PCE JOURNAL OF ELECTRONICS AND TELECOMMUNICATION

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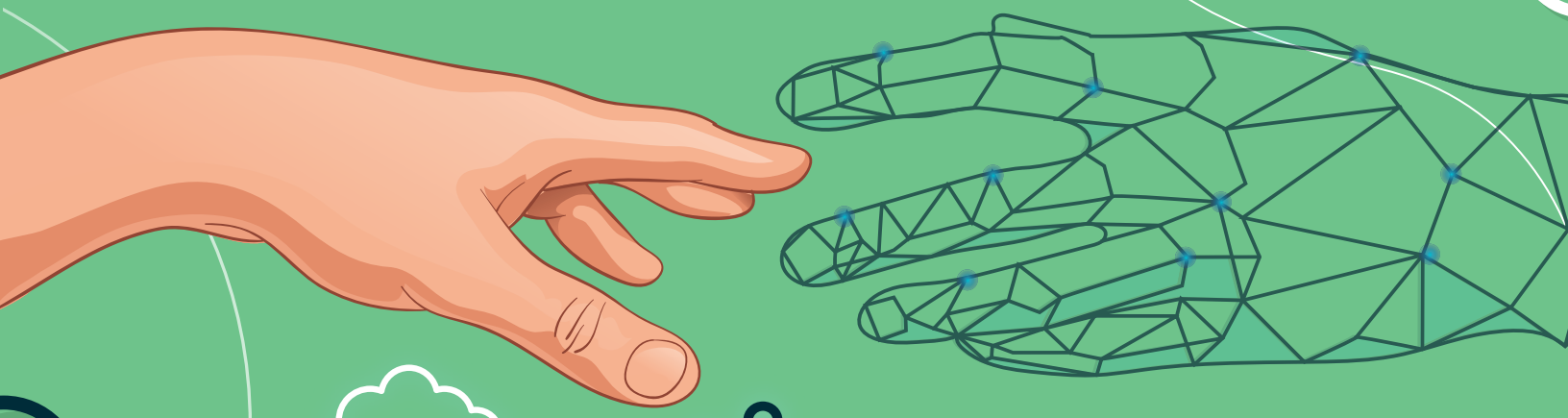

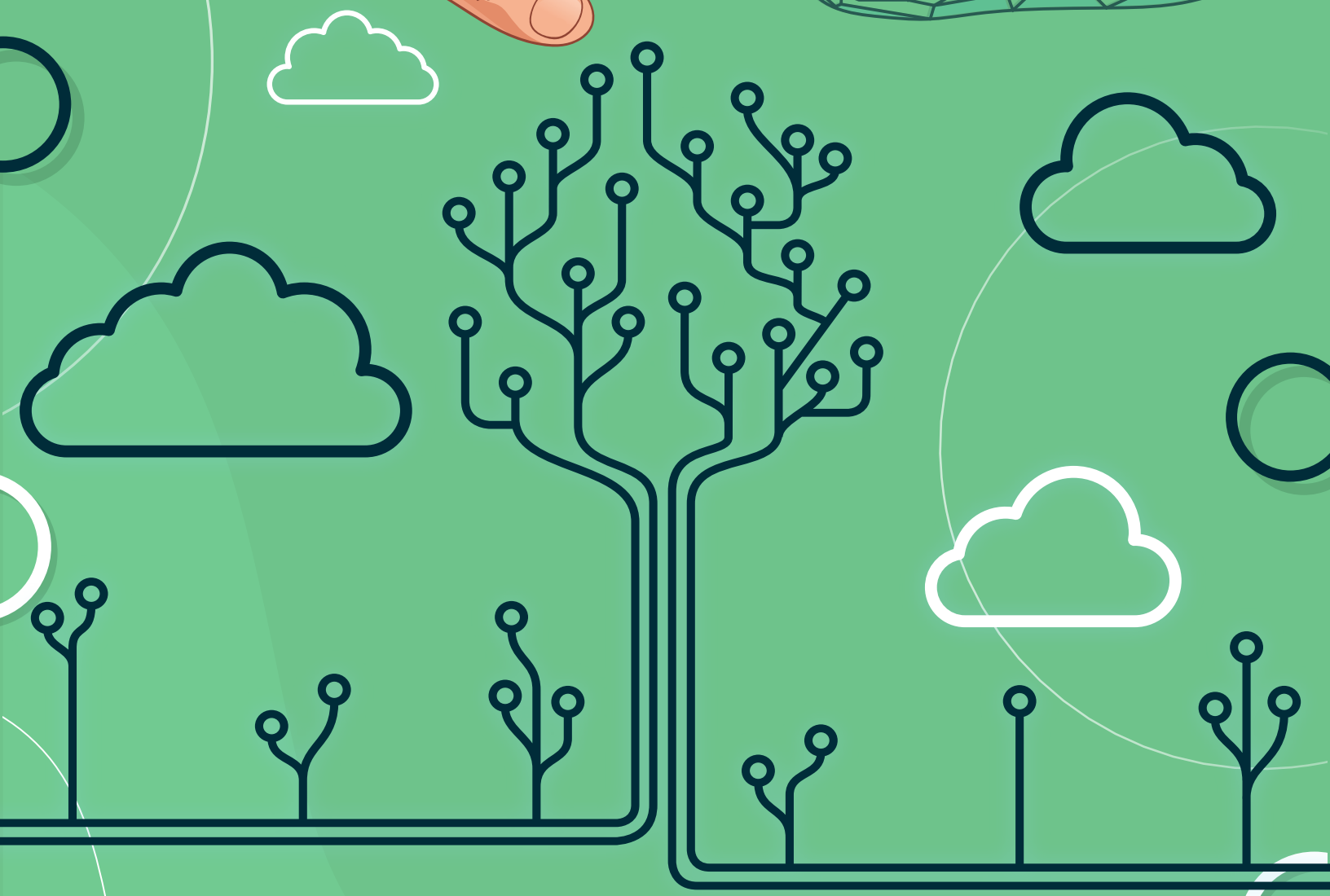

DECEMBER 2020

FROM THE PRINCIPAL'S DESK

I am glad that the faculty and students in the electronics and telecommunication department participated to create such a groundbreaking journal that portrays various technological advancements in the field of electronics and telecommunication. Continuous discovery and advancement is critical in today's engineering field, and it necessitates the highest level of imagination.

As a result, in order to excel and progress toward more realistic goals, today's generation must find new ways to adopt new creative learning processes.

As Principal, I am dedicated to creating the best opportunities for students in an environment that fosters academic and co-curricular learning. Because of the guidance and help they got, students were given a forum to express their abilities. It brings me great joy to see the artistic expressions of the students who contributed to this journal.

This journal has exceeded my expectations, and I wish the department's staff and students continued success in their future endeavours.

With Best Wishes,

Dr Sandeep Joshi
Principal
Pillai College of Engineering

FROM THE HEAD OF DEPARTMENT'S DESK

It gives me immense pleasure to have witnessed the outstanding project work implemented by the final year students from the department of EXTC. I appreciate the students for their exceptional work and sheer dedication; they have created remarkable projects even amidst the COVID-19 pandemic . Along with the innovative ideas, they have also paid close attention to cost-effectiveness in their projects which is an important aspect of sustainable projects. The papers submitted to the journal highlight the dedication and efforts taken by the students. It is admirable to see the work done by the journal committee that makes sure the earnest effort done by our students is noticeable and much appreciated by the entire college through publishing the journal. I hope students keep on finding innovative approaches in the path of their lives. I wish all the students good luck in their future endeavors.

With Best Wishes,

Dr Avinash R. Vaidya
Head of Department
Electronics and Telecommunication Engineering

FROM THE TEACHER'S DESK

The Electronics and Telecommunication department's annual journal is a venue where the department's student's proposals are displayed in front of the entire campus. The papers that students write serve as an outstanding repository of knowledge that other students may turn to. The Journal committee has put in a tremendous amount of effort. The members of the committee not only planned the report but also assisted the student's who were writing the articles. The punctuality with which they completed their work is truly commendable. The technical papers submitted this year demonstrate how creative the student's thinking has been, pointing to a bright future.
I wish the committee good luck and look forward to more marvelous issues of this journal in the future.

Prof. Jayashri D. Bhosale
Assistant Professor
Electronics and Telecommunication Engineering

Each of the projects this year has been both interesting and fruitful in its way. We came across numerous types of projects, each displaying the innovative and ingenious minds of our students. Project work is a learning experience designed to allow students to synthesize information from different fields of study and apply it critically and creatively to real-life situations. All of this was both cost-effective and innovative, demonstrating the students' ability to think outside the box. It's an in-depth investigation of a real-world topic that is worthy of students' attention and effort. The journal committee members have done an outstanding job of highlighting the potential of our department's students. The journal team worked quickly to meet deadlines to ensure that the papers submitted were flawless. I appreciate the teamwork and meticulous attention to detail that enabled us to streamline the entire process and achieve our objectives. I wish all the best to all the committee members and a good heart to keeping up the good work.

Prof. Suchitra Patil
Assistant Professor
Electronics and Telecommunication Engineering

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3D Thermal Sensing to detect body temperature for COVID-19 Cases

Ankita Rajesh, Ravi Kothari, Prasang Dubey, Prof. Ajit Saraf, Prof. Ruchira Patole

***Abstract*— The temperature measurement technology of infrared thermal imaging has become a hotspot in the field of temperature measurement at home and abroad, because of its non-contact temperature measurement and fast response. In general, the temperature contrast in the affected regions is about 0.7 to 1° C above the normal regions, due to sluggish blood circulation. The results suggest that the thermal imaging technique is an effective technique for detecting small temperature changes in the human body due to vascular disorders. In this Paper, we have attempted to review the research works which has reported application of thermal imaging for medical purposes during the covid period. This paper summarized the application of infrared thermal imager research, and prospects the research direction in the field of it related.**

***Keywords*—Heat mapping, IR imaging, Temperature, Thermal Imaging**

I. Introduction

Thermal imaging is the method of detecting Long IR range of electromagnetic spectrum which is invisible to the human eye by means of special and sophisticated cameras called as Infrared Imagers. The Long-Wave IR falls between 8µm - 15 µm and provides thermal data or heat map of the captured scene in quantified form representing temperature data of the same. Thermal imaging does not need ambient light to capture thermal image as its working principle is based solely on detecting thermal emissions of the scene to be imaged. The temperature map thus obtained is represented through application of pseudo color palette for visualization purposes which is done by software application in the form of firmware inside the infrared imager or on an application in a computer system. Uncooled silicon microbolometer based Imagers have been predominantly used for various applications like research, military, commerce, etc. due to comparatively lesser costs as compared to the cryogenic Imagers which are very expensive and used in military and industrial applications. Nevertheless, thermal imagers still remain beyond affordability for groups with modest budgets.

II. Medical Uses Of Thermal Imaging

A range of medical conditions exist that are marked by changes in body temperature that can be detected through changes in body surface temperature. The easiest and most common means of fever detection in daily life is by merely touching the body. But the quantification of fever is vital for understanding the severity of the illness. From clinical mercury-based thermometer to non-contact thermal imagers with advanced detectors and IR optics, the advancement in thermal quantification has come a long way. Carl Wunderlich in 1868 developed the thermometer, which is still being used in clinical practice. It has a limited scale with a typical range of 35 °C to 42 °C or 90 °F to 110 °F which is around the range of internal body temperature. But medical conditions such as hypothermia and hypothermia are characterized by extreme alterations in body temperature which can be life-threatening. The change in body surface temperature occurs due to changes in blood perfusion rate at the peripheral site of the body on account of an illness. In most of the cases, even before clinical symptoms appear, temperature change is preceded, this can be essentially used for early diagnosis and prognosis [5]. Illnesses such as fever, hypothermia, hyperthermia, diabetes, breast carcinoma, peripheral vascular disorders, dermal problems induce characteristic changes in body temperature that can be detected through measurement of body surface temperature. In the following sections we present a small review of the recently reported thermography applications on four most commonly studied medical conditions.

