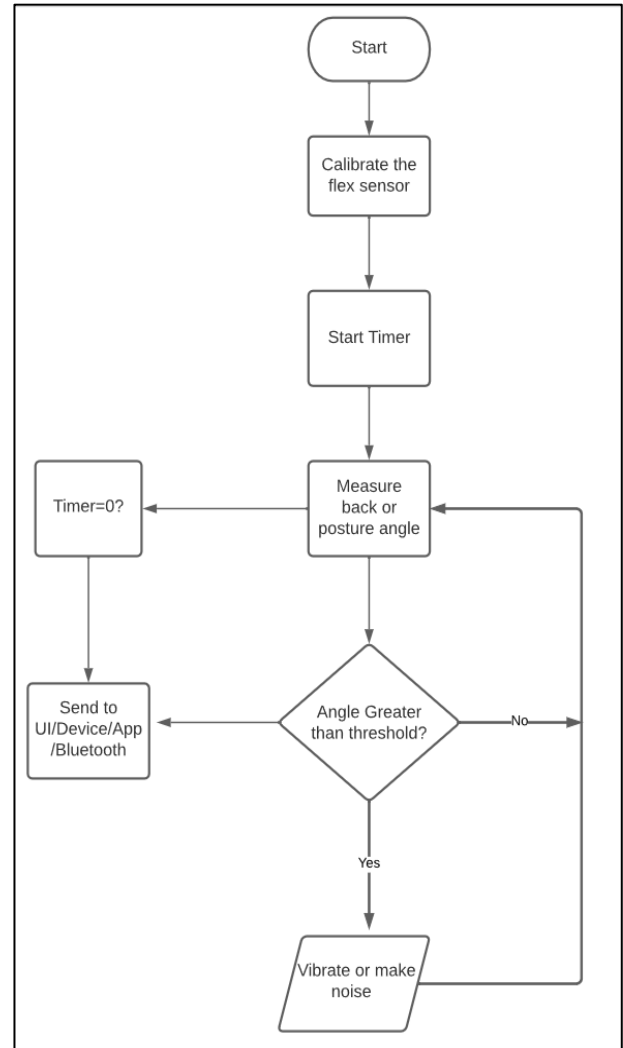


Fig 7. Flowchart of our device

Start – The device starts.

Calibrate the sensor– The person wears the gadget and remains motionless for 10 seconds while the microcontroller builds a reference.

Start Timer– Timer gets turned on.

Measure Bend Angle – The microcontroller gets the information from the sensor and calculates the angle.

Send to Wi-Fi Module– The measured angle will be sent to the module to take it to the front-end application.

Check If Posture Greater Than Previously Set Value- The microcontroller compares the measured angle with the calibrated reference value which will determine whether the user is slouching or not.

Vibrate or Make Noise – If bad posture is detected or the angle value is greater than the human threshold, the microcontroller sends a signal to the buzzer to vibrate. After 10 seconds it will

again measure the back angle and will vibrate against if posture is not corrected.
 Timer = 0? – This would indicate that the user can move and not maintain the previously calibrated posture.
 End- The device is turned off.

IV. RESULTS:

Before wearing the device, the user must create an account on the website. Whenever his bend exceeds the set threshold, he will receive alerts. After that, he will start getting regular updates on his posture while doing an activity and how to improve his posture.

We have built a website for our device which comprises the home page, dashboard, the terms and conditions page, and the about us page.

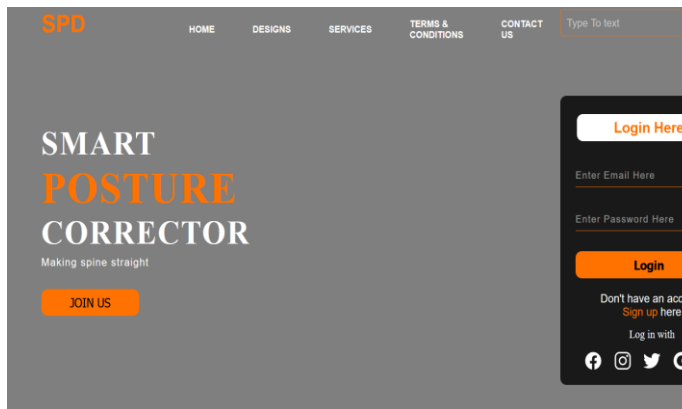


Fig 8. Home Page of the Website

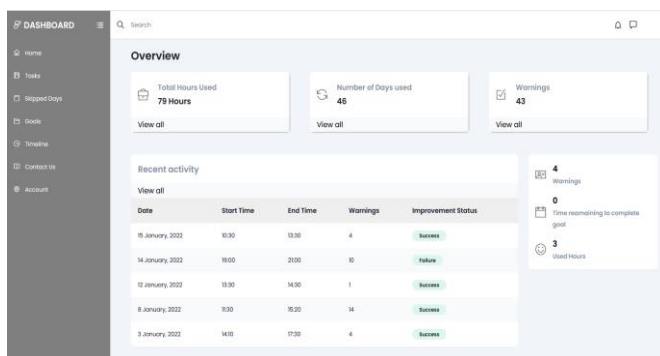


Fig 9. Dashboard for all the user analytics

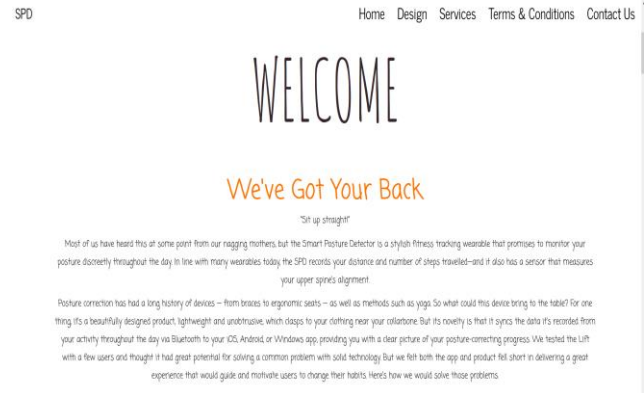


Fig 10. About Us page

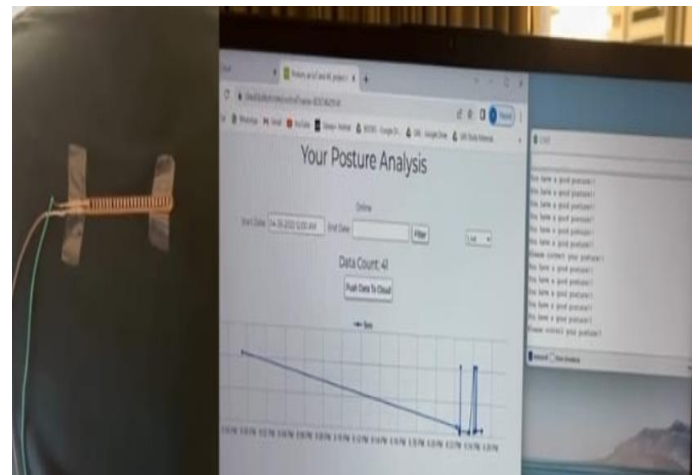


Fig 11. A user wearing the device

The Arduino shows whether the user is slouching or not by displaying the below messages. It then transfers this data to the Bolt IoT, which in turn sends data to the frontend. Output is as shown in the below image.

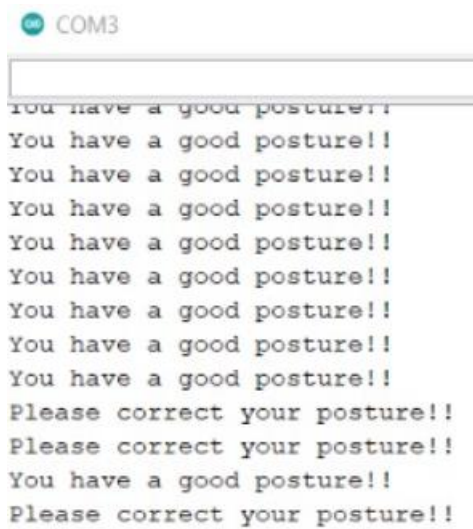


Fig 12. Serial Communication on the Arduino UNO

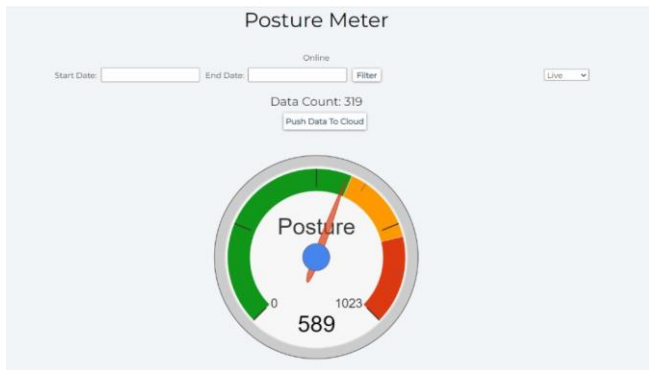


Fig 13. Corrected Posture meter

The above graph shows the correctness of the users' posture according to the bend angle.

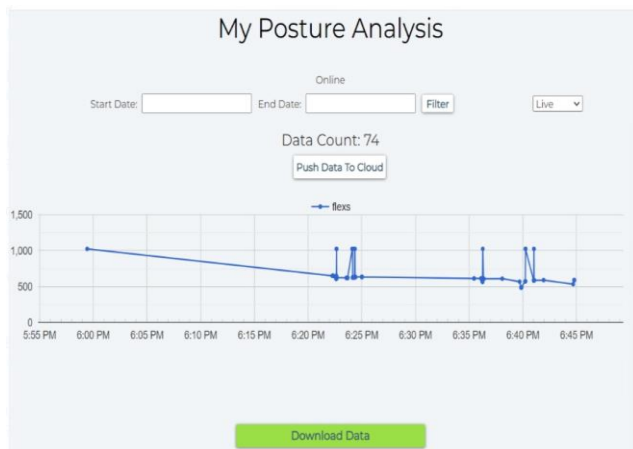


Fig 14. Users' Posture Analysis

The above graph shows the bend degree of the spine to the time the device is worn.

Alert Name	Device Name	Time	Message
posture	BOLT4629141	April 26, 2022 12:10:16 AM	A0 value of BOLT4629141 is 1024. Trigger set for > 920.0. Please sit upright !!! Your posture is bad. - Bolt IoT
posture	BOLT4629141	April 26, 2022 12:10:15 AM	A0 value of BOLT4629141 is 1024. Trigger set for > 920.0. Please sit upright !!! Your posture is bad. - Bolt IoT
posture	BOLT4629141	April 26, 2022 12:09:58 AM	A0 value of BOLT4629141 is 1024. Trigger set for > 920.0. Please sit upright !!! Your posture is bad. - Bolt IoT

Fig 15. Notifications on our android app

The user will be notified on his mobile device; through text message, telegram application message, or email about his posture and the complete analysis as shown in the above figure.

The calibration at the beginning helps in measuring the bend angle for all people properly, irrespective of age group. We can also use some algorithms to predict the posture of a person based on his records and give appropriate solutions. This device will help in standardizing the bend in spine data which could be used by any doctor as a reference for diagnosis.

V. SOCIAL IMPACT

In today's world, the posture of the human body is becoming worse day by day. Covid has done greater damage to our posture. Work from home, online lectures, and gaming are things that affect our posture vastly. It causes numerous back issues over time and can gradually impair natural abilities, placing your head in danger of harm in the long term. Better Breathing. As the posture gets distorted the ability to deeply breathe gets affected. Improves mood (As a bad posture can lead to less amount of Oxygen and blood in the region of the spinal cord and brain). In some cases, digestion is also affected. Bad posture always has a bad impact on your confidence. Lessens the risk of health or body ailments.

ACKNOWLEDGMENT

This project and technical paper were greatly supported by Professor Sanjay Deshmukh. We are indebted to his comprehensive teaching and permanent availability for any help we needed. His continuous help and encouragement aided us in completing this project on time. We are also extremely thankful to our colleagues who tendered their knowledge to us.

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Bank Management System

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Abstract—The key objective is to provide seamless, efficient, speedy and secure banking facilities to users. We also aim at overcoming the shortcomings of the current banking system where the user has to go from one counter to another merely just to open a new account and/or to deposit some cash or cheque by providing users a fully automated banking experience so that they can do all bank related work right from the comfort of their home. The user can Create Account, Do Transactions, Check Bank Statements, Loan Sanctions, Request A New Cheque Book, and many more things very easily just by sitting at home. To ensure the above objectives are met it's necessary to have strong servers, easy to use interface and proper database management system.

Keywords— *Create account, Do Transaction, Available Balance, Money transfer, Transaction History, Apply for new cheque book, Secured system.*

I. INTRODUCTION

If we think about it, it can be understood better if we acknowledge the fact that we live in an era of digital banking. People's buying behaviour and modes of payment have changed over the past 10 years. Cheques and cash are getting replaced with online banking, mobile banking and internet banking rapidly. Since this project provides a very easy to use interface and aims to keep things simple and secure, it adds to the advantages of online banking.

The pros of online banking can be listed as:

Every financial institution provides the facility of online banking to reduce the trouble of visiting the branch.

No more tedious process of waiting in long queues with humid conditions and instead getting your work done on the tip of your fingers.

Since the service is available 24*7, the user can keep track of their finances and does not have to wait for banks to open.

With the alerts and messages after every transaction, it helps the user to keep track and note and also help detect any fraudulence in advance.

It could be said that digital banking is the future of banking and things might look completely different by the year 2030. In other words it can be said that by 2030 banks will be invisible, connected, insights-driven and purposeful. The main objective is to provide a secure and automated banking system. Through this system users can manage all the banking activities securely and hence reduce the manual work. It focuses on providing facilities like opening a bank account, checking the available funds, transferring money from one account to another and also will manage a large number of customer details with ease.

II. LITERATURE SURVEY

An online bank management system provides many benefits to the consumers in terms of easy, fast and secure transactions. It has become an essential part of our daily life. Online bank management system is basically a provision for providing financial services through electronic communication and computation. E banking is basically a digital connection between the banks and their customers. It allows the customers to get access to banking facilities such as money transfer, Loan application, Checking account balance and other banking facilities without physically being present at the bank. This feature of E banking brings in what we can call flexibility and ease of access compared to the current banking system. (Daniel, 1999). E-banking service is basically a self-service by customers, so for banks, it requires less resources and lower transaction and production costs (Southard and Siau, 2004; Witman and Poust, 2008). Operating costs minimization and revenue maximisation are the major drivers that boost e-banking services (Sannes, 2001; Reibstein, 2002). Even in the 1990s, Sraeel (1996) emphasises that creating virtual banking will not only create a new service delivery channel, but also lead to value creation to both banks and customers (Hwang et al., 2007; Murphy, 2007). Amato McCoy (2005) further argues that customers will be attracted to e-banking when the advanced e-banking services like e-transfer and e-bill options are available. Liao and Cheung (2002) indicate that the most important quality attributes underlying perceived usefulness of e-banking are expectations of accuracy, security, network speed, user-friendliness, user involvement and convenience. According to Kassim and Abdullah (2006) trust is an important construct catalyst in many transactional relationships. For banks to succeed in the long run, their ability to convince the customers to do Internet Banking is crucial. Consequently, customer trust is vital to Internet Banking (Jham, 2016). The impersonal nature of the online environment, the extensive use of technology, and the inherent uncertainty of using an open infrastructure for transactions are unique dimensions of customer's trust in Internet Banking (Yousafzai et al., 2009). For winning customers trust, the listed models should be taken into consideration:

Relative advantage
Compatibility
Complexity
Triability

III. SCHEMATIC DIAGRAM

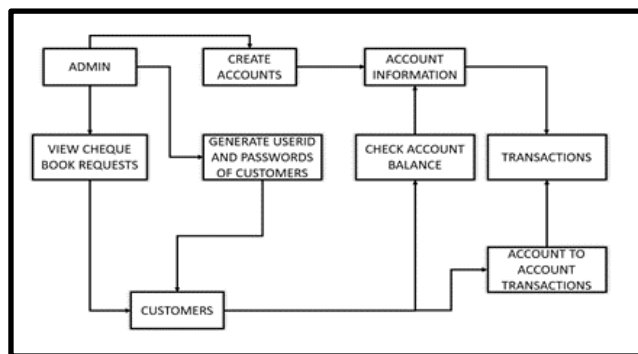


Fig.1 Schematic diagram of the banking system

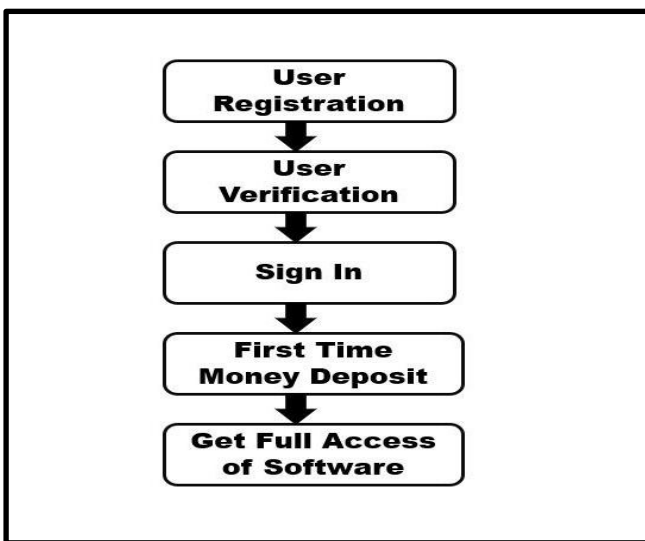


Fig.2 Flow diagram of user access

IV. PROPOSED DESIGN

The system will consist of a good UI design with a very easy to use interface which won't cause any confusion for the user. On entering the website, the user will be asked to enter the login id and the password. After logging in the user will be able to choose options such as 'accounts', 'loan options', 'create new bank account', 'view available balance' and various such options. At the bottom of the page, the user will be able to view options such as 'about us' where the description of the project will be available, 'call us' incase of any technical error or any other need and a few other details. The system will have faster access to the data, faster entry and retrieval. Over and above this it will be made in such a way that possibility of data loss during processing is zero and the system works with 100% accuracy. We worked on the Figma application to design the layout and the UI design of the banking website and what sections the website would contain.

Home Page

EZZBANK

P

[Home](#) [Fund Transfer](#) [BillPay](#) [Invest](#) [Cards](#) [Loans](#) [Other Services](#)

Account Details....

Name: _____ Contact Number: _____
 Email ID: _____ IFSC Code: _____
 Address: _____
 Linked Cards:
 Card Number: _____
 Spending Limit: _____

Fig.3 Home Screen Designed In Figma

V. IMPLEMENTATION METHODOLOGY

The key aim of the project is to provide users an efficient and reliable banking system which has an easy to understand and use interface. Firstly focus on making the layout of the banking website using Html and Css. Once the layout is finalised, deploy the design using Css and Javascript. After the design deployment is done then comes the task of making the website responsive which is done using Javascript and Django. Later use My Sql and integrate it with Django to create and manage the customer database. To summarise the whole process first develop the Front-end interface then proceed to backend development and finally integrate the database management system to the website. Machine learning was used to integrate the VIPV(Video In Person Verification) in the account opening process. In the VIPV process the algorithm detects the face of the user and the digits written by the user. Once the detection is done the algorithm compares the digits displayed on screen with those written by the users. If the digits match the VIPV process an error message is displayed.

VI. RESULTS AND CONCLUSION

Let us acknowledge the fact that conventional banks have come a long way to develop their digital infrastructure and provide their customers with safe and reliable digital banking services. But there has always been a problem with the interface of their digital services which causes inconvenience to the customers leading to poor customer experience. This is where our digital banking system comes into picture, in our digital banking system we have developed a very user friendly interface, easy to understand workflow and an efficient system which improves the overall customer experience. To make our banking system entirely digital we have implemented the Video In Person Verification (VIPV) process.



Fig.4 Welcome Page

Fig.5 Account Registration Page

Fig.6 Sign In Page

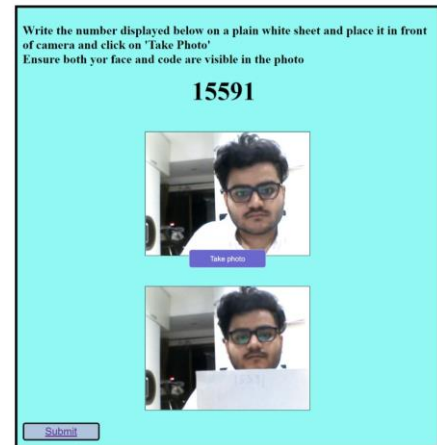


Fig.7 VIPV Page

Fig.8 Deposit page

ACKNOWLEDGMENT

This project and technical paper were greatly supported by Professor Ameya Kadam. The mentorship provided by him has been of immense importance. His guidance and motivation has helped us traverse through crucial stages of the project. We would also like to acknowledge the help provided by our colleagues during the course of the project.

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Intelligent Laboratory Management System

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Abstract—This project proposes a system that mainly focuses on the efficient management of the laboratory. The laboratory is where the students come and perform the practical sessions with guidance provided by the teachers. The system is focused upon the three aspects: 1) The automation of the group action of the scholar for the practical session through biometric authentication and so saving a lot of the time taken to mark the attendance of the student on an individual basis thereby preventing the malpractice of the proxy attendance 2) provides the teachers with full control over the practical sessions by providing them with functionalities such as grading a student, changing the timetable, viewing the defaulter students. So the aim of this project is to make a system that helps within the economical handling of the laboratory sessions conducted in the college. The study proposes a simple web application for solving the aspects taken into consideration. The system makes use of RFID technology for the simple login procedure and biometric authentication of the scholar to mark the group action in the several sensible session. The face recognition is done through open face deep learning model and detection of the presence of a person is also done.

Keywords— Facial Recognition, python, visual studio, CSS3, HTML5, OpenCV, Machine Learning, RFID card.

I. INTRODUCTION

Many options are provided by the internet. Trading statistical data, audio, video, and real files can be done using these methods. Access to these methods is only possible if users are connected to the Internet. The Internet is made up of millions of small local, educational, business, and government networks and websites, which work together and hold a wide variety of information. In other words, the Internet can be regarded as a network of networks. Information Communication Technology (ICT) can be found in all educational institutions to make computers a variety of everyday behaviors. Looking at the current trend, many educational institutions use paper-based systems to manage their academic data involving repeated manual labor, making the process lengthy and error-free. In order to maximize efficiency and facilitate workflow, the educational management system begins to transform workflow from paper document flow into electronic document form. A paper-based system requires a large amount of data storage space, restricts mobility, and causes document losses and editing problems. Work interaction with such a system becomes more difficult which greatly delays processes and delays all decisions in the management system. Recognizing

the importance of the importance and scope of the requirement, we aim to develop an “Intelligent Laboratory Management System for Educational Institutes”, which is a web-based Central Data Repository System to keep student attendance records and their marks electronically. and automating educational processes in Educational Institutions using Information and Communication Technology (ICT). Now, all educational institutions across the country have laboratory sessions held in separate courses where practical sessions are conducted on this subject and students get to learn further on this topic. Somehow or another skill should perform multiple tasks while performing a laboratory session. For example, Presence takes approximately 15 minutes of Faculty production time. Also, the evils associated with the presence come into the picture, which creates a big problem for the Faculty and Management. An important goal of the program is to use it as a platform for capturing student attendance and distance schools online, and to prevent projectile through computerized processes that reduce the diversity of hand-crafted paperwork during the Labs Session and help senior user of process management and performance management to make improvement decisions. .

In this paper, we have proposed an Intelligent Laboratory Management System using a Facial Recognition System. Thus, The primary stakeholders of the project are the Faculties and Students. The teachers put their productive time into mundane work of attendance and cross-checking every student for proxy attendance. The students need to track their marks and their attendance of the attended practicals. Our main aim is to provide relief to both Students and Management (Faculties) through an efficient solution. So, we decided to develop a model for the prevention of proxy attendance through face recognition. Also the desire to learn how Machine Learning and Deep Learning Algorithms can be used in solving real-world problems.

II. OBJECTIVE

The idea of two technologies namely the Student Attendance and Grading system has been implemented with a machine learning approach. Our system is capable of getting the student performance automatically and also maintains the student's records like attendance and their marks in the subjects. Therefore the attendance of the student can be made available by recognizing the face. After recognition, the attendance details and details about the marks of the student are obtained. In the Fingerprint-based existing attendance system, a portable fingerprint device needs to be configured with the student's fingerprint earlier. Later either during the lecture hours or before, the student needs to record the fingerprint on the configured device to ensure their attendance for the day. Our main objective is To build a

system that automatically calculates the attendance of the students and their records like:- Grades in the practicals, Number of practicals to be performed (if absent). To reduce the work of teachers. Also, To save a lot of time that was taken by the conventional methods of taking attendance and maintaining other records as well.

III. PROPOSED DESIGN

Limitations of Existing Systems:

It has been noted that a face-to-face program has been implemented in all educational institutions. The process is not only time consuming but also sometimes ineffective which leads to false positives of existence i.e. Representative. Personalization of Exit Logs, unpaid production and further processing of such information takes more time. The existing system is actually paper-based and has some disadvantages such as improper installation of travel sheet, time consuming, etc. And since the current system does not have an internet site so managers should contact the department in person or should see records. Similarly, Students may not receive any mathematical information about their presence.

The existing systems make use of a haar cascade classifier for face detection and pedestrian detection for which it takes a bit more time and shows low accuracy with some instances of false detection then its hog counterpart. The existing systems have made use of LDA (Linear Discriminant Analysis), ICA (Independent Component Analysis) which have drawbacks of high memory usage and lower accuracy in different lighting conditions.

Component of System and Functionality:

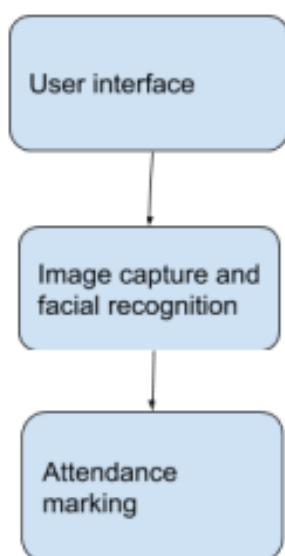


Fig.1 Face recognition functionality

User Interface Once the RFID is scanned or The user enters the respective credentials the system will login to the system depending whether it is a Student or a Faculty. Limited functionality will be given to both Students and Faculties. The Faculty's functionality includes: 1.Giving the Grades 2.Changing the Timetable 3.Viewing the Attendance 4.Viewing the schedule for the Day . Whereas the Student's functionality includes 1.Viewing the grades 2.Viewing the

attendance 3.Marking the attendance through Facial Recognition.

Image Capture and Face recognition: The proposed system will capture the student's face once the student chooses to attend the practicals. The proposed system makes use of two machine learning models. First model (Trained object detection model) will detect the face of a student. The second model (Openface model) will extract all the features from the detected face and convert them into 128 vector embeddings. Both these parameters will be useful in enhancing the overall accuracy and reliability of our system. A classification algorithm will be trained upon the embeddings to make a correct classification.

Attendance Marking: Once the student has been correctly recognized. he/she will be redirected to the page which will display the deadlines, to do work during that session and the attendance of the student will be marked as well.

IV. IMPLEMENTATION:

The facial recognition system is trained by taking photos of various facial expressions and utilising a supervised learning approach. Rfid Scanning, face detection, feature extraction, classification and facial recognition are all part of the system's design.

RFID Card Scanning:

RFID cards which will act as identification cards for students and teachers will have to be scanned in front of the RFID card reader, these cards will store the PRN of the student and the teacher.

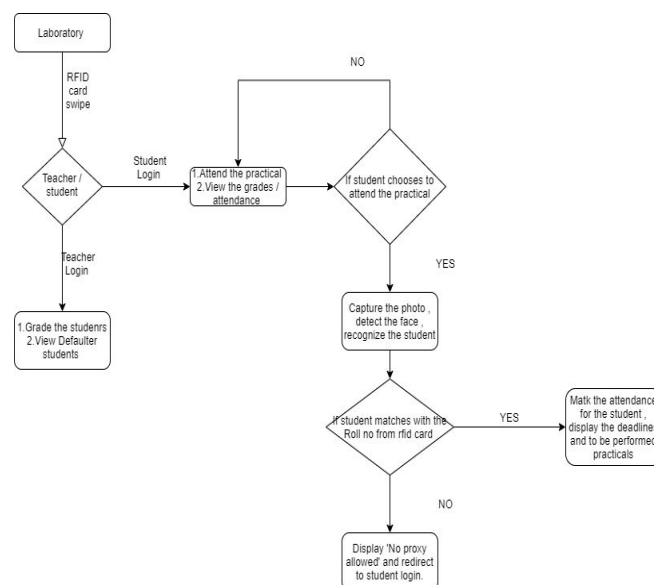


Fig.2 Flowchart of the proposed System

Dataset:The dataset will comprise of the images of the student's face which will be stored in the folder namely the roll no of the student. Training is done on the basis of the roll no so that to verify the scanned rfid card matches with the recognized face.

Face Capture and Detection:

Face detection is useful for identifying a person's face. The Haar classifier is used to detect faces in the training dataset, and OpenCv is used to implement it.

Feature Extraction

Once the student has chosen to attend the practicals a picture of his face will be taken and features of his face will be embedded in the 128 d vector embeddings. Feature selected. In pattern separation function, vector is the most important component. After pre-processing, the face image is used to extract the appropriate features. Scale, shape, translation, and fluctuations in brightness are all important challenges in classifying images.

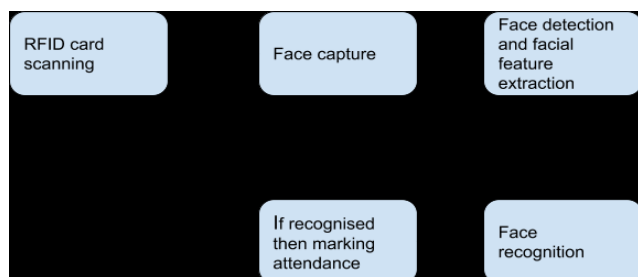


Fig.3 System Flow Diagram

Classification

Support Vector Machine (SVM) - can be defined as a supervised machine learning algorithm that can be used for classification challenges in a very effective way. But it is often used for classification problems. In this algorithm, each data object is arranged as a n-dimensional space (where n is the number of attributes you have) the value of each element being the value of a specific link. Then, with the acquisition of the hyperplane separation is made very well divided into two categories. In this project we will be using svm to differentiate and we will train svm in image embedding obtained from the model.

Face Recognition

SVM (Support vector machines) will be used for classification as it would be trained upon the embeddings obtained from the image. The trained svm model is then used for recognition of the student's face.

Marking the attendance

The attendance of the student will be marked once he/she gets recognized.

V. RESULTS

A Web App has been developed which can be used by the end user. The web application is designed in a way to not be very basic for the students and teachers and yet be very easy to be used by the students and the teachers.

RFID cards which will act as identification cards for students and teachers will have to be scanned in front of the RFID card reader, these cards will store the PRN of the student and the teacher. The RFID card provides login to the Laboratory Management Web App. An alternate login page is also created for remote login.

OUR WEBSITE INTERFACE IS BELOW

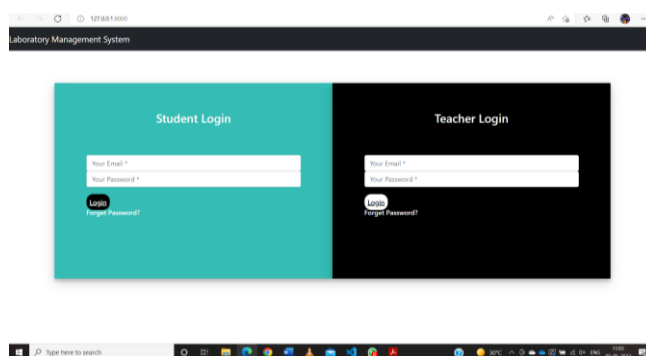


Fig.4 Alternate Login Webpage

There are two options to be selected at the login page: either the teacher login or the student login. Student login provides features such as viewing grades, viewing attendance and attending practicals whereas teacher login provides options such as grading a student, checking the default list, checking the attendance and checking the time table.

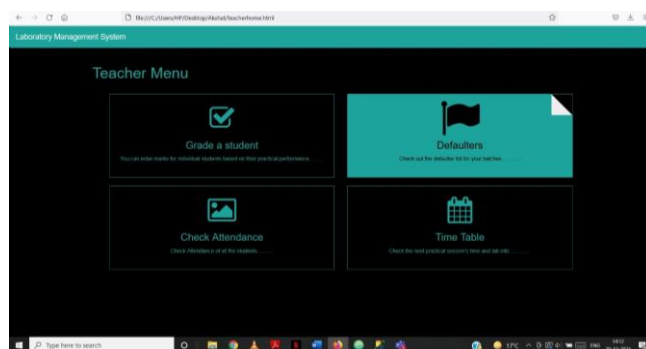


Fig.5 Teacher Menu Webpage

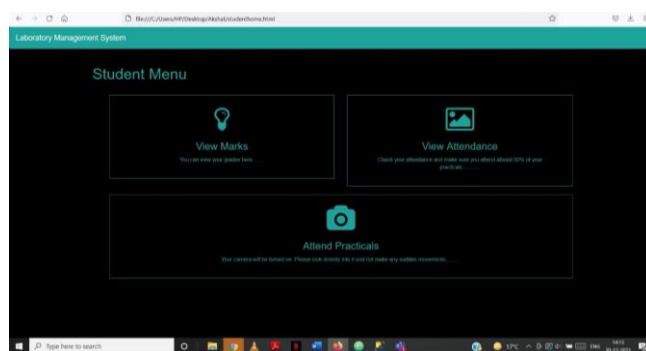


Fig.6 Student Menu Webpage

Selecting the attend practical option will open the camera for facial recognition. Various algorithms were utilized in this project to anticipate a person's real-time expression.

VI. CONCLUSION

Our project focuses on reducing the tedious and unnecessary work of teachers like : Automatically taking Attendance and Grading the Students .The purpose of this project is to build a system which helps in efficient handling of the laboratory sessions conducted in the college.The study proposes a simple web application for solving the aspects taken into consideration.The system makes use of RFID technology for the easy login procedure and facial recognition of the student to mark the attendance in the respective practical session..

VII. FUTURE SCOPE

With the help of IOT we can control the lights, fans, and computer system available in the laboratory. An android app will monitor all these things remotely using the Internet. We can add the feature of submitting the experiments directly on our website, so it will be a one stop portal for students. This project primarily focuses on the management of the laboratory present in the college to help students and teachers. This product can be used globally by people who manage the laboratory present in any part of the world. If a web-camera of high resolution is used, then the accuracy of the face recognition model in low light conditions will not get affected. The accuracy of the person detection algorithm can be increased by keeping the laboratory well lit.

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Reverse Car Parking Circuit

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Abstract— The developments and innovations in the automobile sector has led to a growth in the production of a number of private cars. Subsequently, there is an increase in the number of novice drivers. For a driver that has practically less or no experience, backing up a car is not a piece of cake and more often it can be a task to judge the distance while reversing the car. Besides, the chances of damaging the car due to obstacles that are hardly seen in the rear-view mirror are pretty high. This paper demonstrates the configuration of a parking sensor circuit that assists the driver while parking the vehicle in reverse. On the off chance that the driver is not experienced or is particularly new in driving, it can lead to some potential damage to the vehicle or can even cause some other casualties when parking it in reverse. Hence, this circuit can prove to be very beneficial in such circumstances. It can be installed at the rear side of your vehicle without much of a hassle.

Keywords— Parking Sensor, Op-Amp, Navigation, IR transmitter receiver, LED, Buzzer, Comparator Circuit

I. INTRODUCTION

In this day and age, one of the many useful and crucial skills for any driver or car owner to have, is to park the car properly as it is not easy to estimate or gauge the space around the vehicle and to possibly know the position of each and every bumper. A lot of practice is required for parallel parking. In order to solve this issue; the development of a parking sensor has to be carried out so that it makes it easier for the driver to park the vehicle safely. While parking, it can be difficult to estimate the distance when getting the car in reverse. If someone is available to assist you, that is good for you, but what will you do in cases where you are driving alone? Or maybe you are a relatively new driver who has trouble judging distances? Every day, one of the most menacing things drivers do, is backing up. A recent stat show that one in every four vehicle accidents that occur, happens when drivers are going in the reverse direction. Nearly all of these accidents involve some or the other damage to the vehicle, but also severe bodily injuries. According to the National Highway Transportation Safety Agency (NHTSA), every year due to the back-up accidents, an average of 200 fatalities and approximately more than 15,000 injuries are caused. All these issues will be solved with our reverse parking sensor circuit. You can easily mount it on the rear side of your vehicle. Parking sensors are basically these proximity sensors that the driver uses while parking to identify nearby vehicles or obstacles. The device runs on a 10V power supply and can also be used as a shadow alarm at your car's doors to keep it safe. It will alert you if the shadow of an intruder falls on it. This alarm or buzzer will play a sound that will not irritate your ears. Such shadow alarms are used in malls, theaters, etc. where if an intruder crosses a restricted area, the alarm or the buzzer starts beeping

making the concerned authorities alert. Currently, the circuits that are being made for reverse car parking are either quite expensive or big in size. As a result, we are attempting to construct this project in order to address all of these issues.

II. OBJECTIVE

The suggested project's goal is to create a reverse automobile parking assistance/circuit that can protect your vehicle from any damage or harm while parking the vehicle in reverse. Our goal is to create a circuit that may be installed in cars to safeguard them from any obstacles and to act as shadow alarms while being cost-effective and compact in size at the same time. When the car gets too close to an obstacle or any object (walls, cars, etc), it gives an alert signal for stopping the vehicle. This concept enables the user to park his or her car without the assistance of a second person.

III. PROPOSED DESIGN

To build the circuit, one of the most important components that we require are ICs which can act as a comparator and which do not require independent power supply for working of each comparator and hence IC LM358 is very suitable. LM358: This is a Dual Low Noise Operational Amplifier that combines two Op-Amps into a single chip. This is a general-purpose op amp that may be set up in a variety of ways, including comparator, summer, integrator, amplifier, differentiator, inverting mode, non-inverting mode, and more. One of the most important features of this IC is that we do not require independent supply of power for each comparator to work. This particular IC supports large output voltage swing and can operate on wide range of power supply from 3V to 32V for a single power supply or from $\pm 1.5V$ to $\pm 16V$ for dual power supply.

Shown below is the pin configuration of this IC -

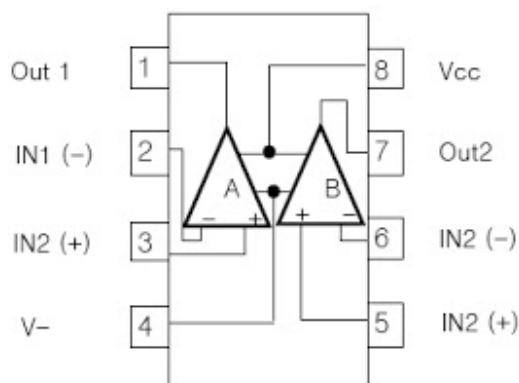


Fig. 1: Pin Configuration of IC LM358

To design this car parking system, we will put an Infrared transmitter-receiver pair at the back side of the automobile.

Infrared (IR) communication is a very easy to use, common and a relatively inexpensive technology of wireless communication. It usually comprises of Infrared transmitter-receiver pair. The remote controls of different appliances like TVs and ACs are the most common use of this Infrared (IR) communication. In the case of a TV, IR receiver is placed at the TV and the handheld remote control consists of the IR transmitter.

Infrared signal or rays are continuously transmitted into the surroundings by an IR transmitter. A voltage difference is created across the IR Receiver LED when these transmitted IR rays strike an impediment and reflect back to the IR Receiver. The voltage difference will be determined by the power of IR photons that are reflected back to the receiver.

A higher-powered signal results in a larger voltage difference. This voltage difference will be utilised to measure distance in our project. The greater the voltage difference, the closer you are to the object. Three LEDs have been used to represent distance from the obstruction. The meaning of these LEDs is explained during the project's execution.

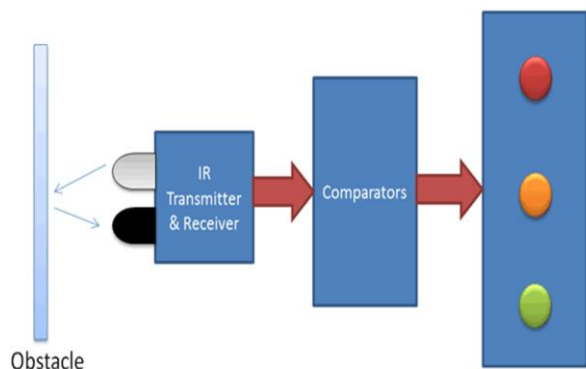


Fig. 2 Diagram

THE REQUIRED COMPONENTS

Breadboard - 1
 Battery of 9V - 1
 IR Transmitter Receiver Pair - 1
 150 Ohm Resistor - 1
 1k Ohm Resistor - 3
 10k Ohm Resistor - 3
 10k Variable Resistor - 1
 IC LM358 - 3
 Red LED - 1
 Yellow LED - 1
 Green LED - 1
 Buzzer - 1
 Battery Connector - 1

IV. IMPLEMENTATION

To detect obstacles, we have used an IR pair and three LM358 ICs which act as comparators to compare voltages in this car parking circuit. The reference voltage will be adjusted with a 10 K potentiometer which is linked to the inverting terminal of the comparator, and to the non-inverting pins of all comparators, the IR receiver's output will be directly

connected. Connect the outer two pins to Vcc and 0 V in order to use this potentiometer as a variable resistor. Now, as the potentiometer is rotated, the center pin outputs a variable voltage between 0 V and Vcc. It is a 3-pin interface. Now, through a 1K resistor, one Red LED will be connected to the output pin of U1: B which is the IC (LM358) as shown the circuit diagram below. A Yellow LED will be connected to the output pin of U2: A which is again IC(LM358) and a Green LED will be connected to the output pin of U2: B which is the IC(LM358). A buzzer will be installed at the Red LED.

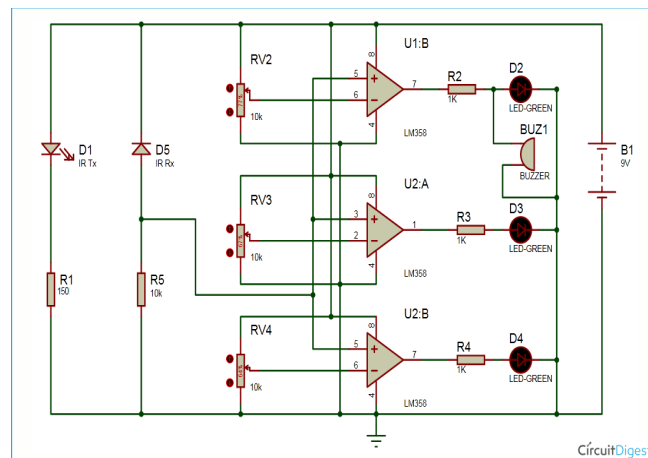


Fig. 3 Circuit Diagram

The reference voltage and the relative parameters are shown in the given table. Although, by changing the value of potentiometer, we can set or change the distance.