Hypothermia/Hyperthermia/fever

Fever can be a vital sign for presence of various infections from which, some could be contagious. Thermal imaging has proved to be effective in mass screening of fever which could be especially useful to monitor crowded places which is illustrated in figure. Outbreaks of pandemics like Ebola and SARS could be monitored effectively in people present in public places like malls, airports and other travelling junctions through means of thermal imaging systems installed at such places. The hypo thermic and hyper thermic body regions can be identified during surgical procedures for observing temperature fluctuations in the organ. By use of thermal imaging system, Danilova et. al attempted to control heart temperature and successfully detected hypothermia by imaging the myocardium.

III. Related Research

A. Thermal Object Tracking Benchmark

This paper propose a thermal infrared benchmark according to the Visual Object Tracking (VOT) protocol for evaluation of STSO tracking methods. The benchmark includes the new LTIR dataset containing 20 thermal image sequences which have been collected from multiple sources and annotated in the format used in the VOT Challenge. In addition, we show that the ranking of different tracking principles differ between the visual and thermal benchmarks, confirming the need for the new benchmark.

B. The Thermal Infrared Visual Object Tracking

This paper gives an overview of the first thermal infrared (TIR), short-term tracking challenge, the Visual Object Tracking TIR (VOT-TIR2015) challenge, and the results obtained. Like the VOT challenge, the VOT-TIR challenge considered single-camera, single-target, model-free, causal trackers, applied to short-term tracking. It was featured as a sub-challenge to VOT2015, organized in conjunction with ICCV2015. The challenge enabled participants not only to evaluate their results on visual data, but also to benchmark their trackers on thermal infrared sequences.

C. Channel Coded Distribution Field Tracking for Thermal Infrared Imagery

In this paper, the differences between thermal and visual tracking, argue that template-based trackers based on distribution fields are suited for thermal tracking, and propose three enhancements to such tracking methods: First, we propose a method for improving distribution field-based trackers using background weighting of object template updates. Second, we propose a method for improving the search phase in such trackers using an adaptive object region. Third, a scale estimation technique employing background information is evaluated. The improvements are complementary, and evaluate the resulting tracker on both RGB and TIR sequences.

D. Temperature model and human detection in human image

In this paper, based on the temperature and the relationship between temperature and pixel value, we have completed the definition of four models: the background model, the cold model, the normal model and the hot model. In this paper, we present about taking advantage of the thermal capabilities of the thermal camera to avoid interference from light effects. The most important point in this paper is the development of temperature models. This show the relationship and link between pixel values and temperature values.

3.1 Summary of Related Work

The summary of methods used in literature is given in Table 1.

Author	Paper	Drawbacks
A. Berg, J. Ahlberg, and M. Felsberg (2015)	Thermal Object Tracking Benchmark	Indicates blur due to motion, high humidity, rain or water on the lens also spatially varying background temperature,
M. Felsberg, A. Berg, G. Häger, J. Ahlberg, M. Kristan (2016)	Thermal Infrared Visual Object Tracking	Difficult to identify a systematic correlation between improvement and type of tracking methods
Amanda Berg and Jörgen Ahlberg (2014)	: Channel Coded Distributio n Field Tracking for Thermal Infrared Imagery	Noisy images with low resolution, used mainly for tracking small objects (point targets) against colder backgrounds.
Pei-Jun Lee, Trong-An Bui, Che-Chih Lo (2018)	TEMPERA TURE MODEL AND HUMAN DETECTI ON IN THERMA L IMAGE	While detection a human body does not detect the background temperature.

Table 1 Summary of literature survey

IV. Proposed Algorithm And Result

Based on the thermal image, we perform an analysis to identify the objects. In this proposal, the most important is to determine the temperature model. This is combined with the human detection method to identify objects. In our research, we used the thermal camera to perform. A thermal camera differs from conventional cameras, which only determine the central temperature of the point of heat output (the highest point of emission). From there, to identify other value areas or identify objects, we modeled the temperature models. Based on these temperature models, we predict other pixel values as well as objects. This step, we call building the temperature model based on the central pixel temperature value. Figure 1 shows the main flowchart for proposed algorithm.

Based on the thermal camera, we collect thermal images directly. From the thermal image, we proceed to determine the center temperature of the image. In the first step, we compare the central temperature point with the predefined safety temperature threshold. In this case, we chose 70 degrees Celsius as a temperature threshold to distinguish safety (less than 70) and unsafe (greater than 70). If the temperature exceeds the safety threshold, immediately proceed to alert and locate the object is not safe in the image. In the other case, if the temperature of the object is within the safety threshold, we apply the object division in the image to four different object types corresponding to four temperature states.

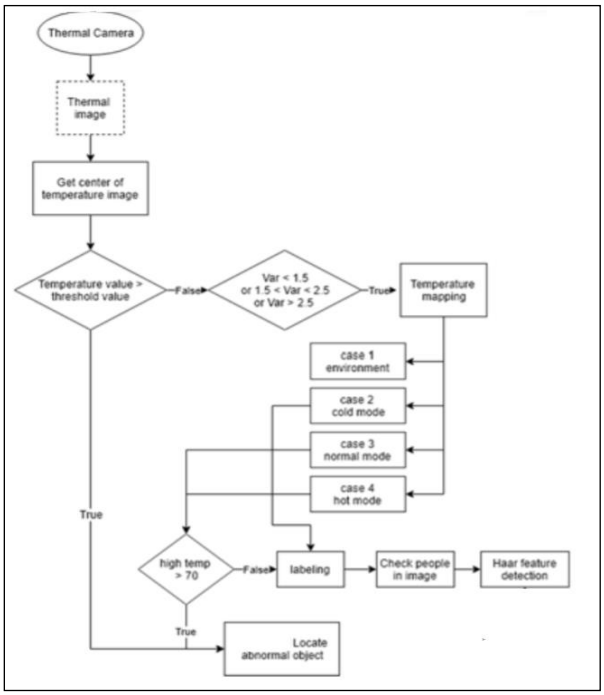

Fig 1: Process Flowchart

This is the most important part of this paper, which helps identify object models based on temperature charts. From the object temperature model noted in the previous step, we apply the algorithm of object identification, in this case, the identification of people in the image. Recognized objects are highly accurate as they have implemented the process of identifying temperature models in combination with the identification algorithms Hear feature detection.

A. Temperature model

The most important point in this research is to determine the relationship between recorded temperature and pixel value. In this section, we clarify this relationship based on specific cases, therefore defining specific object models. We prove based on the results recorded for each case. To get the best value for the models, we conducted directly with the thermal camera, our values are captured and processed directly on the thermal camera so there is a high accuracy of the recorded temperature. We performed image preprocessing to identify cases for the temperature model based on the image pixel block meanwhile the image mean value.

B. Human detection

Based on the normal model we be going process human detection. After eliminating high and low-temperature objects, we focused on the analysis based on normal temperature objects. In this study, we use the algorithm to identify the labeling algorithm, Hear feature. Our implementation process, in turn, applies the algorithm. A Haar-like feature considers adjacent rectangular regions at a specific location in a detection window, sums up the pixel intensities in each region and calculates the difference between these sums.

V. Experimental Setup

The implementation detail is given in this section. The basic ROI analysis, the pre-processing steps, as well as the temperature line profile and histogram analysis of the obtained thermal images, were performed with the use of MathWorks MATLAB R2009a and Python. Although the thermal imager provides image signals both in greyscale and pseudo-colour mode (such as rainbow scale), the overall raw data was processed in the greyscale option. In cases of black/white reproduction, rainbow colour maps appear to be confusing due to their lack of perceptual ordering and are misleadingly interpreted through the introduction of non data-dependent gradients. On the other hand, the processing of greyscale images requires a significantly lower computational burden.

5.1 The simulation results

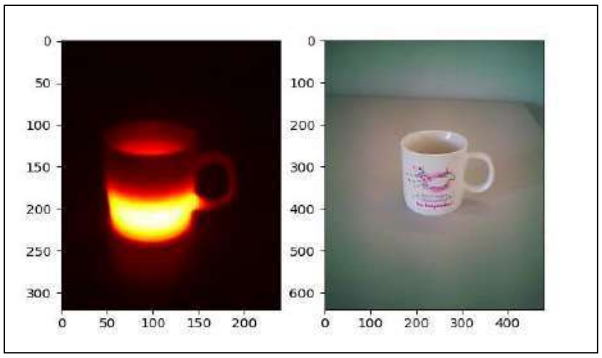

Fig 2 : Simulation result

Thermal image of a particular object will be shown along with the temp at each point with respect to x and y coordinates on the image.

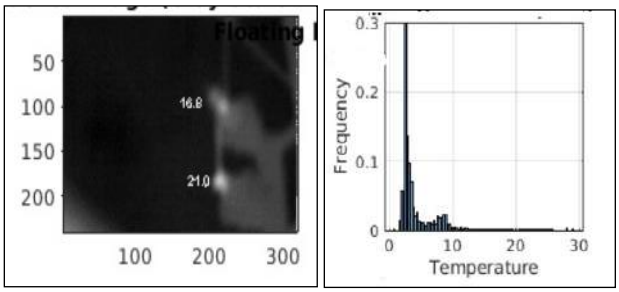

Fig 3: Processed Imaged & Temperature Histogram

temperature at two different points is shown on the cold thermal image along with the histogram of temp of that image , this is done using MATLAB.

VI. Conclusion

The paper presented a precise review of some currently reported applications of thermal imaging on four commonly studied medical conditions where thermography seems to show potential in visual study and heat analysis. The paper also attempted to summarize some recently used IR-based thermal cameras. Aim of this study was to investigate experimentally the potential and applicability of a non-destructive, thermographic approach to hot-spot detection and performance evaluation

Acknowledgment

It is our privilege to express our sincerest regards to our supervisor Prof. Ajit Saraf and Prof. Ruchira Patole for the valuable inputs and guidance throughout the duration of this work. We deeply express our sincere thanks our Head of the Department Prof. Avinash and our Principal Dr. Sandeep M. Joshi for encouraging and allowing us to presenting this work.