Obstacle v/s Vehicle	LED status	Reference Voltage (in Volts)	Distance (in cm)
Not close	All LEDs OFF		> 15
Close	Green LED ON	2	About 15
Closer than that	Yellow LED ON	4	About 10
Very Close	Red LED ON	6	About 5
Touch	Car Hit or Damaged		About 0

Sensor's front side faces toward the obstacle (wall) and this system is placed at the rear of the vehicle. Now in the parking slot, assuming the vehicle is moving back towards the wall or any obstacle. All the LEDs will be off if the distance between the vehicle and the obstacle is greater than 15 cm. If the vehicle moves closer towards the obstacle and if the green LED turns ON, it indicates that the vehicle is about 15 cm away from the obstacle. Green light means that the vehicle is

in the safe area/zone at the moment and the vehicle can go back further if need be. Further, if the vehicle moves closer towards the obstacle and if the yellow light appears to be turned on, it indicates that the car is only about 10 cm away from touching/hitting the obstacle. The yellow light is an alert signal that indicates that the vehicle is getting closer to the obstacle, so be careful. Now, if the vehicle moves further ahead towards the obstacle and if the red light turns ON, it indicates that the vehicle is only about 5 cm away from the obstacle and at the same time, the buzzer starts beeping. The buzzer and the red light indicate that the vehicle needs to stop otherwise it may hit the obstacle and get damaged.

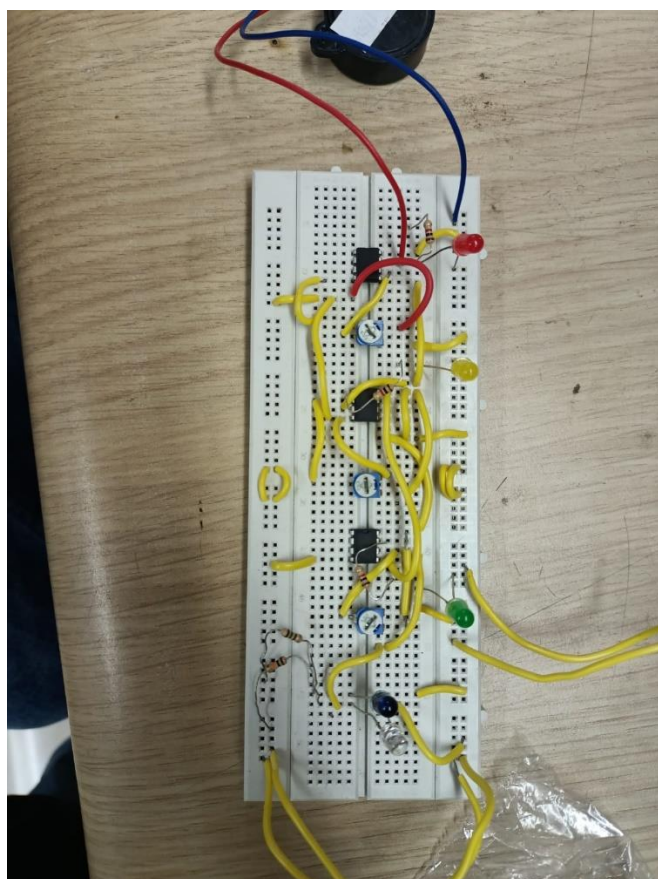


Fig.4 Circuit prototype on breadboard showing the working and connections of the Reverse Car Parking Sensor

V. RESULTS AND CONCLUSION

In spite of the fact that science and technology has been innovating and evolving a lot over the years, it is majorly related to the field of computers, automobiles etc. It is well known that in the automotive space, several superpowers and countries are doing quite well and showcasing new products (vehicles) and innovations to the market. Irrespective of the fact that there are various features available in these vehicles, the reverse parking feature is the one specific feature that has not quite made its mark in the budget-oriented space yet. The circuits which are used for the reverse parking of the car are either quite expensive or are very big in size. So, to resolve this challenge, we have developed a sensor circuit that is going to be of great help to the driver while parking the vehicle in reverse. To sum up, we have made a circuit with the help of

ICs, LEDs, Buzzer, Potentiometers and IR Transmitter Receiver Pair which safeguards the vehicle from any damage while reverse parking and is very useful for the driver and can even work as a shadow alarm while being budget-friendly and compact at the same time.

ACKNOWLEDGMENT

We want to take this time and express our gratitude and regards to our project coordinator, Prof. Rahul Taware, for giving his time, right guidance, support and his cooperation during the course of this project. The mentorship provided by him has been of immense help and this project would not have been completed without his help. We would also like to thank our Head of Department Dr. Amit Deshmukh for his cooperation and support throughout the entire duration of this project. We are very grateful and want to thank all our teachers who have directly or indirectly helped us with our project. We are also thankful to our parents, colleagues and friends for their help, cooperation and constant support throughout this whole time.

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Home Security and Automation

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Abstract— In today's modern world where competition is increasing in every field to secure a job & market is plagued by inflation, poverty is on a sky-rise. Due to lack of available resources to the people, some are often misguided by the concept of stealing, which leads them to commit crimes and ruin their future. Therefore security plays a critical part in maintaining discipline and ensures rules and regulations are being followed. Here we would be executing a straightforward, resilient and fast monitoring home security system using the setup of raspberry pi. In this project we would try to implement two things:- The aim is motion detection using Passive Infrared (PIR) sensor. So, in this project we analyze motion detection to take a snap of the person or trigger video recording via the Raspberry Pi camera module whenever it detects movement or a human (or any animal) when they move in front of it. Meantime the notification about the detection will be sent to us via email. After receiving the notification, the video can be viewed by remotely logging in to the Raspberry Pi System. If it seems that some kind of robbery is going to happen, we can upraise an alarm using an active buzzer to aware others and hence we can secure our home.

Keywords— *Raspberry Pi; Passive Infrared Sensor; motion detection; Raspberry Pi camera.*

I. INTRODUCTION

One Of the most important things that are essential in our day to day life is Security. be it Preventative (meant to restrict access like gates, locks) or Restorative/ meant to restore the Status Of systems like CCTV cameras and find out the culprit). Often in our school, we have heard the phrase "Prevention is better than Cure" which holds even in today's modern era where crimes are money laundering or fraud, gambling, terrorist funding or even murders which are happening at a rapid rate, Statistics depict that more than 75% Of crimes are just merely based on money. Well, sad to say but a person who works day in and day out just so that his/her family can remain safe & happy. if they fall into this trap and lose their hard-earned belongings it would eventually break them both financially and mentally. That's Why to prevent all this, everyone must place Security as one of the top priorities.

We make this possible by designing a simple home security system using Raspberry Pi and utilizing the power of IOT (Internet of Things). The home security system designed in this project is an uncomplicated and easily installable device built using Raspberry Pi 3, Pi Cam and PIR Motion Sensor.

II. LITERATURE SURVEY

The International Journal of Advanced Research in Computer and Communication Engineering - A Survey on IOT Based Security Systems, they have executed a live video monitoring system and acquired data. In their system, the components used are PIR humidity and temperature sensors. The user needs to authenticate before starting the system. The system sends data to the user's smartphone if it determines and detects humans. It has been developed to connect any door with the internet, in this system users also implement a PIR sensor and camera. A PIR sensor is used for detecting a person and a camera is used for capturing the video of a person coming at the door. The video Will be sent through a 3g dongle to the authorized person. They have also discussed some advantages of this system. They have concluded the use of this system like banks, hospitals etc. After referring to the above research papers, it is concluded that they have implemented the automation of security systems but have not addressed the issue of affordability, simplicity and eco-friendly nature Of the device within this price range. Moreover, they use more components which are not easily available hence priced higher. Gaps We address: According to our survey, we had conducted and studied the above research papers, our product boasts the capability of being one of the most affordable ones compared to the rest. Variety of Functionality offered by the product within this price range. Better hardware specifications are used within this price range. This device uses a minimal amount of electricity i.e. it is eco-friendly. A simple and minimalistic UI which is easy to integrate into any device available to the user. Proposed Methodology: The system Structure consists of the following three phases: input, processing & output. The control module gets the required input from the keypad of user. The control mechanism then starts the image sensor which capture image and sends the file to the database through Email. For the output phase, the user can access the door by use of LEDs (red and green). It also includes a buzzer/message alarm and sharing a real time proper live feed to the owner and notifying

about the user when he or she comes in and out of the home. The side figure represents a block diagram for the input-output system.

III. HARDWARE SETUP

The hardware setup is very simple. Other than the PIR sensor, it requires a Raspberry Pi Camera. The ground pin of the sensor is connected to the ground pin of the Raspberry Pi. The VCC of the sensor is connected to the VCC of the Raspberry Pi.

A. Camera Sensor

The Raspberry Pi version 2 camera module could be a 5 megapixel Sony IMX219 image sensor with customized accessory of add-on board plane for R-Pi, including a hard and fast focus lens. It has the ability to shoot 3280 x 2464-mega pixel static images, and also supports various video pixel rates such as 1080p30 fps, 720p60 fps and 640x480p60/90 fps. It is capable of being controlled programmatically by the user. It connects to Pi by a one small socket located on the board's side and uses the integrated CSI interface, which is made dedicatedly for interfacing with cameras. The 5 mp native resolution sensor has the ability to shoot 3280 x 2464 pixel static images. The use of a camera is all thanks to the latest version of Raspbian, Raspberry Pi's preferred software system which supports it. The board itself is very minute, having specifications of around 26 x 24 x 10 (mm). It merely weighs just over 3.2g, making it really suitable and compatible for use in mobile or other applications where size and weight of hardware are play an important role. It attaches to the Pi by usage of a brief ribbon cable. In capturing non-motion images, the camera is capable of taking 3280 x 2464-pixel static images, and it also supports 1080p30 fps, 720p60 fps and 640x480p90 fps video formats. In addition to this it has a S/N ratio of 36db, Dynamic range of 67db @8x gain, Focal length of 3.60 mm +/- 0.01, Horizontal field of view of 53.50 +/- 0.13 degrees, Vertical field of view of 41.41 +/- 0.11 degrees. It supports various picture formats such as JPG, PNG, BMP, RGB888 etc.



Figure 1: Camera Sensor Module

B. Raspberry Pi 3B

The Raspberry Pi is an open source Linux based Computer board(credit card sized) created by the Raspberry Pi Foundation. Anyone can improve their computing skills and programming skills by trying out the RPi 3. By attaching to your television or any screen and a keyboard, and with the correct knowledge of programming, the Pi can be able to do several things that a PC can do like exploring the web, consuming video content, etc. The R-Pi is also great for those imaginative projects that you simply just want to undertake - latest models are suitable for Internet of Things projects due to increased processing and computational power. Wireless LAN connection and Bluetooth LE version are also compatible with the Pi 3. The specifications include: A Processor (Broadcom BCM2387 chipset. 1.2GHz Quad-Core ARM Cortex-A53 GPU: It consists of a Dual Core Video Core IV® Multimedia Co-Processor) which Provides an Open GL ES 2.0, a hardware-accelerated Open VG, and a 1080p30 H.264 high-profile decode. Memory from Micro SD card (1GB LPDDR2 Dimensions: 85 x 56 x 17mm OS: Boots), running a version of the Linux OS or Windows 10 IoT Power: Micro USB socket 5V1, 2.5A

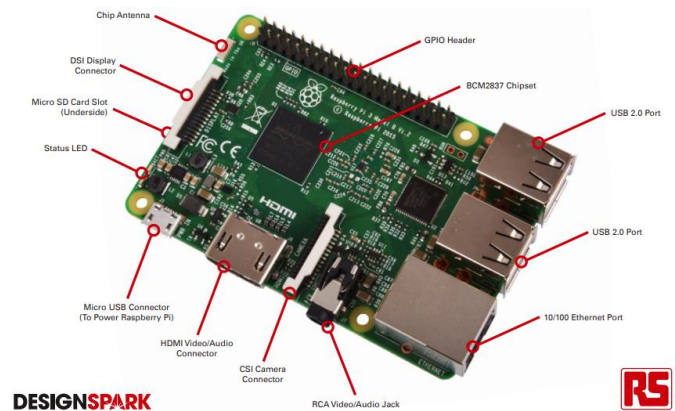


Figure 2: Raspberry Pi 3B

C. PIR Motion Sensor

The passive infrared sensor is employed for determining and to detect infrared radiations. This makes them handy and functional for use to observe moving living objects that emit infrared heat radiations. The output (voltage) of the infrared sensor rises up that is turns high when it senses motion whereas it's down when there's no movement (stationed object or nothing is detected). PIR sensors are employed in various applications for light source control using human detection, human movement detection for security purposes, reception.



PIR Motion Detection Sensor

Figure 3: PIR Motion Sensor

IV. METHODOLOGY

A. Software Requirement

To implement this we require Raspbian OS installed on the Raspberry Pi Model 3B. Raspbian Pi OS is a Debian-based operating system. Python version 3.9.0 for executing codes, Putty to establish a connection to Raspberry Pi, VNC Viewer & Server to view the desktop environment and GUI.

B. Project Implementation

Step one is to confirm that Raspberry Pi is powered off. Next step is to test the PIR sensor there are 3 connectors: VCC, GND and OUT. We use female to female jumper cables, to attach the VCC connector to the 5V GPIO pin Of the RPi. Then, connect the GND connector to a ground GPIO pin on the RPi. Finally, we connect the OUT connector of RPi to GPIO pin 11 on the RPi. Connecting the Camera: Locate the camera port and connect the camera. make sure the connector is inserted correctly and is properly attached to the port. After switching the Raspberry pi on, the Raspbian OS gets booted up. It automatically connects to the wi-fi. After locating the IP address for raspberry pi, next we establish the connection to the desktop environment. Then we use VNC Viewer to open

the Raspbian GUI. Post this we use the python editor on the Viewer where we write the code for our project.

V. CONCLUSION

The smart door lock is one of the most popular digital consumer devices. In actuality, it is replacing a lot of conventional types of locks. Based on a survey we have concluded that a Home Automation is very much needed in our homes and we have created a user-friendly Automation System with an affordable price. Here in our project, we are putting into practice a system for energy conservation with the help of a PIR sensor. This would surely reserve and save electricity. The project is aimed at developing the security of the Home against Intruders. In conclusion, a smart, acute and clever home surveillance system has been successfully implemented according to its objectives and desired specifications. However, there is always room for further improvisation.

VI. FUTURE SCOPE:

This Project aims to expand its reach with an android application. Currently, it doesn't contact the concerned authorities which it will in the future. It also aims to include a Buzzer which would create an alarming sound and warn the concerned people in case they miss the visual feed. Currently, it sends an image to the user when motion is detected. We plan to add a live Video feed integrated inside the mobile application. To further strengthen the security of the home, we are planning to add a PIN lock-based system which would give user's more flexibility to unlock the door. Overall this topic has more room for improvisation with other authentication system to be added.

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SMART MART – A Smart Shopping Experience Using Computer Vision

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Abstract— Recently, many attempts have been made to reduce the time required for payment in various shopping environments. In addition, as the 4th Industrial Revolution era, artificial Intelligence technology is advancing and IoT devices are becoming more compact and cheaper. So, by integrating these two technologies, access to building an unmanned environment on behalf of human beings to save users' time became easier. In this paper, we propose a smart shopping cart system based on low-cost IoT equipment and deep learning object detection technology. The proposed smart cart system consists of a camera for real-time product detection, an ultrasonic sensor that acts as a trigger, a weight sensor to determine whether a product enters or out of shopping cart, and an application of smartphone that provides a UI for a virtual shopping cart, and a deep learning server where learned product data are stored. Communication between each module is made of TCP/IP and HTTP network, and YOLO darknet library, an object detection system is used by the server to recognize the product. The user can check the list of items put in the smart cart through the app of the smartphone and automatically pay. The smart cart system proposed in this paper can be applied to implement unmanned stores with high cost-performance ratio. We have designed a cart, which uses artificial intelligence to help the customer add his product easily. After adding his products, the customer can use the same software to checkout and pay the supermarket using mobile banking.

Keywords— Raspberry Pi- 4, React, MongoDB, Python, TensorFlow, YOLO

I. INTRODUCTION

Nowadays in Supermarkets, customers must spend a long time in the queue to get their products billed. This causes too much discomfort, and due to which the Customer may not come back to the shop that often because of which the retail owners may lose their customers. We thought how we could solve this issue and then we came up with an idea to solve these issues. We can have a self-checkout, and customized shopping experience. The customer data can be stored in a database, which would help the owner have a good customer loyalty. Retailer can serve more customers in the same

amount of time. In Many Research papers, Computer Vision and Deep Learning have been used for making the shopping experience more efficient as there are many advantages of it like Reduced Time, Paper wastage, Reduced manpower etc. In [1] They used infrared sensors to determine the product movement and they have also used a charging method with the help of Raspberry PI which recognizes the product and stores it in their database and makes their cart ready for online payment without the involvement of the cashier and making their experience even better. We are creating a system with more advance features with more personalized focus toward the user's choice and making them stay even more in the mart and converting them into a more loyal customer.

II. SOCIAL IMPACT

Reduced Time: The biggest advantage of smart mart is time efficiency. It helps to reduce the queue and save time in today's fast paced society; it goes hand in hand with busy people. **Virtual assistant:** The virtual assistance inside the mart would help the customer locates his products inside the mart, thereby reducing the time for searching his products. **Paper wastage:** Reduce paper wastage since the bill will be sent to the customer mail-id. **Utilization of available space:** With reduced use of cashier's, the size of the shop can be reduced. **Reduced manpower:** Very few employees are required to run the shop and can be utilized for other services.

III. IMPLEMENTATION

In Machine Learning we have created a Recommendation Model using CNN of Myntra Fashion Dataset where basically with the help of Image Data, we recommended similar items a user would buy. We have also created our object detection model with MobileNet Framework for this Model as it had the highest precision accuracy, and we used the Fruits and vegetable dataset from Kaggle to train our dataset. We trained our models for 50 epochs and used Early Stopping for this case and implemented our model on Streamlit through which we created an Interactive dashboard for our testing purposes.

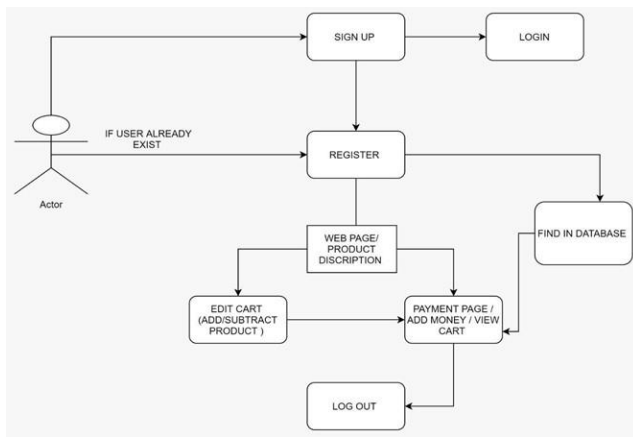


Fig.1 Flow chart of our system design



Fig.2 Steps for the shopping procedure

In the Machine learning model, it will detect in real time what kind of product is added to the cart with the raspberry pi and its rpi cam attached to it, which will define what product it is and accordingly continue updating the cart. Now in the remaining part we will improve our model performance by creating a ROI and making inference time better by reducing the weights of our model and testing with the model in Real-Time.

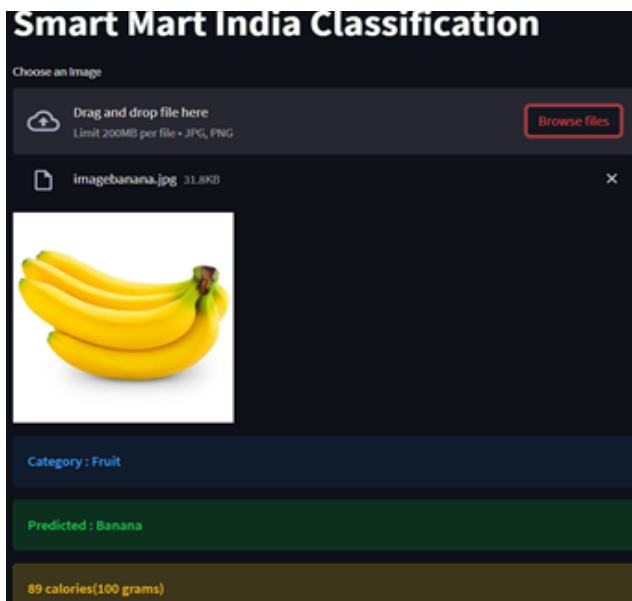


Fig.3 Webpage of our ML model predicting the store item with its calories

In development, we have created a working log-in page for our website and once we get the dataset, we will start working on Backend using Mongo DB. For Front -end we will start making required web pages using the dataset we will fetch from Mongo DB. In the Web Development side, we created our E-commerce Website, with interactive

features where the customer could login to the website and add a product to the cart and then make a payment.



Fig.4 Our ML model detecting the superstore item like bottle in this picture

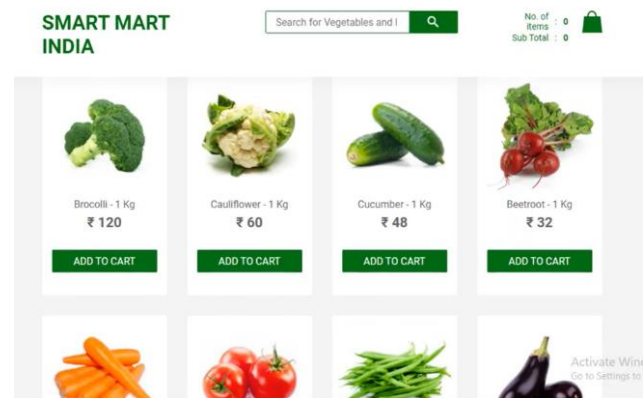


Fig.5 Our Smart Mart Shopping Website

We have had integrate our website with the model and make a connection to the Raspberry Pi through which we will make our feed input Real-time. When the user enters our mart. He/she will get a cart. There will be a 3 camera inside the cart in length breadth and the back of the cart. There will also be a tablet attached to the cart which will have our shopping site web app opened where the user can log in with their phone number/ email id and we will save their data in our database (mongo dB). If he/she is our existing customer, then they can log-in with their credential already saved in our db. After the connection is established, the ultrasonic sensor in the shopping cart recognizes the product when the user puts/pulls out the product and stores the video/image entered from the RPI camera attached to the cart in the RPI for few seconds then it sends message to the central server(firebase/Aws) indicating that the streaming has started over the TCP/IP network. Then our server reads the image/video from the RPI and then uses deep learning to determine the type, the quantity, and entry/exit of the product and passes this information to the web app on user smart tablet provided in the cart using TCP/IP network. Upon receiving the message, the web app adds/delete the

product data in the virtual shopping cart. Once the shopping is completed the user will be redirected to our payment page where he/she can pay with online banking (Paytm, google pay, net banking) there will be detailed information of his/her product. Once the payment is successful the user will get a signed token number which will act as receipt which he/she should use to exit the mart.



Fig.6 Smart Basket with the RPI Camera attached to it



Fig.7 Smart Basket with the RPI attached to it

IV. FUTURE GOAL

The goal of this project is to create a fully end to end working model with an in-app integration where we will be working more on development of our app and creating a user-friendly interface and improving our computer vision model to improve the accuracy in extracting visual features (produce & barcode items) for instant recognition. We are also planning to work more on recommendation so customers can search, locate, and compare products while they shop, and we can offer real-time recommendations based on cart content or location to increase basket size. Customers can also request assistance with a single tap, and,

we can add an augmented reality feature where customer can get in-app navigation related to the product shelf and where is it located and continue with their Smart shopping experience.

V. RESULTS AND CONCLUSION

With the increasing demand for facial recognition in daily use, this is the right time to build the system. In this project, we have discussed two different algorithms which are image detection and face recognition and how they can be used together to create a new mode of payment and a system which can be used to turn the shopping marts into smart mart. There can be many more measures such as iOS suitable app, in-app chatbot, admin side interface, etc. which can be done to improve the quality and security of the system and make help more businesses.

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Smart Shopping Cart with Automated Billing System

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Abstract— In today's fast paced world, optimization of time has become a necessity. Humans aspire and desire to remove all time-consuming tasks. We seek speedier and more efficient methods of carrying out day-to-day tasks. Standing in grocery store lines is one such onerous task. They can be time consuming, and the amount of time spent is typically dependent on the other customers. As a result, in order to reduce this effort and make shopping more efficient, we planned to establish a smart shopping cart with automatic billing. Every second, technology advances, making our life quicker and more efficient. In the conventional method, everyone in a shopping centre buys the merchandise in the trolley. After making a purchase, the customer must wait in line for billing. During the billing process, the employee scans each product's barcode and bills it to the customer. This procedure may be incredibly exhausting, arduous, and time-consuming. To overcome this, a smart shopping method has been devised. Instead of a barcode, each product has an RFID tag. An RFID reader and an LCD module would be included in the smart cart. When the consumer scans it, the name, price, and expiration date of the product are shown.

Keywords— *RFID tag, LCD module, RFID reader, automatic billing, smart cart.*

I. INTRODUCTION

"Self-Monitoring Analysis and Reporting Technology" is what intelligent technology stands for. This technology utilizes modern technology such as the internet of things to provide objects with psychological awareness. Intelligent technology, such as the senses, is used in this workplace technology to collect, familiarize, and transmit information about objects and environments, enabling the monitoring process to move forward and control itself.

In traditional settings, high transmission risk has forced the introduction of small touches to other buttons and handles, as well as reduced human contact whenever possible. Touch

small buttons and mobile ID scanners can make the whole unit 'free'.

RFID (radio frequency identification) is a wireless communication system that uses electromagnetic coupling or electrostatic coupling in the field of electromagnetic spectrum to identify an object, animal, or person differently.

The RFID system consists of three components: a scanning antenna, a transceiver, and a transponder. An RFID reader or tester connects the scanner with a transceiver. RFID students are divided into two groups: static students and mobile students. RFID readers are network devices that may be portable or permanently installed [1]. It works by removing the radio waves that open the tag. When a tag is activated, it transmits a signal to the signal, which is converted into data. The RFID tag has a transponder inside it. The learning distance of RFID tags varies based on parameters such as mark type, student type, RFID frequency, and local disturbances or other RFID tags and students. Readable list of tags with the most powerful power source. An integrated circuit (IC), he says, and a substrate are used to create RFID tags. RFID inlay is part of the RFID tag that stores diagnostic data. RFID tag reading range varies depending on tag type, reader type, RFID frequency, and local disturbances or other RFID tags and students. Two types of RFID tags are active RFID tags and active RFID tags. A valid RFID tag is usually powered by a battery. The idle RFID tag is powered by a reading device, whose magnetic field creates a current in the antenna. The battery is used by Semi-passive RFID tags to power electrical items and leaves a link to the RFID reader.

Markers with a very powerful energy source have great reading ability. RFID tags are composed of integrated circuits (IC), states, and substrate.

The whole RFID system uses a lot of low power, uninterrupted embedded memory. RFID tags usually have a data capacity of less than 2,000 KB, which includes a unique identifier / product number. Read-only or read-only tags allow students to add or change information. RFID tag reading range varies depending on tag type, reader type, RFID frequency, and local disturbances or other RFID tags

and students. Due to improved power supply, active RFID tags have a greater learning scope than idle RFID tags. RFID is immediately used to improve the installation of Internet of Things and wireless data transmission systems.

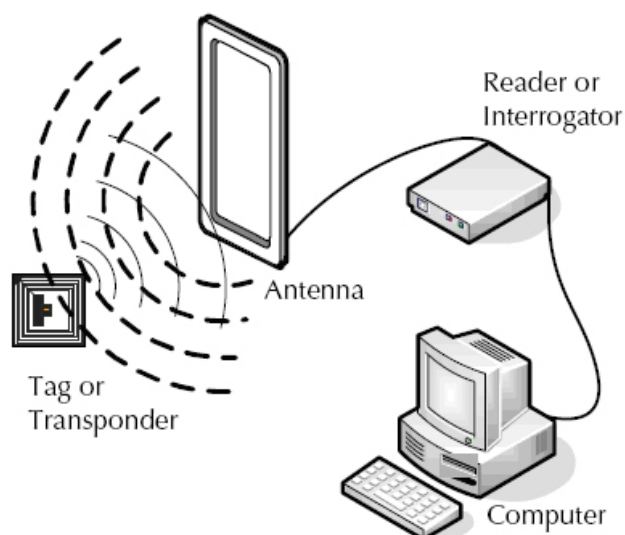


Fig 1: A typical RFID System

Advancements in RFID technology

At first glance, the invention seems to have no problem staying fit because it is an important development, but there will be limitations in reality. These technologies include CMOS design, information management, encryption, radio transmission, sensor setup and integration, and system configuration. The new RFID design uses components such as labels and readers (usually associated with a host PC or system). RFID labels are made of silicon chips and radio waves. It can be a storage cell or radio signals provided with a special learning control or start RFID labels, whether they are flexible or differentiated.

RFID Detector saves data obtained from RFID tags in a website schema. The power of the reader charges the capacitor in the radio tag circuit, which is later used to connect the tag data to the reader. The merging method requires one to choose between flexible and disconnected labels. The structural engineering of the RFID system is important in expanding the RFID framework [4]. The ability to upgrade the system is important. With RFID slowly emerging as the level of a new innovative network, the potential in this business sector has been seen as enormous. It was emphasized that if a business is going to win labels, everyone involved should first understand how the new invention has alleviated their concerns and choose tools and software in such a way that their company can expand in the future. Expiration date may be included in product details such as price, price, and more.

II. OBJECTIVE

The project's goal is to develop a smart trolley. We employ an RFID reader at the trolley's side in the proposed system, and every commodity in the supermarket will have its own

RFID tag with a unique ID. The RFID reader scans the product's tag and communicates it to the controller when a consumer places a product in the trolley. The product value is calculated by the controller and shown on the cart's LCD panel. In this way, we may add as many goods as we need and check the total on the LCD panel. An RFID reader can interpret roughly 40 tags in the time taken by a barcode scanner to properly interpret two tags. RFID tags are firmly fastened to the items and implanted in order to avoid additional wear and tear. Because the printed barcode requires a straight line of sight, it should be printed on the product's outer side, which is subject to significant wear and tear. The re-use of barcodes is also forbidden. Because barcodes lack the ability to read and write, it is impossible to add to the information presently stored on them. The capacity to rewrite on RFID tags is the most significant benefit of their use. The commercial trolley utility will be the first of its kind. Using appropriate sensors such as RFID tags, this system collects data from a variety of products. This information allows the business owner to conduct a comprehensive analysis of the customer's purchases and preferences using a computer; a printout of the information can be obtained. When you use an autonomous trolley, you don't have to haul a hefty trolley, wait in a billing line, or think about your budget. The cart, which is operated by a microprocessor, will follow the customer automatically. It also maintains a safe gap between itself and the consumer. It immediately displays the number of items in the cart as well as the total cost of the items.

III. DESIGN

An RFID reader, RFID tag, power supply, Wi-Fi module, and a push button comprise the smart trolley. The module wirelessly transmits data to the IOT cloud. The microcontroller is the heart of the system. It is connected to the RFID reader and the push button, as well as the Regulator which is further connected to the battery.

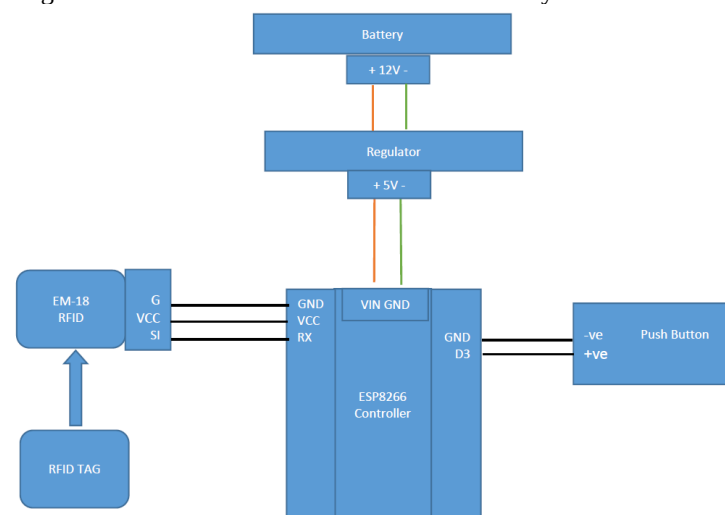


Fig.2: Circuit Diagram of the proposed design

NodeMCU (ESP8266) Controller



Fig.3: NodeMCU Controller

Pin description

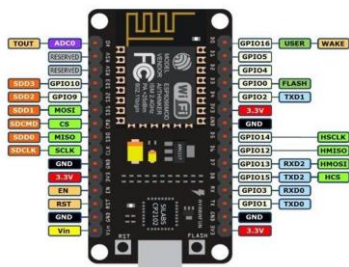


Fig.4: Pin Diagram

Pin Category	Name	Description
Power	Micro-USB, 3.3V, GND, Vin	Micro-USB: NodeMCU can be powered through the USB port 3.3V: Regulated 3.3V can be supplied to this pin to power the board GND: Ground pins Vin: External Power Supply
Control Pins	EN, RST	The pin and the button resets the microcontroller
Analog Pin	A0	Used to measure analog voltage in the range of 0-3.3V
GPIO Pins	GPIO1 to GPIO16	NodeMCU has 16 general purpose input-output pins on its board
SPI Pins	SD1, CMD, SD0, CLK	NodeMCU has four pins available for SPI communication.
UART Pins	TXD0, RXD0, TXD2, RXD2	NodeMCU has two UART interfaces, UART0 (RXD0 & TXD0) and UART1 (RXD1 & TXD1). UART1 is used to upload the firmware/program.
I2C Pins		NodeMCU has I2C functionality support but due to the internal functionality of these pins, you have to find which pin is I2C.

Pin description - Table 1

Features

Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106

Operating Voltage: 3.3V

Input Voltage: 7-12V Digital I/O Pins (DIO): 16 Analog

Input Pins (ADC): 1 UARTs: 1^[1]

SPIs: 1

I2Cs: 1

Flash Memory: 4 MB SRAM: 64 KB

Clock Speed: 80 MHz

Regulator IC (7805 & 7809)



Fig.5: Regulator IC

A voltage regulator is one of the most common pieces of electrical circuitry found in any device. A controlled voltage (free of fluctuations and noise levels) is critical for the proper operation of many digital electronic equipment. A prominent example is with microcontrollers, which require a smooth controlled input voltage in order to work properly. Voltage regulators are classified into several categories. We used a commercially available IC-based voltage regulator, the 7805 IC, to keep the output voltage at 5 volts. It is an integrated circuit whose primary function is to control an unregulated input voltage (certainly within a given range) and generate a steady, regulated output voltage^[2].

RFID Module



Fig.6: RFID Module

For an RFID-based application, the 125kHz EM-18 RFID Reader module is a low-cost option. The Reader module, which has an on-chip antenna, is powered by a 5V supply. With the MAX232 converter, we link the module's RS-232 transmit pin to the microcontroller's receive pin. When we position our card inside the reading distance, the card number is created^[3].

DOMAIN PUSH BUTTON (2 PIN PUSH)



Fig.7: Domain Push Buttons

Specifications

Material: hard plastic

Pin count: 2

Pin type: through hole

Size: 3mm

Weight: 2g

RFID TAG



Fig.8: RFID Tags

This 13.56MHz RFID card is commonly used for data transfer without touch and does not require a battery. It is about 1 meter wide depending on the shape of the antenna. Operating frequency is 13.56MHz and data transmission rate is 106 kbit / s. With data integrity and collision prevention, it has 16-bit CRC, measurement, bit coding, and bit calculations. These cards, commonly used for ticket purchases, have a response time of less than 100 milliseconds, which includes carrying a backup copy.

IV. IMPLEMENTATION BLOCK DIAGRAM

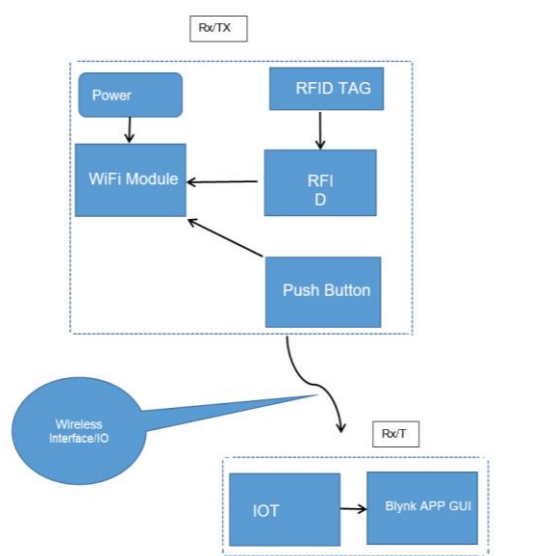


Fig.9 Block Diagram of the proposed design

V. METHODOLOGY

For this project, Lithium Ion batteries were selected to power the control board

This output power from the battery is brought to the capacitor to filter the AC components as well, and is

controlled from IC7809 and IC7805 respectively to achieve a constant output of 5V DC because all parts of our project require 5V DC power.

To control the activities of our project via the Internet, the application GUI (Graphic User Interface), LCD and GUI switch were designed using the Blynk Open Source Io Cloud, as shown in the image below .

This output power from the battery is brought to the capacitor to filter the AC components as well, and is controlled from IC7809 and IC7805 respectively to achieve a constant output of 5V DC because all parts of our project require 5V DC power. The ESP8266 WiFi module controller, the EM-18 RFID module, and the active push button were used for the main operation of the smart device.



Fig.10: Smart Cart

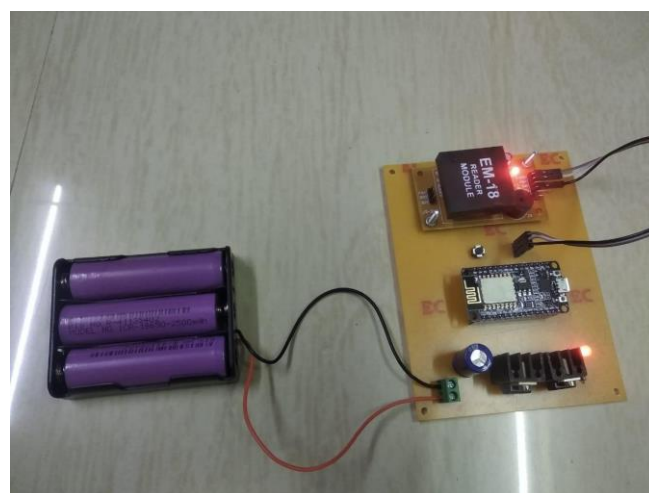


Fig.11: Controller Board

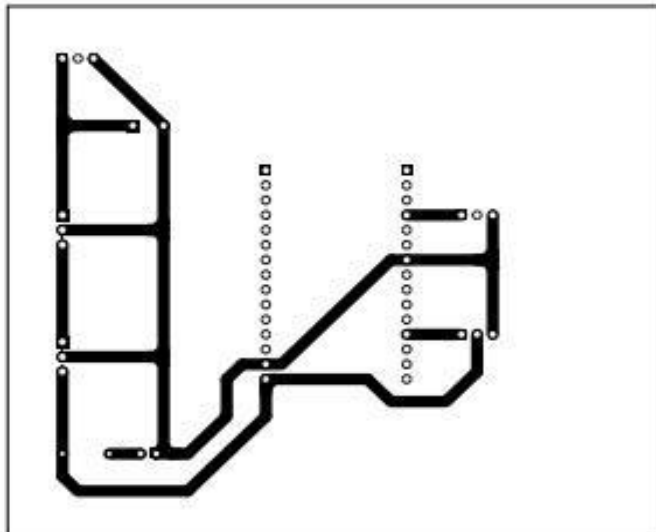


Fig.12: PCB Layout

Module Diagram:-

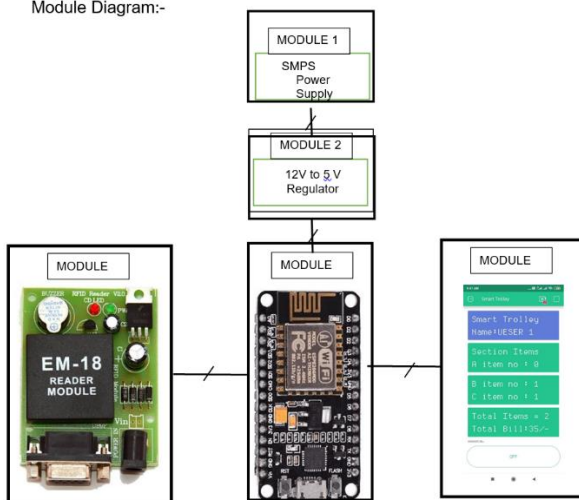


Fig.13: Module Diagram



Fig.14: IOT Application

VI. CONCLUSION

We have successfully built a project called "IOT Based Smart Trolley." We were able to properly interface the RFID module with the controller in this project, and we also built an IOT app with a highly appealing GUI (Graphic User Interface).

We have researched the disadvantages of the present manual trolley system and can declare that we have successfully eliminated some of these disadvantages when building this solution.^[4]

With the aid of project implementation on a trolley, the user will be able to enter the system through RFID tag and may purchase item by scanning it. That item count will be updated on the app in real time. After the user has purchased all of the things, the user can click the hardware button or the one on the application to generate the bill.

VII. FUTURE SCOPE

We can add an offline system to this project in the future since the system must function effectively even when there is no internet connection. In the future, it may be possible to integrate not just billing but also payment processing.

In the case of a larger number of items in the trolley, it may also be extended by utilising more powerful RFID readers with increased capacity.

Water sensitive and more powerful tags with advanced properties like as metal resistance and temperature resistance are being developed and will be highly important in the future.

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Medicine Dispenser

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Abstract— this paper proposed the plan of a medication dispenser that is fueled by Nano Atmega controller which will help individuals to gather their drugs and medicines on time and in amount recommended by their primary care physician. Because of significant expense and absence of information on this subject alongside accessibility, just two out of fifty individuals are utilizing this assistive innovation. By 2050, each 10 out of 20 families will require one assistive item with many old requiring at least 2, it has been explored that people are more worried about their body as opposed to wellbeing. This gadget plans to resolve this issue by reminding them to take prescription on time inside the recommended time, it's a mix of physical and digital update for a patient that is valuable for individuals of all ages, yet particularly supportive for patients who neglect taking their medications. One of the significant advantages of this gadget is the framework is not difficult to deal with and as well as cost-proficient. The gadget utilizes Arduino, LCD show, Real clock (RTC) module and RFID that would alert the patients and lcd would remind them to take medication and the legitimate measurements of it at the endorsed time. Patients of age as well as economically affected individuals can be helped a great deal from this compact and practical framework. Our medication box can be an aid to families with senior individuals as their responsibilities are diminished by reminding them to take prescriptions on time

Keywords— *LCD Display, Real Time Clock (RTC) Module, Arduino Nano.*

I. INTRODUCTION

Upon the analysis of mortality rates for a considerable length of time John Hopkins Patient Safety Experts gauge that in excess of 250,000 deaths happen because of lack of appropriate prescription. In the program in the clinical field, advancement assumes a significant part in maintainability of wellbeing. Additionally, it appears to be that the vast majority of the populace in India is fatally affected because of absence of obtaining the correct prescriptions on time. The issue emerges more often at night times when there is a dire requirement for medicine however pharmacies are shut or stock medications may not be accessible. One of the most widely observed reasons as to the failure of a medicine to cure a patient is a result of not taking the medication at the required or prescribed time. Individuals aged 50 or above are inclined to illnesses, for example, hypertension, diabetes, Alzheimer's and Parkinson's as some examples. Missing a dose for such a patient can end up with dire effects. Consequently the patients must take the prescriptions on time. With age increasing, individuals will more often than not neglect to take out the required time for their prescribed medicines. Working individuals will quite often fail to remember their medications because of their

high-speed life and not keeping a balance between serious and fun activities.

This project plans to give help to individuals to take their drugs or even to the people who need to take a great deal of meds and assist them with taking right medication for the right condition. So this project will direct individuals give to data about the patient's status regardless of whether he has taken the medication. In today's day and age, it is not easy for closed ones to be available all the time for the aged. Today, the vast majority of the families in our general public are a nuclear family. The old favor remaining independent, yet it is a concern for their children. At times, despite taking all precautions they forget to take their medicines. This device aims to reduce the probability of that very scenario.

Radio Frequency Identification (RFID) is a programmed identification innovation that allows the tracking of individuals and articles. RFID uses electromagnetic waves for sending and getting data put away in a tag to or from a reader. A standard RFID framework is divided into three parts: the radio frequency tag, the reader which is fundamentally a transceiver controlled by a microprocessor for obtaining information from a tag and lastly a program for gathering, putting away, as well as handling codes recovered from the tags. RFID Technology has an advantage over other systems, for example, magnetic strip cards, barcode systems, and biometrics (voice, fingerprinting, retina checking) because there is no requirement for direct line of sight for communication, withstands harsh physical conditions, takes concurrent ID into consideration, has good information storage with a wide read range and is cost as well as power proficient.

The dispenser utilizes a care card that is used to store client data, for example, username, password, client prescription, and so forth. So here we utilize the RFID tag used to distinguish the user and this RFID label utilizes radio frequency identification device to distinguish and track patient records, for example, login and the number and prescription taken by the client and save it for future reference. The RFID tag framework incorporates the marker, the read/write device, and the management of data system for data handling, transmission and collection. Drugs use Arduino nano as the fundamental controller of the system to connect the whole module to its function and since there is a requirement of more pins on the machine we have chosen Arduino nano as the controller.

II. OBJECTIVE

The present society gives a lot of importance to researches carried out to increase human life expectancy. Prescriptions and medicines are being upgraded or optimized to cure any disease as fast as possible to reduce risk. Development assumes a big role in supporting health in this field. The installation of medicine dispenser can affect the role of medicines in a positive manner. Pills have turned into a significant part of daily life, carelessness related to inappropriate medications to patients have been seen, one of the instances of such circumstance is the point at which an attendant gave a patient a paralytic rather than an antacid as proposed by the specialist which caused the patient's demise. On noticing the mortality rates of late years, safety experts have determined in excess of 250,000 deaths have happened because of absence of appropriate drug or administration of a heavier dose. Therefore, we can express that taking right pills by patients at the right time is pivotal; in any case, taking the wrong medicine or overdosing or missing a portion can cause numerous unsafe situations, from minor medical issues to fatality. Alzheimer's illness is the most notable type of dementia, a general term for cognitive decline and other capabilities severe enough to interfere with everyday routine. Usage of medication dispenser will handle their memory-related inability by reminding them to take their meds on time. Henceforth by making this we want to manage this issue. This medication dispenser has Arduino nano as one of its basic parts. Medication assumes a role of big significance in social orders and this prescription gadget will assist with enhancing the most common way of getting medication to individuals along with guaranteeing it is consumed by patients on time.

This medication gadget is fundamentally expected for:

Senior Citizens
Ongoing disease patients
Un sighted patients
Un sighted patients

Medicinal blunders are known to happen in the requesting, recording, administering and organization of medicine use. This device is intended to dispose of two most observed reasons for medication related blunders that is misconception of prescription and burden of unbending medicine schedules. Establishment in nursing homes can assist with recognizing the pills of numerous patients, diminishing the chance of accidental ingestion of improper drug and furthermore decreasing the weight on attendants and other clinical staff working there. Patients with time-touchy regimens for drugs, like patients with transplants, and so on, need not contemplate about not taking prescription on time. IOT is characterized by the obtaining and sharing of imperative network connected information through a solid service layer. Basically, the wireless network which is utilized to share information and data which are additionally used to impart and produce new information that can be recorded and examined for future purposes. Gathering of real-time information and recording data set of patients has become simple because of the utilization of Internet of Things. This RFID based device is additionally developed with financially

less affecting means so that it can be made promptly accessible to individuals at an altogether lesser expense

III. PROPOSED DESIGN

In this, the essential component is the Arduino. A RFID scanner and a card are being utilized in this undertaking. If the RFID card is accepted by the reader when the RFID card is brought close to the scanner, the LED shows read information and the RFID readers interprets the client's data. The expiry dates of the drug are considered by the machine and a caution note is shown on the LCD. Then, through a servo engine, the machine provides the said medications. Assuming there is an irregularity while examining the card, "Card not acknowledged" will be shown on the LCD screen. The "Out of Stock" message will be shown on the LCD screen after the load of medications is finished. We're also planning to connect this to the ideal number, so the client will get a notice about the medications being topped off. Likewise, it can also be associated with the number of drug stores so it can effectively send a request on renew the order. The medication container would comprise of a little box isolated into a few sections for up to a chosen number of patients to store pills for specified number of days.

The case will be connected to a RTC board, an Arduino microcontroller unit being utilized as the fundamental microcontroller that will follow and oversee function as and when the peripheral gadgets render a request. Every patient is given a RFID tag. The physician endorsed medication will be distributed as the RFID tag is carried near the scanner. Use of RTC helps with the comparison of dosage to be given with the ongoing time. The clock will have data about seconds, minutes, and hours. The continuous clock will start to tick and the signal will alarm the patient, guardian and an admonition will be shown on the LCD when it moves toward the assigned period of intake. LCD is likewise used to show essential message written in the program like patient name, date and time. We plan to make use of a WIFI-module to send the results that are recorded in the information base. The RFID tag and reader give the project a fundamental security that administers the right medication and dosage when a legitimate tag is scanned at the specified time.

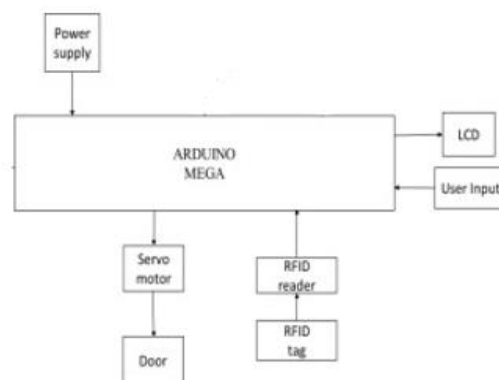


Fig.1 Block diagram of proposed design

IV. IMPLEMENTATION

This medicine distributor utilizes an Arduino nano board including ATmega328 microcontroller with a working voltage of 5 volts and input voltage between 7 to 12 volts. It comprises of 14 Digital I/O pins of which 6 give PWM result and 6 give Analog information. It is analogous to the arduino board with the exception of a DC jack.

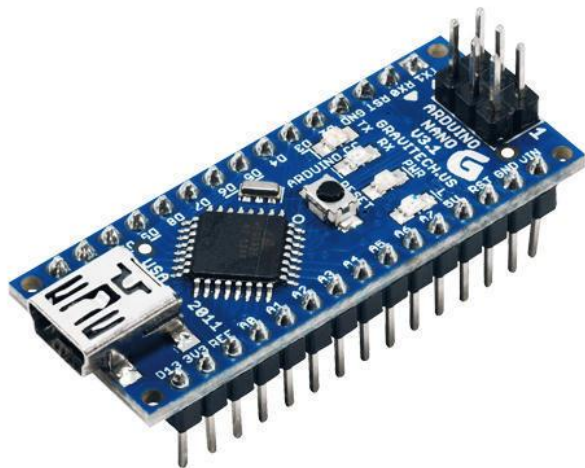


Fig.2 Arduino Nano Microprocessor

A RFID (Radio Frequency Identification) is utilized for the accumulate of client data. The RFID labels have a power source of their own. They can communicate powerful signals over significant distances and can work in dire straits for a long time. RFID tag is examined on the RFID scanner by the client which goes about as a medical services card, when the card is detected, the clients name will be shown on the LCD. Execution of 16x2 Alphanumeric LCD display is done to demonstrate data to the client in regards to which medication has been advised. A Servo engine is attached to the system. When right RFID card is identified Servo motor turns at a specific angle bringing about the dispensing of the medication. With the assistance of RTC module after a specified amount of time medication will be distributed on its own.

V. RESULTS AND CONCLUSION

There is a surplus of models that are filling the indistinguishable need. Be that as it may, these systems are hard to utilize, non-portable, costly and a convoluted process. This system conquers all of the above issues and it's just reasonable with better precision, this strategy is valuable to every individuals. It is useful for following normal admission of medication and lessens manual management and human exertion. With the clear circuit plan and modest sensors acts as an asset for the clients, a direct answer for moms and individuals who give assistance to the senior citizens and the infirm. It can observe use in each family or clinic that has clinical management and might be advertised as an effective solution for us. The objective of

this system is to create sound, pressure free life for those that are taking pills consistently and to supply it at a sensible expense.



Fig.3. Medicine Dispenser Box

VI. SOCIAL IMPACT

Prescription administration gets bulky and the elderly experience the ill effects of various issues related to vision, thinking capacity and actual capacity. Over the long haul, the medicine dispenser will develop into an instrument that will assist huge number of people with taking their prescriptions appropriately, while remaining independent in the comfort of their own homes, and out of the healthcare institutions. Fostering an advanced drug dispenser will emphatically work on the standard of living for senior residents and patients relying on medical care specialists for their livelihoods. The proposed design targets people with Alzheimer's and dementia as it can provide an organized system for medicine intake. It can likewise be utilized for people suffering from psychological issues, learning challenges, physical complications, patients with longstanding ailments on a day-to-day pill schedule, and the visually impaired. In any case, hardly any assessments have investigated how patients conceptualize missed doses or the level of the agreement/disagreement between patients and doctors.

A device dispensing medicines facilitates the complex procedure of dealing with medicines, fully intent on limiting medicine consumption slipups and further developing coordination with the beneficiaries it will forestall blunders in emergency clinics and retirement homes where numerous pills ought to lean every day to everybody in every one of the patients, every patient owing an instrument would decrease the potential outcomes of mistakes happening and increment the speed of the caretakers by permitting the gadget to be refilled rapidly without a lot of issues and can be redone for different patients on their necessities. Medication blunder counteraction and upgraded

coordination are basic to satisfy the more extensive focuses of better older patients' health status and decrease in hospitalization rates etc.

VII. FUTURE SCOPE

Thus, we implement these steps for effectively delivering drugs from the medicine dispenser. Along with this, remote settings, further programming, and any minor errors occurring in operation can be remotely managed by medical personnel or any tech-savvy individual. The performance of the dispenser is observed to be satisfactory, pertaining to the needs and it successfully accomplishes its objective. Further improvements include:

GSM Module: Use of GSM module will allow the medicine dispenser to send text alerts to the user as a reminder to take the medicine or to refill the medicine dispenser.

Hospital applications: The pill boxes can be used in hospitals where huge manpower is not available for a group of patients

RTC, Buzzer and many other applications can be brought into the picture to optimize the product in a positive manner

VIII. LITERATURE SURVEY

There can be a lot of individuals out there who need constant help – may it be our elderly people, family members, the ones who have special needs. Elders are more affected by the timing of taking a certain drug than others, in order to prevent any dysfunction or illness timing is a must. But as with aging comes poor eye sight and poor memory, what if the patient has a dementia like Alzheimer. Some people may forget to take the medicines at the correct time and can forget the medicines which they have to take.

For this very reason, a significant amount of research has been done to produce a better sense of comfort and ease in the lives of these people. Juan Marcelo Parra, in the year 2017, published his paper titled 'Intelligent Pillbox: Automatic and Programmable Assistive Technology Device' where a circular medicine box was made which rotated itself at each dosage time. This was a compact device and had certain limitations. Wissam Antoun released his paper titled 'Smart Medicine Dispenser (SMD)' which comprises of a dispenser unit along with an android application that would send notifications if it's time for the patient's dosage or if the patient missed their dose. 2016 saw the publishment of 'MEDIBOX IoT-Enabled Patient Assisting Device' by Achsa Mary Marks. It comprised of a medicine dispenser fitted with an LED display, that would display the details of the medicine, and a buzzer which would notify the patient on the time at which they are supposed to take their required medications. Another similar project to 'MEDIBOX' was the 'Automated Medication Dispensing System' by Mrs. Bhagya Shree S R. This too saw the LCD display as well as the audio buzzer signals for the notification of the patients. In 2017, Animesh Kumar Sahu published his paper of the title 'Automatic Pill Reminder for Easy Supervision'. This project uses the LCD display for the showing of medicine to be taken by the patient as well the application of GSM modules to send direct text messages either to the patient or to the individual in charge of the patient's medicines. Therefore the patient or

the person in the charge can receive SMS when it's time to take the medicine or notify that the amount of medicine is low and will be soon be depleted, thus requiring a prescription refill. Shubham Kaikade and Piyush R. Pawar are the authors of 'Design of Automatic Smart Medication Dispenser' which saw a dispenser with the implementation of Raspberry Pi, giving added benefits and more scope for refinement.

Such devices, projects and papers allow patients as well as professionals in charge of these patients a better sense of security in terms of responsibility as well as safety. The health of all the medical patients should always be considered paramount. With this thought in our mind we can be more progressive and create a better environment for the ones who aren't as able.

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Object Detection in Image Processing

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Abstract - Object Detection is a technology in the field of computer vision that works to identify and locate objects within an image or video. Deep learning algorithms are rapidly improving the object detection performance owing to the continuous efforts of many researchers. Pedestrian detection, medical imaging, robotics, self-driving vehicles, face identification, and other popular applications decrease human effort in many fields. The goal of this paper is to detect objects in self-driving vehicles for navigation purposes. Autonomous driving will change the face of the vehicle industry in the near future. The frequency of accidents caused by human mistake is currently relatively large, and it may be drastically reduced with the introduction of autonomous driving. Object detection via computer vision is one of the key criteria and a large portion of autonomous driving. This paper aims to add value in the field of autonomous driving by using deep learning techniques to detect objects. The researchers employed the state-of-the-art algorithm YOLO (you only look once) to detect diverse things on the road and classify them into the appropriate group using bounding boxes.

Keywords: *Image Processing, Deep learning, object detection, YOLO, autonomous vehicles, Python, Machine Learning*

I. INTRODUCTION

When a child first learns to walk, the first thing it attempts to do is understand the environment around it; similarly, when it comes to autonomous vehicles, understanding the environment is critical to making the goal of autonomous driving a reality. There are a variety of sensors that can help you understand the environment, but the camera sensors are the most effective [1]. Comprehension of images containing several items is a challenging process to complete, especially when objects from different classes are captured in the same image. Several companies, like NVIDIA[2], ViNotion, and others, have succeeded in building object detection algorithms that are employed by autonomous driving giants like TESLA, but information about these algorithms isn't readily available.

Various research prospects are considering various types of object detection methods. SVMs, KNNs, and other rudimentary machine learning algorithms have been supplanted by state-of-the-art Deep CNNs. Many methods, such as RCNN, Fast RCNN, and others [3], were once widely utilized but had to be superseded with the introduction of the YOLO algorithm. The YOLO algorithm is significantly faster and similarly effective at detecting objects. We used a dataset of classes that we are concerned about to train the algorithm in this paper. There are several aspects to consider before we can make that dream a reality. The main goal of object detection for an autonomous vehicle is to accurately recognise items on the road such as cars, trucks, buses, traffic lights, traffic signs, people, bicycles, buildings, and so on. The most important requirements for object detection in autonomous driving vehicles are that they accurately identify things with higher accuracies and at a faster rate. When constructing an object detector, there are two things to keep in mind: First and foremost, to maintain a high level of accuracy since if this area is not given the attention it deserves, the end effect could be exceedingly negative [4]. Second, be able to quickly recognise the objects in the photos. Deep learning object identification methods are divided into two categories: Multi Stage Detectors and Single Shot Detectors. The multi-stage detectors first discover region proposals before attempting to determine the values of bounding boxes. Single shot detectors do both tasks at the same time, resulting in speedier results. Both types of algorithms have their own drawbacks, which is what the researchers have been working on. In essence, the multi stage algorithms are being tested to see if they can produce faster results, while the single shot detector algorithms are being tested to see if they can produce higher efficiency.

II. LITERATURE REVIEW

During the next wave of technological innovation, self-driving cars will have a revolutionary impact on numerous businesses. General Motors demonstrated the first autonomous car concept in 1939. However, most of the methods tried by early researchers turned out to be ineffective or expensive. Researchers have taken a step closer to establishing a realistic implementation of a self-

driving agent in recent years, owing to cutting-edge breakthroughs in artificial intelligence, sensor technology, and cognitive science. Several companies, including Google, Uber, and Lyft, as well as top universities like MIT and the University of Toronto, are researching and testing new design approaches involving neural networks, multiple sensors such as cameras and Light Detection And Ranging (LiDAR), computer vision, and other techniques.

NVIDIA published a study in 2016 about a similar idea that benefited from ALVINN. The authors employed a CNN architecture to extract features from the driving frames in their work. The network was trained with supplemented data, which helped the model perform better. The training set was used to create shifted and rotated pictures with matching adjusted steering angles. This method worked effectively in simple real-world circumstances like highway lane-following and driving on flat, obstacle-free courses. Several studies have been conducted to develop more complicated perception-action models to deal with the diverse environments and unpredictable circumstances that are common in urban settings.

Another line of research is attempting to compare autonomous navigation to guessing the next frame of a video. Comma.ai has proposed using a Variational Auto-encoder (VAE) and a Generative Adversarial Network (GAN) to learn a driving simulator (GAN). Despite the transition model being optimized without a cost function in the pixel space, their approach was able to forecast realistic looking video for numerous frames based on prior frames. This technique is a subset of the broader task of video prediction. Video prediction models have been used in driving scenarios in the past. In many circumstances, however, video prediction is unconstrained since prior actions are not provided as input; the model handles this by conditioning the prediction on the model's output.

Machine learning techniques were used in many older ways to solve data acquired by various sensors as a classification problem, and they were often taught and tested on datasets of limited size.

III. PROPOSED DESIGN

An algorithm for detecting, classifying, and tracking objects is presented in this paper. The proposed approach uses state of the art deep-learning network YOLO (You Only Look Once) combined with data from roboflow to detect and classify the objects and estimate the position of objects around the car. Object detection and recognition in YOLO is

done as a regression problem, and the algorithm provides class probabilities of the images. Convolutional neural networks (CNN) are used in the YOLO method to recognise objects in real time. To detect objects, the approach just takes a single forward propagation through a neural network.

This indicates that a single algorithm run is used to predict the entire image. The CNN is used to predict multiple bounding boxes and class probabilities at the same time. We start by cloning the darknet repository and getting the YOLO algorithm's weights. We've been referring to YOLO V5 as YOLO throughout this endeavor. The YOLO method was initially trained using the Roboflow data set to detect 11 different object classes out of 1500 images. So, before we start custom training our YOLO algorithm for road objects, we basically run the algorithm to see how accurate it is using its pre-trained weights. The algorithm has been developed and tested using the dataset collected by Roboflow.

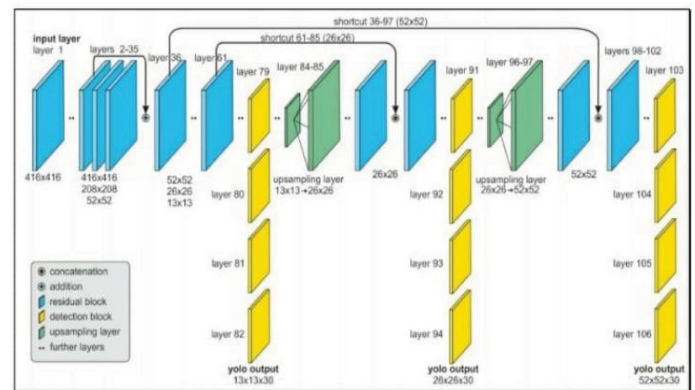


Fig 1. Architecture Of YOLO

IV. METHODOLOGY

Object detection methods are classified as either neural network-based or non-neural approaches. It may be further divided into two categories: machine learning-based approaches and deep learning-based approaches. Computer vision algorithms are employed in more classic ML-based systems to identify groupings of pixels that may belong to an object by looking at various aspects of an image, such as the color histogram or edges. These characteristics are then entered into a regression model that predicts the object's position as well as its label.

The YOLO approach uses fully connected CNNs, a type of neural network that specializes in dealing with grid-like structures [7]. The sharing of parameters is the fundamental feature of CNN that has the most impact. In a traditional network, different weights correlate to different locations; however, in CNNs, members of the weights are used across all inputs, which refers to learning a set of weights for a certain location. This characteristic tends to play a crucial role in enabling object detection.

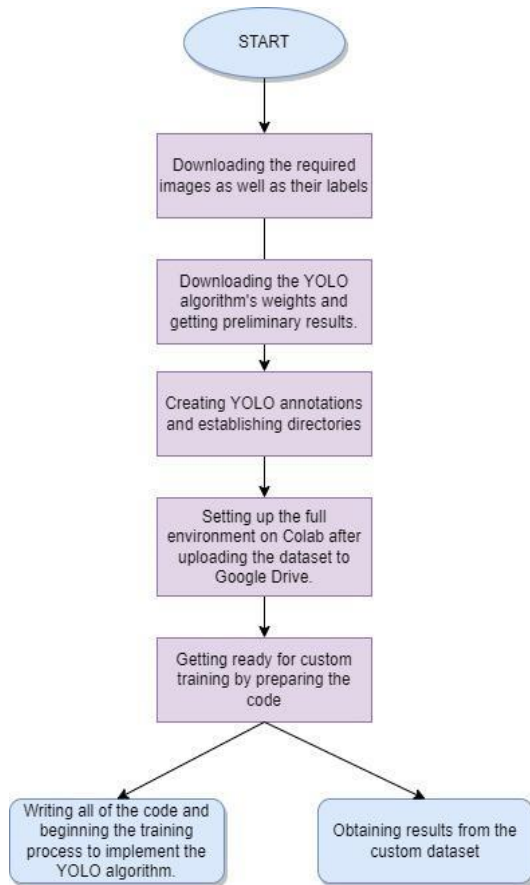


Fig 2. Flowchart of Proposed Designed

The way a YOLO algorithm works is that the image being considered is divided into grid cells, and the algorithm only travels through the image once, allowing the items contained in the image to be spotted using bounding boxes circumventing its perimeter. The following image depicts a model version of the image. The first component reflects the item's existence, followed by the bounding box, the bounding box bounding box, and finally the object classes.

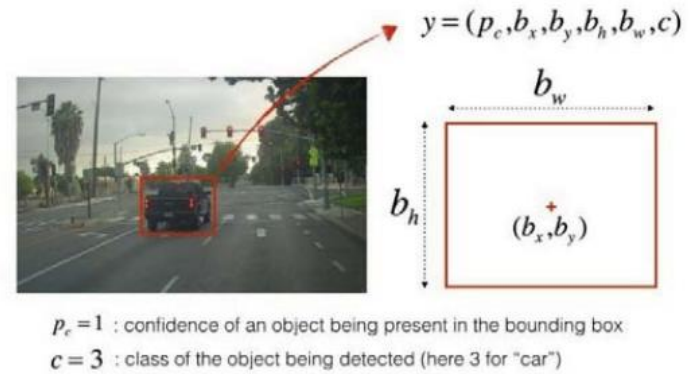


Fig 3: Representation of encoding

Anchor boxes are the boxes that are generated for each grid cell to detect a specific number of objects; for this project, the number of anchor boxes was set to 5, which implies that the total number of anchor boxes drawn in one image will be $5 \times$ the total number of grid cells [8]. As a result, the number of anchor boxes is enormous, and we now need to decrease the number of boxes that we can see in order to reduce clutter and make it easier to find our object. The next thing we do is calculate a class score, which is the product of the chance that a given object exists multiplied by the class.

The score of a class is calculated by multiplying the chance that an object exists by the class to which it belongs. To have a bounding box wrapped around the class score, we specify a specific threshold. To minimize the number of boxes even more, we use a technique known as non-max suppression, which removes all boxes from the image that circumvent the objects from any point other than the object's midpoint [9].

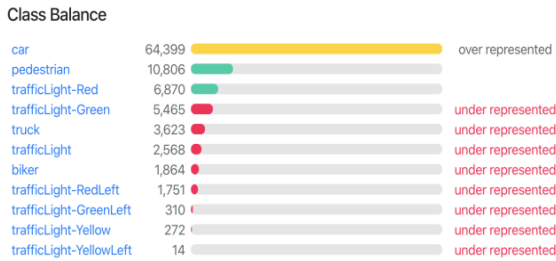


Fig 4: Non- max Suppression

DATASET

The data set that was picked was obtained from the Roboflow data set, which has over 97,942 labels across 11 classes and 15,000 images. Images of many categories have been retrieved from the open images data set. We

chose a total of 11 classes to custom train our YOLO algorithm because the project we're working on is about autonomous driving, and we want to identify classes of things that are more likely to be spotted on the road. Car, biker, person, traffic lights, traffic signals, truck, are the classifications [9]. The extracted data has been divided into two categories: training and testing.



V. RESULTS AND CONCLUSION

We aimed to demonstrate the feasibility of self-driving cars that can navigate exclusively using vision-based object recognition techniques. When implemented in the real world, however, many more parameters may be incorporated, increasing the complexity of the system while impacting the car's performance. It is imperative that we have a high accuracy rate as well as a faster speed for object detection, and there cannot be any loopholes in this. We have successfully trained our YOLO model to aid in the field of autonomous driving for the purpose of object detection in this paper. Our trained model is capable of detecting various objects that appear on the road by creating a bounding box around the object and captioning it with the class category to which it belongs. We still have some false positives and false negatives in our model, which we need to eliminate because adversaries like this may be very destructive to application. There are a range of methods for identifying and localizing objects, each with a trade-off between speed and accuracy.

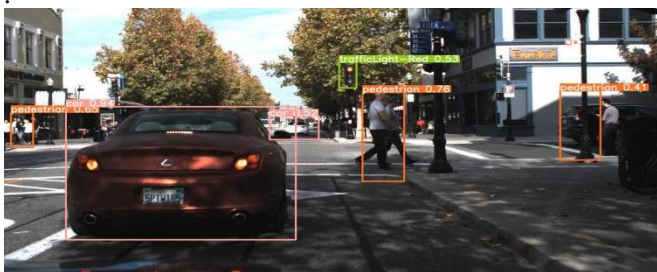


Fig 5: Output Image

VI. ACKNOWLEDGMENT

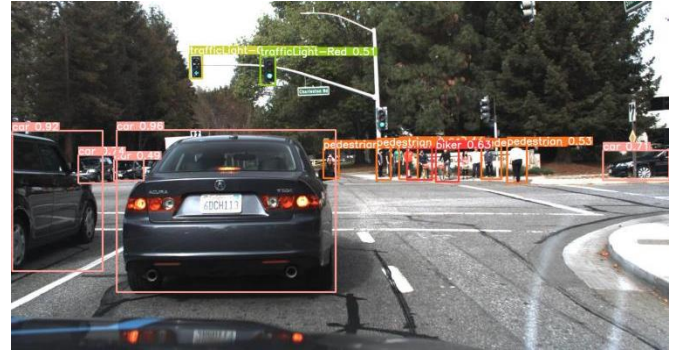


Fig 6: Objects being detected on a busy road

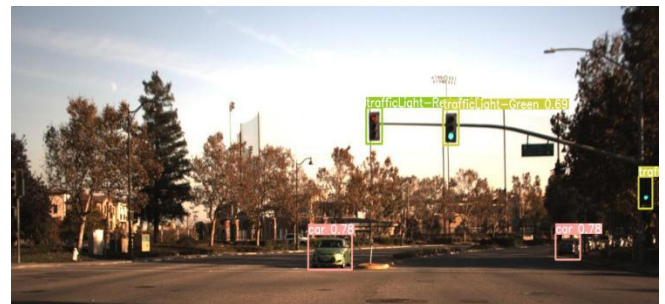


Fig 7. Output Image

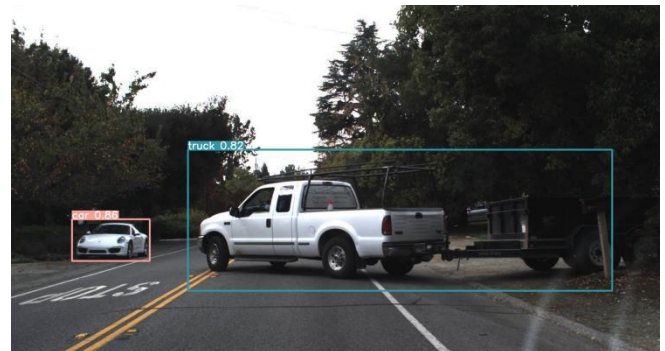


Fig 8. Output Image



This project and technical paper were greatly supported by Professor Vishakha Kelkar. His expert coaching and comprehensive assistance were invaluable to us at every level of this project, and this paper would not have been possible without his contributions. We are grateful to our colleagues who contributed their knowledge and experience in the research and assisted us throughout the process.

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Audio Source Separation as applied to Vocals-Accompaniment Separation

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Abstract— The objective of this paper is to present a system for extracting the vocals from any track composed of vocals, instruments and computerized sound effects. Neural Networks can be leveraged to understand the underlying mathematical and wave nature of human speech and its harmonic overtones as distinguished from that produced by instruments. A first principles approach behind two distinct model architectures as well as the pre and post processing steps on the data has been described. A Short Time Fourier transform (STFT) followed by Mel scale interpolation for perceptual weighing is implemented to expose the frequency spectrum.

A sliding window is applied to the resulting spectrogram to further subdivide the input into individual timeframes with appropriate temporal context. A convolutional neural network is used as a transfer function to generate a soft mask which when applied on the mixture's spectrogram, yields the individual windowed spectrograms. Semantic segmentation techniques are used to discriminate between the vocal and mixed spectrogram. The windowed outputs are concatenated to produce the final output spectrogram. The training dataset is composed of the tracks for the composite 'mix' and the accompanying vocals. The output audio is obtained by postprocessing this spectrogram using the inverse short-time Fourier transform amongst other techniques.

Keywords— Audio source separation, vocals extraction, Cocktail Party problem, STFT, Mel scale, binary mask, soft mask, U-Net, Semantic segmentation, librosa, Tensorflow, Keras, Python, Music, cyclical learning rate, one-cycle adamW

I. INTRODUCTION

Audio source separation involves the decomposition of any composite audio source into its primary constituent tracks, which are distinguished on the basis of certain desired properties such as their source, frequency, amplitude, waveform and so on. In the human realm, these may correspond to sounds generated by different voices, objects or even mathematical functions.

Here, signal processing and deep learning techniques have been applied to extract vocals from any musical track composed of numerous singers, instruments and computerized audio effects all being played simultaneously. There is an extremely high need for vocals extraction in the music industry, ranging from singer identification and genre classification to the tougher problem of developing a system for automated lyric or karaoke generation. A very high amount of research is being conducted to improve music information retrieval (MIR) systems which are applied in tasks such as music classification and recommendation systems. Possibly, the greatest benefit lies in its use by professional musicians in mixing and remixing tracks for

producing new tracks by using the stems or components of previously produced music whose stems may not be publicly available. In fact, musicians have even begun using vocals from other tracks as background music over which they record new tracks. This trend wherein vocals have supplanted instruments in tracks is now a standard technique which is impossible without state-of-the-art vocals extraction models.

Thus, vocals extraction is a multi-billion dollar industry which is expected to grow exponentially with an increase in demand and investments from the recording industry and the cloud-based music industry. A first principles approach to implement such a system has been described.

II. RESEARCH METHODOLOGY

The objective of the system is to primarily recognize the presence, frequency and amplitude of vocals in a particular timeframe. Consequently, working in the frequency domain was found to be more favourable. The objective then changes to recognizing the presence of vocals, at a particular pixel in the waveform. The short-term Fourier transform (STFT) was used to obtain a plot of frequency as a function of time with the brightness of each pixel corresponding to the amplitude at that (f,t). A spectrogram is thus generated for the entire training dataset comprising the mixes as well as their corresponding vocals. Human speech and its overtones can be visually distinguished from the two spectrographs, so it increases the probability that a neural network can learn to do the same.

However, the human ear does not recognize sound at different frequencies in a linear manner. Humans are able to distinguish between sounds at 500 Hz and 1000 Hz but are hardly able to do so between sounds at 10000 Hz and 10500Hz. This results in a loss in precision at higher frequencies. This perception can be approximated on a logarithmic scale. Thus, to overcome this, N to N Mel-scale interpolation is applied on the STFT spectrogram to enhance perceptual weighing. It is observed that the new Mel-scaled spectrogram is markedly more discriminatory.

The input audio file is sampled at 22050 Hz since it yields the optimal tradeoff between sufficient auditory resolution and processing complexity for the frequencies lying in the human range of perception. The spectrogram contains a certain number of frequency bins as rows and certain number of timeframes as columns. Specifically, the number of frequency bins is given by half the window size of the original STFT window plus one. The window size has to be a power of 2 for maximum computational speed and statistically, a length of 1024 or 2048 has yielded the best

resolution. This system has been designed using a length of 1024 frames.

classified at only one timeframe, but certain timeframes were concatenated on both sides to provide temporal context.

Thus, the slices of inputs are generated by applying a sliding

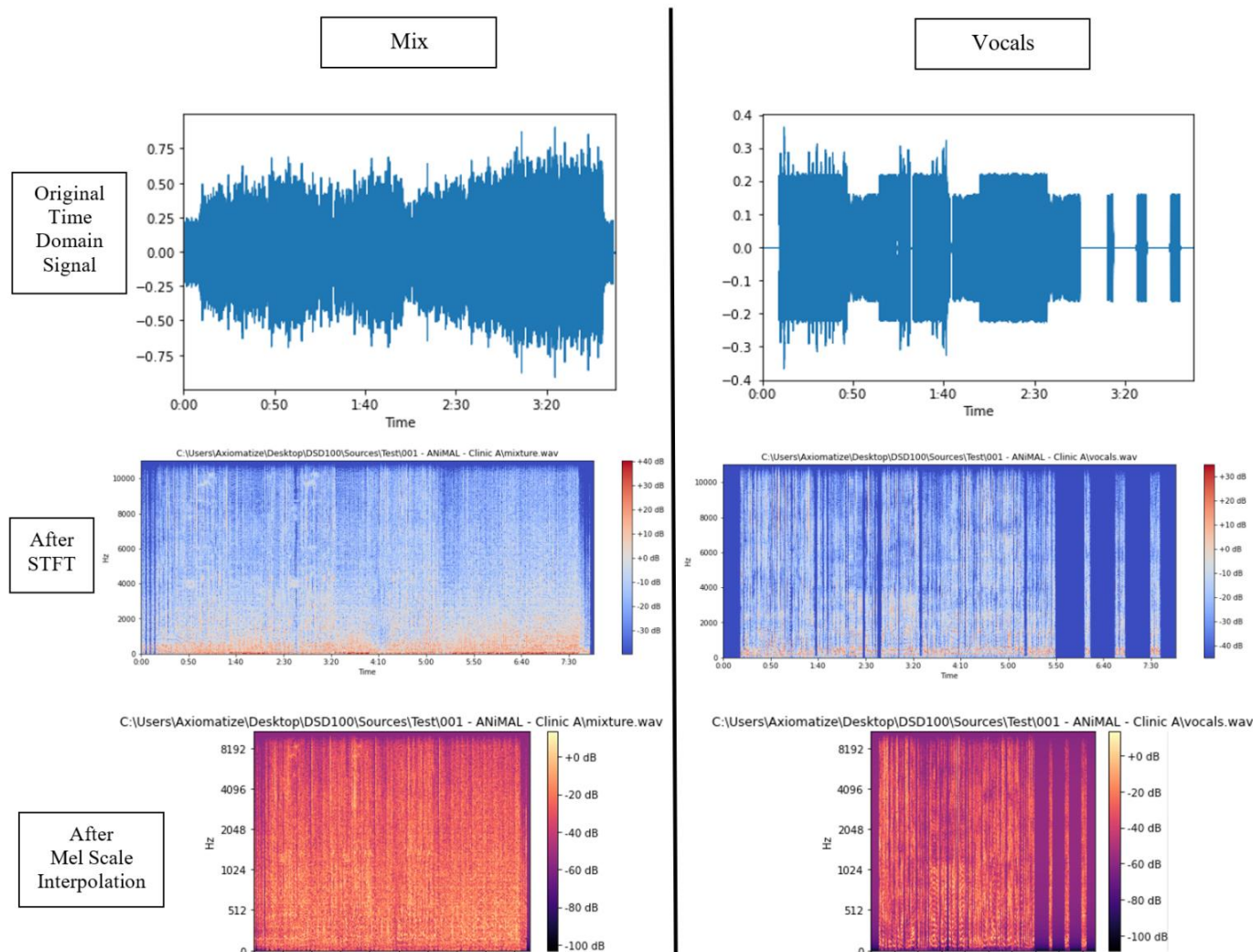


Fig.1 Visually discernable difference between the mix and vocals in the frequency domain

Due to shortcomings in the first system, a second, improved system has also been implemented. A first principles approach to the design the first system is subsequently described.

To maximize the binary classification accuracy at each pixel, the input timeframes should be as small as possible. At the same time, the classification accuracy depends on identifying the unique patterns of human speech, which can be more easily observed if multiple adjacent timeframes are provided for analysis. To resolve this tradeoff, the inputs were to be

window on the Mel Spectrogram with a hop size of one timeframe. These slices were generated for the spectrogram of the mixes as well as the vocals. A power factor of 2 was also applied to the spectrogram to increase the SNR ratio.

A neural network was needed to classify the pixels at each central timeframe. The number of pixels in each timeframe is equal to the number of frequency bins in either of the spectrograms. A convolutional network has been statistically shown to function effectively in complex classification situations and so a suitable network design was sought. The objective now, is to predict a binary mask which would on yield the vocals' spectrogram on application to the windowed spectrogram of the mixture.

A set of 4 convolutional layers was selected as the baseline system^[1]. To reduce image dimensionality in successive layers, maxpooling layers with a 3x3 kernel were incorporated after alternate convolutional layers. Leaky ReLU activation functions were used to increase computation speed and prevent neuron deadening for negative weighted sums. To prevent overfitting dropout layers which randomly disconnect neurons were added. The input size to the first layer is equal to the dimensions of the windowed segments of the Mel Spectrogram = num_freq_bins x window size. The output is equal to the 1 x num_freq_bins with each value being binary denoting 1 for presence of vocals and 0 for presence of just music. A set of two fully connected layers are used as the output layers to achieve the final reduction in output dimensionality. A flattening layer is used to convert the convolutional layer output which is two dimensional into one dimension for inputting into the fully connected layer. All n pixels in each central column of the input will be classified in the vocals and thresholding each pixel according to its normalized amplitude. The thresholding involved rounding off pixels above the threshold to one and rounding off pixels below the threshold to zero. After trial and error, the threshold was chosen as 0.15 for the chosen dataset to prevent noise from being falsely classified as vocals.

The mean square error was used as a loss function since it works well for binary values. The stochastic gradient descent optimizer was used with a decaying learning rate and with Nesterov momentum to converge to the global optimum and minimize overshooting.

The DSD100^[2] dataset, the MIR-1k^[3] dataset and the ccmixer vocals separation dataset^[4] were used for training. The learning rate was actively increased and decreased and different values were used as the initial rate, ranging from 0.1 to 0.0001. Training was taking upwards of 200 hours on a Google Colab GPU so a Colab TPU was used to train the model in a distributed manner and thereby substantially

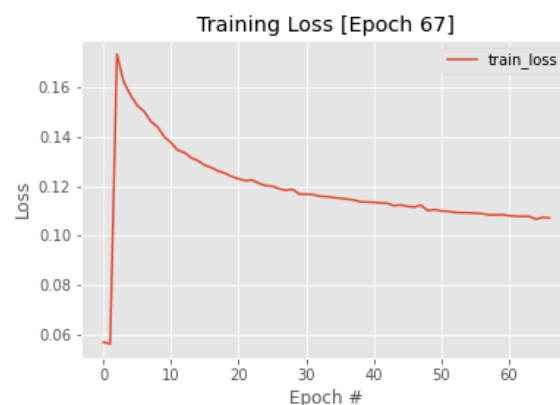


Fig.3 Model 1(Hard Mask) Validation Loss Plot

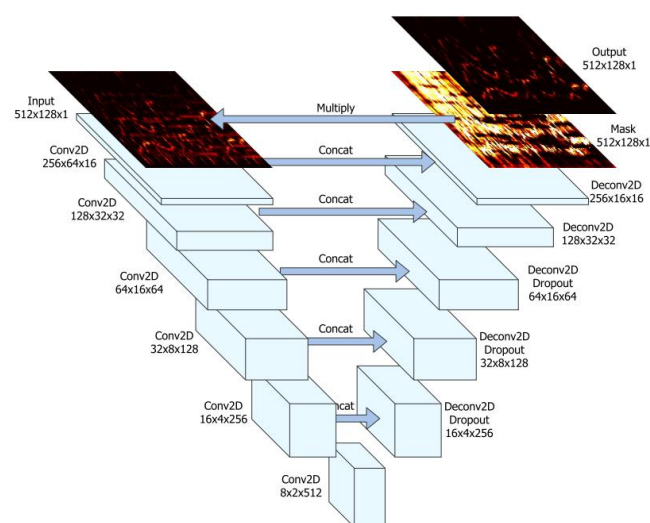


Fig.4 Model 2, U-Net Architecture (Soft Mask)

decrease the training time. However, in spite of several attempts to actively change the learning rate and batch size for training, the validation loss did not decrease substantially and the resultant vocals were not sufficiently clear.