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Android-based Smart Floor Cleaning and Sanitizing System

Sarthak Nitin Deshmukh, Mugdha Sunil Bagde, Mayur Rajendra Dalvi, Mayuresh pradeep Anvekar

***Abstract*—Nowadays Households are becoming smarter and more automated. Home automation delivers convenience and spare more time for people for their other activities. Domestic robots** are entering the houses and people's daily lives, but it is still a **relatively new and unmellowed market. However, growth is predicted and the adoption of domestic robots is expanding very fast. There are many robotic vacuum cleaners are available on the market but only a few ones implement wet cleaning and sanitization of floors. The purpose of this project is to design and implement a cleaning device through a Phone Application. Floor cleaning devices are designed to make the cleaning process become easier rather than by using a manual mop. The main objective of this project is to design and implement a cleaning robot prototype by using Atmega 328p microcontroller, Motor Driver L298, DC motors and HC-05 Bluetooth module to achieve the goal of this project. This smart floor cleaning system will have several criteria that are user-friendly such as easy controls via mobile phone, It uses non-toxic floor cleaners and limited usage of water, It can be easily customized as per requirement to suit the need of different institutions.**

***Index Terms*—Android Car, Atmega328p, Cleaning Robot, Contactless Cleaning, Floor Cleaner, floor cleaning robot, Hospital Cleaning, House Cleaning**

I. INTRODUCTION

The main focus of this project is to develop an autonomous device that can do cleaning and sanitizing. The Android-based smart floor cleaning and sanitizing system is a bluetooth operated device which will be used for the cleaning of the floors. The advantage of using this robot is it will be very useful for people with mobility issues to clean their houses without any difficulties and also helps in time saving. It is a simple and low cost robot. It is also useful for places where human guidance cannot be reached. In the current pandemic situation that the world is going through, it is very important to maintain distance. Therefore this robot will help in cleaning places without any contact. Hence it is very safe and convenient for our front line workers such as the doctors. The robot has the capacity to one handedly clean the entire premises, hence the output is quick and time saving. Whereas if the same work has to be done manually, it would be more time consuming and require more manpower. Robots have a huge impact in every field of our lives. In the current covid situation it is become a necessity for every organisation be it small or big to keep cleaning their premises on daily basis, this might be very time consuming and requires a huge amount of manpower, also the entire process will be expensive and not all organisations are able to keep up with the expenses and are suffering through great losses. Thus this robot resolves the problem as it is less time consuming, doesn't require much manpower and also is also very affordable. The premises need to be cleaned at least 3-4 times per day ,as a result this entire process roughly requires 10-15lts of water on a daily basis. In long term this could be a huge problem ,thuis the robot is a life saviour as it also resolves the problem of this crisis as the robot uses approx only 30% of that required manually.

In recent years, robotic cleaners have taken major attention in robotics research due to their effectiveness in assisting humans in floor cleaning applications at homes, hotels, restaurants, offices, hospitals, workshops, warehouses and universities etc. Each operating and cleaning mechanism of robotic floor cleaners has its very own advantages and disadvantages. The main objective of this is to provide a substantial solution to the problem of manufacturing robotic cleaners utilizing local resources while keeping it low costs. This project aims at developing a highly cost-effective smart floor cleaning system. Which would cater to the needs of medical institutions. It uses non-toxic floor cleaners and limited usage of water. It can be easily customized as per requirement available resources to suit the need of different institutions.This device helps in cleaning the floor without any human contact with the surface, thus it is less risky and more reliable.This smart floor cleaning device is more precise and accurate. It will be very much useful for people with mobility issues to clean the house without any difficulties.

II. DESCRIPTION OF SYSTEM

We have the simple block diagram for android based smart floor cleaning and sanitizing system .The atmega 328p is the important part, heart of the project . Atmega 328p is from atmel family , we are using atmega 328p over atmega 328, because it has the ability to work on lower power .The other components are bluetooth module HC-05 , motor driver L298 and DC motors are successful connected to the atmega328p microcontroller.

From all of the components, the bluetooth module is directly connected to the microcontroller and functions to transmit and receive data from connected bluetooth devices. Also the motor driver is directly connected to the microcontroller which is programmed to pass the command we received as data from the bluetooth module to DC motors connected to motor driver output. The DC motor simply rotates as it receives command.

To operate the cleaning part .We are using a DC motor connected through relay to the microcontroller. This motor has a cleaning mop on its end to carry out cleaning and sanitization of floors.

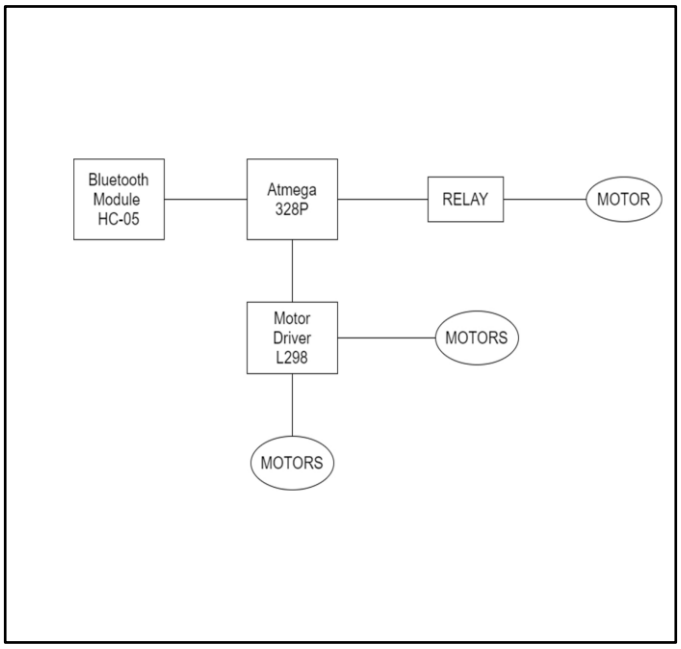

Fig. 1: Block Diagram of the System

Voltage regulators are quite common in electronic circuits. they supply an unbroken output voltage for a varied input voltage. In our case the 7805 IC is an iconic regulator IC that finds its application in most of the projects. The name 7805 signifies two meanings, "78" means it's a positive transformer and "05" means it provides 5V as output. So our 7805 will provide a +5V output voltage. The output current of this IC can go up to 1.5A.

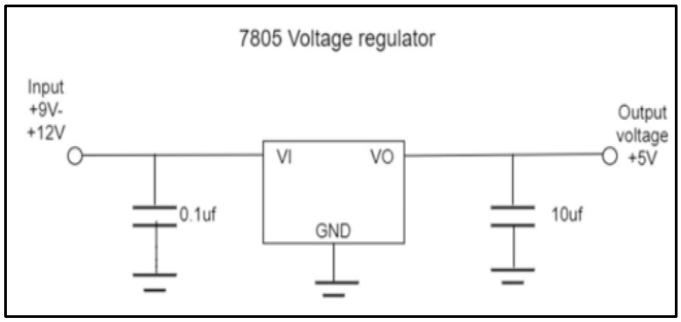

Fig. 2: 7805 Voltage Regulator

Features: It is a 5V Positive Voltage Regulator with minimum Input Voltage of 7V and the maximum Input Voltage being 25V. The Operating current(IQ) is 5mA of the Voltage Regulator. Internal Thermal Overload and Short circuit current are the limiting protections available.Junction Temperature is maximum 125 degree Celsius It is available in TO-220 and KTE package.

2.1 Microcontroller Atmega 328p

The ATmega328 could also be a single-chip microcontroller created by Atmel within the megaAVR family (later Microchip Technology acquired Atmel in 2016). it is a modified Harvard architecture 8-bit RISC processor core.The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP nonvolatile storage with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI interface, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves output approaching 1 MIPS per MHz.

2.2 Motor Driver L298

The L298 Driver may be a high voltage, high current dual full bridge driver designed to simply accept standard TTL logic levels and drive inductive loads such relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the input signals. The emitters of the lower transistors of every bridge are connected together,the corresponding external terminals are often used for the connection of an external sensing resistor. The L298 integrates two power output stages (A,B). The facility output stage may be a bridge configuration and its outputs can drive an inductive load in common or differential mode, counting on the state of the inputs. The present that flows through the load comes out from the bridge at the sense output : an external resistor (RSA, RSB.) allows it to detect the intensity of this current. Each bridge is driven by four gates the input of which are In1 ; In2 ; EnA and In3 ; In4; EnB. The In inputs set the bridge state when The En input is high ; a coffee state of the En input inhibits the bridge. All the inputs are TTL compatible. A non inductive capacitor, usually of 100 nF, must be foreseen between both Vs and Vss, to ground, as near as possible to the GND pin. When the massive capacitor of the facility supply is just too far away from the IC, a second smaller one must be foreseen near the L298. The sense resistor, not of a wire wound type, must be grounded near the negative pole of Vs that has got to be near the GND pin of the IC. Each input must be connected to the source of the driving signals by means of a really short path. Turn-On and Turn-Off : Before to show-ON the availability Voltage and before to Turn it OFF, the Enable in-put must be driven to the Low state. Between this pin and ground is connected the sense resistor to regulate the present of the load.

2.3 HC05 Bluetooth Module

This module is employed to speak between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality, sort of a Phone or Laptop. There

are many android applications that are already available which makes this process tons easier. The module communicates with the assistance of USART at a 9600 baud hence it's easy to interface with any microcontroller that supports USART. we will also configure the default values of the module by using the command mode. The HC-05 has two operating modes, one is the Data mode during which it can send and receive data from other Bluetooth devices and therefore the other is the AT Command mode where the default device settings are often changed. we will operate the device in either of those two modes by using the key pin. It's very easy to pair the HC-05 module with microcontrollers because it operates using the interface Protocol (SPP). To power the module with +5V and connect the receiver pin of the module to the transmitter of MCU and transmitter pin of the module to Receiver of MCU.

2.4 Power Supply

There are two sorts of power supply AC and DC. An influence supply is a device that supplies electrical power to an electrical load. The first function of an influence supply is to convert current from a source to the right voltage, current, and frequency to power the load. As a result, power supplies are sometimes mentioned as electrical power converters.Some power supplies work as a separate appliance while the others work as a part of the system. samples of the latter include power supplies found in desktop computers and consumer electronics devices. Other functions that power supplies may perform include limiting the present drawn by the load to safe levels, shutting off the present within the event of an electrical fault, power conditioning to stop electronic noise or voltage surges on the input from reaching the load, power-factor correction, and storing energy so it can still power the load within the event of a short lived interruption within the source power.

2.5 Relay

The switch may have multiple contact forms in multiple forms.Relays are used where it's necessary to regulate a circuit by an independent low-power signal, or where several circuits must be controlled by one signal. The normal sort of a relay uses an electromagnet to shut or open the contacts, but other operating principles are invented, like in solid-state relays which use semiconductor properties for control without counting on moving parts. Relays with calibrated operating characteristics and sometimes multiple operating coils are wont to protect electrical circuits from overload or faults; in modern electrical power systems these functions are performed by digital instruments still called protective relays.Latching relays require only one pulse of control power to work the switch persistently. Another pulse applied to a second set of control terminals, or a pulse with opposite polarity, resets the switch, while repeated pulses of an equivalent kind haven't any effects. Magnetic latching relays are useful in applications when interrupted power shouldn't affect the circuits .

III. CIRCUIT DIAGRAM

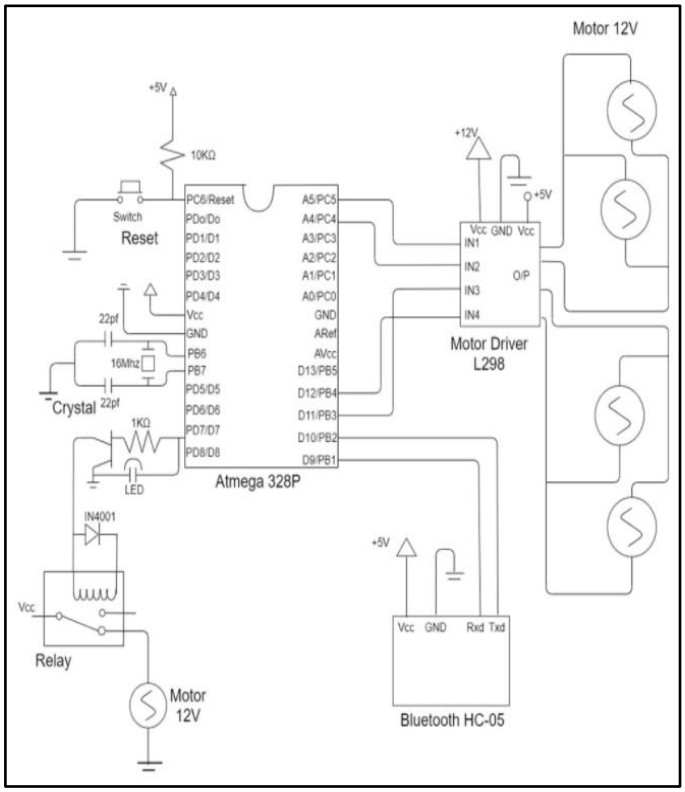

Fig.3: Circuit diagram of Android-based smart floor cleaning and sanitizing system

Project operating on an Atmel ic chip .We are using Atmega 328p instead of Atmega 328 because it consumes lower power. This microcontroller has 32kb non volatile flash memory, 2kb sram memory and 1kb eeprom memory. It is a 28 pin controller. Pin 7 is vcc and pin 8 is ground.

Pin 1 is a reset pin connected to the switch which is connected to ground and a 10 k ohm resistor connected to a 5v power supply. when you push the switch button then the controller gets reset. Pin 9 and 10are oscillator pins at which the crystal oscillator of 16 mhz crystal oscillator is connected and two 22pf capacitors are connected to the oscillator and are then grounded. This will generate a clock.
This microcontroller atmega 328p operates between 1.8 to 5.5 volts of power supply. We are using a 9 v battery to power the controller.

To avoid damage to the microcontroller we use voltage regulator connection which is taking 9v power supply to IC 7805 and giving 5v at output supply by using two capacitors of 0.1 uF and 10 uF respectively. Controler pins 15 and 16 are connected to a bluetooth module HC-05. Receiver pin of HC-05 is connected to pin 15 and transmitter pin is connected to pin 16.bluetooh module will have power supply from controller.Pins 17,18,27 and 28 are connected to motor driver L298 . These pins basically provide input to the motor driver. Motor Driver L298 has two vcc pins 12v and 5 v. At output

we have 4 pins which give 2 outputs and can drive two sets of instructions at a time. Four motors are connected to the motor driver. Two motors are short in one output similar for other two motors.Pin 14 has a relay connected with a transistor, a IN4001 diode and a resistor of 1k ohm. Relay is connected to a 12v DC motor. We are using 12 volts rechargeable batteries.

The Bluetooth module is connected to our Android phone through bluetooth connectivity. Via Android device application we can give commands to vehicles to move forward, backward, left , right and can start or stop the mopping motor. Android devices give commands from the app to the microcontroller.The microcontroller takes command and fetches it and carries out operation. For example , if we give command to move forward or backward microcontroller will command motor driver to move all motors in same direction but if we give command to go left or right microcontroller will give command to motor driver to move its two outputs in different directions.

When we command to rotate a mopping motor then the microcontroller fetches it though relay and through relay we get mopping DC motor in rotation.we can also command to stop mopping motor from rotating by simply resetting the relay.

IV. SYSTEM ASSEMBLING PROCESS

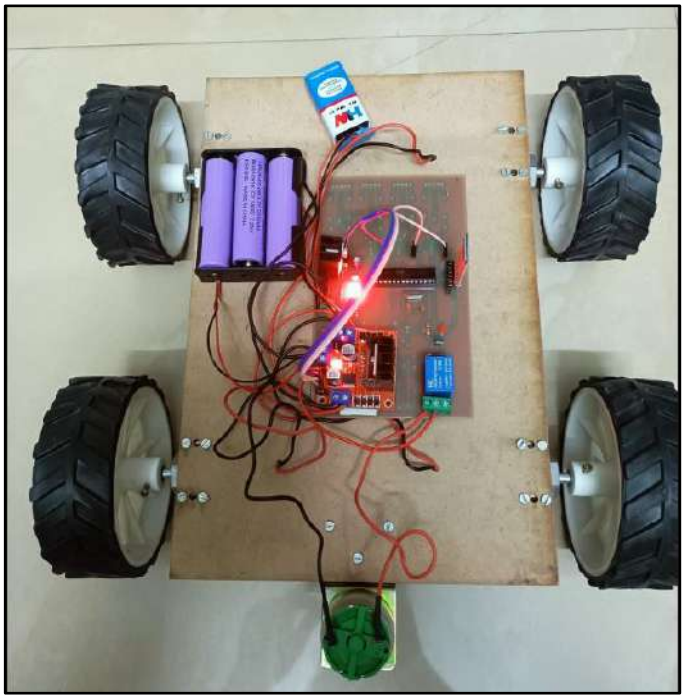

Fig.4: Visible Circuitry of robot

There are two DC power supplies we use. One with 9v which was reduced to 5v using a 7805 voltage regulator for protection of the microcontroller from failing. And the second power supply is of 12v used specifically to drive all five DC motors used.Microcontroller Atmega328p is mounted on a PCB board. It needs a clock so that a crystal oscillator of 16mhz is provided.two 22pf capacitors are connected to the oscillator and then grounded. To reset the microcontroller we mount a reset circuit with a switch and a resistor of 10 k ohm. These three things are important for microcontrollers to use. Bluetooth module HC-05 is connected to pin 15 and 16. Motor driver L298 is connected to pins 17,18,27 and 28 of the microcontroller. Motor drivers get 12v of power supply. Four motors in pairs of two connected to the output of the motor driver.Pin 14 connected to a resistor with a transistor and had a IN4001 diode and finally got connected with a relay. And relay output is connected to a 12v DC motor power by 12 v power supply.

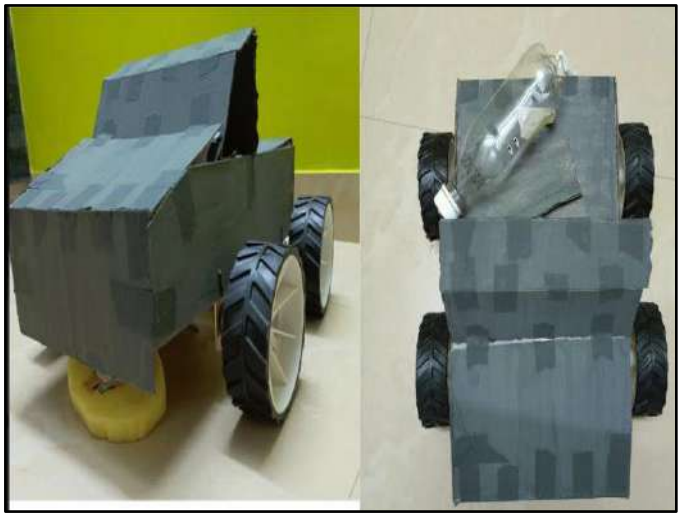

Fig.5: Assembled robot

V. SYSTEM INTEGRATION(PROGRAMMING)

The Bluetooth module is connected to our Android phone through bluetooth connectivity.Via Android device application we can give commands to vehicles to move forward, backward, left , right and can start or stop the mopping motor. Android devices give commands from the app to the microcontroller, the microcontroller takes command and fetches it and carries out operation.

For example , if we give command to move forward or backward microcontroller will command motor driver to move all motors in same direction but if we give command to go left or right microcontroller will give command to motor driver to move its two outputs in different directions.

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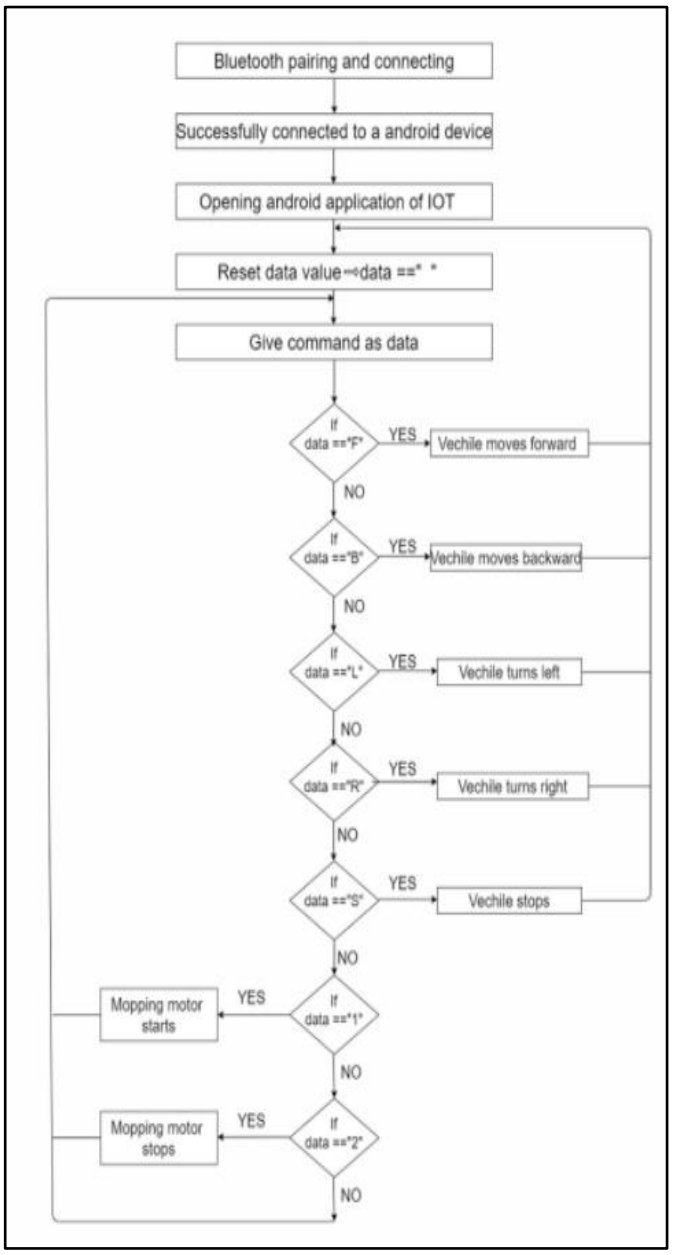

Fig.6: Flowchart of the System's working process

VI. FUTURE SCOPE

The following shows the advancement that can be done to improve the automation and thereby providing better cleaning mechanisms with the help of a robot. In future Image/video captured of a car/house is fed to the controller so that the robot can clean the entire car/house according to the input fed automatically without the need of human intervention . The cleaning mechanism on the robot can be replaced by a handlike structure.so that it can lift things from one place to another.Voice controlled locomotion of robots instead of remote control. Vacuum mechanism can be added to the robot so the vacuum process can be executed simultaneously with the cleaning process. Automatic charging dock can be created so that after the battery is drained the robot will automatically go to the charging station and charge the battery wirelessly.

VII.CONCLUSION

The primary purpose of the Smart floor cleaner is to clean the floors efficiently. As earmarked, it can clean the dirt with efficiency. The device not being a large-sized one can be mistakenly hit by unwary pedestrians. We aim to introduce an automated fix to this problem in the later versions. The mapping process involving a bluetooth and GPS module is quite complex. As a low power DC motor was used for mop cleaner, the cleaning process is not optimized for a huge bunch of dust and dirt. So, these drawbacks should be resolved. This way, we can reduce the power consumption of the robot. The robot can clean a plane floor. The custom made Floor Cleaning Device was constructed with Atmega 328p Microcontroller , Bluetooth Driver HC-05 and motor Driver L298. Two batteries are the power source for this proposed cleaning system. 4 Motors are attached to the bottom surface of the body of the floor cleaner to make its use as wheels and rotational Cleaner DC motor is connected to the Microcontroller through relay. Our future endeavor would be to modify it so that it can clean the stairs too.