Therefore, inspired by the paper by Jansson et al^[5], the U-Net architecture which has been developed for medical imaging and semantic segmentation and has found success in the audio processing domain as well, a new model was implemented. The first system predicted a hard-binary mask for semantic segmentation to obtain the vocals' spectrogram while the second system predicts a soft mask. This thus enables a particular frequency bin of the mixture's spectrogram to belong to both classes, that is, the vocals as well as the accompaniment instead of just one.

Since the U-Net model is much larger than the previous model, the sampling rate was further reduced to 8192 Hz and again, an STFT with a window size of 1024 was performed. However, here a hop length of 768 steps was taken. To ensure compatibility with the network, 128 frame windows of the STFT were passed into the model and 128 frame soft masks of the vocals were performed. These were concatenated to yield the complete output spectrogram. The model required an input dimension of 512 x 128 whereas the windows generated from the STFT were of size 513 x 128. Therefore, the first row of the windows was discarded to make the input dimensions compatible with the model requirements.

Layer (type)	Output Shape	Param #
input_2 (InputLayer)	(None, 513, 25, 1)]	0
conv2d_4 (Conv2D)	(None, 513, 25, 32)	320
leaky_re_lu_5 (LeakyReLU)	(None, 513, 25, 32)	0
conv2d_5 (Conv2D)	(None, 513, 25, 16)	4624
leaky_re_lu_6 (LeakyReLU)	(None, 513, 25, 16)	0
max_pooling2d_2 (MaxPooling 2D)	(None, 171, 8, 16)	0
dropout_3 (Dropout)	(None, 171, 8, 16)	0
conv2d_6 (Conv2D)	(None, 171, 8, 64)	9280
leaky_re_lu_7 (LeakyReLU)	(None, 171, 8, 64)	0
conv2d_7 (Conv2D)	(None, 171, 8, 16)	9232
leaky_re_lu_8 (LeakyReLU)	(None, 171, 8, 16)	0
max_pooling2d_3 (MaxPooling 2D)	(None, 57, 2, 16)	0
dropout_4 (Dropout)	(None, 57, 2, 16)	0
flatten_1 (Flatten)	(None, 1824)	0
dense_2 (Dense)	(None, 128)	233600
leaky_re_lu_9 (LeakyReLU)	(None, 128)	0
dropout_5 (Dropout)	(None, 128)	0
dense_3 (Dense)	(None, 513)	66177
Total params: 323,233		
Trainable params: 323,233		
Non-trainable params: 0		

Fig.2 Output

The U-Net comprises of a series of downsampling ‘convolutional layers’ till a minimum image dimension referred to as the ‘bottleneck stage’ is reached. Since semantic segmentation requires an output of the same dimension as the input image, a series of upsampling ‘transposed convolutional or deconvolutional layers’ are used to increase the dimensionality and recover an output image of the same size as the input image.

The downsampling and upsampling stages, each consist of 5 convolutional layers, interspersed with Leaky ReLU and batch normalization layers. The convolutional and transposed convolutional layers, both have a kernel size of 5x5 and a stride of 2. The loss function is the L1 norm of the predicted and target output, which is the difference of their absolute values. Due to the large amount of data and the lengthy resultant training time, this model too was trained on a Google Colab TPU.

Manual hyperparameter tuning was found to be time consuming since due to the distributed nature of a TPU, hyperparameter values previously successful in the literature, were not yielding desired results. Thus, a better method for tuning was sought. Primarily, optimal values for the batch size, learning rate, momentum and weight decay was sought. Leslie Smith’s cyclical learning rate finder^[6] was used to obtain a good initial set of hyperparameters. Herein, the learning rate is varied cyclically with a triangular window function to observe the loss at various rates. An optimal rate was found from the graph and an implementation of AdamW with a one cycle learning rate scheduler was used based on the findings of Grugger and Howard^[7]. AdamW was used due to its statistically superior weight decay algorithm. Due to the large size of the dataset and the limitation placed on google cloud buckets, transfer learning was performed wherein the model was successively trained on each of the datasets.

III. RESULTS AND CONCLUSION

Most of the models in current academic literature have been trained on datasets upwards of 20,000 music tracks. However, due to copyright limitations imposed by the production companies, none of these datasets have been publicly released. This and the feasibility of storing such a large dataset in the cloud for Colab based training presents a major bottleneck.

Since our dataset comprises of fewer than 500 songs, the model fails to effectively generalize but is successful in extracting the vocals for certain intermittent audio samples. This gives us confidence that the system is scalable. It is highly probable that increasing the size and variance of the dataset in both musical style and language will increase the model accuracy significantly. Hence a dataset is being prepared by scraping acapella databases and finding their corresponding mixes and where possible, their accompaniments as well.

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Autonomous Fire Fighting Robot using OpenCV

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Abstract— Human infiltration has become far less common as the field of robotics has grown, and robots are now widely utilized for security purposes. In our daily lives, fire injuries have become prevalent, and they might occasionally result in hazards that make it difficult for firefighters to safeguard human life. It's worth noting that it's tough for a human to detect fire in an area that's difficult to reach or see with the naked eye. Furthermore, because finding a water supply might be difficult, it may take several attempts to extinguish the fire. In these situations, a firefighting robot is utilized to safeguard people and the environment from fire harm. At present, the sector is transferring in the direction of the usage of technology (software programs and hardware). To design this robot with the maximum performance we're using OpenCV for human detection via image processing through a camera module. Sensors like a flame sensor for detecting fire, a temperature sensor for heat detection, and a gas sensor for gas released during the fire outbreak. Each sensor and a camera module in the robot is managed through the Raspberry Pi.

Keywords: *Raspberry Pi, OpenCV, Human detection, Camera module, image segmentation, flame sensor, python.*

I. INTRODUCTION

In real life, fires can occur at any time and in any location, and they are frequently difficult to control for firefighters. Fires can wreak havoc on structures, kill people, and result in unpredictably high damages. However, detecting a minor fire in an area that is difficult to reach or observe by humans is tough. The fire will spread swiftly as a result of this, which can be dangerous and devastating. This autonomous firefighting robot is being designed with an OpenCV to detect fire in a short amount of time, reduce damage, and detect humans (used for human detection). The management can be categorized into this step:

The robot is divided into two environments: control and the location of the fire. The control unit is responsible for monitoring and collecting data from the incident area through a camera module attached into the robot. These two areas are linked through the internet. The robot is made up of Raspberry Pi, which aids in the robot's movements and other features such as detection and visualization. The Raspberry Pi serves as a server, allowing communication between the robot and the control unit. Raspberry Pi includes an in-built Wi-Fi module that allows the entire environment to function as an IoT device. Enter the server IP address on the control unit remote desktop to connect to the robot. This will provide live

streaming as well as a count of the number of people present in the incident location. The camera module put on the robot does the live broadcasting. The OpenCV algorithm is used for human detection and also, we get the count of humans' presence in the incident area. When the robot detects fire or any gasses produced due to leakage, it sends the data to the control unit. The temperature sensor provides the temperature of the incident area that increases due to fire presence. During this procedure, the ultrasonic sensor is also employed for obstacle detection so that the chassis and interior components are not harmed. After receiving data from the incident area, the control unit can monitor the surroundings or regulate the robot's motion.

Some relevant work has been completed on the following subject:

Starting with [1] it describes the procedures involved in creating an autonomous and controlled IoT firefighter robot. When the flame sensor senses a fire, the robot waits a certain amount of time for manual control. If the robot is not being controlled, it will be changed into an extinguishing action. The remote desktop program receives the fire alarm. For the fire environment, there will be a surveillance window. The OpenCV-Python application is used to do both automated and manual activities.[2] explains the design of development of the robot mainly using a Wi-Fi enabled camera module and gas sensor. The process here is a wireless prototype that is possible to control from remote locations and constantly provides live video buffering.[3] says that the authors have developed an aluminum alloy chassis. Also with the help of a temperature sensor, they have detected the temperature of the area to have accurate results from the incident area and an ultrasonic sensor for detecting the obstacles around the robot to avoid the collision.[4] the authors proposed the prototype by using the Viola-Jones algorithm for detecting the human face. The built firefighting robot utilizes sensors that detect fire and employs a connected water pump to extinguish it.. In addition to the many sensors employed, the authors proposed a fire-resistant and waterproof chassis made of locally accessible materials that uses an Arduino fire extinguishment algorithm. The robot is designed to protect itself from fire by maintaining a safe distance. [6] It explains that the robot's primary duty is to serve as an unmanned support vehicle that can hunt for and extinguish fires. As indicated by the preceding literature, all robotic systems designed for fire detection and control fail to enable the rescue of humans besieged in fires. In addition to detecting the fire and providing live monitoring of the incident

area, the proposed work addresses this restriction by incorporating a human detection system to detect the presence of a human being caught in the fire and a count of humans present in the incident zone.

II. OBJECTIVE

In real life, fire hazards can happen anytime and anywhere when firefighters are out of control. Fire hazards can cause fatal damage to buildings, kill people, and may cause unexpected losses. Fire safety is therefore essential to human health. However, it is difficult to spot a small fire in an area that is difficult to reach or to be seen by anyone. This will cause the fire to spread quickly, which can be dangerous and deadly. In order to catch fire in the short term, we minimize damage and get people to design an independent fire extinguisher with an Open CV (used for human detection). It is noteworthy, from the above sources, that all robotic systems designed to detect and control fires fail to support the rescue of trapped people. The proposed work overcomes this limit by not only seeing the fire and providing live surveillance of the scene but also including a personal identification system to determine who was caught in the fire and giving the number of people present at the scene or place.

III. PROPOSED DESIGN

This is a robot chassis with caterpillar type wheels. The robot is used along with Raspberry Pi to drive the motors along with the L293D Motor Controller. This is made up of two wood plates and space is present between these plates to mount different sensors along with a raspberry pi module placed on top of the chassis. The chassis has holes for the screws to hold the Raspberry Pi, motor drivers, and other sensors/components. The weight of the chassis is about 450gms and the motor attached to it has a voltage between 3-9V. The caterpillar track is made of plastic to which the motors are attached. These motors will be driven forward and backward with the help of the L293D Motor controller. The sensors and raspberry pi are placed on the chassis in such a way that there is uniform distribution of weight over the surface of the chassis. Also with the chassis we have two different functions that are carried, one where the incident has occurred and another where all the data has been collected and monitored. Here we have used the human detection system using OpenCV, where humans are detected and we get the total count of the people present in the incident area. Using different sensors such as flame sensor and gas sensor used for detecting the fire. The sensors and motor controller are connected with Raspberry Pi, that has an inbuilt Wi-Fi connection present. All the data is collected, observed and accordingly further steps are taken depending on the level of intensity and casualties. This robot was made with a thought that it can detect dangers present in its range, provide real time data as well as surveillance of a given particular incident area

where human access may get difficult (areas caught up with lots of fire).

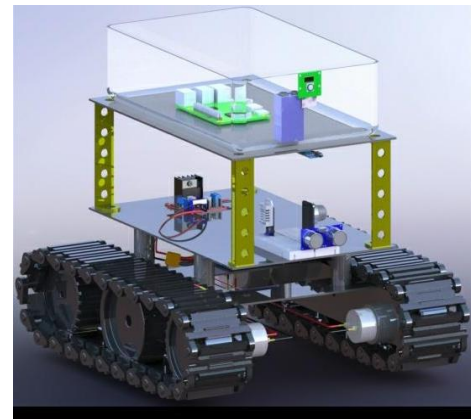


Fig.1 CAD Model

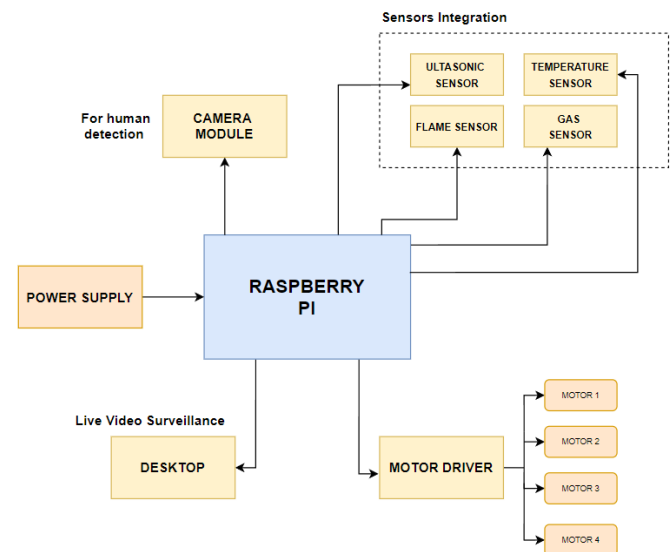


Fig.2 System Architecture

IV. IMPLEMENTATION

A. HUMAN DETECTION

Human recognition and tracking are used by computer vision systems to find and follow persons in video footage. Human detection is a technique for recognizing all human occurrences in an image or video by evaluating all sites in the picture at all feasible sizes and comparing a tiny portion at each site with known people templates or patterns. Human tracking is the process of creating persistent traces, or trajectories, of people by linking human detections in a video clip across time. The first two aspects of a video surveillance pipeline are typically human detection and tracking. The first two aspects of a video

surveillance pipeline are typically human detection and tracking. There is a difference between recognizing people and detecting other objects. Object detection in manufacturing, for example, is very different from people detection in most cases. Manufacturing object detection applications could include pipeline tracking, robotic behavior analysis, or the use of computer vision to evaluate microscopic defects. Human detection objectives in the same industry may be more oriented toward other aspects of operations.

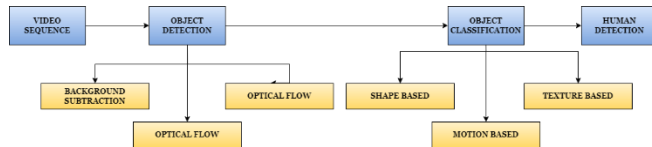


Fig.3. Flowchart for object and human detection

AI analysis, for example, may be able to use existing security camera feeds to improve worker safety in plants, supplementing existing practices and safeguards. This level of versatility is enabled by the AI CV tools' ability to detect object types rather than just their presence or movement. We implemented OpenCV for human detection and image segmentation to get several humans present in the incident location. Image segmentation is the process of dividing images into distinct sections. We used two alternative ways in this example: one using photos and the other with a live camera module.



Fig.4 Human detection using image

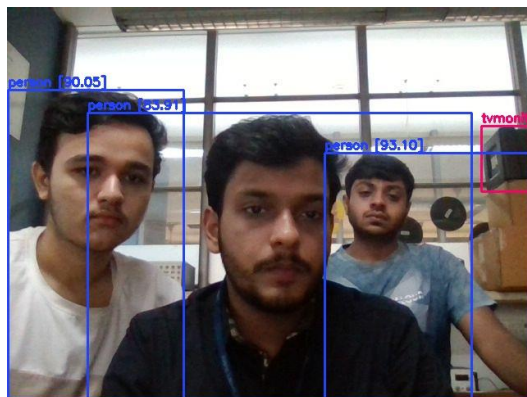


Fig.5 Human detection using camera module

B. CHASSIS

We created an all-terrain chassis with caterpillar wheels and tread. Caterpillar wheels give improved flotation, a smoother ride on bumpy fields, stability on hillsides, and superior maneuverability. The robot moves by employing a motor coupled to the caterpillar tread's rear and front wheels. The L293D controller is utilized to drive the robot's high torque and speed motor. By connecting the ultrasonic sensor to the Raspberry Pi, the distance between the robot and the barrier is determined. All of the sensors are mounted on an alloy sheet that can withstand temperatures of up to 200 degrees Celsius. To install the sensors and other mechanical components, holes in the alloy sheet on the top of the chassis have been drilled. The flame and ultrasonic sensors, as well as the camera module, are placed in front of the robot to detect fire quickly and prevent colliding with any obstructions. A 3D schematic of the firefighting robot is created using Solidworks. To illustrate the figure clearly, 3D rendering is employed. The whole weight of the robot, as well as the sensors mounted on it, is equally distributed, resulting in a sturdy chassis.

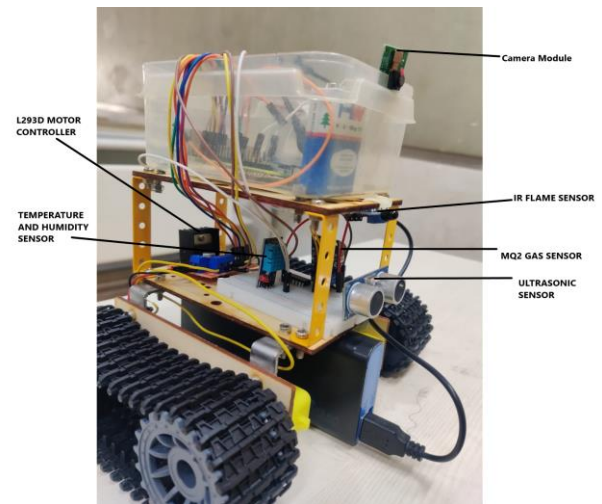


Fig.6 Designed model

C. HARDWARE IMPLEMENTATION

The Raspberry Pi OS is used to build wireless and web-based robots. The Raspberry Pi camera module is linked to the Raspberry Pi, and movies are wirelessly broadcast from the robotic car to the user's monitor, where the user may command the movement of the robotic vehicle. Wi-Fi is built into the Raspberry Pi, allowing it to send and receive data over the internet. To monitor the incident area, we may use an IP address generated by the Raspberry Pi. We used a flame sensor to identify the presence of fire at the incident site. A flame sensor is a detector that detects and responds to the presence of a fire or flame. At a distance of 100cm and a detection angle of 60 degrees, flame detection is achievable. This sensor's output can be either analog or digital. An MQ2 gas sensor, on the other hand, has been used to detect gas leaks

or fire-generated gas. Among other gases, it can detect H₂, LPG, CH₄, CO, Alcohol, Smoke, and Propane. Because of its great sensitivity and short reaction time, measurements may be performed as quickly as possible. When the temperature climbs over a certain threshold, the flame sensor does not provide us with the correct output. In this case, we use the DHT11 Temperature and Humidity sensor, which can detect temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of 1°C and 1%. This sensor measures the safe distance between the obstacle and the robot. The non-contact measuring range of the HC-SR04 ultrasonic ranging module is 2cm to 400cm, with a ranging accuracy of 3mm.

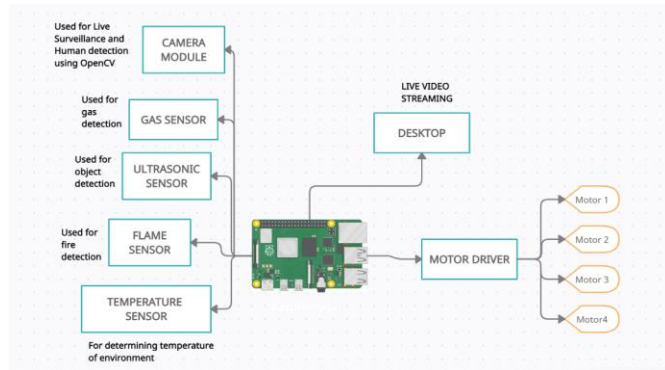


Fig.7 Connection of different component on Raspberry Pi

V. CONCLUSION

We have successfully developed a Fire Fighting robot with all the essential systems which will help safety and rescue management forces. This robot can be handy in situations where human intervention is not possible or a bit dangerous before getting the insights on a situation. The Fire Fighting Robot is made from locally sourced materials and put to the test in a variety of scenarios to discover how successful it is. This efficacy test will aid us in designing a better model because the Fire Fighter Robot must deal with a range of conditions. The Fire Fighting Robot is capable of putting out small-scale fires. In low-light situations, it is more effective at detecting fire flames. This multisensory-based robot could be the answer to all fire-related problems. It has advantages such as the capacity to automatically detect the location of a fire, as well as a compact body and lightweight structure. The data of fire detection in the incident region is provided by flame sensor, gas sensor, and temperature sensor, and the constructed chassis has the capacity to avoid hitting any obstruction or surrounding object due to the presence of an ultrasonic sensor. Here the main role is Human Detection using OpenCV. We have used OpenCV using python for this, where we get the count of the presence of humans in the incident area.

VI. SOCIAL IMPACT

Independent or not, no one expects the machines to completely replace people in the fire line. Robots are tools and one

important and valuable thing they can do to reduce the risks to human firefighters. A fire incident is a disaster that can result in loss of life, property damage and permanent disability to the victim. They may also suffer from chronic mental illness and trauma. Firefighters are primarily assigned to handle fire incidents, but they are more likely to be exposed to high risk when extinguishing a fire, especially in dangerous areas such as nuclear power plants, gas stations and gas tanks. They also face other difficulties, especially if the fire comes from narrow and confined spaces, as it is necessary to inspect building ruins and obstacles to put out the fire and save the victim. A fire-extinguishing robot helps or helps responsible individuals to prevent a fire from spreading and extinguishing it. A robot with the help of an open cv can detect people trapped in a fire and help locate the victim's exact location where firefighters can easily rescue them from the ordeal. There are many uses of this robot in real world situations such as it can be used in archives where fire can cause loss of important data, all work environment that requires permanent user attention. -In power control rooms, captain's bridges, air traffic control centers. An autonomous firefighting robot is proved to be very useful in critical situations.

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Android Controlled Car Using Bluetooth

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Abstract— In today's date we are surrounded by emerging and ever growing technology around us. When we talk about technology as such we mention smartphones which have been continuously upgraded and improved in recent times. Bluetooth is one of those features which is used to connect to external devices as well for data exchange. Android has been extensively used and accepted in smartphones. Android has an entire package of an operating system, middleware and core applications. Self driven car and autonomous driving is already an active research field with several capabilities and outcomes. The following paper is dedicated towards a small prototype as such in the form of an Arduino based android controlled car. In this project we will use dual H bridge gate drivers to drive and control the dc motors. The motors will receive their supply from a DC source battery. The entire circuit will be programmed by an Arduino module. The circuit along with the microcontroller will be connected to an android application with the help of HC-05 Bluetooth module. The app on detecting the taps and gestures of the user will communicate the commands to the arduino through Bluetooth module serial communication.

Keywords— *Arduino, sensors, gate, drivers, Bluetooth, Android.*

I. INTRODUCTION

Nowadays the need of automisation has increased with the hype, trend and demand of self driven cars the need of proper utilization of cutting edge technology is a must. With this view in mind one can control the movement of a mobile device with the help of Wifi, Bluetooth or any radio controlled mechanism with the soul target of maneuvering the main object. With the hype, trend, and desire for self-driving cars, correct use of cutting-edge technology has never been more important. With this perspective, one may use Wifi, Bluetooth, or any other radio-controlled mechanism to control the movement of a mobile device with the only purpose of manipulating the main object, in this case our Bluetooth-controlled car, whose ultimate goal is to safely reach its destination! This device may be controlled by humans via their mobile phones, which can use the built android app to move the Bluetooth car, which

is connected to the mobile device via a Bluetooth wireless connection located inside the arduino chip. In this case our Bluetooth controlled car whose end goal is to search the destination safely! For the communication between android application and arduino, Bluetooth module will be used. This Bluetooth module that is popularly known as HC-05 is a broadly used popular module which can add full-duplex wireless functionality. The android application will be able to establish a connection with the designated microcontroller through the Bluetooth setup. The application will act as a remote control for the arduino-based vehicle. The app will have a set of charges which will be communicated to the microcontroller, with the help of which a vehicle will commute forward and reverse as well as left and right. Such a program will be run within the microcontroller to act according to those commands.

II. OBJECTIVE

In the twenty-first century usage of Smart phones have now become inevitable and especially Android-based smartphones are getting increasingly powerful and equipped with a variety of robotics-related peripherals. Our project explains how to control our arduino based car using your own mobile via Bluetooth communication. It makes our robot that is our bluetooth controlled car to move front, back, left, and right. Wireless connections like Wifi Bluetooth etc, has transformed how people use digital gadgets at home schools and even at work, and these means of communication have transformed wiring systems and digital devices to wireless ones. In this project bluetooth communication and arduino connections have been used. For connection the Bluetooth module is connected to the microcontroller, we're using Arduino software. The cars mobility is controlled by commands received via Android via the bluetooth module that is connected to the app on the phone. This is a project that is both cost-effective and efficient. In comparison to existing projects, the innovation resides in the fact that it is a cost-effective project with a simple and easy-to-use interface, because of this functionality the Bluetooth RC Controller that we are using is trouble free to implement in any application. Because the robot is small, it can be utilised for espionage. This robot can be employed in the army to identify and destroy buried ground mines with a few improvements and adjustments. The robot can be used to keep an eye on things. We can connect the sensors and various electronic components to this working model in the future so that it such that it can examine and update certain parameters and which are implemented by the logic used in using Internet

of Things (IoT). In order to combine extra security elements, we may also add a wireless camera. Bluetooth connectivity between the Smartphone and the microcontroller is possible. It can be utilised building robots with military applications on a large scale. It can be used to track an opponent without the need for a person to cross a border. It allows for more application creation using the Android operating system. With such a great smart phone on the market, there will undoubtedly be many more applications in the coming future.

III. LITERATURE SURVEY

The ultimate goal is to design a Bluetooth-powered android car for autonomous environment as well, as cost effective. Many researchers have extended their research on android programs to reduce human capacity and human efforts and define their methods. These projects were controlled by software programs. M.Selvam has predicted a design to develop a robotic system connected to a wireless night vision camera for remote monitoring, in his research paper. Bluetooth was used in his project to provide communication between the robot and the smartphone. Although Vito M Guardi has come up with a blueprint for Bluetooth by making an android robotic system driven by a small controller. The main purpose of his work is to show that a single android app can be run using completely different electronic devices. On the other hand, Arpit Sharma, Reetesh Verma, Saurabh Gupta, Sukhdeep Kaur Bhatia have developed an android smartphone that can control a robot with Bluetooth technology. The phone uses motion sensors and records signals sent to the android phone. It also has a built-in accelerometer and a Bluetooth module to control the movement of the robot.

The Bluetooth-Controlled Robot Car which is cost-effective is designed not only to reduce human activities but also to operate privately, security, and rescue operations. Tezel and Hangan designed and installed a Bluetooth-controlled robot using Arduino. Braun et al. describe roaming systems for off-road robots that rely on roaming to avoid obstacles on the map. Ritika Pahuja and Narender Kumar have designed an Android-powered Arduino-based Bluetooth car. When the Android app is turned on, the system connects via Bluetooth. Android provides easy-to-use information. Nelson et al. described a Bluetooth-enabled robot model that was controlled by Bluetooth modules and sensors. This design does not affect any visible obstacles such as walls, doors, etc. Even with so much research and trials, a Bluetooth-controlled android car is not available completely in the market. Therefore, these devices need a lot of distribution and can be used as one of the best personal means physical labor.

IV. LITERATURE REVIEW

Arduino being the brain of a limited number of projects as it has all the end user needs including its built-in converters, I / O pins, etc. Wireless technology has become the current need but unfortunately, it is not utilized fully due to the abundance of data and communication overheads. Our project uses a Bluetooth HC-05 module and can be controlled using android phone. Arduino integration with

Bluetooth can control many things like home lights, air-conditioners and much more through phone. The project is designed to advance android application-based robotic vehicle for remote operations.

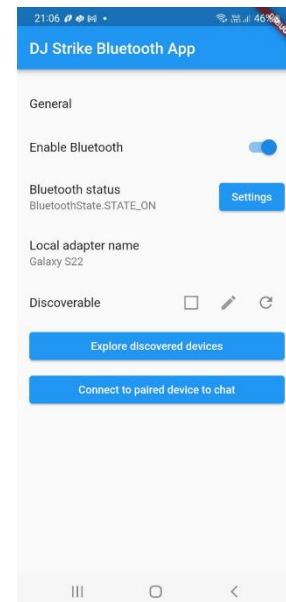


Fig.1 Start screen of the application

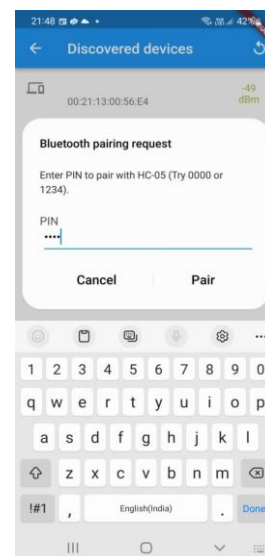


Fig.2 Configuration screen

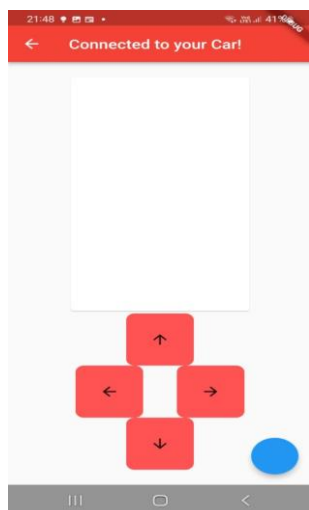
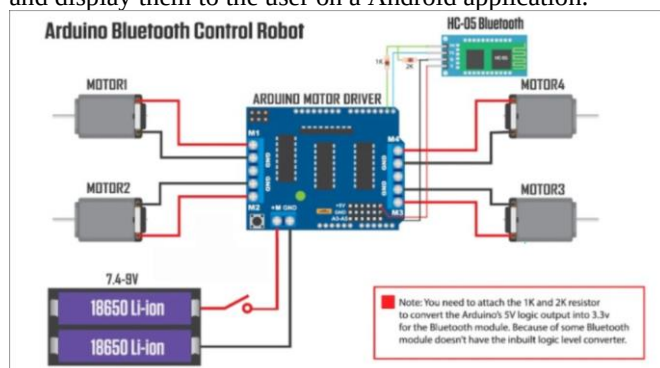


Fig.3 Home Screen

V. IMPLEMENTATION

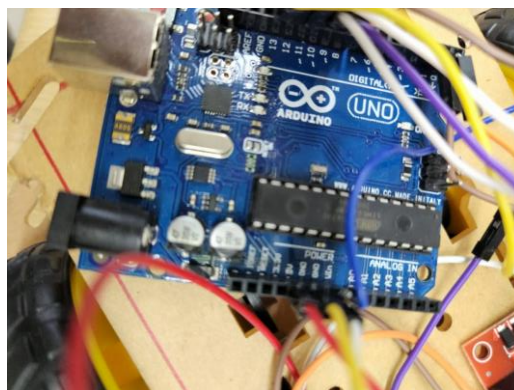
Our project consists of the following parts for implementation:

Arduino Uno ,Motor Driver connected to the Wheels (4x) 12V Gear Motor (4x) HC-05 Bluetooth Module as a source of wireless connection 12 to 14v rated DC battery cells for power Male and Female Jumper wire for arduino module connecton along with ground and the Bluetooth module mounted on Acrylic Sheet and DC Power Switch for on and off. Additionally a ESP32 Camera module has been used to capture real time images of the vicinity in front of the car and display them to the user on a Android application.

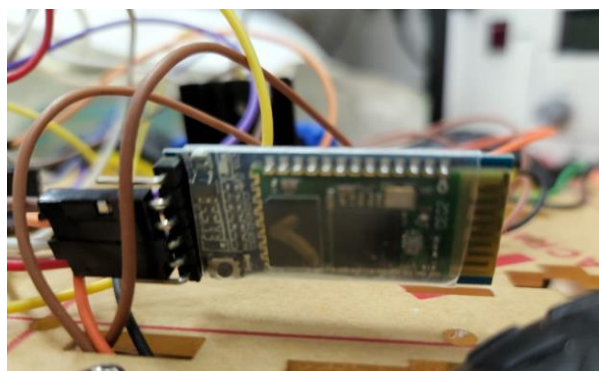


Usage Of Arduino:

Arduino a micro-controller has the main use as brain of the robot just like the mind controls the actions of human body Arduino is programmed to control the output control like buttons, motors, switches, and other electronic parts . This main organ that is the brain of the electronic body works when it is connected to the computer by a plug it works when the program on the computer is received by the Arduino.



Arduino



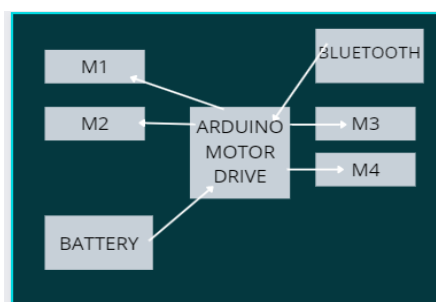
Bluetooth Module

The popular HC05 module forms the medium of serial communication between the Arduino and Android application. It is a low energy device used for serial transmission of data/messages in the form of bits.

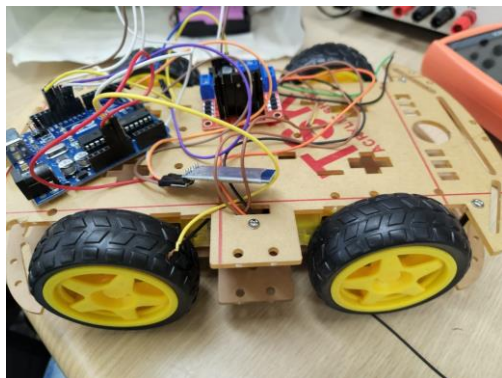
Usage of Motor Driver:

There are two factors one is the direction of motors and the other is the current. Arduino Capacity is only 40mA and we require 100mA hence we need a driver circuit that is provided by microcontroller L293D capacity of L293D=1A with 4 outputs AC and DC motor can rotate in both directions. According to the user control one can change the direction of rotation of the motor by changing the DC motor could rotate in another direction just by changing the polarity of the current. These motors of Direct current has very good efficiency. To avoid the complexity and IC name l293d which solves both the problems of direction that is clockwise or anticlockwise and even the positive and negative polarity.

Block Diagram:



This system's main functional unit is the RC module. The Arduino Uno, and all devices as mentioned above are coupled to the circuit. The dc motors are controlled by L298N motor drivers. The Arduino Uno, a little android chip, is located in the core of the device. It's in charge of talking with an Android smartphone over Bluetooth and controlling the motors via the motor driver. This Arduino chip is used to power the RC device, which is powered by a 6V battery. The addition electronic device is used as, a sensor, is used to sense the fluctuations in temperature and humidity and climate of the of the environment. The Bluetooth module HC-06 is used for controlling the module.



The following milestones have been reached throughout the development of this project. The android guided arduino car has been successfully developed, and testing has been completed for all known situations of project utilisation.

The following milestones have been reached during the course of this project's development. The android-guided arduino car was successfully developed, and all known scenarios for project use were tested. The project goal of building an android interface, Arduino bot, and configuring arduino microprocessor has been achieved. The Arduino car includes an Arduino microcontroller with minimal motion control. Arduino apps serve as a bridge between the Android controller and the Arduino car.

VI. RESULTS AND CONCLUSION

The following project was based on a popular aspect of interfacing Arduino with a Mobile application. The current project has been executed and performed successfully. The use of popular bluetooth serial communication to control a car over an android app has been successfully implemented. Additional features such as adding surveillance camera has met satisfactory results. The hardware implementation along with assembling the chassis has been done successfully. All the constraints were taken into considerations while writing the code for the microcontroller and the application. The code and application has provided with prosperous results. The code was written in such a way following good practices with optimization and clean architecture. The system built hereby is tested and entire working has been a success.

There is scope for future improvements such as improving wireless range by using a Wifi module instead of a

bluetooth. Bluetooth also can be ambiguous due to noise in the communication or baud rate mismatch.

VII. SOCIAL IMPACT

The Arduino vehicle includes an Arduino microcontroller with minimal movement capabilities. The Arduino utilisation in today's tech world plays the role of a connection between the Arduino automobile mobility device and the controller. To supervise mobility, the Android mobile controller makes use of a variety of mobile sensors. With the wireless communication the device can be operated from a distance within the range of the bluetooth frequencies hence reduction the cost of wiring.

It can be employed in a variety of sectors to pick up objects that don't require human intervention. It can be utilised to manufacture robots which can be used for army purpose on a prolific scale. It tracks down an opponent without the need for a living being for actual movement while passing the barriers. It allows for more application creation using the Android operating system. Sensor-based applications (accelerometer, gyroscope, etc.) are an example. With such a powerful smartphone on the market, there will undoubtedly be many more applications in the near future. It can be used in rescue operations because it is sturdy, sensitive, and rapid moving.

This module can be utilized in a variety of applications, including: low-level mobile monitoring devices, military applications (no personal involvement), assistive devices (such as wheelchairs), and home switches. This robot can be employed in the borderlands to detect and dispose of buried land mines with a few changes and adjustments. The robot is capable of reconnaissance and surveillance.

ACKNOWLEDGMENT

This project and technical paper were greatly supported by Professor Tanaji Biradar. His professional training and full assistance were helpful to us at all levels of the profession, and this paper would not have been possible without his ideas and contributions. Many thanks to our colleagues who contributed their knowledge and experience to the study and assisted us throughout this process.

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Energy Monitoring System

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Abstract --- Electricity is one of the basic needs of mankind, often used for living purposes and for short periods of time. Extremely unfamiliar with half a meter of power in the grid. It is an important part of the distribution network. Currently, IoT based applications are becoming more and more popular as they provide efficient results for many real-time problems. Energy meter helps mile (electrical distribution company) track consumer electricity consumption in kw hourly. In order to minimize fatal errors and energy consumption costs, smart meters are forced to use digital power meters and mobile operations that can automatically translate meter units.

Keywords— *Arduino IDE, ESP32, ZMPT101B, SCT013030, LCD display, Capacitor, Resistor, Load, Jumper wires, Blynk app.*

I. INTRODUCTION

Currently, the demand for electricity is very high and the demand for electricity is increasing day by day, leading to electricity theft and electricity shortages. Energy Monitoring Systems take a lot of time and effort. The proposal for this project is to provide monitoring of electricity meters so that the Department of Electricity can read meter readings without going to each house, avoiding electricity theft and eliminating the need to operate and save costs.

The biggest problem in power distribution is collecting meter reading data, currently manually collected meter readings can lead to faulty readings. This is also a waste of human resources. Our existing power meters are not a guarantee of accuracy. There is no voltage and overvoltage protection in existing meters, no overpower warning system, so the application cannot collect peak demand and power theft is a big problem in these date, resulting in significant losses. on the electrical panel. To overcome these problems, we will develop energy monitoring system based on IoT.

II. LITERATURE SURVEY

This article provides a wireless power monitoring system meter using the Blynk system with a smartphone. In addition, the battery is used as a backup power and the over usage notification is an optional feature built into this system.

In this paper, the authors propose an Arduino-based smart energy meter with an ESP8266 WiFi device that can provide electricity bill information via SMS or email and can provide monitoring applications. Monitor energy anytime and anywhere in the world.

The smart grid goes beyond the limitations of the conventional grid with the installation of smart meters on

the grid through AMI. Its smart meter can be defined as a force meter that measures energy consumption with many built-in smart features such as demand management, demand response, load control, load reduction, etc

In this article, Electricity meter with Internet device monitoring smart home for objects. This paper proposes a system that weakens the ability of workers to self-regulate meter readings and to produce invoices that reduce existing errors, one of the main causes of electricity-related corruption.

III. BLOCK DIAGRAM

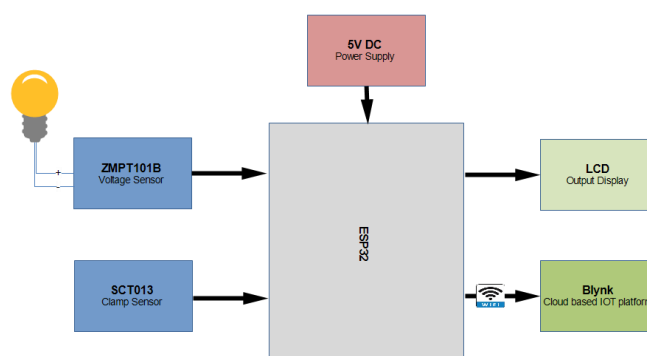


Fig.1 Block Diagram of Energy Monitoring System

IOT based energy monitoring system senses and monitors the electricity consumption of either a single appliance or the overall energy consumed by all the appliances. In this project we have used:

1. ESP32 Microcontroller
2. ZMPT101B (AC Voltage sensor)
3. SCT013030 (Current sensor)
4. LCD Display

IV. CIRCUIT DIAGRAM

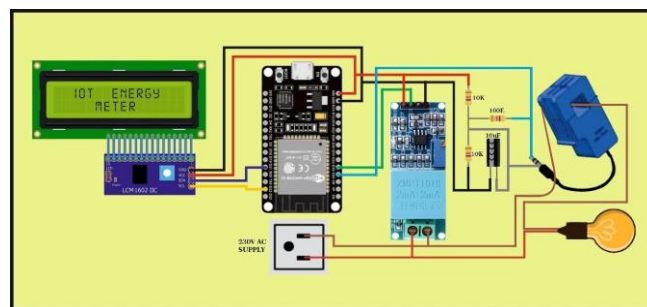


Fig.2 Circuit Diagram of Energy Monitoring System

IV. WORKING

ESP32 Microcontroller:

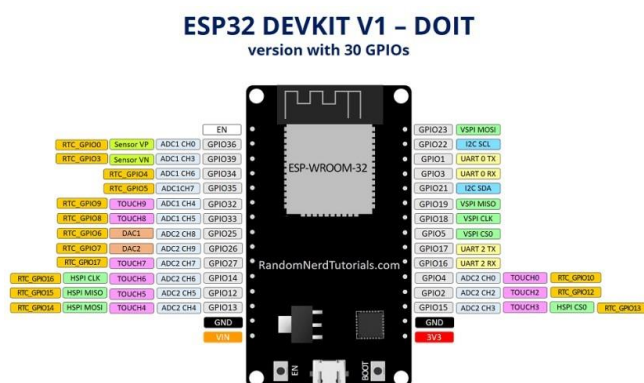


Fig.3 ESP32 Microcontroller Pin Out

We have chosen ESP32 microcontroller as it has in build WiFi and Bluetooth module which is a great advantage in building IOT based project all the data revived from ZMPT101B and the SCT013030 are processed by the ESP32 and sent to LCD via I2C and the Blynk app through internet.

ZMPT101B (Voltage sensor):



Fig.4 ZMPT101B

ZMPT101B is a voltage sensor which measures the voltage consumed by the load and converts it into suitable digital format and gives it to the ESP32 microcontroller, it can measure voltage upto 250V it has high precision OPAMP board. Initially the ZMPT101B requires to be calibrated with the help of the potentiometer because it has a primary and secondary coil and the output signal will change accordingly during the calibration we must take care the waveform obtained is not clipped so as to get a correct reading.

SCT013030 (Current Sensor):



Fig.5 SCT013030

SCT013030 is a AC current transformer it can accurately measure from 0-100 Ampere. It is a fairly simple device as we just have to pass the current carrying wire through the clamp. It has a major advantage that we do not need to strip the wire in order to measure the current, it measure frequency is from 50Hz to 150KHz. This device requires an input current of the range of 0-30 Ampere. We have connected this device through AUX input to the ESP32 microcontroller.

LCD Display:



Fig.6 LCD Display

We have chosen the LCD display to display the real time voltage and current values. We have used a basic 2x16 LCD display and interfaced it to ESP32 Microcontroller via I2C.

Linking to the Blynk App:

Using the Blynk Cloud we have uploaded the outputs and Serially Displayed them on the Blynk app the factors such as voltage, current, power and kWh are mapped to the virtual output pins in the code. Using the Blynk app a user can monitor the energy consumption remotely and accurately without any human error.

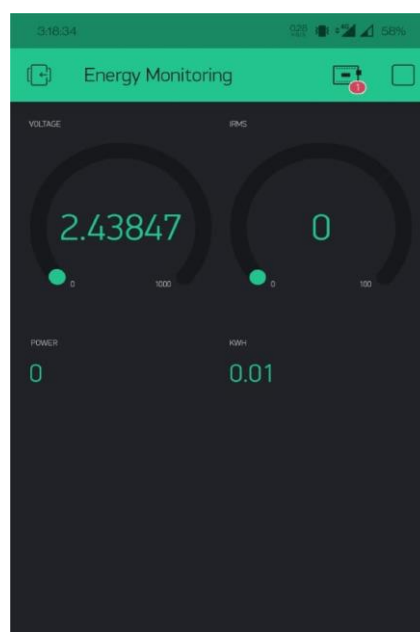


Fig.7 Output using Blynk Cloud

VI. RESULTS

After the implementation we can see that the energy consumption is been measured every 3 seconds, we can remotely measure values such as voltage current and KWH as measure by the sensor and sent by the ESP32 remotely on the Blynk app.

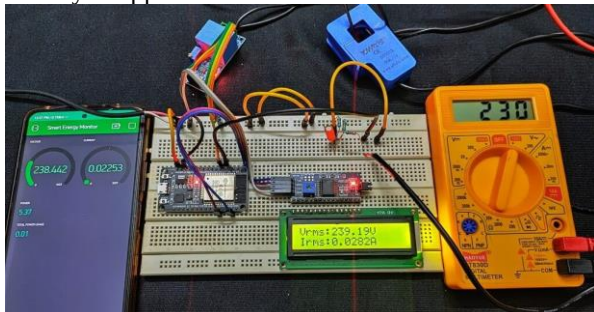


Fig.8 Output

VII.FUTURE SCOPE

- 1) We can use a voltage sensor with better accuracy.
- 2) We can modify flash make a dedicated app such that a user can see the amount of energy consumed in terms of money and can customize the upper limit of the energy as per his/her need
- 3) We can control appliance by setting a threshold value, which once crossed will turn on or off the appliance and thus saving energy and the planet.
- 4) We can introduce ML to monitor the energy consumption pattern and notify the user when it detects unusual power spending. Thus preventing electricity theft.

VIII. CONCLUSION

Thus after implementing the project we can successfully avoid the human error, the wastage on time and fuel which is spend in order to collect the reading from every house. Its implementation will also make the people aware of their energy spending habits and help them to cut down their energy wastage and their money.

It solves the problem which we all face during the lockdown of ridiculously heightened electricity bills as there was no provision to take the readings.

IX.ACKNOWLEDGEMENT

This project and technical documentation is strongly supported by Professor Archana Chaudhary. Her wise advice helped us in most of the aspect of this work. Thanks to everyone for providing us your knowledge which helped us in successfully making the project.

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Health Care Management

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Abstract — Half the world's population lack access to basic health care. Many families are pushed into poverty because health care is too expensive for them. Despite the huge differences between developing and developed countries, access is a major issue for rural health worldwide. Even in countries where the countryside is densely populated, resources are available in the cities. All nations have problems with transportation and communication in rural and remote areas, as well as a shortage of doctors and other health workers. Many rural people in developing countries are trapped in a cycle of poverty, poor health, and low productivity. Healthcare facilities are a major problem in today's world, especially in less developed countries with limited access to high-quality hospitals and medical professionals. Health has benefited from the wisdom to do the same as it has been achieved in other areas of health. In this study, we present a novel and intelligent health care system based on advanced technologies such as Internet of Things (IoT) and machine learning. The system is smart enough to hear and evaluate patient data using a health care decision support system. For those living in remote areas, this gadget provides an inexpensive way to determine if they have a significant health condition and seek care by driving local hospitals. Medical staff can use this method to diagnose a patient. Maintaining a patient's health regularly becomes a daunting task in hospitals with small staff. This gadget makes tracking patient progress easier.

Keywords — Internet of Things (IoT), TTGO ESP32, Cloud Storage

I. INTRODUCTION

When connected to the Internet, Internet of Things (IoT) refers to a network of sensors with built-in sensors and software that can interact and exchange data with other tools and systems. When essentials are collected and sold for data acquisition, it reduces the amount of personal involvement required for a variety of tasks, which ensures seamless communication between people, processes, and objects. Near-Field Communication (NFC), Radio Frequency Identification (RFID), low-power Bluetooth and Wireless, and Wi-Fi Direct are some of the technologies that can be used to build IoT systems. The integration of IoT with cloud computing, machine learning, and artificial intelligence has allowed it to be widely used in a variety of industries, including agriculture, manufacturing, health, energy, automotive and transportation, and more. The healthcare industry has seen great strides in technology. The potential for hospitals, medical professionals, and providers to provide quality health care services has been severely hampered by growing barriers to health care, ranging from the development of chronic and incurable diseases. Disruptive illnesses to lifestyle disorders to the ageing global population. However, advances in cutting-edge

technology such as the Internet of Things (IoT), Artificial Intelligence (AI), Machine Learning (ML), and Data Analytics have enabled healthcare practitioners to overcome these challenges and provide patients with effective treatment. In this regard, IoT has sparked the most interest in healthcare because of its wide-ranging potential. Health workers can take the necessary steps early and respond quickly to changes in the patient's condition. The specialist system transmits patient information and data about these devices to a cloud-based environment, where they are stored and monitored. The purpose of this paper is to provide an overview of current IoT technologies in health care. The potential of IoT-based healthcare is constantly being explored to determine how IoT can increase access to preventative public health services and help us move from our current health and higher education programs to more efficient, sustainable, integrated systems. approach. Finally, this paper will discuss potential problems with IoT-based health care, including market acceptance barriers for both health care professionals and patients, trust and acceptance, privacy and security, cooperation, suspension and payment, data retention, and control and ownership. Policy support, cybersecurity-based practices, strategic planning, and open-ended policies will be major supporters of IoT in modern health care within health care organizations.

II. MOTIVATION

The healthcare industry is changing dramatically in today's highly technologically advanced environment. Concerns about rising health care costs, effective treatment of chronically ill and rural patients, and the need for early diagnosis have all contributed to the significant growth of IoT technology and use in recent years. We continue to create technology to treat diseases and improve our quality of life as we move forward in the 21st century. The gap between the quality of health care in rural and urban areas is widening as new technologies emerge every day. A major problem with rural health care systems is the lack of access to qualified doctors and specialists. A health monitoring system can help us close the gap by collecting information such as heart rate and temperature and send it to a specialist. Such a system can also be helpful in treating Covid-19 patients. As we know a great percentage of hospital staff suffered from covid-19 due to direct interactions with the patients. By using a Health monitoring system to take temperature and pulse readings these interactions can be reduced. Furthermore, a lot of other benefits can be gained by using this project. In daily life when the patient is away from the hospital or is away from home, immediate help can be given to the patient. In case of lower heartrate, the patients watch will have an in-built system which will send

alarming notification to the patient's family and the doctor in charge.

III. LITERATURE SURVEY

One of the most frequently debated issues related to high technology, especially in modern times, is health care management. The technology and healthcare these days go hand in hand. The introduction of various digital gadgets has had a huge impact on the healthcare sector. In the field of medical science, much work is being done using IoT to monitor patient health. The following are the activities linked to this field: In the IoT Network, Tamilselvi et al. [5] developed a health monitoring system that can monitor important patient symptoms such as heart rate, airway obstruction, body temperature, and eye movements. Heartbeat, SpO2, Temperature, and Eye Blink sensors are used as recording components, Arduino-UNO serves as a processing device. Although the designed system was used, no specific operating measures for any patient were provided. Trivedi et al. [6] has proposed a health parameter monitoring system controlled by Arduino mobile device. The analogue data from the sensors is transferred to the Arduino Uno board. The analogue values are converted to digital data using a built-in analogue converter. Visual properties have been transferred to a Bluetooth-enabled gadget. The Bluetooth gadget used a module that did not cover the main region. We have developed the TTGO ESP32 for our health care management project, which will help us make our project more cohesive and easier to use.

IV. PROPOSED DESIGN

We begin by measuring the required details with the help of a temperature sensor and a pulse rate sensor. The data of the sensor is processed in TTGO. Further, the data collected is added to the IoT device. The required data is sent via ESP32 to the cloud storage. The information is then extracted from the cloud and is analysed by transferring it to the Android App. The Android app then displays the data which was initially received from the pulse rate sensor and temperature sensor.

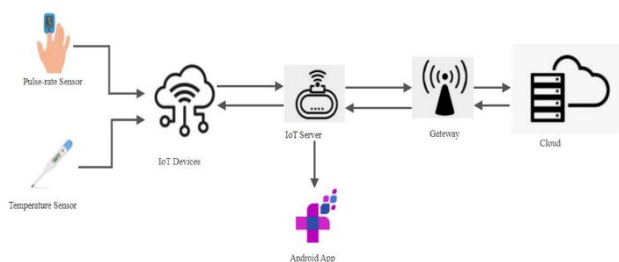


Fig.2 Flowchart of the proposed design

V. IMPLEMENTATION

5.1 Hardware Integration

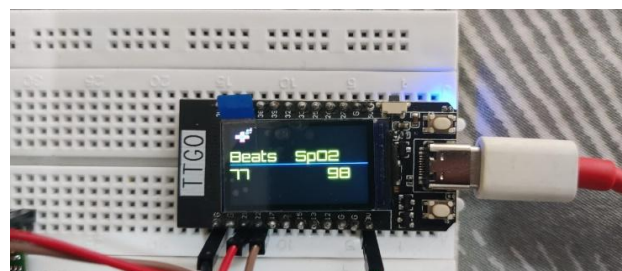


Fig.3 TTGO Module

The ESP32 Wi-Fi Module powers this TTGO board. It contains an onboard battery hookup and energy management system, as well as a built-in 1.14inch display. The board contains a USB Type-C port onboard that may be used to power the ESP32 and upload programs. It's simple to use and consumes little energy. MAX30100 pulse rate sensor
MAX30100 is optical sensor that provides oxygen level and heart rate level. It measures pulsating blood through photodetector which emit red and infrared wavelengths. It communicates with the host through I2C Protocol. The digital output is kept saved in device through 16-deep First in First out

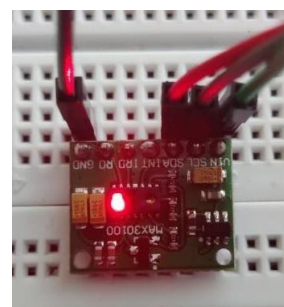


Fig.4 Max 30100 IR sensor for heartbeat and SpO2

Fig.1 Working of system

Two sensors are used in IoT patient monitoring. The SPO2 sensor is the first, while the Heartbeat sensor is the second. The doctor may monitor patient health metrics with this initiative, and IoT apps are also being created. As a result, the doctor or family members may now use Android applications to monitor or track the patient's health.

Person 1 had a MAX30100 sensor reading of 98 and a pulse oximeter measurement of 98 after the heating period. When tested with an oximeter, individual 2's MAX30100 was 97 and varied between 97 and 98. As a result, we deduced that the sensor gave reliable readings after a 30-second heating interval.

5.2 Software and Database

The android app that communicates with the Arduino esp32 and displays sensor readings on the screen. For data communication, we use the TTGO's built-in Bluetooth module. The android phone must be linked to the Bluetooth module for the transfer to work. The app has a button to connect and disconnect Bluetooth connectivity. It also notifies the user via noise whenever a Bluetooth connection is established or disconnected. Once the Bluetooth connectivity is established with the esp32 the reading of the sensors start displaying on the screen of the android phone. The app displays reading in a large font to aid the elderly people. The app has a simple interface and is very easy to use.

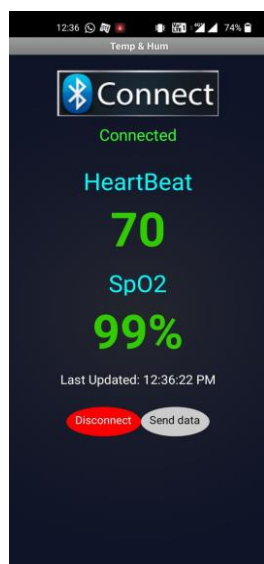


Fig5. Mobile App showing HeartRate and SpO2 value

The app's sensor data is saved in a database. The database was built using Firebase, a Google-backed application development platform. The purpose of creating this database is to allow future patient doctors and family members to cooperate on data analysis to enhance diagnostic and health observations.

VI. RESULTS AND CONCLUSION

As seen, we have so far been successful in detecting the pulse rate of the patient as well as his oxygen level. The app is created especially for displaying the result of the parameters which are to be measured. As the patients' finger is placed on the MAX30100 sensor, the sensor detects the pulse rate and the oxygen level of the patient, the TTGO module displays it on its screen. Along with it, our Bluetooth connection gives us the liberty to transfer the same data into our app and display it as well. The app will be of great usage to the patient's family since they can

determine the patient's health using this app. Therefore, using this technology we can help the patient, his family and the doctor to say in loop with the patients' health in daily life as well as in times of emergency at a far-off distance.

VII. FUTURE SCOPE

The ESP32 microprocessor has number of pins due to which this project can be expanded by adding additional sensors. The AD8232 ECG sensor, which measures the electrical activity of the human heart, may be incorporated. A glucose sensor can be used to deliver the patient's blood sugar readings at predetermined intervals. By combining these devices, a comprehensive health monitoring system may be created within a box-like structure, eliminating the need to retain and maintain many devices to measure different readings. Everything can be handled and monitored using a single system. Another option is to turn this prototype into a wrist bracelet-like interface that is more flexible and allows patients and clinicians to conveniently monitor readings. Patients who require regular monitoring yet are able to move around can benefit from this approach.

VIII. ACKNOWLEDGMENT

Prof. TUSHAR SAWANT was a huge supporter of our initiative and technical report. This work would not have been feasible without his substantial efforts. His suitable mentorship and thorough leadership helped us at every level of this endeavor. We'd like to express our appreciation to DJSCE for providing us with the required infrastructure, resources, and equipment, without which the project's completion would be impossible.

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Arduino Based Accident Alert System Using GPS and GSM.

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Abstract- The global positioning system (GPS) tracker is a cutting-edge device that uses the worldwide satellite system to follow the whereabouts of a vehicle. The design of an emergency detection device based on global positioning is discussed in this study. Interaction between the system and the worldwide system for mobile communication (GSM). It is proposed and shown to use the Arduino Uno board as a platform. The technologies of Arduino, GSM, and GPS are all studied. The satellite's coordinates are received by the GPS module. SMS is delivered to users using the SIM900A GSM module. The exact position of the vehicle can be discovered using Google Maps. A type of microcontroller is the Arduino microcontroller.

This gateway system handles all GPS and GSM hardware and software connectivity.

The design shows how combining a GSM and GPS interface with an Arduino Uno board as a platform can make vehicle tracking more efficient and convenient because it can work in any weather and offer real-time item position. The geographic location of the coordinates should be automatically displayed on a map in future designs

Keywords- Arduino Uno, GPS Module, GSM Module, Push Button.

I. INTRODUCTION

The global positioning system (GPS) tracker is a cutting-edge device that uses the worldwide satellite system to follow the whereabouts of a vehicle. The design of a SOS emergency device based on global positioning is discussed in this study. Interaction between the system and the worldwide system for mobile communication (GSM). It is proposed and shown to use the Arduino Uno board as a platform. Arduino, GSM, and GPS technology are all investigated. The GPS module receives the information. the satellite's coordinates Users receive the GPS coordinates. SMS is sent via the SIM900A GSM module. By utilizing Google Maps. The vehicle's or a person's exact location can be determined. The Arduino microcontroller serves as the system's hub for all GPS and GSM hardware and software connectivity. The proposal demonstrates how combining a GSM and GPS interface with an Arduino Uno board as a platform can improve vehicle tracking by working in any weather and providing real-time item position. The geographic location of the coordinates should be automatically represented on a map in future designs. Security, route management, and significant cost savings are all

guaranteed with tracking. Technology from the global positioning system (GPS) tracker system is used in vehicle management. An Arduino-based car tracker or better known as an emergency gadget based on the global system for mobile communication (GSM) and GPS interface is utilized in this study to follow autos or a person remotely via the GSM network. Previous research has used the internet to track automobiles. This is a low-cost design utilizing widely available materials. This project is critical for cost reductions and security.

II. OBJECTIVE

This paper presents the implementation of an easy and cost-effective Accident detection, emergency device reporting system using communication technology. The main objective of this project is to report the accidents happening to the respective authorities so as to ensure that help reaches in time. Certainly, if an accident occurs due to some unavoidable circumstances, the used electronic devices will be able to provide a spontaneous message and exact location to the nearest emergency centers or hospitals in order to rescue the victims. Thus, we can save lives and help those in need who are in emergency.

III. LITERATURE REVIEW

Emergency situation handling is the need of the hour. There may be an accident or someone's life in danger having an emergency switch as a safety device would be of great help. Lives are endangered due to the time taken to the relevant authorities to be known of the situation and coming for the rescue. Vehicle accident detection and notification system/emergency system Using GSM and GPS Modules, a system was presented that detects a vehicle accident or any other emergency using a switch and sends an alarm message to the appropriate authorities for assistance. This work provided a framework for emergency scenarios such as accidents and women's safety that generates an alarm to the appropriate authorities combining GPS, GPRS, and GSM technology. The GPS and GSM modules, which are vital for accident reporting, are not integrated. A number of studies on vehicle-to-vehicle communication have been analyzed in this paper. In this paper, we are proposing a system that could increase functionality by reducing time required for

the authorities to be known about the emergency in order to prevent vehicle accidents or other mishaps by reporting the emergencies. The idea was implemented after taking into consideration about issues like women safety and vehicle accident emergencies that have increased their numbers over the years. This paper aims at designing an automation system on Arduino UNO through interfacing GSM modules for security purposes, GPS module for tracking purposes.

IV. APPARATUS FOR RESEARCH METHOD

Arduino Microcontroller with GPS Neo 6M and GSM Sim 900A and a push button/switch is used in this project.

ARDUINO: Arduino is an open hardware development kit for creating and building electronic gadgets. Six analogue inputs, a 16-Mhz ceramic resonator, and 14 digital input-output pins constitute the microcontroller. The Arduino acts as a hub for interfacing the GPS and GSM module for this safety device

With a built-in ceramic antenna measuring 25x25x4 mm, the GPS receiver NEO-6m GPS module provides a robust satellite search capability. The status of the module can be checked using the power and signal indicators. If the power goes off, the data backup battery allows the module to store data. VCC, TX, RX, and GND are the four pins on the NEO-6M GPS module. The GPS module communicates with the Arduino microcontroller through serial communication (TX and RX pins).



Fig.1 Arduino

GPS NEO 6M: This is the GPS module that provides us with Latitude and Longitude coordinates to our hub which further passes the coordinates through the GSM to the respective authorities.



Fig. 2 : GPS Neo 6M

The SIM-900A GSM module is a comprehensive GSM/GPRS quad-band solution with a powerful single-chip processor. SIM900 is a low-power GSM/GPRS phone that supports voice, SMS, data, and fax. A device is connected to the GSM-GPRS system via the GSM-GPRS module. The GSM (global system for mobile communication) architecture is a mobile communication architecture. GPRS (global packet radio service) is a GSM modification that allow for quicker data transmission.

GSM SIM 900A: This is the GSM module SIM 900 A which is used to send coordinates to the respective authorities through SMS.



Fig 3 :GSM SIM 900A

PUSH Button as a switch: This is used as the emergency button to trigger the system to send an SMS consisting of coordinates to the respective authorities.



Fig. 4: Push button

V. PROPOSED DESIGN

The following Block Diagram shows how the flow goes on to this emergency device.

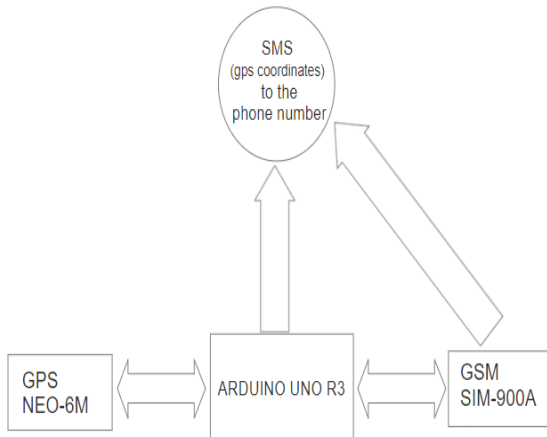


Fig. 5: System Design

The Arduino integrated development environment is available for download from the Arduino website. The Arduino IDE (Integrated Development Environment) is an open-source program for developing and compiling code for the board. Any Arduino board can be used with this software. The text messaging platform component of cell phone systems is known as SMS. Mobile devices exchange brief text messages using established communication protocols. Any mobile phone must have an SMS application built in. When the switch is pushed to obtain the coordinates of the subject, an SMS will be delivered, and the geographical area can be traced via Google Maps.

The circuit diagram and it's working is shown:

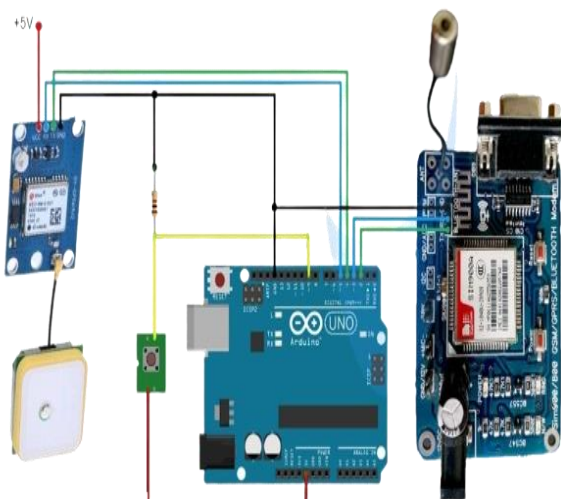


Fig. 6 :Circuit Diagram

VI. CIRCUIT DIAGRAM

In this design, with a GSM module and a GPS receiver, Arduino handles the entire procedure. Using the GPS receiver to identify the vehicle or subject's coordinates and the GSM module to deliver the coordinates to the emergency authorities through SMS. The vehicle's coordinates can be calculated after the application is uploaded to the Arduino.

The circuit shows the schematic diagram of the gadget, which shows the pin connections between the Arduino, GSM, and GPS modules. The Tx pin of the GPS module is connected to Arduino digital pin 4, while the RX pin is attached to Arduino digital pin 5. Serial communication on Pins 4 and 5 is allowed and used as Rx and Tx, respectively, using the software serial library.

Serial connection is enabled by default on Arduino Pins 0 and 1. However, through using software serial library, serial connection on other Arduino digital pins can be achieved. The GSM Sim-900A module is connected in a similar fashion with the Tx pin on pin 2 of arduino following Rx pin being connected on pin 3 of the arduino. The switch/push button is connected for a state detection with pin 9 of the Arduino for its operation. The Button is powered by 5V as well.

The power is supplied through Arduino 5V pin of the Arduino and common ground is enabled for all the sensors and devices used.

The GPS and GSM modules are operated by a 5-V supply and the Arduino can be powered by a power supply or a battery, in this case for testing purposes it is powered by a laptop COM Port.

Practical implementation for testing the accuracy was done on a breadboard connecting with Jumper cables and thus providing required power supply and common Ground for testing purposes, the practical implementation circuit image is attached below. It shows the above circuit diagram how it was implemented accurately in real life on a breadboard with the help of required components and jumper cables.

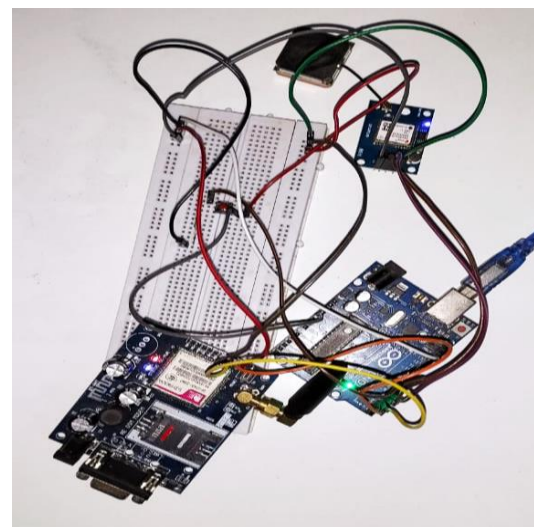


Fig. 7: Practical Circuit

VII. RESULTS AND DISCUSSIONS

This paper shows how to design an emergency gadget for car tracking and safety utilizing GSM and GPS as interfaces and Arduino as the platform. GPS is a device that takes data from GPS satellites and assesses the position of the device. Using relevant maps software, a mobile phone will show the position on a map and provide directions (Google Maps). In order to locate the vehicle's positions, device's an SMS will be sent to the device. The GSM module helps to transmit the GPS coordinates as well as an emergency message to the provided emergency services. Arduino reads the coordinates and sends them over GSM to the user's phone. The device's current coordinates are included in the message. The geographical location of the device will be established using Google Maps based on its position on a map. Throughout the test, the location tracking was accurate.

Below is the image of the GPS co-ordinates that we receive through the device.

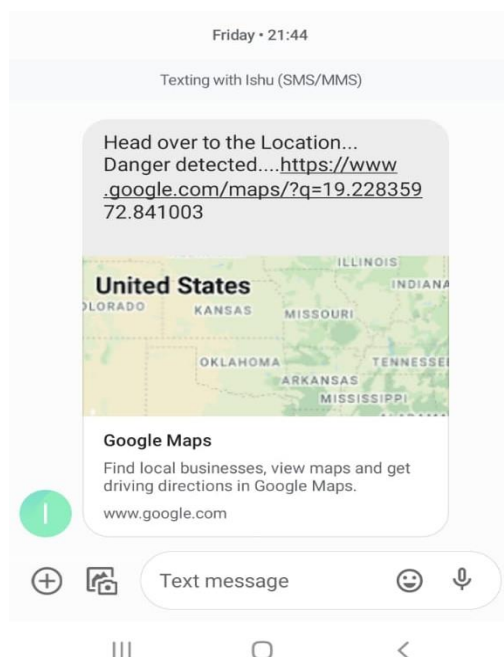


Fig.8: Output

This gives us the message to the respective mobile number that we have selected to send the SOS message.

Based on this when we open the coordinates on any map application such as Google Maps we get the exact location of where the device was triggered.

Image is attached below.

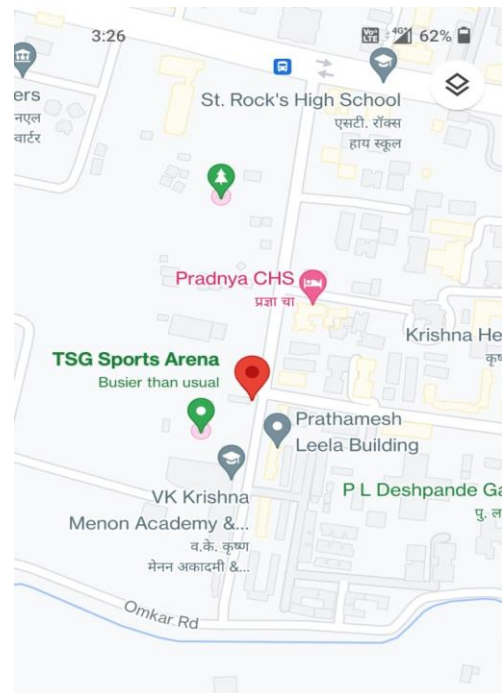


Fig. 9 : Message display

Based on this project we can actually use it in multiple applications, it can be used as an emergency SOS device also it can be used for accident detection and requesting help inside vehicles where the switch can be triggered by collision detection mechanism which is used in cars thus alerting the appropriate authorities for requesting help.

VIII. CONCLUSION

The development of an emergency tracking system employing GSM, GPS, and Arduino has been successful. The operating architecture of the system provides accurate and timely data. During the test, the location tracking was accurate. The new methodology is intended to provide information on the occurrence of the accident or emergency as well as its location. It makes giving support and aid to the accident victim easier. This system utilizes a GPS module to locate the car. Accident signal is distributed through GSM. The outputs of the proposed systems are good. In the event of an accident, this system can be upgraded by the inclusion of a sound sensor or a collision detector to strengthen the accuracy and efficiency of vehicle tracking. This might be modified to include alcohol detection as well. If a driver has ingested alcohol, the automobile will be immediately stopped and relevant sensors will sound an alert. This can also be performed by connecting the camera to the picture-taking controller module. GPS and GSM modules have shown to be quite useful in the construction of a vehicle tracker using this platform. The creation of a vehicle tracker system using a GSM module, a GPS module, and an Arduino, specifically an ATmega 328P module, can save lives and time for emergency services to arrive while facilitating through a low-cost gadget. This is a minimal design that makes use of readily available materials. In the future, a dynamic location in the web page will be

included.

ACKNOWLEDGMENT

This project and technical paper were greatly supported by Professor Archana Chaudhari. Her insightful assistance were of great use to us at every level of this project, and this paper would not have been possible without her contributions.

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Robotic Arm using Arduino

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Abstract—In this paper, we will be examining one of the significant areas of Research & Development in which we have made a significant improvement in Computer Science, Electronic devices, Automation and Artificial Intelligence and Machine Learning. In present, many industrial applications use strong, manually operated, or programmed robotic arms. And so, our concept is entirely based on spreading the notion that robotic arms help us make our lives easier and are one of the most significant factors in driving faster global progress. Pick-and-drop, emulating a human arm, drawing items with programmed intelligence, accurate placing of light-weight and heavy-weight objects, all based on mathematically calculated functions, and other such uses are all possible with a robotic arm.

Keywords—Robotic arm, Autonomous Robot, Arduino Uno, MIT app Inventor, Degree of freedom, Forward Kinematics, Servo Motors, Arduino, Gripper, Torque, MSC Adams.

I. INTRODUCTION

The area of robotics is large and widely used in research, laboratory or factory-based work, and industrial work to automate processes and eliminate any possible human mistakes. This study describes the mechanical operation and construction of a robotic arm. This robotic arm is mostly used to transport an object from one point to another. This project can be used in an industrial context when a weighing object, such as massive metal blocks, containers, or other things, need to be transported. Various varieties of robotic arms are currently used at all levels of manufacturing, from meticulously precise circuit board assembly to large-volume heavy industries such as car production lines, as well as a wide range of 'pick and place' applications.

II. LITERATURE REVIEW

A survey on robotic arms since the beginning of the world of automation has been the grounds of Artificial Intelligence and Machine Learning. It has resulted in the unprecedented speed with which we can construct complicated devices while requiring no additional strength. Since the 1900s, the continuous creative development and updating of basic robots have resulted in a large growth in demand at the industrial level, resulting in high machine demand worldwide. On the contrary, worldwide robot sales continue to grow at a significant rate every year.

III. OBJECTIVE

The major purpose of this project is to develop and build an automated gripper control system for a robotic arm. The purpose of this project is to create a robot that can replace manual labour in choosing and positioning goods while also ensuring an accurate and continuous process of moving or placing objects. And so, our project comprises building,

controlling, and monitoring a robotic arm that executes "pick up and drop" operations. The arm is designed to pick up objects up till a specific weight, move them, and then place them at the desired spot. To control the servo motions, all the commands will be transferred in electrical form to the microcontroller, where they will be converted into modulated servo signals using the digital pins on the Arduino Uno board.

IV. PROPOSED DESIGN

Mechanical Gripper

A mechanical gripper is essentially the hands, and it is used to grab and hold objects in order to move them from one location to another. The servo shaft is affixed to the end of the first jaw and connects to the gear on the second jaw. The gear rotates in mesh as the motor rotates, and the jaws open and shut to release or grab the items.

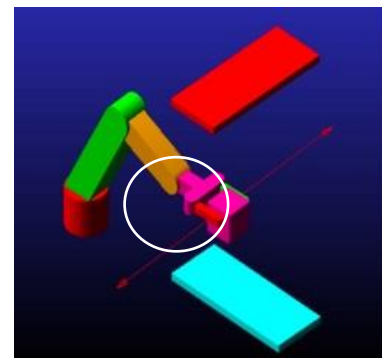


Fig. 1. Mechanical Gripper

MG996R Servo Motor

The MG996R servo motor is essentially an upgraded, optimized and better than MG995 servo, with improved shock-proofing and significantly more accurate than its predecessor. This basic servo with strong torque can rotate roughly 120 degrees (i.e. 60 degrees from its mean position in each direction).



Fig. 2. MG996R Servo Motor

SG90 Servo Motor

This servo has a characteristic rotation of 180 degrees (90 degrees in from mean position in each direction) and works like standard servos but in a compact size. It has a sufficient torque rating enabling user to pick up wider range of objects.

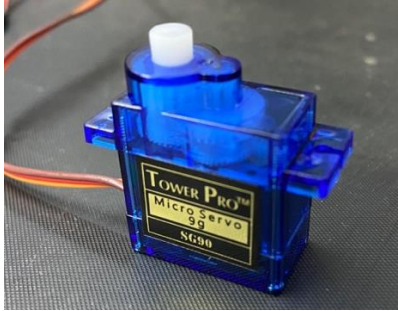


Fig. 3. SG90 Servo Motor

HC-05 Bluetooth Module

The Bluetooth module HC-05 is used for wireless communication. It has a total of six pins. The HC-05 consists of red LED that indicates whether or not connection is made using Bluetooth. This red LED blinks constantly and in a regular pattern before connecting to the HC-05 module. When it connects to another Bluetooth device, its blinking time is shortened to two seconds.

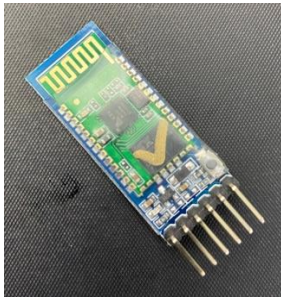


Fig. 4. HC-05 Bluetooth Module

Li-Po Batteries

This battery is made up of lithium-ion and is rechargeable using a polymer electrolyte rather than a liquid electrolyte. These are dependable rechargeable batteries that will provide with sufficient power budget to the microcontroller so it can work for longer periods.

Arduino Uno

Arduino Uno is going to be the brains of this project. It is a microcontroller board which is open source. It is processed by on board microchip ATmega328P, with a clock speed of 16 MHz. We can upload the programme regarding the movements of the servos by using the microcontroller and control all of the six servos at once to synchronise the movement of the robotic arm in any preferred sequence, and to synchronise actuation of five servos in a sequential way using a loop programme. It provides multiple general purpose input-output pins with a data bus width of 8 bits. There are 14 digital pins of which six pins are used to digitally program the servo motors using the Arduino IDE.

V. THEORY AND CALCULATIONS

There are five degrees of freedom. The degrees of freedom of robot arms are used to describe their movements. This number often relates to the number of single-axis rotating joints in the arm, with a higher number indicating greater flexibility for object placing.

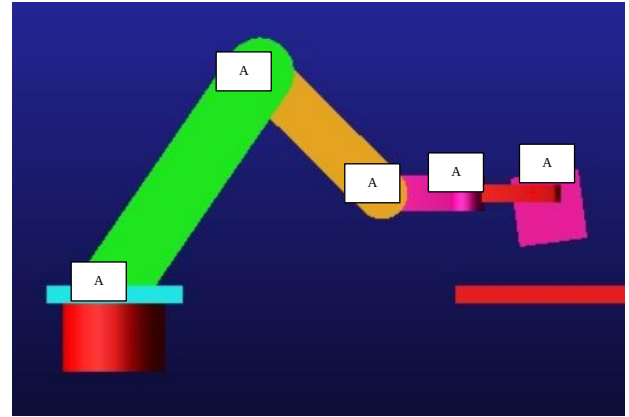


Fig. 5. Angles in a 5 DOF Robotic Arm

The improved D-H parameter representation was utilized for numerous assessments during the robotic arm design phase. The Denavit-Hartenberg (D-H) protocol is used to determine the forward kinematics of the robotic arm. The central point of the robotic arm's gripper is specified as (x, y, z) , where:

$$x = \cos(\theta_1)[L_4 \cos(\theta_2 + \theta_3) - L_3 \sin(\theta_2 + \theta_3) - L_2 \sin(\theta_2)] \quad (1)$$

$$y = \sin(\theta_1)[L_4 \cos(\theta_2 + \theta_3) - L_3 \sin(\theta_2 + \theta_3) - L_2 \sin(\theta_2)] \quad (2)$$

$$z = L_4 \sin(\theta_2 + \theta_3) + L_3 \cos(\theta_2 + \theta_3) + L_2 \cos(\theta_2) \quad (3)$$

Given the values of the joint angles, the above equations represent the forward kinematics of the robotic arm.

TABLE I. D-H PARAMETERS

Joint i	Type	α_i (deg)	a_i (mm)	d_i (mm)	ϕ (deg)
1	Base	0	0	90	ϕ_1
2	Shoulder	90	0	0	ϕ_2
3	Elbow	0	100	0	ϕ_3
4	Wrist	0	100	0	ϕ_4
5	Gripper	90	0	65	ϕ_5

Here, d is the distance along the previous z-axis between the previous x-axis and the current x-axis, is the angle around the z-axis between the previous x-axis and the current x-axis, a is the length of the common normal, which is the distance between the previous z-axis and the current z-axis, and is the angle around the common normal between the previous z-axis and the current.

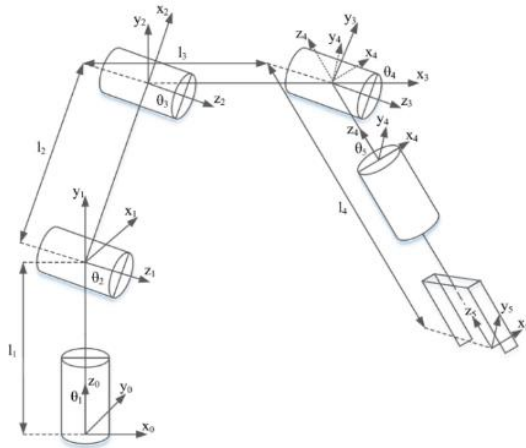


Fig. 6. Schematics of a 5 DOF Robotic Arm

The inverse kinematics job would be to calculate the joint angles given the end-position effector's and orientation. Following the determination of the inverse kinematics of the robotic arm, a feedback technique was developed to determine whether the solution will properly move the robotic arm to the desired place. The feedback algorithm is used to acquire a location in space from the inverse kinematics via the forward kinematics, which is then compared to the supplied goal location. The first solution that produces the correct spatial position is chosen. The online simulation to calculate the transformation matrix T to get the Forward Kinematics is:

LINK	A	ALPHA	D	THETA	MATRIX	
Link 1	0	0	90	55	$\begin{bmatrix} 0.574 & -0.819 & 0 & 0 \\ 0.819 & 0.574 & 0 & 0 \\ 0 & 0 & 1 & 90 \\ 0 & 0 & 0 & 1 \end{bmatrix}$	Remove
Link 2	0	90	0	-40	$\begin{bmatrix} 0.766 & 0 & -0.643 & 0 \\ -0.643 & 0 & -0.766 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$	Remove
Link 3	100	0	0	180	$\begin{bmatrix} -1 & 0 & 0 & -100 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$	Remove
Link 4	100	0	0	60	$\begin{bmatrix} 0.5 & -0.866 & 0 & 50 \\ 0.866 & 0.5 & 0 & 86.603 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$	Remove
Link 5	0	90	65	10	$\begin{bmatrix} 0.985 & 0 & 0.174 & 0 \\ 0.174 & 0 & -0.985 & 0 \\ 0 & 1 & 0 & 65 \\ 0 & 0 & 0 & 1 \end{bmatrix}$	Remove

Fig. 7. Online Calculation

T = Link 5 * Link 4 * Link 3 * Link 2 * Link 1

$$\begin{bmatrix} -0.33 & 0.259 & -0.908 & -128.066 \\ -0.089 & -0.966 & -0.243 & -101.608 \\ -0.94 & 0 & 0.342 & 3.397 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Fig. 8. Transformation Matrix

At each joint of a robotic arm, an actuator is employed to move the linkages. The actuator delivers torque at the joint to overcome the link's resistance to motion. The resistance to motion of any connection is caused by inertia and gravitational influences. As a result, some of the actuator's torque is needed to overcome this resistive torque (due to gravity). The gravity-induced resistive torque acting on each link of the arm has to be determined in order to pick an actuator with an adequate torque rating for individual joints.

Since there won't be any motion in any of the links due to the waist motion (i.e., against gravity) $T_{1g} = 0 \text{ Nm}$,

$$T_{2g} = W_2\left(\frac{L_2}{2}\right) + W_{j3}L_2 + W_3\left(L_2 + \frac{L_3}{2}\right) + (W_{j4} + W_4 + W_{j5} + W_{gripper} + W_{payload})(L_2 + L_3) \quad (4)$$

$$T_{3g} = W_3 + \left(\frac{L_3}{2}\right)(W_{j4} + W_4 + W_{j5} + W_{gripper} + W_{payload})(L_3) \quad (5)$$

$T_{4g} = 0 \text{ N-m}$ because rotation in wrist does not produce motion against gravity,

$T_{5g} = 0 \text{ N-m}$ because opening and closing of the gripper jaw does not result in motion against gravity.

Here,

W_1 denotes the Weight of L_1 ,

W_2 denotes the Weight of L_2 ,

W_3 denotes the Weight of L_3 ,

W_4 denotes the Weight of L_4 ,

$W_{gripper}$ denotes the gripper weight,

$W_{payload}$ denotes the payload weight,

W_{j2} denotes the weight of 2nd joint,

W_{j3} denotes the weight of 3rd joint,

W_{j4} denotes the weight of 4th joint,

W_{j5} denotes the weight of 5th joint,

T_{1g} denotes torque resistance at 1st joint due to gravity,

T_{2g} denotes torque resistance at 2nd joint due to gravity,

T_{3g} denotes torque resistance at 3rd joint due to gravity,

T_{4g} denotes torque resistance at 4th joint due to gravity,

T_{5g} denotes torque resistance at 5th joint (gripper joint) due to gravity.