ACKNOWLEDGEMENT

It gives us great pleasure and immense satisfaction to present this report on our project "Android based smart floor cleaning and sanitizing system",which became possible due to unstinted guidance and focused direction of Prof.Rubina Shaikh, Electronics and Telecommunication Department,Pillai College of Engineering,New Panvel.We express our sincere gratitude to Dr.Avinash Vaidya ,HOD, Electronics & Telecommunication Department without whom it would not have been possible to successfully accomplish our project.We also thank our senior faculty members of the Electronics and Telecommunication department, for their time to time suggestions to develop the project.Furthermore, we are indebted to the Principal Dr.Sandeep Joshi whose constant encouragement and motivation inspired us to do our best.Last, but not the least, we sincerely thank our family members, colleagues who contributed in making our task easier.

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Biomedical Waste Collection Robot

Yatish Singh, Sakshi Salvi, Priya Saroj, Sarvesh Mohite.

***Abstract*—In the present era, people follow a busy lifestyle. Amid this sedulous life, the world has been hit with the COVID-19 virus that turned out to be a fatal pandemic resulting in numerous deaths around the world. The healthcare personnel in medical facilities have been facing a lot of difficulties in treating all the infected patients. This is where our project could play a huge role in terms of assistance. The proposed robot is a machine that can fulfill a few tasks on their behalf. It is designed to collect biomedical waste that is discarded in the hospital wards with the help of ladder shaped algorithm. It will basically reduce the work of collecting trash from the dustbin and avoid physical contact of medical professionals with the infected biomedical waste.**

Keywords*—Biomedical Waste Collection Robot, ladder shaped path follower and waste collector.

I. Introduction

In the present day and age, a busy lifestyle with an indulgent work environment became the norm. However, all of this gradually came to a halt amid the COVID-19 pandemic which shook the whole world to its core. Causing the death of millions, the pandemic resulted in failed economies leaving some countries on the brink of a collapse. While this paper is being published, the situation hasn't improved much with new strains of the disease being detected all over the world. A fatal virus that cannot be controlled until everything is shut down and sealed causes a lot of difficulties across various verticals of our very existence. The fatality rate is a concern for sure but the loss of one life affects everyone related to that person and that number obviously stands at more than a billion.

In this scenario, healthcare professionals around the world have worked tirelessly in their efforts to save lives even though a cure for the disease is yet to be developed. In a situation like this, finding volunteers is tough and therefore countries like India where the number of cases doesn't dip that easily, the entire healthcare system remains overworked and burdened by the number of patients they have to tend to everyday. Helping on the technical front would take a lot of investment and monetary commitment. The resources required would also include a huge number of individual involvements, something the world doesn't have time for.

Overcoming a pandemic isn't an easy task, even in the 21st century with world-class infrastructure at our disposal. The system works well when the problems are within a limit but not when things are on the verge of spiraling out of control. The corona virus is highly contagious and the fact that it's evolving at a considerably rapid rate doesn't make things easier at all. It has a R number of three generally but in the second most-populous country in the world we're staring at something lot worse. Now in scientific terms, an R number of three means that one infected person, if not contained quickly enough would spread the virus to three more individuals. Those three would do the same and the number just grows exponentially.

This paper contains the details of a concept which has been developed to aid healthcare professionals in their day-to-day tasks, especially during a pandemic. The idea of a robot which will be conveyed through this paper aims at taking over a very mundane task in the form of biomedical waste collection which at times can be time consuming and equally hazardous on a healthcare professional's physical state. The whole purpose is essentially to keep the people who take of our wellbeing away from things that can be handled without their involvement.

Biomedical waste has been known to cause many problems historically over the years. Waste segregation and proper disposal is as important as treating a patient itself. The aforementioned robot technically collects biomedical waste in a hospital environment that its familiar with. The dimensions, load bearing capacity and autonomous working abilities can be altered according to the requirement in a particular domain. This does away with the problem of recruiting willing individuals in these tough times to work in the waste disposal domain in hospitals. The same professionals can be utilized for various other tasks that demand more human involvement. Social distancing is a term that is being used all over the world and the time is just right to move away from biomedical waste collection in such vulnerable circumstances.

The proposed system for the robot's practical implementation starts with dividing the whole system into two different parts. The first part would be the mechanical arm which controls the task of picking up garbage, storing it temporarily until an ample amount of garbage is picked up for a singular trip and then finally assists disposing it off at the pre-decided site. The other part deals with the movement of the robot on a pre-defined path.

The mechanical arm requires remote human involvement to achieve precision, something very important when handling hazardous biomedical waste. The mechanism works on the back of an intricately planned circuit with a simplistic design which contains an Arduino Uno at the heart of all the proceedings. The system includes just four SG90 servo motors which sum up the overall movement of the 3-D printed mechanical arm. On the other hand, is the base which contains a slightly complicated circuit just so that the entire system that assists movement remains autonomous. Now to provide it a self-driving feel, the circuit contains two IR sensors which detect a blackened strip present on the floor so that the robot follows a pre-defined path. Driving the entire system back and forth are two DC motors which are connected to Motor Driver L298D to improve power distribution during operations.

The entire system's movement relies completely on the H-shaped ladder algorithm for precise movement including important stoppages for waste collection. The

system once started in a loop wherein it makes all the pre-defined stops during operation contains a simplistic approach. Further explanation on the same can be found in section IV of this paper titled "Algorithm".

There have been various robots designed to collect garbage and many research papers have been published to refer the designs of the existing robots. One of the models was a "Waste management by a robot with a smart and autonomous technique" which was designed to collect the garbage and dump into a particular location where further actions were to be taken like reuse and recycling. But the robot lacked in terms of possessing proper navigation systems and was able to be used for a single task. The second model was an "Automatic health care waste segregation and disposal system" which was designed to collect health care waste, segregate it and dispose it off to a dumping area. But this robot had a major drawback. It was highly complex and very expensive on the implementation and maintenance fronts.

The third robot to be referred was a "Bluetooth based garbage collection robot using Arduino microcontroller". This model was designed especially as a river waste cleaning machine and lacked in the field of deep cleaning. The fourth robot was a "Autonomous trash collecting robot" which was designed to collect waste from the environment and dispose it of accordingly. But this prototype also had a drawback that, it could not survive in a complex environment. The fifth prototype was an "Automatic garbage separation robot using image processing technique", this model was based on webcam to collect the waste and image processing technique to segregate the waste according to the color of the garbage. But the robot had limited functions and needed more research for its smooth working.

After referring all these prototypes, there were no records of any officially launched robot to work in the hospitals. In this situation there is a need of designing a robot that can help in cleaning the surrounding in the hospital wards without any physical contact. We are proposing a design of the robot that helps to collect the disposed biomedical waste from the dustbins in the wards. The path planning of the robot is important as it has to collect the waste from the dustbins from each bed in the ward. It walks on the predefined path and it is much better than the other algorithms like random walk algorithm, s shape algorithm, spiral algorithm, etc. In this paper, section II describes the block diagram and its explanation, section III describes design, and section IV describes algorithm and flow diagram.

II. System Overview

This section explains the block diagram and the brief details about the components used for the designing of the proposed system. The overall block diagram of the proposed model is shown in Figure 1. In this proposed prototype, IR sensors are used for the determination of the path that the robot should follow. The waste collection is done by the hand gripper used in the design. The arm picks the waste from the dustbin with the help of the mechanical gripper. And the controller is used to control the movement of the arm.

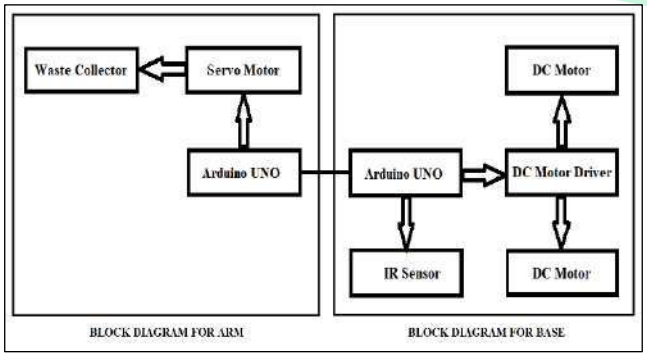

Figure 1. Overall Block Diagram

Many components have been used for the perfect working of this robot. The key components used in this prototype are depicted in the diagram above, and the following are brief descriptions of the components:

A. ARDUINO UNO

The Arduino UNO is a standard Arduino board. It was the first USB board released by Arduino and works with the help of Arduino IDE software. It has a total of 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It can run on both online and offline platforms. There are two Arduino's used in this system. one Arduino controls the 4 servo motors attached to it with the help of jumper cables and commands the hand to pick the waste with the help of the code compiled in the board. The second Arduino is used to control the movement of the base.

B. SERVO Motors

The SG 90 Servo motors are used to adjust the speed control at high torques and accurate positioning. These servo motors are used to rotate the hand from 0 to 180 and can further rotate till 210, depending on the manufacturing. These servo motors have a potentiometer to calculate the angles and move accordingly. The motor is used at each joint of the arm to make it more flexible to pick up the biomedical waste. In this prototype, four SG 90 servo motors are used.

C. IR Sensor

The IR sensor is known as the infrared sensor that detects infrared radiation in its surrounding. It detects the heat and moves in that direction. As black is a good conductor of heat there is a black tape placed in the environment where the robot should work and halt at the white space as white color reflects heat. When it halts at white space it will collect the waste present in the dustbin nearby. The IR sensor working is shown in Figure 2.

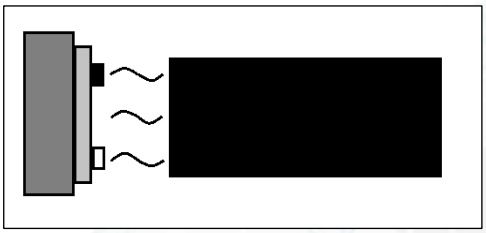

Figure 2. IR Sensor Working

D. DC Motors

A motor is an electrical device whose main function is to convert electrical energy into mechanical energy. The motor contains a rotor, stator, bearings, conduit box, enclosure, and eye bolt. Electric motors are used everywhere, from common machines to the most complex computers. These motors are competent for the tasks which they perform when compared to pneumatic or hydraulic alternatives. These motors are used to commute or relay the supply current to the wheels to rotate. In this prototype, 2 DC motors of 6V for the functioning of the base are used.

E. DC Motor Driver

The L298D is a dual H-Bridge motor driver which allows speed and direction control of two DC motors at the same time. The module can drive DC motors that have voltages between 5 and 35V, with a peak current up to 2A. The motor driver is connected between the motors and control circuits. The controllers work on low current signals, while the motors work on high current signals. So, the driver converts the low current signals from the Arduino to high current signals that are provided to the motors to work efficiently. In this prototype, 1 DC motor driver is used to control the 2 DC motors used for the base of the robot.

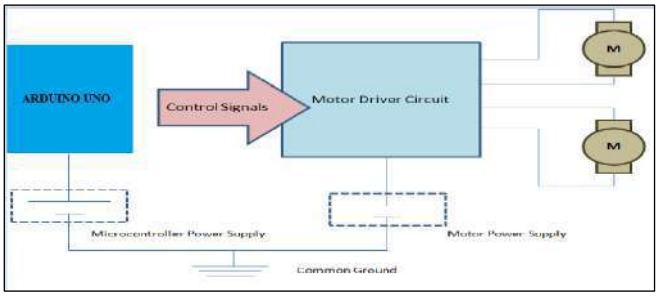

Figure 3. Working of DC Motor Driver

F. Waste Collector

In this prototype, 3D printed parts are used to create the arm that can easily pick up the biomedical waste present in the dustbin. The 3D printed parts are connected with the help of nut and bolts and the movement of the hand depends on the servo motors connected at each joint. The mechanical gripper is attached to pick up the waste easily. But for the movement of the arm, directions should be provided with the help of the code that has been saved in the Arduino board.

This section included an overview of the system; however, the next section would include detailed statistics on the calculations used in the prototype's construction.

III. Robot DEsign Calculation

This section consists of the detailed calculations used in this design that are important for the movement of the base. The calculations are referred from a similar model that was designed for a base used in a moving robot that was working with 4 wheels. In the calculation for the movement of the base of the design, the main part is the wheel as the whole movement of the base depends on it. The wheels should be selected according to their radius so that they can bear the weight of the whole robot build above. The distance between the wheel and the center point of the base is also important to calculate the turning of the wheel. The number of revolutions per minute of the wheels and the total length of the robot should be determined to calculate the turning of the wheels along with the forward and backward movements. The detailed calculations are mentioned below:

Let assume,
Wheel radius = r,
Wheel to center point distance = R,
Number of revolutions per minute = N,
Robots body length is L,

Then time required for moving forward, backward and turning is calculated by using the below given formula:
Backward = L/ (6*3.14*r*N)
Forward = L/ (2*3.14*r*N)
Turning = R/ (4*r*N)
In our robot's model,
Body length L= 29.5 cm
Wheel radius r = 3 cm,
Number of revolutions per minute N is 10,
Wheel to center point distance R is 8.5 cm.

So calculated robot movement,
For backward movement = 0.521 seconds
For forward movement = 1.565 seconds
For turning = 0.70 seconds

This section included a summary of the calculations that were used to operate the robot's base. The algorithm and path flow used in this built prototype are detailed in the following section.

IV. Algorithm

This section is all about the algorithm followed by the robot and the path on which it travels. This robot has an algorithm that keeps on repeating in a loop once the power is supplied to the robot. It is a very simple algorithm to follow as the design of the robot is made accordingly. The wall follow algorithm is given below:

Algorithm to be followed:

1. Move Forward when detects the black taped line.
2. Stop to collect the waste when detects white space.
3. Collect the waste
4. Keep moving forward when commanded in loop
5. Return to dump the waste
6. Go to step 1

According to the above algorithm, the robot follows a specific path flow that allows the system to keep moving when detects the heat from the black tape and halt when a white space appears. As black is a good conductor of heat and white is a good reflector of heat, this concept allows the robot to work efficiently. The map of this algorithm is the same as the shape of the ladder so that the robot can move on the black

path and halt when the white space appears to collect the waste near the beds of the patients in the hospital.

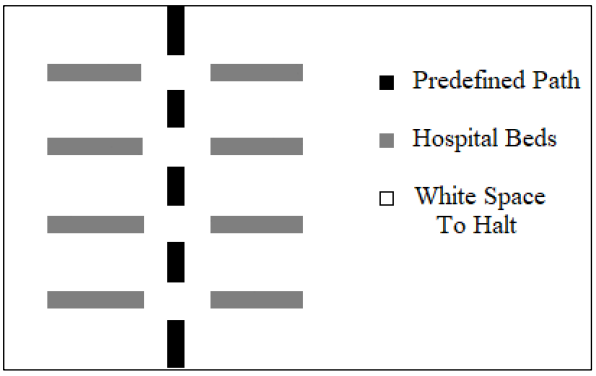

Figure 4. Ladder Shaped Path

The ladder-shaped algorithm flow is shown in figure 4. And the flow chart followed by the bot is shown in figure 5 given below.

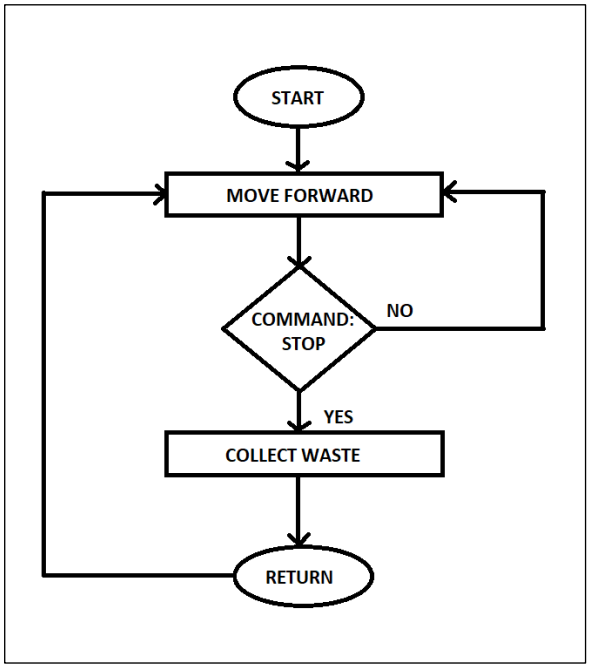

Figure 5. Flow Chart for ladder shaped path

The path flow and algorithm used in this prototype were explained in this section, while the hardware and software parts of the model were implemented in the next section.

V. IMPLEMENTATION

In this section, the software used for the designing of the bot and the final overlook of the prototype is provided. In this designed robot Arduino UNO has been used and the Arduino IDE software is used for the coding purpose. Navigation of the robot in the particular direction and the movement in the ladder shape algorithm are coded in this software. This software supports the C language for coding and can be used for designing various robots in the field of development. This software is very simple to use if you know C programming. The code for this prototype is specifically coded in C++ language. The successful execution of the code is shown in figure 6.

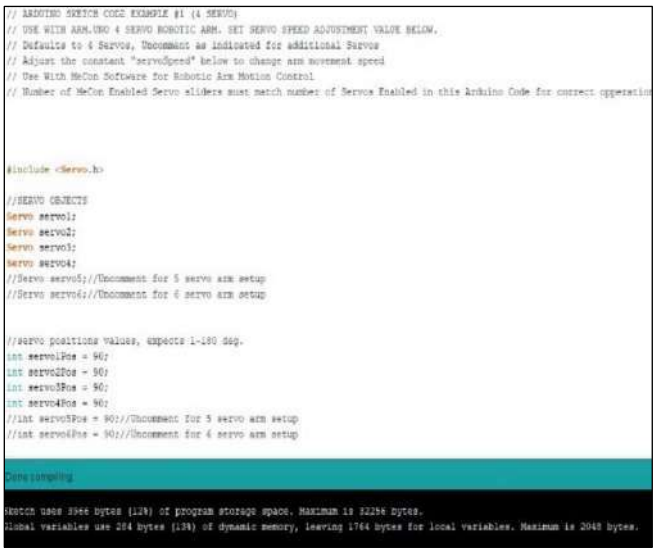

Figure 6. Successful Code Compilation

Before saving the code in the Arduino, the implementation of the hardware part is done, and then test if the model is working. The experimental working model of the proposed biomedical waste-collecting robot is shown in figure 7.

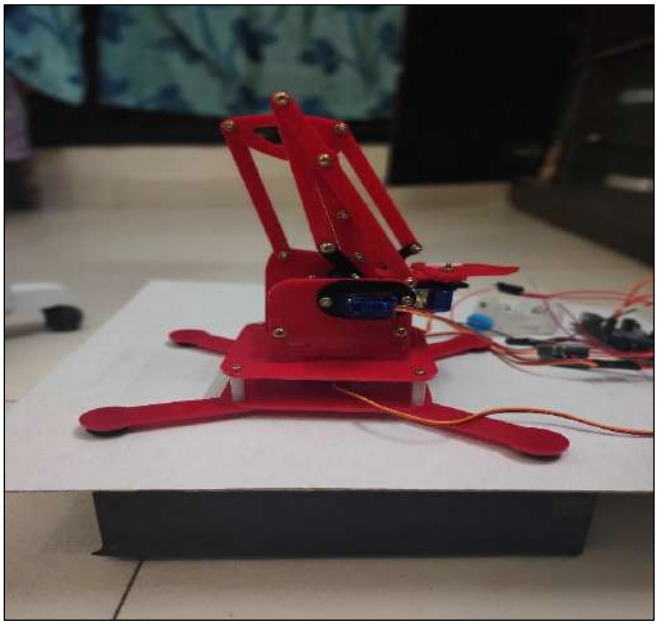

Figure 7. Experimental Model

There are many existing models out there and their performances are based on different algorithms proposed by the respective authors. Figure 8 given below shows a virtual comparison of the referred models.

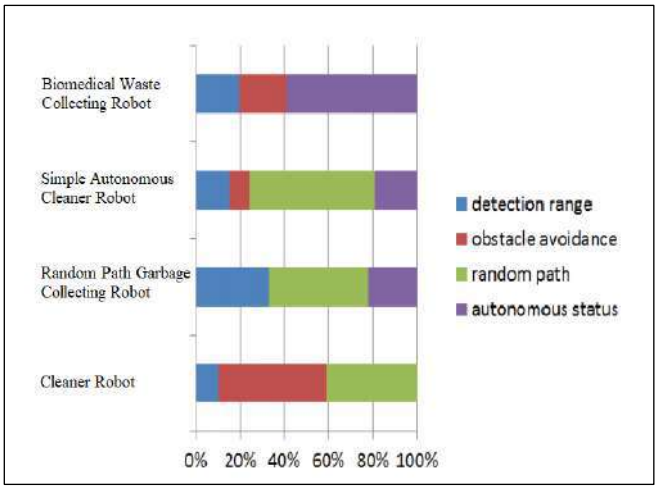

Figure 8. Performance Comparison

This section explained the hardware and software implementation, as well as comparisons to all of the models listed. The following section summarizes the entire proposed scheme and discusses its future potential.

VI. Conclusion and Future Work

The main aim was to design and implement a robot with the algorithm of the ladder-shaped path which can collect the Biomedical waste present in the dustbins of the hospital wards with the help of a mechanical arm that is controlled through software. The proposed prototype mentioned in this paper was successfully implemented. And the proposed algorithm is verified with the help of Arduino IDE software. The future scope of this robot is that it can be improved to support dry and wet waste segregation and can work in a complex environment.

Acknowledgement

Dr. Monika Bhagwat, the guide and faculty member from the Department of Electronics and Telecommunication, Pillai College of Engineering, Navi Mumbai, India, provided valuable guidance to the authors.

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Contactless Drone Monitoring for Health Care Service

Darshan Jain, Mahesh Bhise, Trushali Chandekar, Prof. Sonali Kathare.

Abstract— **Small civilian unmanned aerial vehicles (drones) are a novel way to transport small goods and proved to be efficient in performing a spectrum of the task, a very little step has been taken to actually implement it in an integrated way for hospitals and laboratories, to work in the similar lines and increasing the efficiency and reducing the diagnosis time, maintaining a contactless way has a wide scope, including the context of a pandemic.**

Our project provides the solution to reduce the time as well as the risks involved in delivering the samples. It is capable of tracking location in connection with the GPS module. The project deals with an enhanced and simpler method of designing a quadcopter that is lightly weighted and has greater interfacing and enhancement features. This also provides a cost-effective methodology that is customizable according to applications. The project includes a design of a quadcopter with a temperature-maintained box to suit the different needs for RBCs, PLTs, FP24 testing.