VI. IMPLEMENTATION AND WORKING PRINCIPLE

The suggested project will incorporate an Arduino Uno, which will act as the project's brain. Arduino IDE is used to program the microcontroller. Movements of the arms and the mechanical gripper will be controlled using the servos. The microcontroller will be connected to the HC-05 Bluetooth module using the UART protocol. All of the robotic arm joints will be controlled by the MG996R and SG90 Micro servo motors.

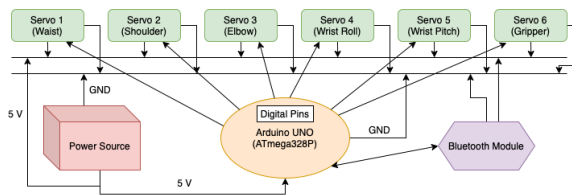


Fig. 9. Block diagram of the design

A robotic arm is composed of numerous solid parts connected by n joints, each of which has one degree of freedom (DOF), so if the arm has n joints, the arm will have n DOFs. The servo is a rotary actuator that enables us to accurately control the angular position from 0 to 180 degrees. The Bluetooth module will be utilised to connect the user inputs with servos.

Simulation & MSC Adams

MSC ADAMS (Automated Dynamic Analysis of Mechanical Systems) is an online software system for simulating multiple-body dynamics. Adams comes with a comprehensive graphical user interface that displays the complete mechanical assembly in one window. First a new database is created. Then links and cylinders are created and Revolute Joints are added for each joint. Two platforms are created and fixed with respect to the ground. A cube is placed on one of the platforms. Contact forces are established and a coupler force is added between the left gripper and the right gripper for grabbing objects. A torsion force is created and then motions are added to each joint. Step functions are defined in each motion and then the model is simulated.

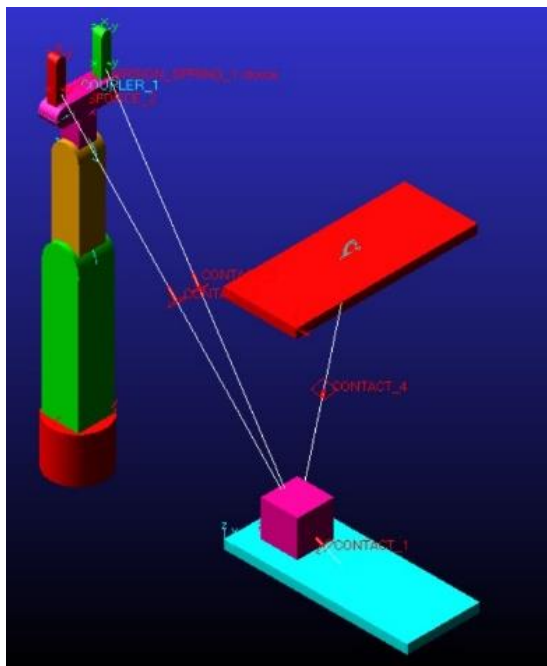


Fig. 10. Isographic figure showing all the forces

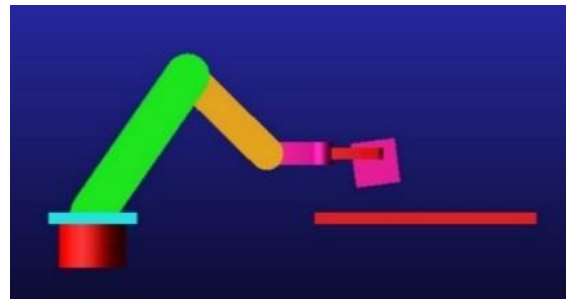


Fig. 11. Robotic Arm picking up the object

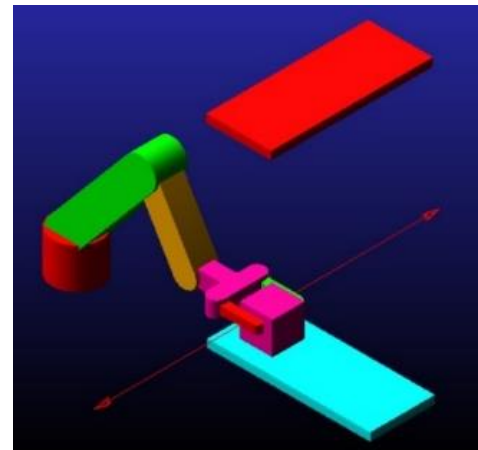


Fig. 12. Robotic Arm placing the object

Working of the App

MIT App Inventor is a programming tool that is block-based and enables everybody, including beginners, to begin programming and make a fully working app for Android OS devices. The Android app features an easy-to-use interface with sliders for transmitting servo movement orders. The software allows the user to record and preserve each step.

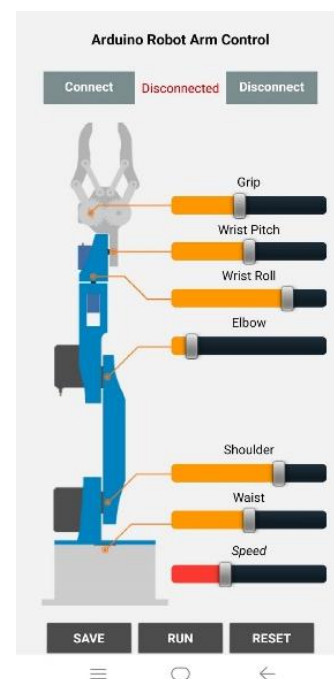


Fig. 13. Robotic Arm controller application using MIT App inventor

Code Algorithm

You can connect your smartphone to the HC-05 Bluetooth module using two buttons on the top. On the left side, there is an image of the robot arm, and on the right side, there are six sliders for regulating the servos and one slider for speed control. Each slider has a changeable beginning, minimum, and maximum value to suit the robot arm joints. On the left, you'll see the blocks for connecting the smartphone to the Bluetooth module. The slider blocks for servo position control and the pushbutton blocks for programming the robot arm come next. So, if we utilise the Bluetooth function to move the slider. We use SendText to send a text message to the Arduino. This text includes a prefix that indicates which slider has been changed, as well as the slider's current value. We have three buttons at the bottom of the interface, SAVE, Operate, and RESET, that we can use to programme the robot arm to run automatically. There's also a label underneath that indicates how many steps we've saved.

Hardware Implementation

Before purchasing the hardware, careful preparation and research were conducted. Using a breadboard and jumper wires, hardware was connected according to the block diagram. We used MIT App Inventor to link the Bluetooth module to the mobile app. The servo motors were controlled with Arduino microcontroller after they were debugged. The expected outcome was noted down.

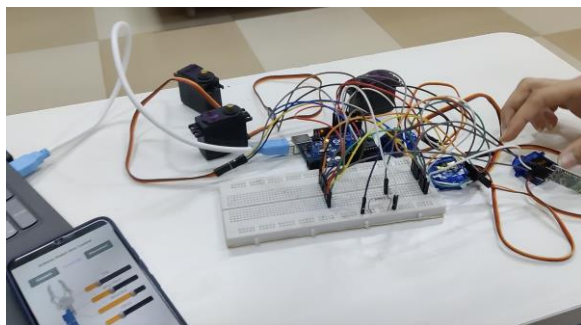


Fig. 14. Hardware Testing

VII. RESULTS AND CONCLUSION

We were able to complete the 5-degree free rotation. The arm was successfully simulated, allowing for easy control of the robot's movement. Based on observations, it became evident that it is ideal, manageable, and simple to use. The primary goal of this study was accomplished through the synchronisation of hardware and software throughout the robotic factory.

VIII. FUTURE SCOPE

This pick and place robot could even be modified to be voice controlled so that it can be used by handicapped or quadriplegic individuals for everyday tasks. Brain-Computer Interface (BCI) is a new area of study. BCI can control the arm by acquiring signals from the human brain. The technology can function similarly to a human arm. With such mechanical arms, a person who has lost a hand in any kind of accident can resume using a robotic with his or her normal life. Robotic arms are adaptable and can be used in a variety of ways.

ACKNOWLEDGEMENT

Prof. Venkata Chavali provided significant help for this study and technical report. Her proper mentorship and comprehensive direction assisted us at every level of our research, and this article would not have been feasible without her considerable efforts. We would like to express our gratitude to our colleagues who provided insight and expertise to the research and aided us throughout the process. We would also want to thank Manoj Ravindra Deo for his involvement in the project, as well as for giving us with suitable direction and assistance at all stages of the project.

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Smart Drive

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Abstract—Saving social media passwords online is always a threat to privacy and security. The main objective of this project is to enable users to use different passwords for different social media whilst not needing to remember any of them. There are multiple occasions when users are required to sign in to their social media accounts on different devices where saving passwords online isn't viable. With the push of a button, the device opens the browser, goes to the social media site, and enters the user's sign-in credentials, all done seamlessly without human intervention. Smart Drive is a pocket-sized device that enables the user to set different, strong passwords, giving the liberty to not remember them, makes multi-device sign-in easier than ever before, saving loads of time and seamlessly integrated with a smart tag which takes care of the small probability of losing the drive, being portable.

Keywords—ATtiny85, Arduino UNO, ESP 8266-01, Button, Buzzer, Security, Password, Automation, Windows, social media, Sign-in, Safety, Portable, Internet of Things (IoT)

I. INTRODUCTION

The use of technology has been increasing exponentially for the sole reason of saving human effort and time. The number of social media users has been intensifying. Even after decades of the introduction of social media, the login process has not seen a major overhaul. When it comes to social media websites, the routine of opening the web browser, searching for the website in the address search bar and then finally entering the login credentials has been time consuming. This monotonous routine has a scope of a major breakthrough.

Whilst saving passwords online can be helpful only when it comes to logging in using your own PC and is always a risk because of numerous password breaches, remembering passwords is not easy if a user uses different passwords for different social media accounts. Not to forget, strong passwords are often difficult to remember. The user thus has to make a choice between a difficult to remember, secure password and an easy-to-remember, vulnerable password. There has been a need to ease the entire login process with minimum to no human intervention whilst keeping in mind the security aspect. A software solution might be easy to develop but is always vulnerable to hacking.

A hardware solution which can open the web browser, enter the website address of the desired social media website in the address search bar and finally enter the lengthy email-id or

username as well as the strong password without needing to remember it, can solve the problems of people with disabilities as well as advanced age people who find it difficult to remember different passwords and perform the entire, monotonously long login process and also help save time. A hardware device, combined with an IoT solution which can locate it within close proximity can ease the login process and make it more secure than ever.

II. OBJECTIVE

The aim of this project is to present an affordable, portable, automatic social media sign-in device which eases the entire sign-in process, coupled with an IoT based buzzer system to locate the device within close proximity. As per a survey by the hosting tribunal, 90% of internet users are worried about password breaches, 53% rely on their memory to manage passwords. 51% of people use the same passwords for both different accounts. For some context: While the leak contains more than 8 billion passwords, there are just under 5 billion people online worldwide. Also, as per a survey by IoT Analytics, the authentication process needs the most improvement. After multiple kinds of research, we found out that there have been multiple password breaches, so saving passwords online may not be a great idea, but saving the user's time is equally important. We decided on saving more time of the user by getting automation into play. There's a need of such an affordable, time saving, secure and portable convenience device which fits all the needs. To begin with, we targeted the most used, popular operating system worldwide- Windows and the most used web browser- Google Chrome (according to statistics from IDC for 2021).

III. LITERATURE REVIEW

Development of Simple Solar Charge Controller using 8-bit microcontroller Attiny85 talks about using Attiny85 as an effective and cost-efficient solar panel micro-controller. It suggests replacing high-end and expensive solar panel controllers with cost-effective and easier-to-access Attiny85 microcontrollers. A solar charge controller is a voltage and/or current regulator from the solar cell to a battery that keeps the battery from overcharging. This paper shows a simple solar charge controller using microcontroller ATtiny85 as its switching mechanism for the charging current driver. For both charging cases, this device successfully managed to provide

current and voltage according to the expected design with 400 mA, 8.9 V for the first charging case and 150 mA, 12 V for the second charging case. This system is suitable if the input panel and the output voltage do not change have many different values of voltage. From this paper, we learned how microcontroller ATtiny85 was utilized to process input and output in the solar charge controller. The input comes from voltage sensing. The output is PWM [1].

Now a days, Internet of Things (IoT) is the emerging trend in technology that aims at making our life simpler using sensors and smart devices. All of them are connected to the Internet. Because of this it is possible to access and control them from any place and at any time. The most important aspect in this networking is communication between the smart devices. The correctness in the behavior of the devices mostly depends on its efficiency to send the data properly. In the paper Elliptic Curve Diffie-Hellman(ECDH) key exchange on NIST P-192 curve for secured communication between ESP8266 modules has been discussed and implemented using NodeMCU. Thus, security is very important in IoT implementations. The idea of universal transmission also popularly known as (IoT) Internet of Things, can lead to the development of innovative origination of the Internet. However, this constant advancement of the internet of things (IoT) usefulness is extremely cherishing [5].

The working principle of Arduino and using it as a tool for study and research addresses the various hardware components used on the board and the software used to program it. Not only does it simplify Arduino for beginners, but also is an impressive guide to kickstarting your own project and carefully talks about all the important details of Arduino UNO. In this paper, they have studied the working principle of Arduino, its hardware / software features and its applications as to where it is currently being used and where all it can be used. They have also learned how to write sketches for Arduino in its own IDE (software). Developing new ideas with Arduino is endless, with the help of this paper we have learned to build new devices of our own to create and implement innovative things [3]. In this paper we also learnt how can we send keystrokes using 'Digikkeyboard.h' library without physically pressing keys but by sending software signals for respective keys. It implements keyboard in Arduino Environment [7].

IV. Design

The project is designed to simply and remove the complexity of remembering various passwords of our social media accounts by providing an easily, accessible device to ease the process. We have used an affordable ATtiny85 microcontroller that is offers the functionality of storing the passwords and simplifying the login process. The ATtiny85 has been installed with Digi spark driver to directly program it without the need of Arduino UNO every time. It's fed with log in credentials that includes usernames and passwords of the respective social media accounts and it is programmed such that on pressing the push button connected to the ATtiny85, it will directly open the browser window and direct us to the social media website, put in the respective credentials and log us in, without us pressing

any button on the keyboard. To make this device easily discoverable, we have paired the device with the ESP8266-01 Wi-Fi module that acts as a HTTP Webserver and hosts a web page which can be accessed through a HTTP Client i.e., host device. The ESP 8266-01 acts like a workstation and runs a WebSocket Server which is joined by the phone via Wi-Fi network. The phone requests the web page. The ESP then sends the local host website (HTML page) that can be accessed from the phone. Phone connects to the WebSocket server and gets access to the buzzer. The buzzer connected to the ESP can be accessed via the phone by sending WebSocket message through pressing the button on the web page. Thus, making the device easily discoverable when in proximity.

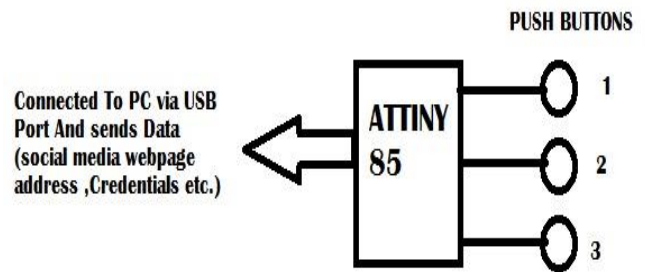


Fig. 1. Block Diagram of Attiny85 microcontroller controlled circuit

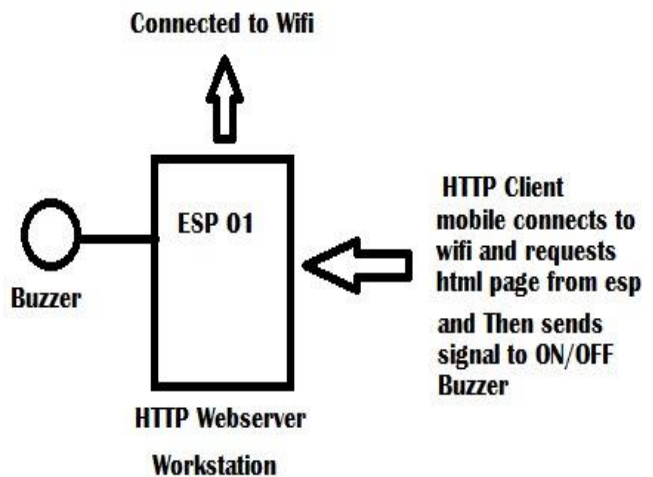


Fig. 2. Block Diagram of ESP8266-01 module controlled circuit

V. IMPLEMENTATION

Part One: The first circuit consists of the Attiny85 microcontroller powered by a USB Type-A male connector and coupled with push buttons along with suitable resistances.

Part Two: The second circuit consists of the ESP8266-01 Wi-Fi module which is rated to operate at 3.3V. If a greater voltage is

supplied, a voltage regulator might be required. The circuit also consists of a passive buzzer which is controlled via the ESP network. A Web application is used to wirelessly control the buzzer.

A. Description (Part One)

- 1) Attiny85 microcontroller: The Attiny85 is an eight terminal IC, of which three terminals (PB0, PB1, PB2) are connected to three push buttons, assigned to a social media account each. The other terminals are connected to the USB Type-A male connector to establish connection to supply power to the microcontroller and execute the uploaded code.

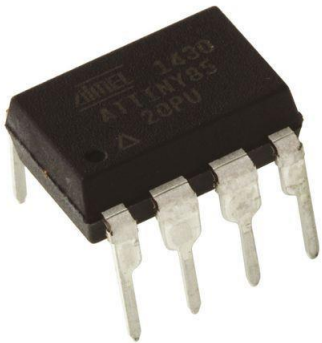


Fig. 3. Attiny85 Microcontroller

- 2) USB Type-A Male Connector: The USB connector consists of four pins, of which the D+ is used for the transferring of data from ATtiny85 to the computer and the Vcc is used to provide the required voltage for the ATtiny85.

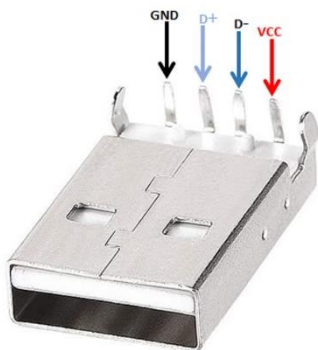


Fig. 4. USB Type-A Male Connector

- 3) Two-Terminal Push Button: Three push buttons are connected to the ATtiny85 and by pressing a push button, we can start the automated login process for the concerned social media account assigned to that push button.



Fig. 5. Two-Terminal Push Button

B. Description (Part Two)

- 1) ESP8266-01 Wi-Fi Module: The ESP8266-01 Wi-Fi Module is connected to a buzzer. The main role of this module is to establish a local connection which can be accessed by the IP address assigned. It uses the TCP/IP Protocol.

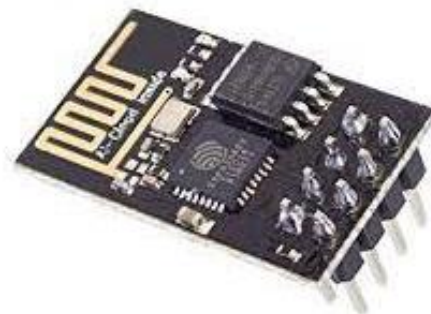


Fig. 6. ESP8266-01 Wi-Fi Module

- 2) LD33V Voltage Regulator: The voltage regulator is one of the most important component needed to control the ESP8266-01 when a higher voltage is used, to regulate it to 3.3V, which is the ideal voltage used to operate the ESP8266-01.

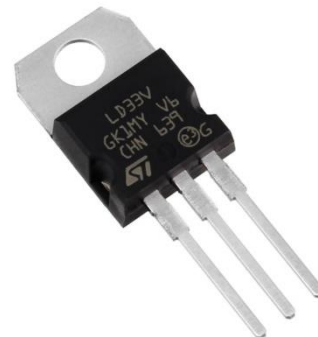


Fig. 7. LD33V Voltage Regulator

- 3) Passive Buzzer: The buzzer is controlled by the ESP8266-01 and it is an audio signaling device which helps us locate our device by producing a beeping

sound. The state of the buzzer can be changed from 0 (OFF) to 1 (ON) and vice versa from the mobile device connected to the ESP network.



Fig. 8. Passive Buzzer

The Attiny85 controlled USB circuit was first implemented with all the necessary components assembled and then soldered on a perf board.

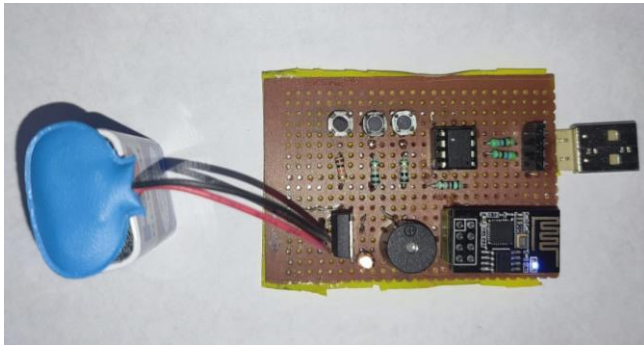


Fig. 9. Final implementation of the Attiny85 and ESP8266-01 circuits soldered and integrated on a perf board

The working of the ESP8266-01 controlled Buzzer circuit was tested with all the necessary connections made on a breadboard and then finally soldered on a perf board.

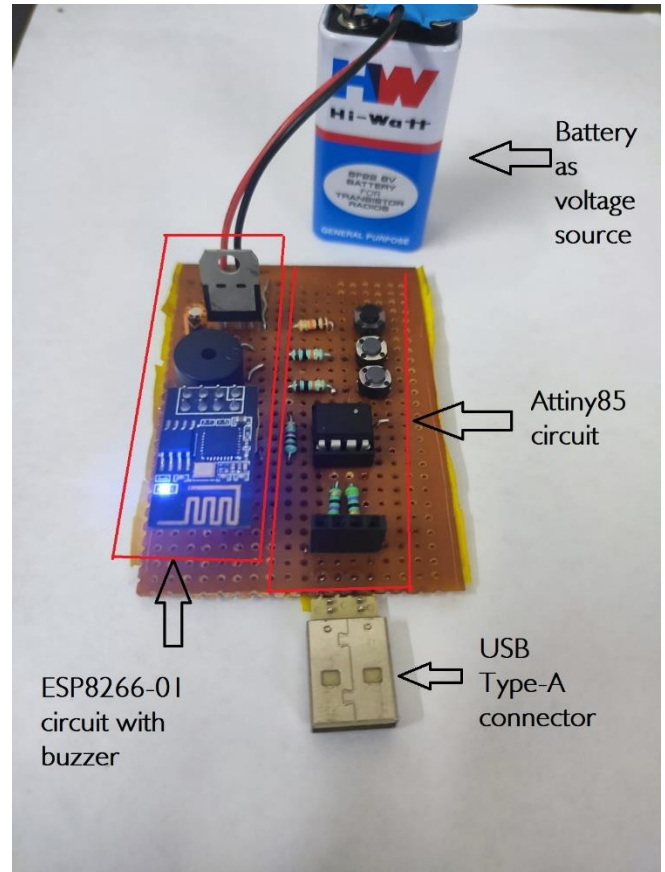


Fig. 10. Labelled implementation of the Attiny85 controlled USB circuit and ESP8266-01 controlled Buzzer circuit

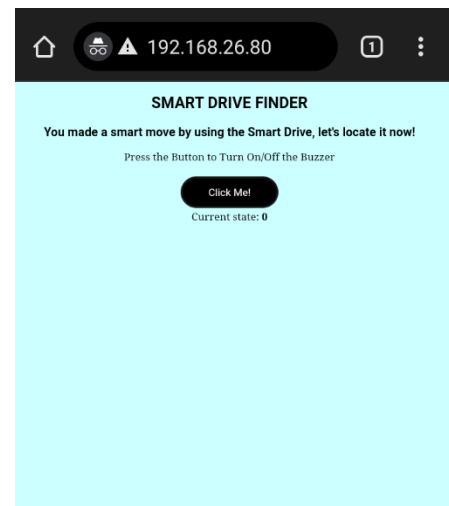


Fig. 11. Webpage UI Hosted by ESP WebSocket Server

VI. RESULTS AND CONCLUSION

In this project we have implemented a prototype model of the SmartDrive with two functionalities, first being the login automation and the other being discoverability through the

ESP01 enabled buzzer circuit. The project demonstrates the ease with which the entire login process can be carried out without having the need touch the keyboard. The project solves the problem of people with disabilities and also emphasizes on saving time while keeping the security aspect in mind. The hardware and software put together with the built-in IoT solution makes the device convenient and secure. Hence this project can be scaled and used in day-to-day life.

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Agricultural Applications using Unmanned Aerial Vehicle

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Abstract— Agriculture is the fundamental source of national prosperity. Because of technology developments in monitoring, supervision, management, and control systems, many traditional agricultural techniques have become obsolete. Their replacement with modern technologies is classified as "advanced farming," which comprises using current ways to make the process easier, boost efficiency above past yields, increase production rate through sophisticated inspections, and assist farmers in avoiding avoidable losses. Many countries are concerned about plant disease and health automation in agriculture science, as food demand is quickly increasing due to population increase. Furthermore, contemporary technology has improved the accuracy and usefulness of detecting plant diseases. Unmanned Aerial Vehicles (UAVs) in harmony with computer vision, machine learning and data processing like techniques, have proven to be one of such strategies since they are a remarkable invention with the potential to revolutionize the way agriculture's normal manual activities are carried out, as well as assist farmers incorrectly managing their farms to maximize production. This project aims to reduce human labor and boost yields, reduce wastages, and perform various agricultural chores by designing and developing a UAV as well as learning more about illnesses and how to apply models to detect them quickly. The project also intends to make UAVs at a lower cost trying to increase the reach of technology to the maximum number of farmers possible at affordable rates and reducing the computational complexities while integrating multiple applications making the model multi-faceted.

Keywords— *facial recognition, emotion recognition, python, JavaScript, visual studio, CSS3, HTML, Tensor flow, OpenCV, Machine Learning, Autism.*

I. INTRODUCTION

Drones are increasingly being used in agriculture as part of an efficient approach to sustainable agricultural management that allows agronomists, agricultural engineers, and farmers to help simplify their operations and gain useful insights into their crops utilizing strong data analytics. Crop monitoring, for example, is made easier by using data collected by the drone's components to precisely plan and make continuing improvements, such as ditch placement, fertilizer application changes, maintenance planning, and checking plant diseases and health condition. Instead of more typical time and labor-intensive data collecting, products will be properly traced from farm to fork utilizing GPS locations for each stage along the path.

UAVs are especially beneficial for the meticulous surveillance of large expanses of farmland, with the software installed precisely and quickly identifying the needed criteria, such as green cover. Already, the agriculture drone market is

expected to be worth \$32.4 billion, indicating that the industry is recognizing the benefits of drones over more traditional approaches such as ground mapping. Given the large area that needs to be surveyed, drones are more efficient, allowing users to gather high-resolution imagery faster than other methods. The application of technology in the detection and analysis processes improves their accuracy and dependability. People who employ advance technology to analyse unexpected diseases have a better chance of controlling them than those who do not. The world relied on cutting-edge technology to develop preventive measures that have helped to slow the spread of the disease. Computer vision (CV) and machine learning (ML) could help with disease detection and treatment. Computer vision is a type of artificial intelligence (AI) that entails using computers to recognize patterns in images.

Wherever manned aircraft and satellites have traditionally been used to monitor agriculture, UAVs are increasingly becoming acknowledged as a more precise and cost-effective alternative. Even on foggy days, studies have proven that drone imagery gives a higher level of precision and backbone. While traditional terrestrial approaches to data collection in difficult climatic circumstances could potentially cause projects to be delayed for days, UAVs provide precise crop health checks all year.

II. LITERATURE SURVEY

Drones and quad copters are examples of unmanned aerial vehicles (UAVs), which have revolutionized flight. They assist humans in experiencing the air in new and meaningful ways. Unmanned aerial vehicles (UAVs) are ubiquitous in a variety of fields, including agricultural, surveillance, military operations, fire detection, traffic control, and commercial and industrial uses. The report aided in the understanding of quadcopter design, building, and testing procedures [1].

The testing phase of a UAV's development is crucial. Various tests are performed on the individual components and the entire device to guarantee that everything is working properly for the quadcopter flight. It was discussed how to test motors of various speeds and thrust characteristics. In most cases, the quadcopter unit test and flight test are carried out in two steps. [2].

The major load bearing component of a quadcopter is the frame. Because of its minimal weight and strong strength, the F450 frame is the most common frame used for quadcopters.

The 'X' design of the F450 frame allows for greater area in the quadcopter for mounting additional components [3].

The use of unmanned aerial vehicles (UAVs) in agriculture allows for agricultural innovation in terms of planning and monitoring operations, which helps to boost food production. Crop monitoring, soil analysis, and field analysis can all benefit from UAVs. The monitoring duty is made easier, closer, and more precise with these aerial platforms, which saves money and time. Some uses of UAV are as follows: a) crop data collection (using several types of cameras); b) plant health and growth monitoring; c) sprayer (fertilizers, herbicides, and insecticides); and d) picture capture to produce 3D models. To better their agricultural outcomes, more farmers should use drone technology, according to the article's conclusion [5] [6].

One of the most important challenges for enhancing agricultural food production is disease diagnostics. Data analysis is characterized by the training and validation of datasets. Crop health monitoring with UAVs in the future should include a gimbal with many sensors, big datasets for training and validation, and the creation of site-specific irradiance systems, among other things [11].

The structure of the production area is analyzed using high resolution photographs, the type of plant is inventoried, seedling height parameters and the degree to which the soil is covered with leaves are determined, and the normalized difference vegetation index (NDVI, RGB/VARI) is calculated [12].

The wireless technique of the plant health monitoring system presents a model based on the calculation of vegetation index values of healthy and unhealthy plants. It uses a Raspberry Pi control system that is programmed in Python to capture photos with an NIR camera and calculate the vegetation index [13]

III. MOTIVATION

Unmanned upstanding vehicles (UAVs) also called drones which are ever piloted aircraft systems with a system, programmable regulator, automated flight planning features, and thus the capability to hold cargo like cameras, scattering systems, and other particulars for negotiating a given task.

Drones are in use for a prolonged time, still, moment practical operations for drones are rising faster than ever in a veritable form of fields, with husbandry being one amongst the foremost burgeoning, which is giving husbandry a high- tech makeover. The drone used for agrarian conditioning is understood as a husbandry drone. In India, husbandry employs relatively 60% of the population. It is the backbone of Indian economy. Thus, it absolutely was important to boost agrarian affairs and effectiveness by icing the planter's safety, feasibility while husbandry and to pave the long run for Agriculture and Farming with a vision of Digital India in mind.

Growers can accurately calculate their field sizes, categorize crop types and kinds, monitors plant health, etc. and plan the harvesting of their crops using data acquired by drone cameras and data analytics. However, it'll be analyzed singly using

image processing ways, if a factory is stressed. This information can indicate their health and growers can use this information to implement precautionary measures to stop conditions from spreading to other crops, a speedy response can save a complete farm.

As soon as an illness is discovered, growers can implement and cover remedies more precisely. At the same time to stop losses caused by biotic stresses like insects, pests, and conditions are frequently averted, optimize fertilization, explain irrigation, and reduce the impact of global climate change thanks to changeable rainfall, and a variety of imaginable operations is enforced using a drone. As a result, this design was chosen to be enforced as a result of the wide selection of operations and also the thing of enforcing the most effective and utmost demanded among them to borrow advanced husbandry to help growers and take a significant step towards an advanced and a brighter India, shining with technology.

IV. PROPOSED DESIGN

A powered, aerial vehicle that employs aerodynamic forces to create vehicle lift and may fly autonomously or be directed remotely is referred to as an unmanned aerial vehicle (UAV). The frame of our drone is an F450. it's made of durable yet lightweight material to strike a balance between aerodynamics and sturdiness. The sensors that have caught our eye and are feasible for our drone design include thermal sensors, Infrared sensors, and Raspberry pie camera.

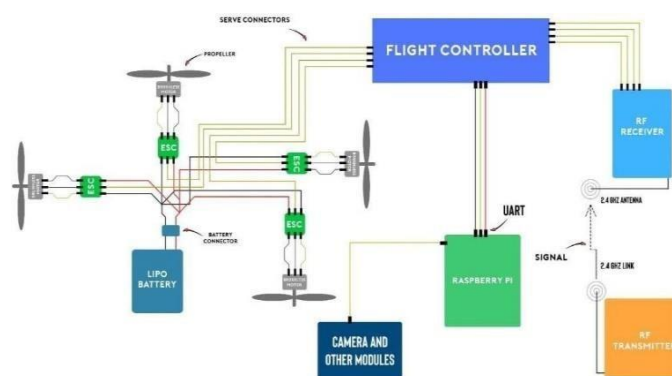


Fig. 1. Block diagram of UAV

V. METHODOLOGY

Agricultural drone technology has improved in recent years, and farmers are getting down to see the advantages of drones in agriculture. On the surface, agricultural drones appear to be similar to other types of drones. The use of the UAV simply shifts to meet the needs of the farmer. Drone production is divided into various steps, as follows:

Model Designing

Any drone manufacturing starts with a proposed design, which has to be completed to scale before any parts are purchased. The process of designing a drone is as follows: -

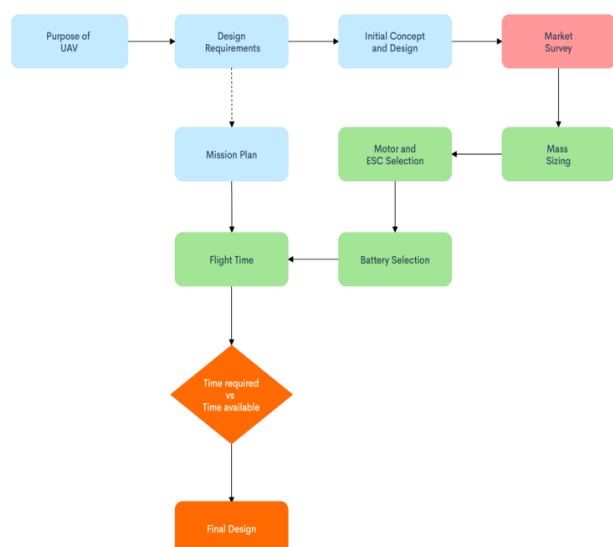


Fig. 2. Procedure of Designing Drone

Components Selection and Procurement

The components are chosen in step with a particular procedure. The applications that our drone will serve are taken under consideration, and therefore the necessary calculations of varied factors are allotted as a result. After this, the desired materials are browsed, keeping in mind that the utmost number of parameters and elements of labor are covered with the tiniest number of things, together with the opposite limitations, the accuracy, tolerance, working range, pricing, size, weight availability, and significance of the components should be considered. Vendors, dealers, websites, and other resources are thoroughly investigated while keeping all of the above factors in mind. Multiple solutions are evaluated so as to stay the value as cheap as feasible while still meeting all of the necessities. Before purchasing the components, all of the insufficient aspects like delivery charges, delivery days, product quality, and then on are considered.

Drone Assembly

A drone's frame is developed first, and it's the key contributor to structural stability. The frame that we've got used for our drone is F450. To create a balance between aerodynamics and sturdiness, it is built of sturdy yet lightweight material. Next is the assembly of the motor and also the connection of the propellers which is a very important step. After the propellers have been fitted to the motors and frames, it's time to put the drone electronics together. To complete the inner electronics that allow the motors to run, you'll need an electronic speed control (ESC), an RC receiver, a LIPO battery, an influence distribution board, and connectors. We've got a 30 Amps ESC and a 1500m Ah battery. The wire used within the board, still as adherence measures to support the printed circuit, are other components. Even a mounting pad can be used to reduce vibration. A Pixhawk flight controller, as well as a transmitter and receiver, has been installed to help with air stability. More complicated drones will have additional components to accommodate photo storage or control arms, depending on the role of the drone. accommodate a camera and photo storage or control arms. Required and selected sensors, cameras, and other components are integrated into the microcontroller and can be coded consistently with required applications to serve the

aim of agriculture drones. After the internal workings of the drone have been checked, it must be programmed to respond to the transmitter. Additionally, if the drone lands on the bottom, whether intentionally or accidentally, landing equipment would be required to protect it.

Testing and Debugging

Drones will be put through stringent testing processes for quality assurance and to ensure that our components are in good working order. During these flight rounds, relevant real-time data is collected, analyzed, and any faults are debugged by making necessary changes to the drone.

Image Detection

The Raspberry Pi is a microprocessor that has been assembled along with OpenCV that is an outstanding computer vision library used for our project. The Raspberry Pi camera is integrated with the Raspberry Pi and is configured and coded in Python, with the OpenCV library being used to record real-time images of the plant at regular intervals. It will also run the machine learning algorithm to track plant health over time.



Fig. 3. Image Capturing Using Raspberry Pi

Model Training

The main program model.py is implemented on the startup. This program contains various functions inherited from various other programs which are executed simultaneously to yield the necessary result. When the program is running, it captures image every 5-6 seconds and simultaneously saves the captured image in a local library or folder. These images are then taken and saved in a created array and is then fed to a function to calculate the NDVI index. Normalized Differenced Vegetation Index (NDVI) is an index used to calculate the health of the plant. The greener the plant is, the closer the NDVI index is to

The program feeds the array of images, and each image is given as an input to calculate its index. The index received from the function is appended in an array corresponding to the image. Then we check whether the plant is healthy (greener hence NDVI index closer to 1) or unhealthy (pale leaves hence NDVI index nearer to 0) or dead plant or non-plant elements (NDVI index in negative).

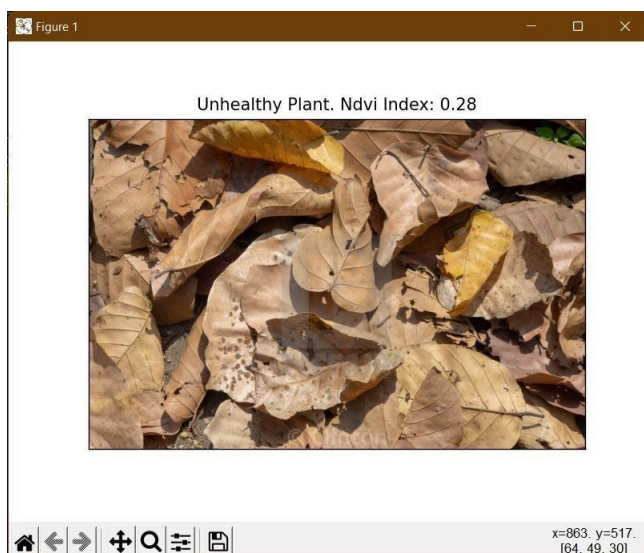


Fig. 4 (a). Output image displaying NDVI index and health status of the captured plant image (Unhealthy Plant)



Fig. 4 (b) Output image displaying NDVI index and health status of the captured plant image (Healthy Plant)

Sdf

User Interface

The program uses a CNN model to predict the data and the result is predicted and stored in correspondence to the image. The dataset is then transferred to the backend of an online hosted website. This dataset contains, the image captured, class predicted and the geological position of the class. The website, upon further login and profile creation, shows, the unhealthy plants, with the location so as to reduce the strenuous efforts of individually monitoring the plants. Upon further, updates and additions, it may also be able to give a didactic measure, on cure and prevention of spread of such diseases.

DESCRIPTION OF THE PROJECT

Unmanned aerial vehicles (UAVs) are planes which will fly without a pilot on board. The aircraft, sensor payloads, and a communication system station too are components of unmanned aircraft systems. Onboard electrical equipment or control equipment on the underside could even be accustomed to control them. It's spoken as an RPV (Remotely Piloted Vehicle) when it's operated from the underside and

requires dependable wireless communication. Large UAVs may necessitate specialized control systems, which could be carried on cars or trailers to allow close proximity to UAVs with limited range or communication capabilities. UAVs are divided into three categories based on their altitude range, endurance, and weight, and they are used for agricultural, military, and commercial applications. The smallest categories of UAVs frequently use ground-control stations made out of laptop computers and other components small enough to be transported with the aircraft in tiny vehicles, on boats, or in backpacks.

Advantages of using drones are as follows: -

- Aids in increasing productivity
- Aids in pollution reduction
- Reduced expenses of analysis
- Greater safety of farmers
- Effective and Adaptive Techniques helping evade LOCUST SWARM and much more.

A drone can broadly be divided into its software and hardware, which are described below: -

Software

The drone is supplied with a microprocessor that aids within the application of assorted algorithms for stabilizing and flying the drone. Firmware is the name for this sort of software. The correct firmware and software are installed within the flight controllers and microcontrollers of the drones, which are then connected to the transmitter, which provides the mandatory commands, or the drone is totally adapted to figure autonomously. Functions like developing autonomous drone systems, applying computing and machine learning, implementing computer vision and image processing, making app-based drone controls, computing sensor data and analyzing the identical and lots of more such things be the software category.

Hardware

Materials Top materials used in drones:

- Carbon fiber-reinforced composites (CRFCs)
- Thermoplastics such as polyester, nylon, polystyrene, etc.
- Aluminum
- Lithium-ion/Lithium-Polymer batteries

Flight Controller

A flight controller is an electrical circuit that functions as the drone's brain. The flight controller is equipped with a number of sensors. The flight controller receives data about the aircraft's height, orientation, and speed from these sensors. An inertial measurement unit (IMU) is used to determine angular speed and acceleration, a barometer is used to determine height, and distance sensors are used to detect obstructions. The specified speed is transmitted by the flight controller to the Electronic Speed Controllers (ESCs), which turn it into a signal that the motors can understand.

Frame

The frame, which also holds all the subsystems in place, determines the shape of the drone. As it serves a mechanical function, the frame's most important material quality is

strength. Thermoplastics, including as nylon, polyester, and polystyrene, are popular choices for commercial drones because they are inexpensive to manufacture into complex parts using injection molding techniques. Commercial drones may be able to save money by losing weight, whereas industrial drones prioritize performance. Smaller quantities of a high-strength material can be used, resulting in a lighter, higher-performing drone.

Drone Propulsion system

This system comprises of: -

Electronic Speed Controllers (ESC)

Motors

Propellers

ESC (Electronic speed controller)

Drone flight controllers use ESCs to control and change the speed of the aircraft's electric motors. The ESC adjusts the propeller speed in response to a signal from the flight controller by increasing or decreasing the voltage to the motor as needed. Drone electronic speed controls often have a maximum current rating. ESCs that can tolerate a higher current demand are often larger and heavier, which could be a factor for smaller UAVs. The refresh rate of an ESC is measured in Hertz, and it indicates how many times per second the motor speed can be altered. Quadcopters and other multirotor drones may have greater refresh rates since their stability and maneuverability are totally dependent on the balance of rotor speeds, which necessitates careful control over the motor RPM.