Keyword— Hospitals and Laboratories, contactless way, GPS, temperature-maintained box.

I. INTRODUCTION

A. Significance

Unmanned aerial vehicles, also known as drones, are aircraft without an onboard human pilot. They are a potential solution to the logistic challenges associated with the different systems because they are immune to traffic delays, have low overhead costs, and have the ability to go where there is no passable road. Now considering the most rural areas where the proper health services are not available to need a support system such as on-time blood sample transportation for diagnosis. As we know biological samples are fragile, drones are a viable solution if they do not adversely affect the integrity of transported samples or product characteristics of blood components. Other transport methods such as pneumatic tubes commonly used for transportation cause damage to various types of specimens. Thus, new transport methods must be tested to determine the presence and extent of adverse effects that need to be analysed. Sudden accelerations and decelerations, as well as increases in air pressure and temperature, are all forces that are applied to samples carried by drones. The effects of these stresses cannot be predicted. Previous studies on drone transport of chemistry, haematology, and coagulation laboratory specimens demonstrated that the results for drone-flown specimens were similar to those of matched controls that were not flown.

In addition to the above benefits, one more benefit it offers is of contactless delivery of those samples. So the significance of using drone technology in sync with the health sector can deduce a number of effective applications.

B. Background

Like many modern technologies, the latest revolution in the mode of transportation is a drone that is commonly known as Unmanned Aerial Vehicles (UAVs). These are also named Unmanned Aircraft (UA), Remotely Piloted Aircraft (RPA), Remotely Operated Aircraft (ROA), and Remotely Piloted Vehicle (RPV). The drone is an autonomous flying that is applied in many areas such as military, sports, police, arts, and entertainment. Initially, drones were only used for defence purposes. In some recent years, big companies like Amazon and Google have already started implementing them. Drones are of different sizes and configurations that can be operated from onboard computers. Nowadays the main function of using the drone is to deliver small items to emergency locations. During emergency situations, vaccines, medications, and blood are important needs in healthcare. So this project is all about aligning and syncing with all the non-negotiable involved in the health sector.

C. Scope

The future of a quad-copter is quite vast based on various application fields it can be applied to. Quad-copters may be used to carry out emergency missions in areas that humans are unable to enter. In terms of its military applications, it can be more widely used for surveillance purposes, without risking human life. Thus quad-copters can be used in day to day working of human life, ensuring their well-being. Today many companies are researching developing automated drones that can deliver medicines to remote locations automatically without the help of man. These types of automated drones will be very helpful in delivering time-sensitive items such as medicines to patients at their doorstep. Not bound to only deliveries it is also useful in working with laboratories and hospitals to build an integrated system to provide transportation of samples in an efficient way. This will be very beneficial in providing contactless delivery to the patients in pandemic situations. With certain simple customization, the drones can be used with a spectrum of applications. Drone technology is very popular today and can be enhanced in various applications.

II. LITERATURE REVIEW

2.1 History

Drones may have been invented in 1849 when Austria invaded Venice with unmanned balloons stuffed with explosives. About 200 of these incendiary balloons were shot over Venice by Austrian troops, who were besieging the city at the time. The model which existed at that time and the one which exists now there is a lot of difference in technology. It was only in the early 19s the actual quadcopters type design came into the picture. So years back the drone was majorly used for military purposes only. The Vietnam war saw the great use of drones with cameras for reconnaissance. The major use case of the drone used in the war was mostly during combat. The years 1990-2010 were watershed moments in the production of military and commercial drones. After 2010 is referred to as the golden age for drones as there was a massive downfall in the cost of hardware associated with the technology. This was because of the huge demand for microcontrollers and other parts for smartphones. This was the period where drones picked up momentum for application in a wide range of sectors. Various researches were conducted in transforming, customizing drones, and aligning them to the applications. Below is an evolution involved the literature surveyed here consists of four papers. This paper comprehensively gives an analysis of drone technology used in different applications and each application use case to the project and key techniques used, the analysis of non-negotiables involved in the medical sector, and the impact of technology and feasibility of the same. It comprehensively includes the technological aspect as well as the ethical aspect required to build a system.

The techniques in this category are specifically for moderate to heavy loads and are found to be specifically where the flight time would be a crucial factor.

2.2 Comparison with existing implementation

The existing implementations are classified according to techniques used in different papers and thereby compared according to the need of the application.

a) Technique One: In the technique of Hexacopter used by Author Bhakti et.al for heavy load carrying purposes. It primarily uses 6 rotors and used it in plus frame configurations. This technique has eventually possibly try to increase the amount of weight that it could possibly carry, and then compromising on the flight time due to power consumed by six rotors is more.

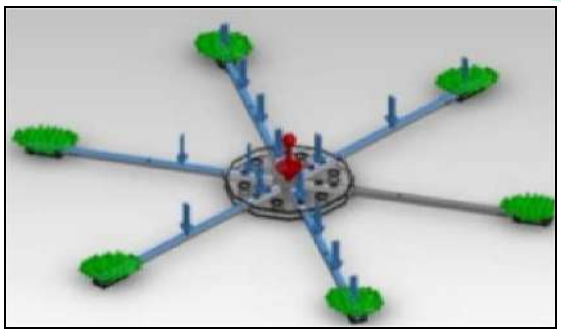


Fig 2.1: Hexacopter frame

b) Technique Two: It was developed by Author Gordon Ononiwu et al. [3]. It gives an overview of techniques and mechanisms involved in quadcopter and their alteration with regards to the cost-effective modes and their simulation for rescuing. So, the technique of quadcopter will be feasible in case implementing them increases the flight time and cost-effectiveness. This technique is making an intelligent drone that would change certain parameters according to the sensor's reading.

c) Technique Category Two: The techniques in this category are primarily based on the specifically knowing insights of medical services related non-negotiable and their inception with drone technology also reviewing some crucial factors in the blood samples, blood products, and their testing

d) Technique three: Author Timothy Amukele et al presents surveys and experiments on various analyses on blood samples, blood products such as platelets, FP24, and their pH changes, and their temperature maintenance. This technique includes the sample transportation and analysis of changes that occur in them to have a better understanding of actual aspects to be more precisely focused on.

e) Hybrid Approach One: Author Dylan Cathrone et al have presented a hybrid approach for blood sampling transportation domain techniques and presents various ethical sets of principles that are needed to be taken care of and evaluated the effectiveness of this technology in this sector, uses similar techniques on different datasets. It has used a middle approach of having a medium-size payload, without compromising with flight time, and also has a bit disadvantage while transporting FP24.

Fig. 2.2 technique used by Dylan Cathrone et al. [5]

2.3. Problem Definition

Contactless words are what we have heard thousands of times amid this pandemic because taking such measures has possibly reduced the chances of reducing the spread of covid-19 in many countries. Now in these current times, a major role is played by health workers who are risking their lives to save others. Possibly by various applications of drone technology can add value during a pandemic by solving some problems of the health workers. Some of the applications could be lab sample pick-up and delivery and transportation of medical supplies in order to reduce the transportation times and minimize the exposure to infection aerial spraying in public spaces to clean potentially polluted areas, as well as public space inspection and instruction during lockdown and quarantine. So, working on the transportation of blood samples by aligning them to the non-negotiables of the health sector which are beneficence, non-maleficence, human autonomy, justice, and explicability.

III. PROPOSED SYSTEM

3.1 Overview

The overall device will include a quadcopter that is configured to create the conditions needed by blood samples and their products (RBCs, PLts, FP24). As a result, the quadcopter will assist in moving blood samples from hospitals to labs in an effective manner, avoiding all traffic

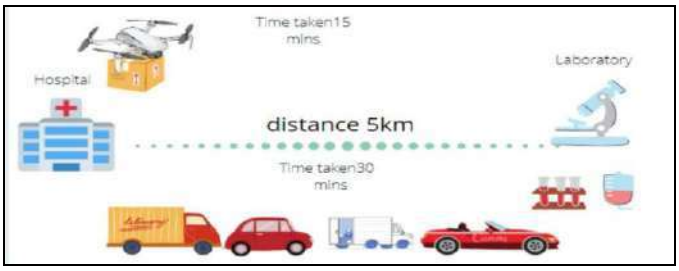
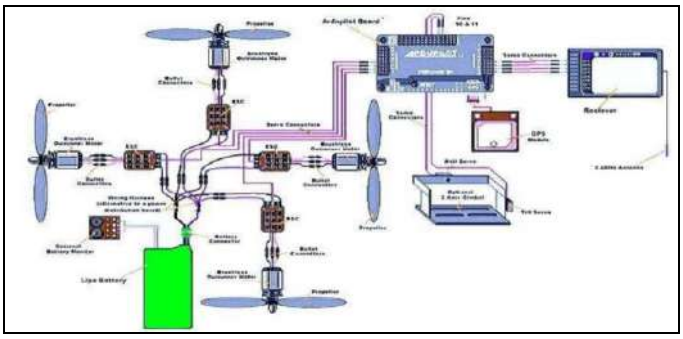


Fig. 3.1 General flow

3.2 Proposed System Architecture



Our project's flow begins with the transmitter-receiver portion. The Arm and Disarm in the controller help to turn on the APM 2. The Arm option is selected to turn on the APM 2.8 and if Disarm is selected, then the whole circuit goes off.

The quadcopter can be controlled manually using the same transmitter-receiver module. Once this gets over, the GPS retrieves the current location of the quadcopter, and by using the 'Mission Planner 'software the predefined path is set by using waypoints. Then the APM 2.8 subtracts the current point's position (as determined by the GPS) from the waypoint given by the Mission Planner app. After this process is completed, according to the result, the quadcopter is made to fly in the desired direction using Electronic Speed Control (ESC). The ESC is an interfacing mechanism that allows the controller to adjust the motor's speed using the controller's inputs. The APM 2.8 module sends signals to all four ESCs to shift the quadcopter in a certain direction based on the performance of the subtracted location. As a result, each motor must bear ¼ of the weight of the Quadcopter as compared to a Helicopter, where a single motor holds the whole weight. As a result, developing a flexible quadcopter with live control and autopilot capability necessitates addressing a number of issues. The quad is then refitted with a mobile camera that can be operated from the ground station. We have used the motor as a brushless motor because it can achieve high torque. The aircraft must be capable of carrying a sufficient payload as well as stabilisation and localization. Alongside the aircraft, there is a need for a camera that is able to perform the image acquisition process at the right place and time.

The quadcopter's movement is managed by four motors. Assume that if the quadcopter needs to move forward, the backward motor can spin at a higher RPM than the front motors. The quadcopter's action is thus operated in this manner.