Motors

Drone electric motors transform electricity into energy within the sort of linear or rotation, which is the most frequent. This motion is caused by the attraction or repulsion of two magnetic fields in most drone motors. A permanent magnet provides one of these fields, while the other is created by utilizing the fact that passing an electric current through a conducting wire produces a magnetic field around that wire. The rotor is the moving component of these two motor components that produce magnetic fields, while the stator is the stationary component. A shaft will extend from the rotor, allowing the motor's rotating motion and the rotational force or torque created to be harnessed.

Many parameters, including the weight of the drone, will influence the choice of a drone motor for a specific drone propulsion system. A drone motor must be able to provide enough thrust to overcome the drone's weight and allow it to take off. The ability of a UAV motor to alter speeds is represented by its torque. Larger propellers necessitate higher torque motors, which draw more electricity than lower-torque motors. Brushless electric motors are used in nearly all UAVs released in the last few years and in the future. Brushless motors in UAVs are more efficient, reliable, and quiet than brushed motors. It's crucial to think about the motor's type and design. A more efficient motor means less battery drain and more flying time. Because the stability of a UAV is so important, the top motors produce relatively little vibration, meaning the flight controller has less work to do to keep the UAV stable.

Propellers

Propellers transform rotational motion into linear propulsion. Drone propellers provide lift by spinning and producing airflow, resulting in a pressure differential between the top and bottom surfaces of the propeller. This causes a mass of air to accelerate in one direction, providing lift and counteracting gravity. Hex copter, octocopter, and quadcopter propellers, for example, are stacked in pairs and spun clockwise or anti-clockwise to achieve balance. By altering the speed of those propellers, the drone may hover, rise, drop, or vary its yaw, pitch, and roll. The Electronic Speed Controller changes the voltage provided to the propeller's motor in order to modify the propeller's speed (ESC). Based on inputs from either the human pilot's controller or an autopilot, the drone's flight controller delivers the appropriate signal to the ESC, which may also include data from an IMU (Inertial Measurement System), GPS, and other sensors. Most drone propellers are made from plastic and therefore the better quality is made from carbon fiber.

Battery

Lithium-Polymer (Li-Po) batteries are used in drones. They weigh half as much as nickel-cadmium or nickel-hydride batteries of the same capacity, and their volume is 40-50 percent nickel-cadmium and 20-30 percent nickel-hydride, making them large-capacity batteries of the same capacity. Specific energy (J/kg) and specific power (W/kg) are weight-based metrics of a battery's ability to store and discharge energy. A constant current and constant voltage charger with a rated voltage of 4.2V may fully charge the lithium polymer battery in one to two hours. Colloidal electrolytes, which offer a larger discharge platform and more stable discharge behavior than liquid electrolytes, are used in polymer batteries. The typical operating voltage of a single lithium-polymer battery is 3.7 volts, which is equivalent to three nickel-cadmium or nickel-hydride batteries connected in series. The charge and discharge cycle of a lithium polymer battery can reach 500 times under normal conditions.

Sensors

Visible light (i.e., cameras sensitive to the red, green, and blue wavebands, often referred to as RGB cameras), multispectral, hyperspectral, and thermal sensors are all available for plant monitoring. Specific agricultural or forestry goals, such as vegetation characterization (e.g., measuring vegetation features and plant traits) or assessing certain variables related to plant production (e.g., nutrient content/deficiencies and water stress) and plant protection (e.g., weed detection and disease diagnosis), should guide the selection of the right sensor.

VI. SOCIAL IMPACT

Drones are used within the agriculture industry which results in steady growth as a part of a good approach to sustainable agricultural management that permits agronomists, agricultural engineers, and farmers to assist streamline their operations, using robust data analytics to realize effective insights into their crops. Crop monitoring, as an example, is made easier by using drone data to accurately plan and make ongoing improvements, just like the utilization of ditches and evolving fertilizer applications. The potential for UAVs

within the improvement of sustainable agriculture is large. The agriculture drone market is expected to be worth \$32.4 billion, indicating that the industry is beginning to see the benefits of drones over more traditional approaches.

VII. RESULTS



Fig. 5. Assembled Drone

The drone was built using the methods mentioned above. Raspberry Pi was used to compile different models and Pixhawk was used as the flight controller.

The receiver was connected to the motor controller controlling the motors, which was further connected to a flight controller Pixhawk, such that the add on components can improvise the functionality of the drone system. The connections were systematically monitored and properly soldered, such that no hindrances occur mid-flight. Later, work was done to assemble and make a working model of the drone. Multiple tests were run on the drone and its functionality was successfully checked; the drone was working as expected.

Simultaneously various ML models using open CV were browsed, developed and compiled, leaf images were captured at regular intervals and the health of the plants was assessed using the NDVI index obtained through a certain procedure. Various complications were faced while simultaneously working with different components like Raspberry pi, Pixhawk, ESC, motors, receivers each having its own hardware and software complexities. The model was loaded into the Raspberry pi python IDE which detected the class of plant and its disease successfully using the camera module and in-built processors.

VIII. CONCLUSION

We've learned through this experiment that using drones, intelligent systems, and sensor technology in agricultural settings has additional benefits that could help most countries and continents, including India. Poverty reduction, environmental preservation and water efficiency, job creation, improved balance of payments, and increased income of UAV and intelligent systems vendors are only a few of these socio- economic benefits.

Agricultural producers must adopt ground-breaking solutions for food production, productivity, and sustainability. Drones, as well as more collaboration between governments, technology leaders, and industry, are part of the solution. With our project we have tried our level best to make a cost-effective drone which can carry out the essential analysis

mentioned above for plant health monitoring also which is easy to operate and understand.

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IOT based Autonomous Vehicle with Lane Detection, Traffic Signal Detection Using OpenCV Python

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Abstract --- In this study, the paper introduced an algorithm for finding route and controlling traffic light using the OpenCV python. We still use them in a variety of image processing techniques such as giving a mask, the discovery of a canny edge and an interesting region. By combining these strategies, we can create a powerful way to find a route from the end of self-driving cars using modern computer vision techniques. This paper also includes the discovery of robots, which are important in reducing traffic accidents at intersections and monitoring independent driving. Simple BGR conversion to HSV and Hough Circle Transform can be used to facilitate traffic light detection.

Keywords — Independent Robot, Raspberry pi, Route Detection, Hough Transform, Threshold, Python Language, OpenCV Library, Hough Circular Conversion, Image Processing, Traffic Light Detection.

I. INTRODUCTION

The Autonomous Self Driving Car System was used which included route detection, traffic detection and obstacle avoidance system. In Finding a Route we first defined the color of the road line by giving the range of HSV colors accordingly. Now in order to find the edges of the route we used to see the canny edge and we have to define the region of interest, as it only matters to find the lines of the line closest to the car. After defining the ROI we want to represent two lines of lines, so we use Hough Transform which produces features like lines, circles, etc. we will use it to find straight lines on the edge of the pixels that appear to form a line again sees white color. If no route has been found the vehicle should stop, and perhaps inform the operator that no line segments have been found. So we use a slope intercept to separate the left and right part of the border region and provide the same condition. After that we have to show those queues we can use the line function from cv2 to show the received routes.

To get traffic light, we simply allocated 3 hex values and its various shades of RED, GREEN and YELLOW. We used Hough circle transform to find the right color and display the circle found in the window. And appropriately perform the necessary tasks such as standing, walking slowly and moving like a robot color.

II. OBJECTIVE

According to research presented by WHO, [6] about 1.35 million human deaths were caused due to road traffic injuries. Autonomous vehicles with lane detection and traffic light control systems will bring this number down by some extent. So we can use lane detection and traffic light detection systems which are useful in avoiding these accidents as safety is the main purpose

of these systems. The aim for lane detection system is to detect the lane lines and alert the driver that the vehicle is going to going off the lane and if the driver is unaware of traffic signal then the system will alert the driver accordingly as by the traffic light signal colour whether to go, stop or go slow.

III. LITERATURE SURVEY

[1] Route Detection and Advance Collision Alert System Based on Stereo Vision.

This paper has introduced a system that can detect the route once differentiate yourself using the stereo concept that is the backbone of Advanced Driver Assistance Systems (ADAS). They propose a model to find a route using the concept of Interest Range (ROI), as well as segmentation function, sees Used Convolutional Neural Network (CNN) structure namely trained with KITTI database to distinguish right or left lanes. However, the system failed to find the routes as the contrast image was noisy.

[2] Ultra-low Complexity Block-based Lane Detection and Departure Alert system

This paper contained a warning scheme for route discovery and departure by determining the region of interest (ROI) in the region closest to the vehicle. The ROI is subdivided into continuous fragments and in order to obtain chunk gradients and chunk angles, a basic mask is created to reduce computer complexity. Driving conditions are divided into four categories, and the departure system is developed with respect to the results of the route acquisition. From the test results, it is shown that the route acquisition rate is 96.12% and the departure warning rate is 98.60%. However, it takes relatively considerable processing time due to computer-generated straight and horizontal gradients.

[3] How To Find The Solid Route Based On The Range Of The Lost Point Using The Link Of The Line Parts.

This paper has introduced a route acquisition method based on endangered area estimates. The system used a voting method that may have detected the missing areas of the rail segments in the first place. Real route segments are determined by setting the extinction zone and line direction. In addition, in order to assess the route acquisition rate a real-time inter-system similarity plan was proposed which reduced the false acquisition rate. Since the geometric features of the trail do not differ significantly, the real-time

testing program was under postulation. However, the system cannot be operated on unpaved roads.

[4] The method of developing a robust hypothesis uses binary analysis of the blob to identify multiple pathways.

This paper contained a route marking method based on the analysis of binary bubbles. In order to eliminate the viewing effect on the street area, the system used the detection of a perishable area and a reverse view map. Binary blob filtering and blob verification methods are proposed to improve the efficiency of the route finding system. System results show that the average acquisition rate for multiple lines is 97.7%. However, the system failed to work in real-time.

[5] Active Route Acquisition Based on Spatiotemporal Imaging.

This paper was based on the route marking method using spatiotemporal images collected in the video. A spatiotemporal image created by stacking a set of pixels in a horizontal scanner with a vertical line across the frame and time axis. Hough Transform is used in collected images to find routes. The system works best for short-term noises such as lost lanes of traffic jams. The system has achieved calculation efficiency and high detection rate.

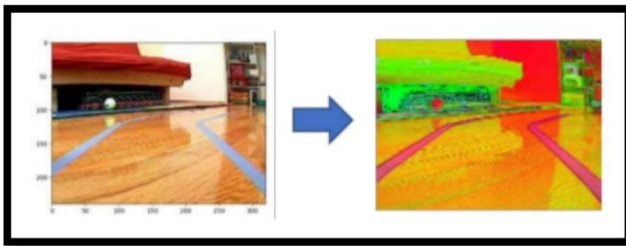
IV. IMPLEMENTATION

a) Lane Detection

1) Detection (Route Detection)

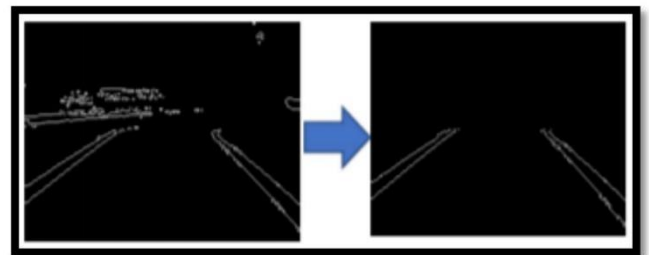
The independent route acquisition plan has two parts, namely, route vision detection and Path Planning which is the guide. Our proposal will convert street video into link lines found. But before we can see the lines of video, we must be able to see the lines of a single image. Once achieved, the video recovery line lines are simply, repeating the same steps for all frames in the video.

Fig.1 Route detection



basic thing to do is to distinguish all the blue areas in the image as we have chosen the color blue in our route lines. So we convert the color space used in the image, RGB (Red / Green / Blue) to the HSV (Hue / Saturation / Value) color space. The main idea behind this is that in an RGB image, different parts of the blue tape can be illuminated in a different light, making them appear darker in blue or light blue. However, in the HSV color space, the Hue component will provide all the green tape as one color regardless of its dimensions.

The



4) Defining a Region of Interest

As in the previous step, we realize that we have found all the green areas that are not linear. Here we can see that the upper part of the screen contains the part that is not needed for us only the lower part that is needed. As we do navigate the route, we only care about finding the lines, when the lower part of the screen is satisfied. So we're just going to remove the top part. Then we can see two clearly marked lines as shown in Fig.4.

Fig.4 Isolating Region of Interest

5) Detecting Line Segments

In the previous cropped image, for us humans, it is very clear that we can see four lines where 2 lines represent a linear line, hence the sum of 2 lines. On a computer, however, they are mostly white pixels on a black background. Therefore, we need to extract the links of these



Fig.2 Provision of Masks

3) Finding the Edges of the Line

Next, we need to find the edges on the blue mask so that we have a few lines representing the lines of the blue line. The task of finding the canny edge is a powerful command that finds edges in the image. In the picture, the first parameter is a blue mask from the previous step. The second and third parameters are the minimum and maximum threshold for the acquisition of the edge, assuming (50, 100).

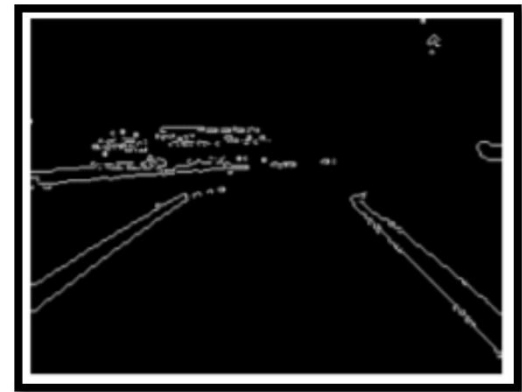


Fig.3 Finding the Edges of the Line

2) Giving the image of the mask by enhancing the color of the lines.

lines to white pixels. We can use the function in OpenCV, called Hough Transform, which is a process used in image processing to extract features such as lines, circles, and ellipses. We'll use it to get straight lines from a bunch of pixels that seem to form a line and get a white color.

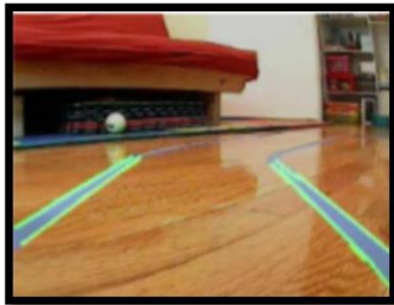


Fig.5 Acquisition of Line Sections

6) Combine Line Parts into Two Lines

How can we combine all the parts of the thin lines with their end (x1, y1) and (x2, y2) into only two lines? All line segments relating to the left line should go up and down the left side of the screen, while all right line segments should be vertical and right-handed, as shown in the diagram above.



Fig.6 Merge Line Parts into Two Lines

7) Summary of Route Finding Here is the last picture with the found lines drawn in green.

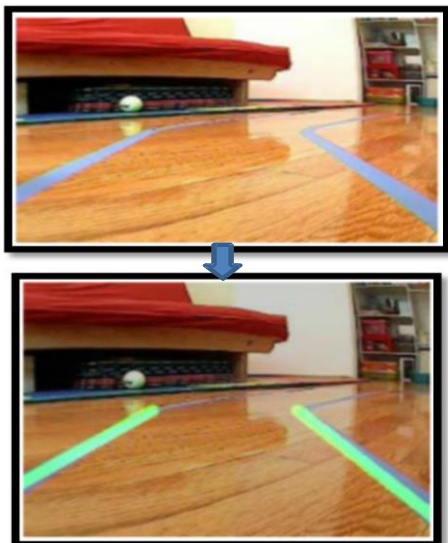


Fig.7 Final image

b) Traffic Light Detection

There are four phases in this first project we usually do Convert BGR image to HSV color space. Then the hex distance values are determined based on the color of the traffic. After determining the hex range values, then using the third phase we will have to use the Hough version to find the circles, and finally, if the color is matched to the mean distance values and the color scheme then it is obtained as a traffic signal. A flow chart of the provided system is provided below in Fig. 8.

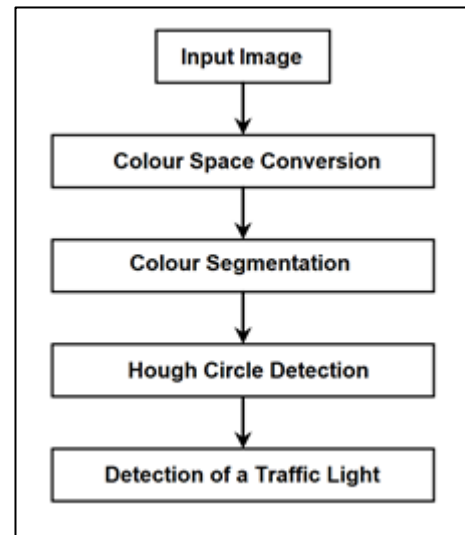


Fig.8 Data flow diagram of the proposed route

1. Change the color space

Traffic lights often have sky and structures in the background that lead to different image brightness and also when the images are removed from the video, the automatic display settings can cause the light to change dramatically from frame to frame. First, start by converting the inserted image to an HSV color space as it is very sensitive to slight changes.

2. Extract color details

Next, describe the color range of the information Red, green, and yellow as it represents the 3 colors used in Normal Traffic Lights and used as a mask.

3. Remove circles

Then, we can use the Hough Circle Transform to get circles from the image as the normal traffic light is circular.

4. Organize regions

Finally, the regions that satisfy the shape is then identified as color-coded traffic signals as shown in Fig. 9 below.

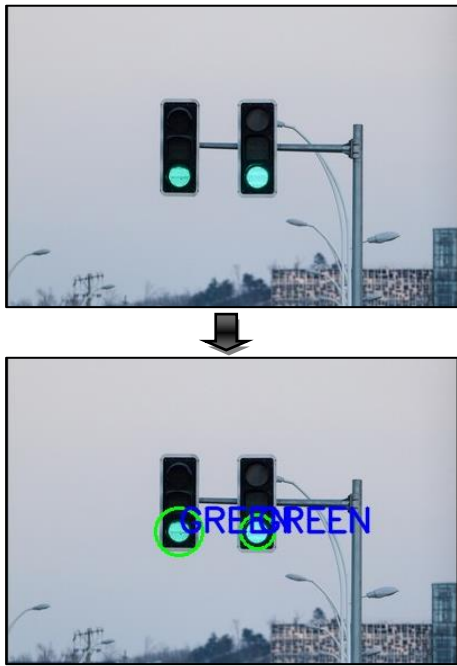


Fig.9 Traffic Light Detected indicated by circle and its name

V. CONCLUSION

The overall goal of this project is to make lane detection possible in poor road conditions where lane markings are either not visible or rendered obsolete. Also to alert the driver if the vehicle is off path the lane lines and recognize the traffic light and indicate the driver about the current state of the light if the driver is unaware. For a smart autonomous car, this research proposes using Simple BGR to HSV conversion, Hough Transform, ROI, and Canny Edge detection to achieve lane detection and traffic light detection.

VI. APPLICATIONS

1. Automotive Industry
2. Commercial Printing
3. Hospitals
4. Pharmaceutical Industry
5. Chemical Industry
6. Food Management
7. Production
8. Paper Industry
9. Warehouse distribution

VII. THE FUTURE PLAN

1) Sign recognition.

We can add more to our image processing by adding note recognition so that the car can slow down and stop following the direction indicated.



Fig.10 Sign Recognition

2) GPS (Global positioning system).

We can add a GPS system, as we can define a source route and location and the bot will navigate that way using GPS, Signs Detection, Automation, and Obstacle Prevention System and we can pinpoint the location of the bot.



Fig.11 GPS route

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This project and technical paper were greatly supported by Professor Aarti Ambekar. Her expert coaching and comprehensive assistance were invaluable to us at every level of this project, and this paper would not have been possible without her contributions. We are grateful to our colleagues who contributed their knowledge and experience to the research and assisted us throughout the process

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Intelligent Transport

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Abstract— In this day of increased air pollution, traffic, and fuel prices, many people have already shifted to public transportation, and many more will do so in the future. With increasing demand, we must strike a balance between space and resources allotted to satisfy the demands of the population. After the suburban train network and ferries, BEST is Mumbai's second-largest public transportation system. BEST serves 30 lakh commuters every day. We proposed a seat occupancy monitoring technology to make commuters' lives easier. Some of the BEST buses are extremely full, preventing passengers from properly planning their journey. However, using this approach, individuals can simply determine which bus is most accessible and comfortable for them. Maintaining social isolation is necessary in this pandemic condition. As a result, commuters should make the greatest use of available resources to avoid breaking social distancing rules.

Keywords— ESP32-cam, GPS Module, OpenCV, YOLO, OV2640 camera, Firebase

I. INTRODUCTION

Because of growing gasoline prices and the need to avoid traffic congestion, most individuals now prefer to go by public transportation rather than driving their own cars. Hence For the general people, public transit is the most preferred means of transportation. It is one of the most cost-effective and time-saving modes of transportation. For the convenience of consumers, many public transportation firms have developed a system for showing the position of the passenger vehicle. However, those systems simply show the car's position and do not reflect the availability of seats in the vehicle. Nowadays, as the risk element travelling in an overcrowded passenger car has increased, people generally prefer to travel in a vehicle that is less congested and preferably has a place to sit. Passengers frequently squander time waiting for a bus with available seats that will carry them to their chosen destination. Customers can plan accordingly and utilize the time before the passenger vehicle comes if they are aware of the vacancy of seats. Customers can better organize their trips. We can also take an example from today's world, in which every employee has to go to their respective offices, which are far away from their homes, so they have to use transportation and they have to take care of their health as well by maintaining a social distance wherever they go, so in this project, we are going to help those employees by letting them know the situation of the bus, whether it is crowded, empty, or moderate by notifying them.

II. OBJECTIVE

The project's goal is to create a system for buses that can notify passengers of upcoming stops, the availability of seats in buses, the crowd travelling, as well as the passenger's current location and the time required to reach the bus stop. This will also assist bus operators in increasing the frequency on routes where buses are becoming overcrowded during peak hours or for other reasons, allowing for the development of a systematic and straightforward transportation management system. The passenger information system in this project will be created using image processing techniques. A Raspberry Pi camera module connects to the Raspberry Pi in the bus to detect the number of passengers and relay the data to the server via 4G communication. The system analyses and processes data in real time using Open-Source Computer Vision (OpenCV) or You Only Look Once (YOLO) object detection to count the number of people on the bus and send it to a server where it is shown to the broader public.

III. PROPOSED DESIGN

The major goal of our proposed design is to count the number of people aboard the bus as well as the vehicle's real-time position. This data will subsequently be displayed to the end user via the web application. The OV2640 is used as the camera sensor, and the NEO-6M GPS module is used to extract the coordinates. Both will be linked to the ESP32-Cam module, which includes built-in Wi-Fi and Bluetooth. The recovered image will next be processed with OpenCV to count the total number of passengers in the vehicle. This information is transmitted to Firebase for quick and safe data transfer. The data on the host application, which includes an interactive user interface, is updated every 15 seconds. This process can be shown in the figure below.

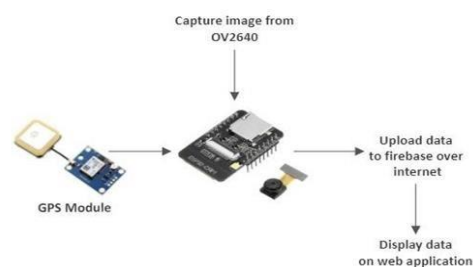


Fig.1 Design flow

IV. LITERATURE SURVEY

GPS has been employed in numerous study articles since it has various advantages such as real-time bus tracking, remote informing about public transportation vehicle trip, and quick status observation. In the system, [1] information gathered from the GPS module was transferred to the main central server and displayed to the user in the form of a digital monitor. In addition to GPS technology, the authors of [2] employed Google API to provide information about public transportation to the user. GPS does not stop working regardless of the weather, which is an advantage when compared to other navigation gadgets. It also offers complete coverage of the earth and is quite inexpensive when compared to other devices. [3] Artificial Neural Networks (ANN) and MQTT (Message Queuing Telemetry Transport) protocols are utilized to accurately predict when the bus will arrive and are commuted via an application. While in [4,] a statistical classifier technique is employed to estimate arrival time, GPS and Google maps are also used for navigation. [5] utilized an Arduino Uno, a pressure pad, a Bluetooth HC-05 module, a potentiometer, and a data collection software module to count the number of individuals. If the weight observed is greater than 20kg, pressure sensors positioned beneath the seat count every seat as occupied by a person. The design in [6] is built with the help of a GPS module, a GSM module, and a microcontroller, and the user can obtain data on the whereabouts of the bus by dialing the number of SIM present in the tracking system.

V. IMPLEMENTATION

The system is separated into two parts: the hardware that will be installed on the car, and the server and user application that will be used to transport data and allow users to interact with the application [6] The hardware is made up of three major components: the OV2640 camera sensor, the NEO6M GPS module, and the ESP32-CAM module. Omni Vision's OV2640 is a high-quality 2megapixel camera sensor capable of capturing 3280 x 2464-pixel static images. It allows picture transfers at 15fps for 1600x1200, 30fps for SVGA, and 60fps for CIF. This is a fantastic camera sensor, and one of the best on the market. Its low power consumption at a reasonable price makes it one of the finest options for our application.

The Ublox NEO-6M GPS module is utilized to track the bus's real-time location. It can monitor up to 22 satellites on 50 channels and reaches the highest level of sensitivity in the industry, -161 dB tracking, while utilizing only 45mA of supply current. It features two power supply pins, Vcc and ground, as well as two UART communication pins, Tx and Rx. To extract the GPS coordinates, these pins will be linked to the main microcontroller. It includes an external antenna that snaps onto the module via the U. FL connector. To collect real-time photos, we will use the ESP32cam module. This module's primary function is to deliver picture data to the Python program. It will also include a built-in WIFI module for data transfer over the internet. It has a 32-bit low-power CPU with a clock speed of up to 160MHz. It contains

520 KB of built-in SRAM and supports external 4MP cameras. SRAM. It has a UART interface for communicating with the GPS module. It contains built-in Wi-Fi and Bluetooth, as well as a micro-SD card slot that can hold up to 4GB. The FTDI programmer and the Arduino IDE are used to program it.

For the entire project implementation, we will use Open-CV, an open-source platform. It is a robust framework with numerous algorithms and strategies for detecting and categorizing photos. It aids in data pre-processing and is significantly faster than most other libraries, with a very high operational speed and little errors. It has built-in trained models, which reduces the time required to establish up training models for comparison. It makes image recognition easier by using the ESP32-cam to collect images and the Arduino IDE for highly flexible platforms. It is commonly utilized in real-time applications that need high accuracy. It includes predefined capabilities that aid in the detection of people in varying lighting circumstances. The operation will begin with the ESP32-cam module capturing an image inside the bus. This image data will be saved in temporary variables so that image processing methods can be applied. OpenCV will be used to detect the total number of faces. This will give us the total number of passengers on the bus, which we will save in a variable. The GPS module will assist in tracking the bus's current location. It is made up of a specific memory address where the latitude and longitude will be kept. To extract the precise latitude and longitude, the I2C protocol is employed to communicate between the microcontroller and the GPS module. This data will be saved in variables once more, and the microcontroller is now ready to deploy it to the server. For fast, secure, and dependable data transmission, we used firebase as our real-time database. Firebase is a very smooth and quick to use service that saves and retrieves data in real time. Because the count is updated every 15 seconds, it is promptly updated in the real time database on the firebase server. Firebase will then send this value to the web application, where it will be displayed.

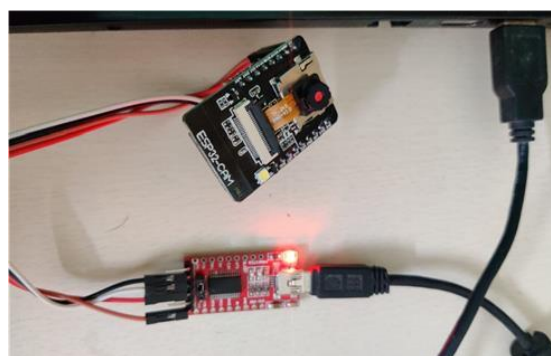


Fig.2: ESP32-cam programmed using the FTDI programmer

We have developed a web application which will help users perceive information in a readable and graphical way. The latitude and longitude information can be displayed on google maps, using which the user can get the exact location, as well as the expected time of arrival (ETA). This can be

taken into consideration the traffic conditions which makes the resulting ETA even more accurate. The passenger count and the maximum seat occupancy in the bus, will give the user a good estimate of the crowd inside the bus. The location and passenger count will together provide a very accurate means for the user to plan their journey.

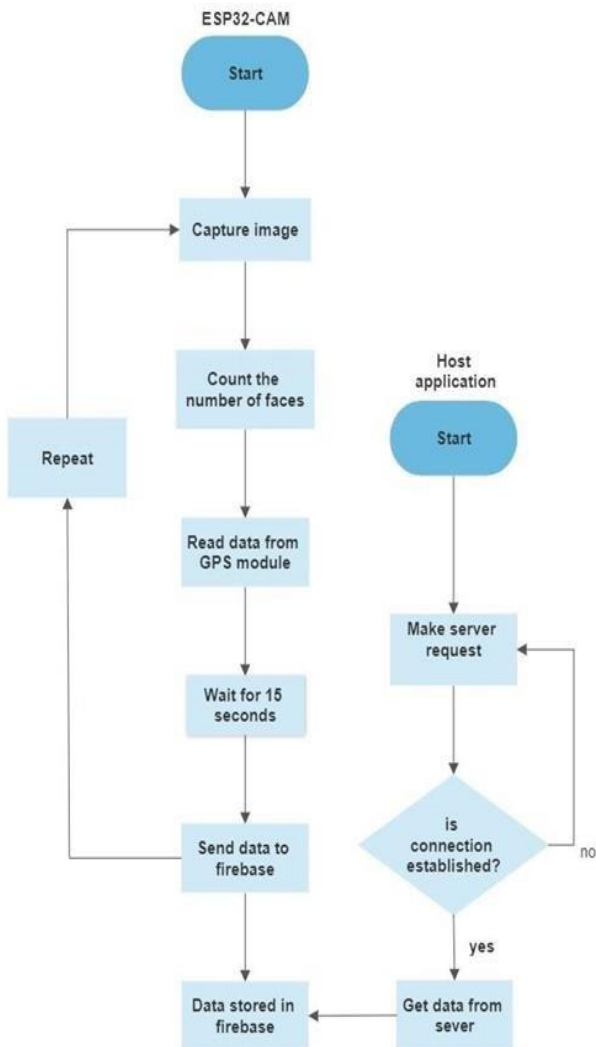


Fig.3: Flowchart of the proposed design

VI. FUTURE SCOPE

These days, public transportation vehicles, particularly buses, are quite congested. People would want to keep a safe distance from the public, which is not happening in the current pandemic climate. BEST is Mumbai's second largest mass transportation system, serving over 30 lakh passengers daily. We proposed the seat occupancy detection system to make passenger travel easier and to assist BEST operators. Some buses are quite busy, and passengers must wait for a long time for their bus due to a lack of regularity, but with the help of this system, they can simply plan their travel based on the timetable and availability of the vehicle that is not entirely full.

CONCLUSION

With the problem of congested buses being around for a while now, this model is surely going to resolve the issues withstanding overcrowding in public transport. The important goals of the project have also been met from seat availability to mapping out the passenger's current location and the time required to reach the bus stop.

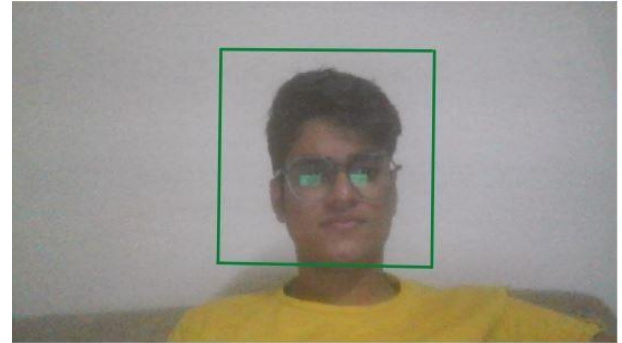


Fig.4: Body detection

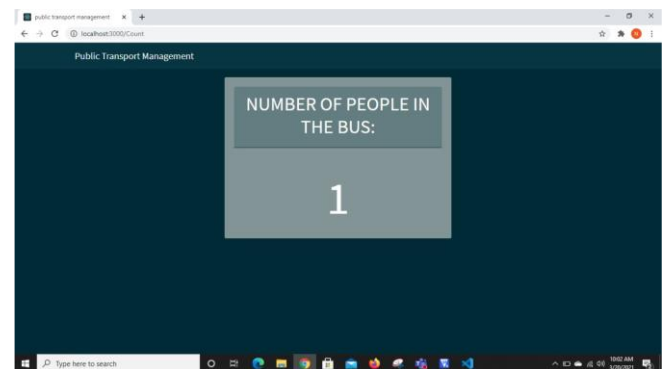


Fig.5: Platform notation of the number of people traveling in Bus.

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Sign Language Translator Application

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Abstract- This paper proposes the development of a sign language recognition application that identifies different hand signs made by the user. This project aims to aid the communication of people with speaking and hearing difficulties with the world on a routine basis. The World Health Organization (WHO) projects that by 2050, nearly 2.5 billion people i.e 1 in 4 people will have some degree of hearing loss, of which over 700 million will require hearing rehabilitation. Equally shockingly, the current world population of deaf-mute people is estimated to be between 7-and 9 lacs. These numbers underscore the increasing importance of sign-language and gesture-recognition systems to bridge the communication gap between well-abled people and “divyangjans”. The dataset for different gestures is stored in a file. This file is loaded in the feed-forward neural network model. When the user makes the sign using the phone camera, the gesture will be recognized using an ML model. Upon recognition, the meaning/value of the gesture shall be displayed on the user’s screen. The system will be fully app-based and hence anyone with a smartphone shall be able to download the application from the app store and use it, ensuring wide availability and accessibility.

Keywords- Sign language, MediaPipe, Neural networks, Machine learning, Android application

I. INTRODUCTION

From the previous works, sign language gesture recognition can be achieved in the following ways: Using sophisticated hardware like gloves with Doppler radar sensors, which works in the dark environment as well [1]. In [2], electromyography sensors are used in combination with algorithms like decision trees and K-Nearest neighbors for classification. Using the inbuilt camera of the device with appropriate algorithms. Gaussian filter was used to smoothen the contours after binarization [3]. To perform segmentation, in [4] a depth map was calculated by matching the left and right images with the SAD (Sum of Absolute Differences) algorithm. In [4], the Theo Pavlidis Algorithm which visits only the boundary pixels was used to find the contours. This method brings down computational costs. In [9],[13],[15] the biggest contour was chosen as the contour of the hand palm after which the contour was simplified using polygonal approximation. Most of the methods described above make use of dedicated hardware or contour detection, segmentation methods for extracting the region of interest (ROI) i.e., the hand region in this case.

However, detecting for multiple hands leads to inaccuracy. Though electromyography sensors on hand gloves give accurate results, it adds to the cost and fails to reach a wider audience. Hence, we have proposed a methodology that uses an inbuilt device camera with a suitable algorithm. Thus, ensuring the primary goal of this project is to give accurate results free of cost. The method proposed in this paper provides greater accuracy and flexibility between the hand gestures. Using the best of open-source resources, successful creation and storing of gestures were achieved. This model was tested for multiple gestures and yielded an average accuracy of 99.984%. The model was built using Python in Jupyter notebook IDE. MediaPipe, an open-source tool was used for palm and landmark detection. The model is converted to a tflite file and deployed on an android application created using Flutter. This application uses the phone camera in real-time and displays a text message as an output on the mobile screen.

II. METHODOLOGY

MediaPipe Hands, an open-source, high-fidelity hand and finger tracking solution are used. MediaPipe uses a machine learning (ML) pipeline comprising multiple models working together to identify 21 landmark points of a hand from every frame (as shown in Fig.2). The first model, a palm detection model, works on the raw input frame and returns a bounding box around the hand region. Next, this cropped region is sent to the hand landmark model which detects the landmark points (shown in Fig. 3). The value of each landmark point is stored in the form of (x,y) coordinates in a comma-separated values (CSV) file. Gestures can easily be recorded and added to this file as required. This CSV file now functions as a dataset that is used to train a feedforward neural network. Now, if the gesture uses one hand, model DNN1 is used for gesture detection. Else, if the gesture uses two hands, model DNN2 is used. The network architecture consists of four hidden layers with 64, 128, 512, and 128 neurons respectively. The trained model is saved as a TensorFlow Lite (tflite) model which is deployed on the android application (shown in Fig.). This application gives a text message on the display upon detection of gesture. The flow of this project is proposed in Fig.1.

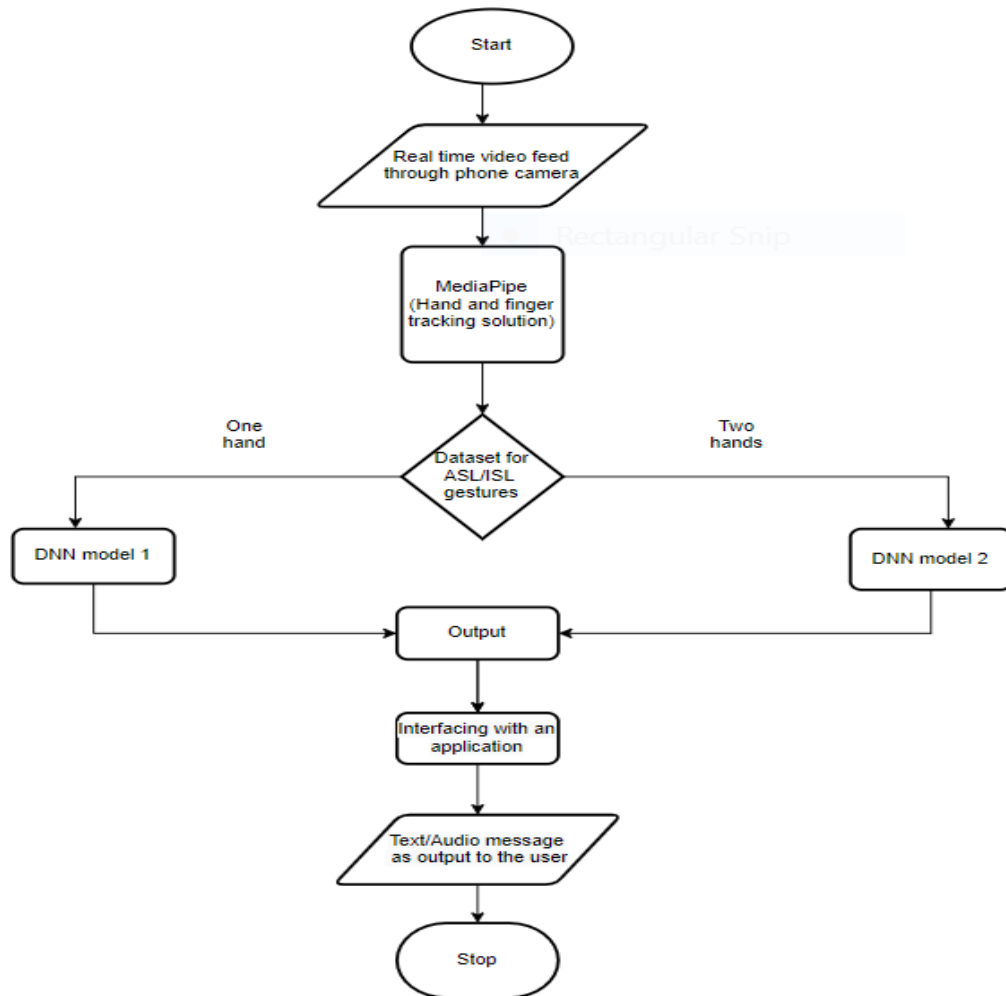


Fig. 1. Proposed model.

In Fig.2, it is shown how MediaPipe uses palm detection to find the region of interest. Further, it uses landmark detection to find the key points of the hand. All these coordinates are stored in a CSV file. These coordinates are used by the model for gesture detection.

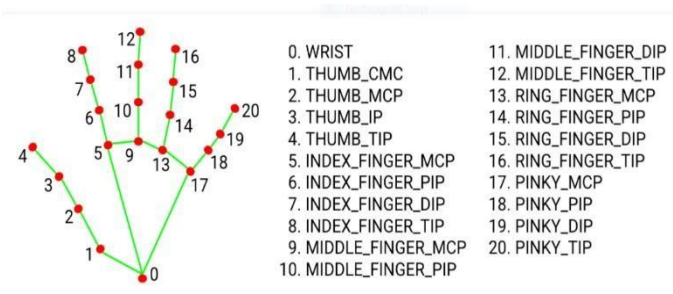


Fig. 2. Palm detection and hand landmark detection using MediaPipe.



Fig. 3. Using MediaPipe to mark the landmark key points of both hands.

III. RESULTS AND DISCUSSION

The detected gestures using the DNN (Deep Neural Network) model were successfully identified and displayed on the screen. Fig. 4 shows the successful detection of the gesture.

Fig. 5 shows the mobile application deployment of the same.

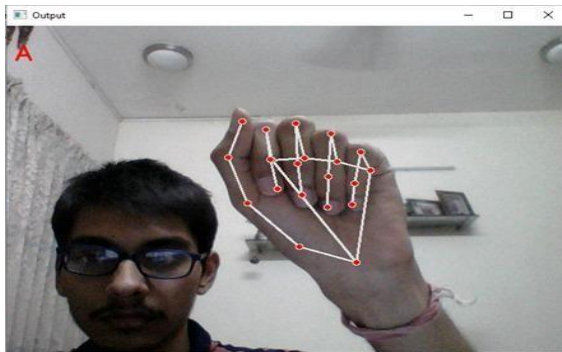


Fig. 4. Detection of gestur

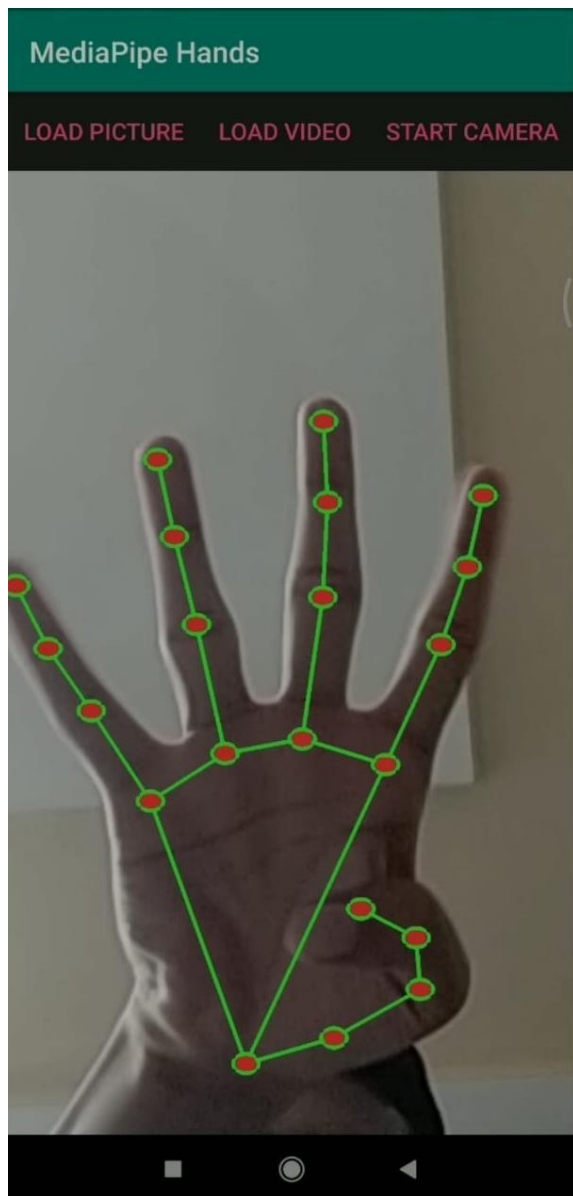


Fig. 5. Working of mobile application

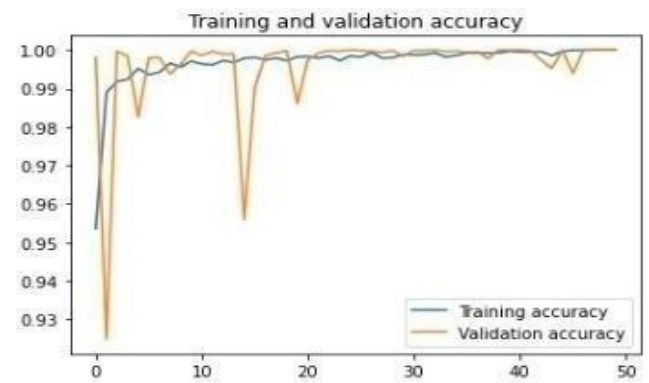


Fig. 6. Comparison of training and validation accuracy of the model

TABLE 1.1

Evaluation of model based on different metrics

Gestures	AUC-ROC	F1 Score	Accuracy
1	0.9999144507777993	0.99923254	0.99984
2	0.9999144507777993	0.99917831	0.99984
4	0.9999144507777993	1	0.99984
5	0.9999144507777993	1	0.99984
A	0.9999144507777993	1	0.99984
B	0.9999144507777993	1	0.99984
F	0.9999144507777993	1	0.99984
L	0.9999144507777993	1	0.99984
Thumbs up	0.9999144507777993	1	0.99984
Y	0.9999144507777993	1	0.99984

Table 1.1 shows the different metrics to evaluate the model. The high value of the F1 Score is obtained for the model. This means the proposed model can correctly identify the 10 output classes/gestures. This is further supported by the value of accuracy which is 0.9984.

The average accuracy of the proposed model for 10 gestures is 99.84%.

IV. CONCLUSION

The project aims to develop a sign language translator application for the divyangjans. Communication is an integral part of everyone's lives. Unfortunately, people with hearing or speech problems face difficulties on a routine basis voicing their thoughts. This project provides a viable solution to aid the divyangjans. A dataset of commonly used gestures in ASL/ISL was created. A Deep Neural Network(DNN) model is used to recognize the gestures. This model is deployed on an android application. On using the android application in real-time, on gesture recognition, a text message will be displayed on the screen. The results obtained are satisfactory and have an overall accuracy of 99.984% on average.

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Online Voting Software

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Abstract— Under this course we are planning to build an online voting software which will allow the citizens to vote with the comfort of their houses. The tiring period of travelling and waiting in the long lines of the polling booths is eliminated here altogether. It will also save the time and effort of the Government to organize the voting camps. Hence it will make the voting procedure more efficient and convenient. The application not only provides comfort, but the security and privacy of citizen-votes are also not compromised. This application aims to be as secure as possible by keeping the data of the voters hidden and private. Just like the current voting system, the citizen-votes will be non- traceable back to the voters, keeping in mind the voters' privacy and safety. Hence, Mr. Sharma's privacy and confidentiality is taken care of. The application would aim to prevent any electoral frauds, Election manipulation, voter fraud, or vote rigging, involves illegal involvement with the electoral process, either by boosting the vote share of a preferred candidate or by decreasing the vote share of rival candidates, or both. We do this by implementing a fool proof User authentication system consisting of methods like finger-print verification and many more. Thus, safe polling is also a prime objective of our application. The application also aims to eliminate the post-election vote counting period. We do this by keeping real time track of the vote distribution and other analytics.

Keywords— *Flutter, Firebase, Dart, App API, Object-oriented Programming, Software engineering paradigms*

I. INTRODUCTION

This document's objective is to provide a full description of the Online Voting Software. It will explain the system's goal and features, its interfaces, what the system will do, the limitations under which it must operate, and how the system will respond to external stimuli. Customers are invited to circulate this paper to potential users and management in order for us to receive feedback. This will assist the development team in ensuring that the final product fully meets all requirements. This document will also be beneficial for individuals who will be upgrading or maintaining the software when it is finished. The e-voting method under consideration is a minor component of the overall election process. Technically, the elections are made up of the following components:

Elections are being called,
candidate registration,
Polling list Preparation,
voting (a subset of e-voting),
Votes Counting.

Using this software, organizations will be able to design and operate elections safely and confidentially on a server connected to a dispersed network.

The application not only provides comfort but the security and privacy of citizen-votes are also not compromised.

This application aims to be as secure as possible by keeping the data of the voters hidden and private.

Just like the current voting system, the citizen-votes will be non-traceable back to the voters, keeping in mind the voters' privacy and safety.

II. OBJECTIVE

The project requires very less bandwidth; Therefore the performance will be Optimized with the Expanding number of prospective users/customers. However, when the system is installed in a genuine academic setting, it will be housed on a much more stable server to improve performance. Many parts of this system have security features.

User authentication:

Users must authenticate using usernames and passwords, one-time passwords (OTPs), and finger-print verification. Each user will gain access to the system's functionality based on their access level. The user can change their passwords.

Login details:

The system will keep track of each user's login and logout times to make the traceability procedure easier in the event of a wrong activity.

The user interfaces are designed to allow any potential user to quickly become acquainted with the system. No additional training is required to use the system, neither to the management nor to the respective authorities involved in the procedure.

The system will be operational 24 hours a day, seven days a week. To improve availability, the mean time to failure and mean time to repair will be determined. The availability of a paid hosting space can be ensured to a high degree of precision.

III. PROPOSED DESIGN

The Online Voting Software has 3 active actors and one Administrative system. The Voters and the Candidates are the ones who would actively participate in these elections. The Customer organization is the one who would organize this event using our servers. The Admin accesses the entire system directly. The division of the Online Voting Software into 3 component parts, the voting participants, the organization-end

and server-end management, is an example of how domain classes can be used to clarify an explanation.

Online Voting System

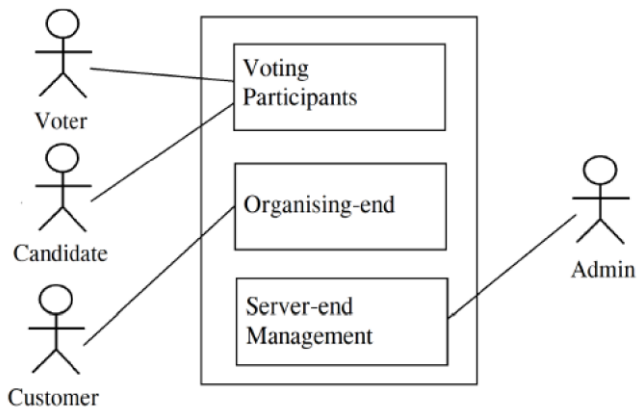


Fig.1 System Environment

Customers are individuals or organizations who purchase Online Voting Software. They will be granted permission to host elections on the Server. Let us assume an Organization 'XYZ' which is interested in purchasing and using this voting software. This organization would be free to conduct any kind of in-office elections or surveys according to their needs using our servers. The Voting Client will be available free of charge, and any purchasers of the server software will be authorized to distribute it to their voters. A System Administrator will be required to oversee the installation and operation of each Online Voting Server.

The System Administrator will not have control over or access to any particular elections once they are activated on the server, but he or she will be the only one able to authorize and start new elections. This person is necessary to ensure that the overall system is working and that its security integrity is not breached. Voters are those people who are authorized by the customer-organization to vote in each election using our Voting client. They are expected to have access to a fully networked Mobile phone. They must also have secure access to a private email address.

Candidates are the users who are authorized by the customer organization to contest in the election conducted using our Voting client. They are expected to contest the elections by abiding to the rules and regulations set by their respective organization and the rules mentioned in our policy. The system is intended to respond in a fair amount of time. The voter should be able to login and receive responses to his requests in 2-3 seconds. All passwords that are generated or approved must be encrypted and stored in a database. To prevent data loss in case of system failure, the result of votes that are polled till then have to be saved in database. If the administrator discovers a security flaw in the system, he should be able to promptly shut down the system and restrict

all connections to the server in order to preserve previously polled votes. The system should notify users if there is a problem with the system.

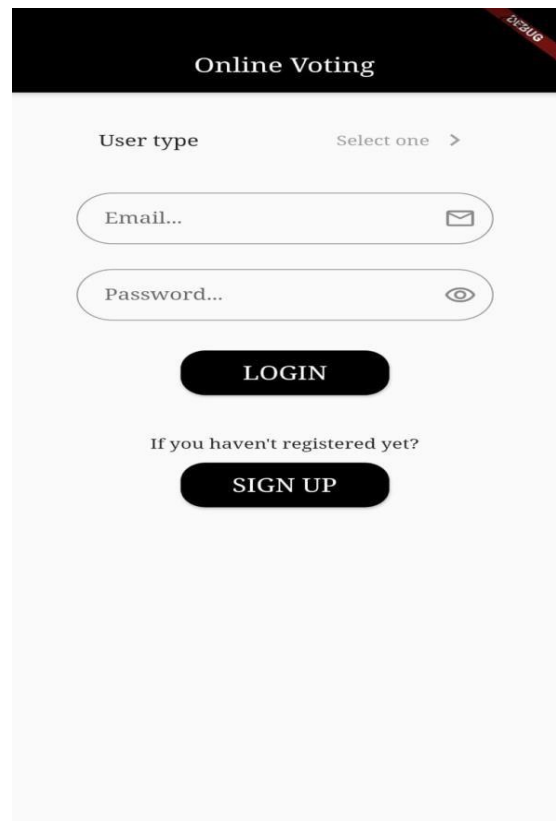


Fig.2 Home screen of Online Voting Interface

Fig.3 Registration Page of the Application

IV. IMPLEMENTATION

One of the links to an external system is a link to the User Firebase database, which is used to validate a User's membership. When a voter intends to vote, he must first authenticate himself using credentials such as his password, OTP, and fingerprint kept in the Firebase database. The Online Voting Software is interested in the database fields of the user's name, gender, email address, phone number, and date of birth. When the Candidate submits his manifesto, the information is stored in the database. The election's history also displays the results and information about previous elections which is also stored in the database. When the user wishes to update their user details, the database comes into action.

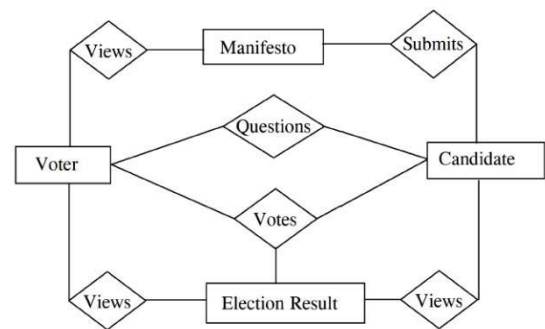


Fig.4. Flowchart of the Application

Fig.5 Election Campaign of the Application

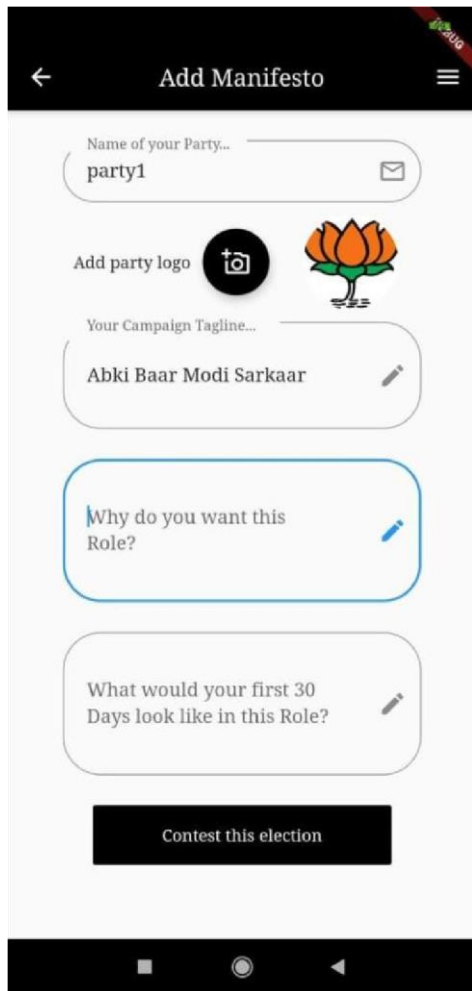


Fig.6 Manifesto of the Application

The application not only provides comfort but the security and privacy of citizen-votes are also not compromised. This application aims to be as secure as possible by keeping the data of the voters hidden and private. Just like the current voting system, the citizen-votes will be non- traceable back to the voters, keeping in mind the voters' privacy and safety. Hence, voter's privacy and confidentiality is taken care of. The application would seek to prevent any electoral frauds, election manipulation, voter fraud, or vote rigging that involved illegal intervention with the election process, either by boosting the vote share of a preferred candidate, decreasing the vote share of competitor candidates, or both. We do this by implementing a fool proof User authentication system consisting of methods like finger-print verification and many more. Thus, safe polling is also a prime objective of our application.

V. RESULTS AND CONCLUSION

The application not only provides comfort but the security and privacy of citizen-votes are also not compromised. This application aims to be as secure as possible by keeping the data

of the voters hidden and private. Just like the current voting system, the citizen-votes will be non- traceable back to the voters, keeping in mind the voters' privacy and safety. Hence, voter's privacy and confidentiality are taken care of.

The programme would seek to avoid any electoral frauds, election manipulation, voter fraud, or vote rigging including illegal involvement with an election's process, either by boosting the vote share of a preferred candidate, decreasing the vote share of competitor candidates, or both. We do this by implementing a fool proof User authentication system consisting of methods like finger-print verification and many more. Thus, safe polling is also a prime objective of our application.

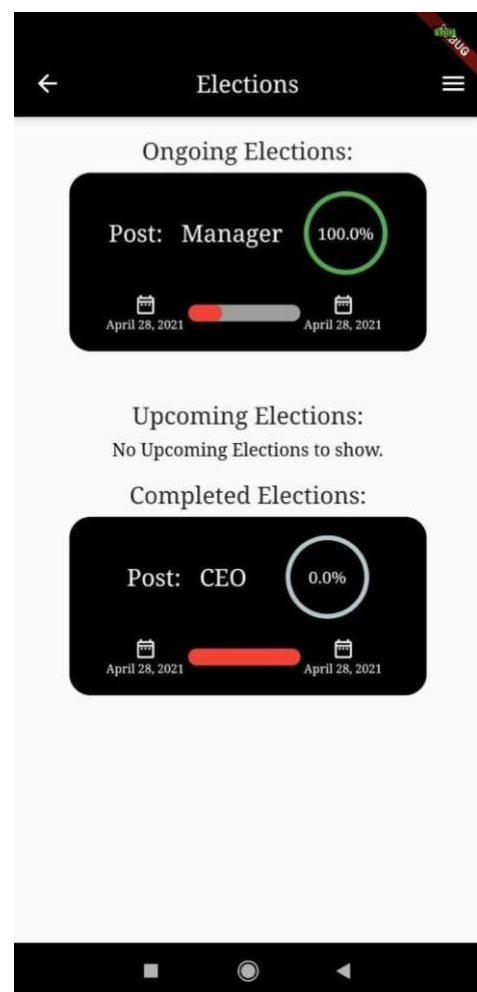


Fig.7 Election Result of the Campaign.

VI. SOCIAL IMPACT

We will be building an online voting software which will allow the citizens to vote with the comfort of their houses. As part of this, the costs and benefits of the proposed system are weighed, and the project is only economically viable if the

tangible and intangible benefits outweigh the expenses. The implementation and development cost of this software under the reach of any small organization. So, the resources of this software are very much available. Thus, it is financially feasible. The project makes use of freely available development tools and distributes the system as open source. Potential customers will only be charged for maintenance. Since it promotes less use of manual work on papers, it will benefit the organization financially and also the environment.

The feasibility of risk can be considered in a variety of settings. The dangers of being too big:

Estimated product size in the line of codes:

With a large number of stakeholders, the project will have a large number of code lines. Because the system lacks a multimedia component, the file sizes and total application size will not exceed 200MB.

Estimated product size in several programmes:

Despite the fact that the app supports a large number of stakeholders, it will be built as a single app with a single login page rather than a collection of sites for distinct users. The contents will be shown or concealed depending on the access rights.

Number of anticipated changes to the product's requirements after delivery:

Prior to the implementation phase, the needs are identified. Because this is a generic product, the requirements will only change if new system functionalities are implemented.

Customer-related dangers::

The project is a generic sort of mass-market product. This application aims to be as secure as possible by keeping the data of the voters hidden and private. Just like the current voting system, the citizen-votes will be non- traceable back to the voters, keeping in mind the voters' privacy and safety.

Risks associated with technology:

Is the technology being constructed from scratch?

All of the technologies are well-established (but not obsolete).

Do the system requirements necessitate the development of new algorithms, input, or output technology? Several algorithms will be used in the project to carry out data transfers and keep the community running smoothly.

Everything is switching online. In this scenario, it is of utmost importance that a suitable Online Voting method is incorporated, particularly in sectors like Election (For instance in Government Election Process). Our system with further enhancements and modifications will be suitable in such platforms in the future.

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This project and technical paper were greatly supported by Professor Anuja Odherkar. Her professional coaching and comprehensive help were invaluable to us throughout the project, and this paper would not have been possible without his contributions. We are grateful to our colleagues who

contributed their knowledge and experience to the research and assisted us throughout the process.

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Android App for All Forms of Sensor Monitoring Over Bluetooth

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Abstract—Arduino sensor monitoring with Android is one of the most popular and advanced applications in the tech world, having grown to aid people in receiving better and quicker information support in the form of medical, technical, software, hardware, or both software and hardware mutuality. To achieve the finest information collection and monitoring, networked sensors are either worn or integrated in our living surroundings to enable the process of acquiring rich information and making our lives a little less tangled in cables. This project elaborates on the technique used and shows different design factors to be addressed in order to make users' lives much more convenient through the usage of simple applications. In this manner, the arduino sensors that are linked to our Android app are recorded and transmitted to the selected smartphone application as preference shared data. The proposed system in this project helps to implement the combination of hardware and software in a much more economic and effective manner. The prime use of this system can be inside a server room where there is a need of monitoring some information like temperature, humidity, gas state. This is just one use from many uses. The use of this system is only limited to the user

Keywords— *Android App Development, UNO , BreadBoard, Arduino, Bluetooth Module HC-05, Smartphone, Sensors, DHT-11, MQ-135, Server room temperature monitor, Sensor Connector app, IOT*

I. INTRODUCTION

In its most basic form, the Internet of Things (IoT) refers to the notion of linking physical devices, machinery, software, and things. Kevin Ashton, a digital innovation guru, created the term "Internet of Things" in 1999. Since then, the IoT business has seen enormous growth and development because it provides a platform that allows users to connect things and operate them using big data technologies. IoT applications are classified into four kinds. They are classified into four categories: consumer, commercial, industrial, and infrastructure.

In this project, we constructed an Android app and an Arduino gadget that is Bluetooth-connected to numerous sensors. The Arduino Uno Board is an open-source microcontroller board based on Arduino's ATmega328P microprocessor.

Sensor networks have always been widespread wireless networks consisting of tiny, low-cost sensors that gather and distribute environmental information. Wsns enable more accurate monitoring and management of different surroundings from remote regions. They can be used for monitoring systems, interior temperature monitoring, spying, measurement apparatus, biomedical imaging, crisis response,

and emergency management, ambient air monitoring, and acquiring sensory data in unfriendly environments.

To monitor this many things in a real time its quite difficult. So a android os based app is developed to monitor the data that sensor is collecting from the surrounding.

For Android app development API level decided is Android 4.0.03 IceCream Sandwich. So as far the percentage of community we will be targeting are around 99.87% of android users.

XML is a markup language comparable to HTML in that it does not have preset tags to utilize. Instead, you create your own tags that are tailored to your individual requirements. This is an effective method for storing data in a format that can be saved, found, and shared. Most significantly, because XML's basic structure is defined, if you exchange or transmit XML across systems or platforms, whether locally or over the internet, the receiver can still understand the data owing to the standardised XML syntax. And the IDE used to develop the app is 'Android Studio' which is developed by Google.

II. OBJECTIVE

The present objective of the technology sector is to give greater assistance to people in a more cost-effective and user-friendly manner. As a result, there is a need to enhance user monitoring devices in order to increase user convenience. In today's fast-paced world, monitoring our hardware devices with traditional means is getting increasingly difficult, therefore everyone expects to know about their gear's health. Their beneficial applications may be found in everyday life via the use of smart technology that is both simply accessible and effective. As computer, bio instrumentation, and telecommunications technologies advance, it has become possible to design more smart devices that assist telemonitoring systems in recording data, acquiring data, displaying data, and transmitting sensor signals from the sensors. It can improve efficiency by better managing monitoring and professional settings on shared devices. Software monitoring entails keeping an eye on hardware-based sensors from afar. The benefits of utilising App technology with Arduino for a user tracking system are discussed in this project. This technology collects input from the user and feeds it to two different displays i.e display sensor characteristics and details and sync the key information to an Android app. A professional faculty member can then access this information through an application placed on his or her Android phone. his or her experiments. Also, the project is a fantastic solution to a huge outbreak systems such as server rooms, cryptomining rooms where there is an accumulation of super high speed computing and they require some systems to

check if certain equipment are not exposed to high temperatures, or the moisture is good for the server rooms, and so on.

III. LITERATURE SURVEY

Since the Arduino is utilized to make a minimal expense information gathering card with an examining recurrence of up to 50k Hz, the testing recurrence may likewise be utilized to adjust the sign estimation of various frequencies by means of the product. In this paper, utility power signals are utilized to quantify the objective, and the simple signs caught by Arduino from the deliberate power transport signals are changed over into computerized signals, which are then communicated through Bluetooth to an Android cell phone so the sign waveform sent by Arduino can be shown on the cell phone. Signal clamor and high music are sifted through utilizing a Fourier advanced separating strategy, and afterward the zero intersection method is utilized to definitively gauge the major recurrence of the power signal. Because the power signal is a high-voltage AC signal, this exploration develops a voltage Step-down circuit as sign pre-handling to change the sign level to the standard level that Arduino can acknowledge. As indicated by the exploration, this study can develop a compact power signal obtaining hardware to look at signal waveforms utilizing an Android App and evaluate signal vibration and recurrence.

The capacity of versatile applications to speak with each other is a fundamental element of portable stages. Android was explicitly made in light of between application correspondence, and it depends on it to convey stage explicit capacities. Android Apps might be made utilizing the Android SDK and IDEs like Android Studio, or using a program based stage called App Inventor. At the point when applications are created using the two different improvement stages, these two advancement stages give their own methodology for between application correspondence inside a similar stage, however miss the mark on laid out method of between application correspondence. This paper fills in the holes in application correspondence by introducing a way for sending and getting contentions between applications made on these two stages. The pertinence is additionally examined in the review.

It is wanted to foster a Wi-Fi-based fitting and-sense savvy contraption for particular air quality observing using the Internet of Things. This framework depends on a gadget to-cloud engineering in IoT and is utilized to precisely screen contamination levels. When the sensor hub has perused the substance of different poisons as well as their topographical directions, the air quality file (AQI) will be created utilizing the straight division idea, the more noteworthy Vancouver AQI data set, and the Max administrator conglomeration approach. In view of the AQI esteem, the matching LED will be enacted for sign, and data about the wellbeing impact and careful steps will be introduced on the screen. Each of the information will be shipped off the distributed storage, which is an open source application programming point of interaction for IoT-based gadgets. These pushed information, along with the date and time, might be downloaded as a different succeed report for additional assessment. Constant

contamination levels with area might be seen as a line chart utilizing the stuff view android application. With the reception of this minimal expense, little size shrewd device, people might be made aware of wear against contamination veils and divert their travel courses where there is unnecessary air contamination, guaranteeing high reliability and consistency.

IV. PROPOSED DESIGN

Arduino UNO

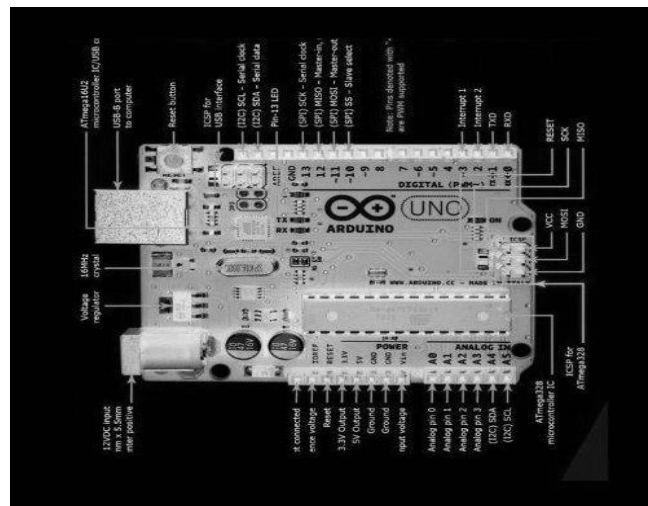


Fig. 1 Arduino UNO

The Arduino UNO is a microcontroller which uses the ATmega328P microprocessor. It has 14 pins, a quartz crystal and a USB port. It is programmed by connecting the board to a PC and then burning the code onto it using Arduino IDE.

Bluetooth Module(HC-05)

The HC-05 is a Bluetooth module that is used to communicate wirelessly.

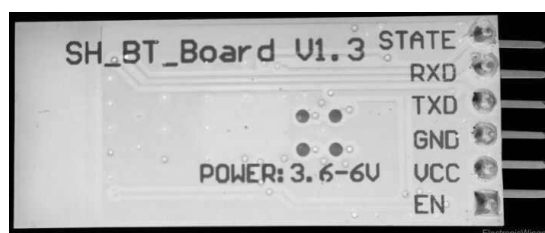


Fig.2 Bluetooth Module HC-05

Pin Description

Bluetooth serial modules allow all serial-enabled devices to interact wirelessly. There are six pins on it -

1. Key/EN: This pin responds to the AT instructions. It is in data mode by default.
2. Data mode: It facilitates transfer of data.
3. Command mode: It makes use of AT commands to adjust the HC-05's settings. The module serial (USART) port is utilised to deliver these commands.
4. VCC: 5V or 3.3V is given to this pin to allow it to function.
5. GND: This pin must be grounded during use.
6. TXD: Serial data is sent through this pin.
7. RXD: Serial data is received through this pin..
8. State: Indicates whether or not the module is connected..

The LED present on the module tells us whether it is connected to our device using Bluetooth. Fast blinking tells us that no data is being transmitted yet. Once data transmission begins it blinks every 2 seconds. ..

Breadboard

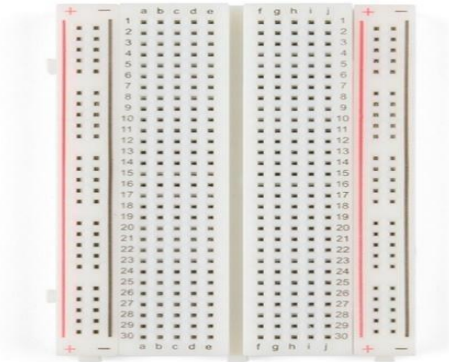


Fig. 3 Breadboard

A breadboard is a device which has multiple pores inscribed in which the 'a' to 'f' are shorted vertically and the top two last rows and horizontal are shorted horizontally. The breadboard can be used for experimental purposes with new demos. The biggest advantage of the breadboard is that we don't have to solder anything. The small pockets are known as holes.

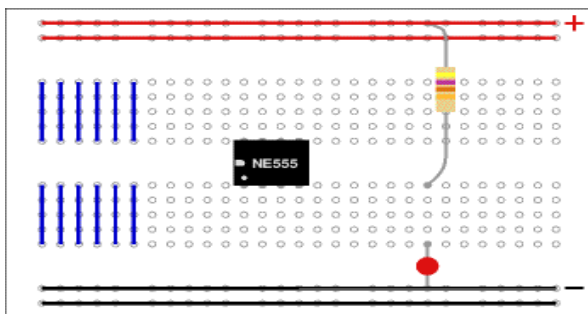


Fig. 4 Breadboard Connection

In the figure we can see that at the extreme there are two rows, the top most row has + sign and the lower row has - sign.

MQ-135

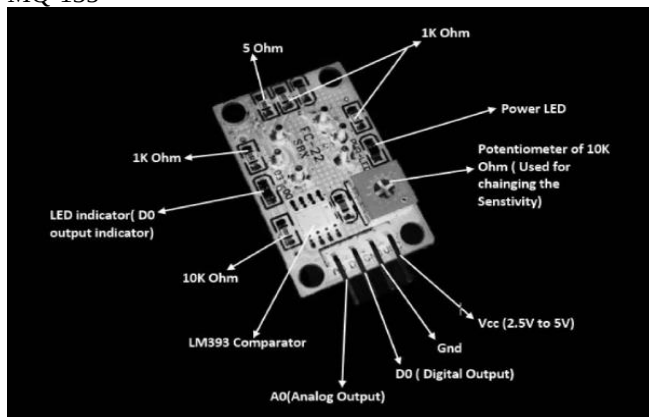


Fig. 5 MQ135 Gas Sensor

(NH₃), (S), (C₆H₆), CO₂, and other toxic smokes may all get detected by the MQ-135 Gas Sensor. This datas features a DA o/p pin. The digital pin goes high when the level of these

gases in the air exceeds a threshold limit. The on-board potentiometer may be used to set the threshold value. The analogue output pin generates an analogue signal that may be used to estimate the concentration of these gases.

Technical Specifications of MQ135 Gas Sensor

1. OPER Voltage: 2.5Volts - 5.0Volts
2. Watt consumption: 150 milli Ampere
3. Parameters: NH₃, Nox, CO₂, Alcohol, Benzene, Smoke
4. DIGI Output: 0 Volts - 5 Volts
5. ANA Output: 0-5 Volts

DHT-11

The figure shown above describes the DHT-11 sensor which is used for getting information on Temperature and Humidity. This sensor is a compact version as it combines two different sensors in one sensor. Because of this compactness the space in the microchip can be saved also there will be no issues in architecture compatibility as both the data are coming from the same sensor.

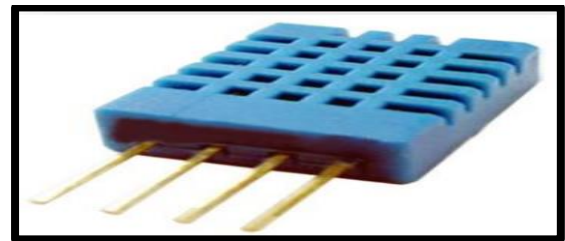


Fig. 6 DHT-11 Temp and Humidity Sensor

3. Typical Application (Figure 1)

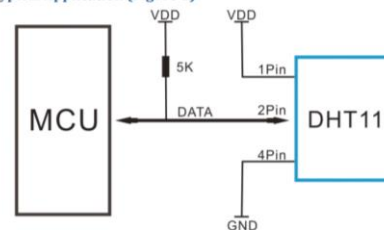


Fig. 7 MCU and DHT-11 Connection

9V Battery

The 9V (nine volt) battery is a rectangular dry cell classified by its 48.5mm x 26.5mm x 17.5mm dimensions and one-sided clasp terminals. This small 9v batteries are the best of low capacity supplies as this batteries are small in size and can give a small device enough power to work on. They hold mid-range capacities upwards of 1,200mAh and were often used in radios, but today are used more for walkie-talkies, clocks, smoke detectors, and house alarms.



Fig. 8 Volt DC Battery

V. METHODOLOGY

1.The most important part for making a big project is to first make a MVP of that project i.e Minimum viable Product so far in our case, for starters point we will be using Android studio and Arduino IDE for programming the software side and variable resistor for sensors.

2.After testing the product, if the product works properly as we expected, then we can start the replacement of the variable resistor with any sensor we want. As you can see the middle leg of the potmeter is connected with the Arduino's analog pin A0, while the other two legs of the variable resistor are connected with the Arduino's 3.3V & GND (as shown in the figure 2.0) .

3.Now after heading one step towards our main goal we will start checking about the sensors we want for our product . Also we will be checking the compatibility between the sensors we want to use and the software programme that we developed . If something goes wrong we will first try to use that sensor in some alternate ways like by compounding two compatible sensors to create our required sensor which was incompatible beforehand .

4.Now we will connect our bluetooth module with arduino as the bluetooth module Tx and Rx pins are connected with the Arduino's pin number 2 and pin number 3. Pin number 2 and pin number 3 will be used as the Serial Port, which will be defined in the programming. While the VCC and GND pins are connected with the Arduino's 5v and GND (As shown in fig 2).

5. The bluetooth module is connected to the Arduino. This is done by connecting the TX and RX pins to UNO's pin 2 & 3 respectively.

6.So now for Android programming we will start by deciding the API level. Since we want to target all the android smartphone community we will try to make our API as low as possible . For the time being we have decided the API level 15 i.e Android 4.0.3 IceCream Sandwich .So as far the percentage of community we will be targeting are around 99.87% of android users .

7.After deciding the API level and Platform we will move our team to designing and programming . The programming language we will be using is Java since its a common programming language that we all know .The designing language we will be using for our app development is XML .So far till now we can say that we will be making our apps brain with Java , Organs with Arduino and skeleton with XML .

8.The database of this app will include the sensor data that was intercepted from the arduino. For starters we will be using Shared Preferences , shared preferences is not a database but in android it is used for storing temporary information about the data that is cleaned after reinitializing the app.

9.After some testing and taking reviews from the users we found out that there was no need of putting user authentication on our app. Because we know that

Identification is utilised by a client when the client wants to understand that the server is the system that it professes to be. The user or machine must confirm its identity to a server or client during verification. So thus we never felt a need for doing authentication but it can be molded down to have authentication.

VI. SCHEMATIC BLOCK DIAGRAM

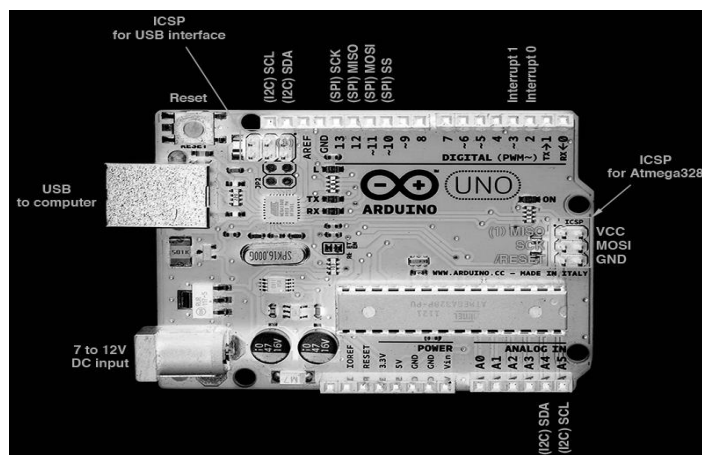


Fig. 9 Arduino and Bluetooth HC05/HC06

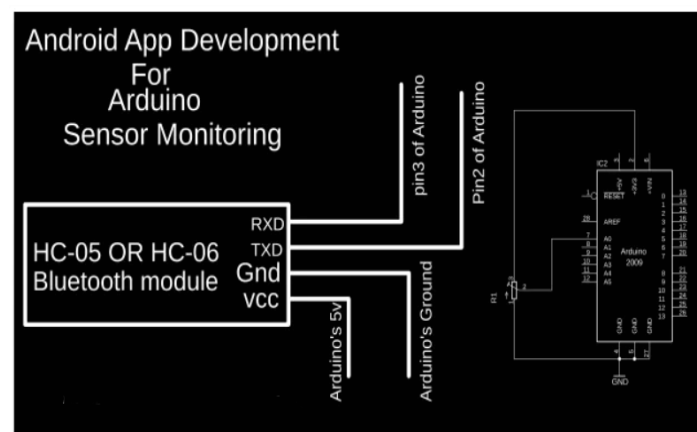


Fig. 10 Architectural Diagram

VII. IMPLEMENTATION

The start of our Project setup was laying out our android app like defining our UI/UX and then going for the coding part of our app that will help to connect android app with any Arduino sensor with Bluetooth. During this course, simultaneously we were working on arduino code that was written to verify the sensor's connectivity via Bluetooth.

Once the connectivity between Bluetooth module and arduino were tuned correctly we started the connectivity of Bluetooth module with our android phones. During coding for native android app we faced an issue where the system was not allowing for the user to enable Bluetooth. After some sweet debugging the team found out that we weren't operating under safety checks which was later done by adding some if loops.

After successfully connecting our app through the Bluetooth module we setted up the potmeter by connecting the arduino with it, taking help from jumper wire connections. In the future the potmeter can be replaced with any type of sensor for simplicity. We will be doing this implementation with the help of potmeter.

After this connection we must verify that connection was correctly done and to verify this we open up our app and then we do a scan then click on the Bluetooth module and connect with it. Once it gets connected the app will start to receive the data from the arduino and will display it on the screen. The visuals here are real time data fetched from the arduino(changes made through potmeter). So if your data changes when you increase the value of potmeter or decrease it then the implementation is verified and correct.

Once the experiment with potmeter was successful we purchased some sensors like Temperature, Humidity, Air Quality Index to verify our statement that the app can read data from any types of sensors through bluetooth. Thus after connecting and doing some arduino programming related to the sensors .0We were able to use the same app without changing anything from it.

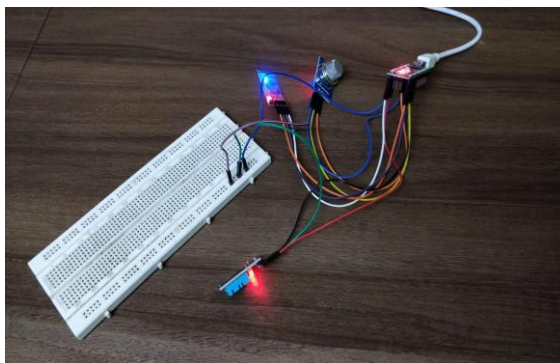


Fig.11 Arduino, DHT11, MQ135 sensors & Bluetooth module connected



Fig.12 Device connected successfully and data from sensors is shown every second



Fig.13 Device connected successfully and data from sensors is shown every second

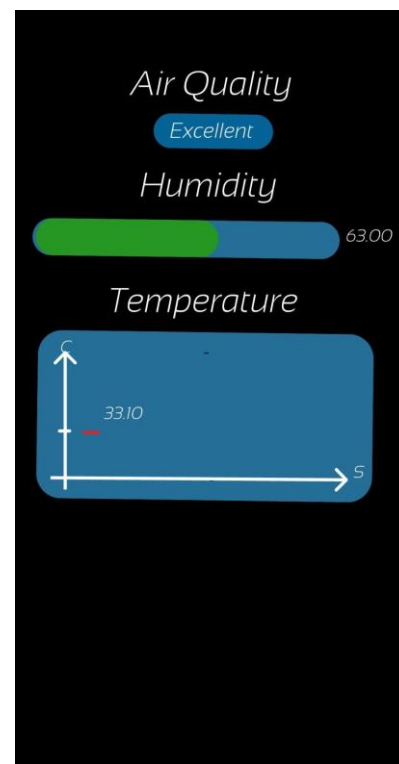


Fig.14 Sensory Graphs

V. RESULTS AND CONCLUSION

Results show that ARDSENSE can be used for temperature monitoring, humidity monitoring & Air quality index sensing in the server room. Temperature and humidity are monitored in real time (every 5 seconds) through the channels provided by the Bluetooth module and the android os. For work, acceleration is done by increasing the number of points and sensors to obtain more accurate data. Links and Bookmarks. Also the sensors we used are just some example sensors, the user can always replace the sensors to their will since the app was made for connecting different and almost all types of sensors with it.

VI. SOCIAL IMPACT

In this new era, an organization cannot wait for a server failure only to discover that part of the server room's temporary management system is down. This is costly both in terms of equipment costs and possibly the number of users that could be impacted by outages affecting service. That's why we needed a proactive monitoring system and data logger to keep industries as well as firms informed in real time of what's going on in your server room, so you can take action. before a major production failure.

Thus a small remote control with a few analog sensors can remotely access data from sensors located in the server room, so businesses can always be informed of the status of the device.

Successful and accurate temperature, Air monitoring, Humidity and many controllable sensors have numerous benefits to both Industry's, Humanity and their surroundings such as:

1. The information gathered from 'Air Quality Monitoring' assists us in checking effects caused by lesser quality of air on human health. Air standard information simplifies for us to confirm if a part is meeting the air quality standards devised by CPCB, United Nations agency or federal agency.

2. The information gathered from 'Humidity Sensor' would firstly assist us to find the area which has higher amounts of moisture and which can be really bad for the tech devices especially circuits which are vulnerable. If this occurred there can be huge financial loss or in the worst case scenario life loss. Since the IT worlds are made up of things like server rooms that have many types of data inside them.

3. The information gathered from "Temperature sensors" can be used for server racks maintenance or can be used inside the cryptomining rooms where there are super high level processing systems used to mine the crypto blocks causing the temperature to rise. In the end if the cooler temperature is not maintained correctly then it can short circuit or even fuse semiconductors.

4. The above cases were just some example sensors that can be used for connecting through our app. The app's potential for connecting to different sensors and showing readings for those sensors is only limited by the user. The app's backend was made in such a way that it can become the new dynamic bridge between the software world and the hardware sensors world & In the end we as a team tried to create a setup which will try to bridge the gap between software and hardware which are used now.

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