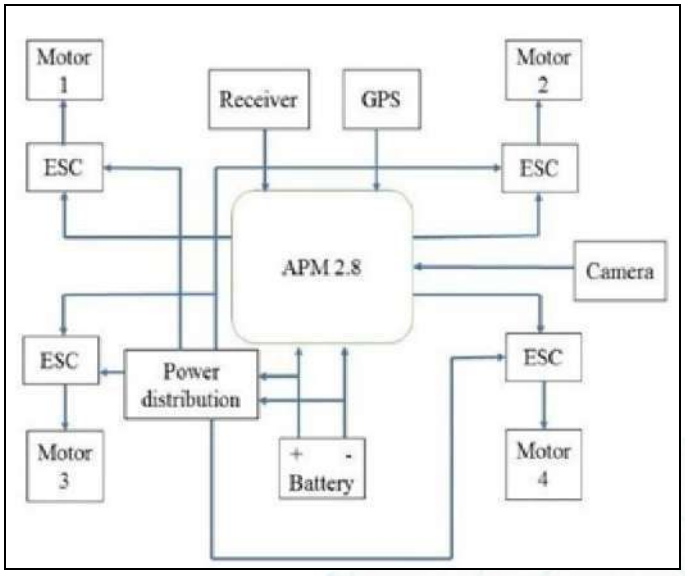


Fig. 3.2.a Block Diagram of interface with microcontroller.

A quadcopter which we have implemented consists of four propellers attached to a rotor located at the cross frame. To control the vehicle, motion these fixed pitch roots are used. The speeds of these four rotors are independent. By independence, the pitch, roll, and yaw attitude of the vehicle can be controlled easily. Pitch, roll, and yaw attitude of Quadcopter.

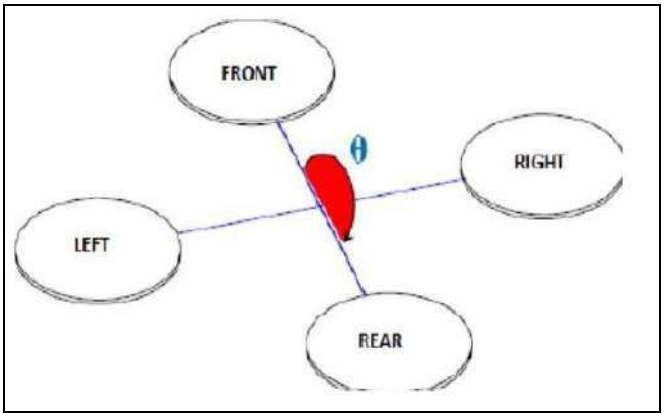


Fig 3.2.b Pitch direction of Quadcopter.

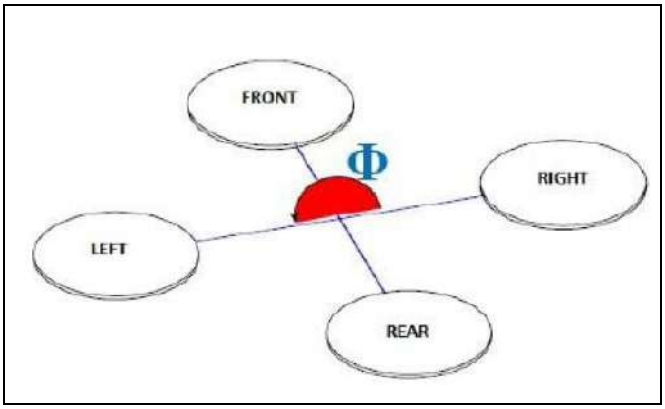


Fig. 3.2.c Roll Direction of Quadcopter.

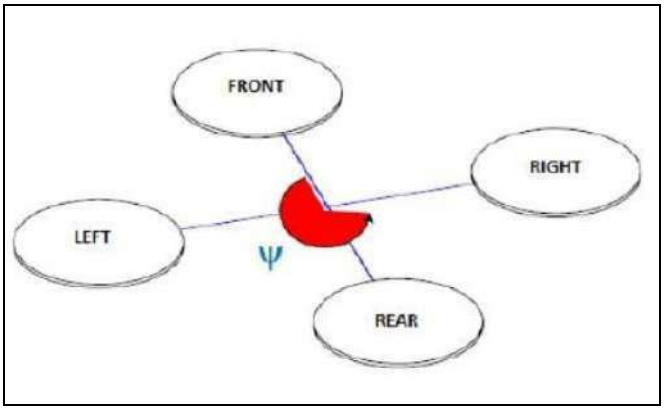


Fig. 3.2.d Yaw Direction Of Quadcopter.

A quadcopter has four input powers, the thrust provided by the propeller that connects to the rotor being the most important. The thrust generated by a Quadcopter may be used to guide its movement. The speed of each rotor can be used to control the thrust.

Take-off and Landing Motion Mechanism

The rotation of a Quadcopter that raises up from the ground to the hover position is known as take-off, and the landing position is the inverse of the take-off position. The take-off (landing) motion is adjusted by adjusting the vertical motion by increasing (decreasing) the speed of four rotors at the same time.

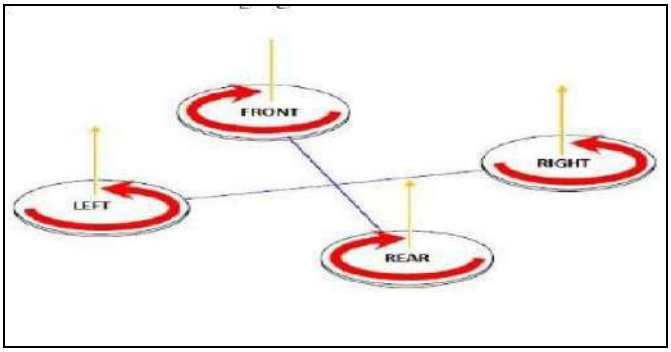


Fig. 3.2.e Take Off Motion of Quadcopter.

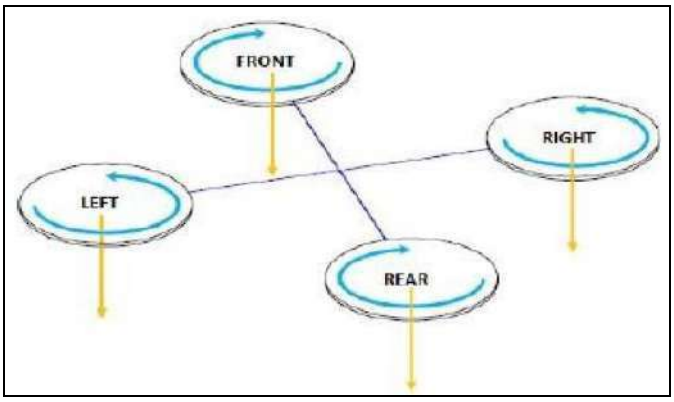


Fig.3.2. f Landing Motion of Quadcopter.

Forward and Backward Motion

The speed of the rear (front) rotor is used to guide forward (backward) motion. Decreasing (increasing) the rear (front) rotor speed at the same time would impact the Quadcopter's pitch angle.

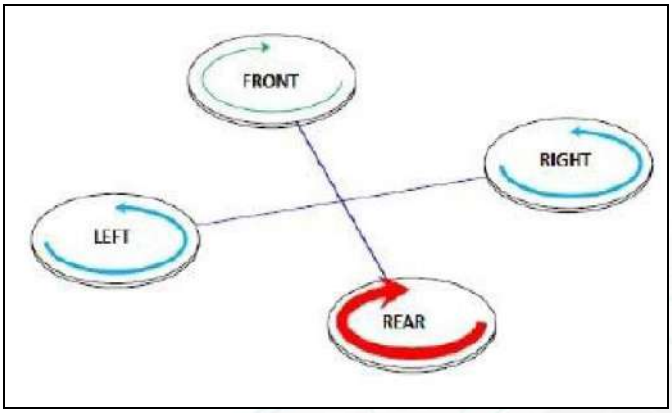


Fig 3.2.g Forward Motion of Quadcopter.

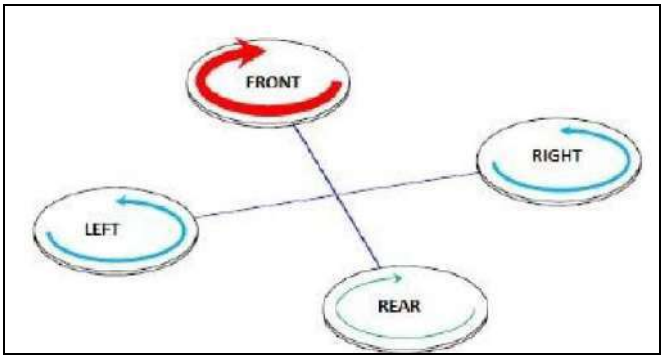


Fig 3.2.h Backward Motion of Quadcopter

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Left and Right Motion

The yaw angle of the Quadcopter can be adjusted to control left and right rotation. Controlling the yaw angle is as simple as raising (decreasing) counter-clockwise rotor speed while decreasing (increasing) clockwise rotor speed.

IV. CALCULATION AND RANGE

4.1 Thrust calculation

motor = 1400kv

motor rpm = input voltage + 11.1v

motor rpm = 1400*11.1=15540 rpm

Brushless motor giving a thrust of 900gms when used with 1045 (10x 4.5 inch) propeller

2200maH Lipo battery (11.1v)

Selection of Esc: ESC, suggesting 20%-50% extra Amps is a good rule to ensure your ESC does not burn out. For example, the present rating for the motor is 22A so ESC you're considering 30A should do fine. Here is a simple formula

ESC = 1.2- (1.5 x max amp rating of motor).
So, we will select ESC between ranges of 26A to 33A

Part Description	Avg Weight (gm)	Qty used	Total weight(gm)
Flight Controller	80	1	80
Propellers	7	4	28
Receiver	13	1	13
Motors	50	4	200
ESC	20	4	80
Battery	150	1	150
Frame	270	1	270
Payload	500	1	500
Carrying Box	50	1	50
Miscellaneous	60	1	60

Table 4.1 Hardware quantity and weight(gms)

Total:1431gms Payload: 500gms

4.2 Flight Time calculation

Flight Time = Battery capacity in amp hour x 60/avg Ampere draw

Battery Capacity = 2200/1000 mah = 2.2 Ah (amp hour)

Battery Discharge = 2.2 Ah * 0.8 = 1.76 effective capacity

Average Ampere Draw = 20 Amp

i.When battery is fully charged = 12.6 V

ii.Lowest Battery voltage used = 10.5 V

∴ we get only 2.1 V battery for flight time.

We used 11.1 V & 2200 mah battery so,

flight time = 2.2*60/20 = 6.60 minutes ≅ 7 minutes.

If we use 5200 mah battery then,

flight time = 5.2*60/20 = 15.6 minutes ≅ 16 minutes.

4.3 Range

We used Flysky Fs as Transmitter and Receiver for the drone.
The normal range of Flysky Fs is 1000 meters to 1500 meters and up to 2km with a range booster.

Blood Products	Temp to be maintained in degree Celsius	Amount in mls
PLTs	+20 to +24	Few 100 mls
RBCs	+2 to +6	Few 100 mls
FFP24	-8 to -20	Few 200 mls

Table: 4.3 Blood temp maintenance

Considering blood testing it requires around 20 to 15 mls of blood for testing, whereas including all the storage tube it requires around 100 gms for around 3 to 4 samples Considering blood particular process followed for particularly FFP24 is Placing a pre-frozen gel pack over the perforated sponge. Placing specimens sealed in a 'Ziplock bag' over the gel pack. Placing another pre-frozen gel pack over the sample.

V. RESULT AND DISCUSSION

5.1. Result

According to the implementation results expected was the range of 1.5 km, a flight time of 7 mins, expected stability for the blood sampling carrying a payload for ranging 4 to 6 (100ml) testing samples for normal testing and for FFP24 would be reduced to around 2 to 3 (100ml) testing samples. When tried and tested all the calculations done above some discrepancy is observed regarding the stability, again with proper calibration and re-testing of individual components some discrepancies are solved.

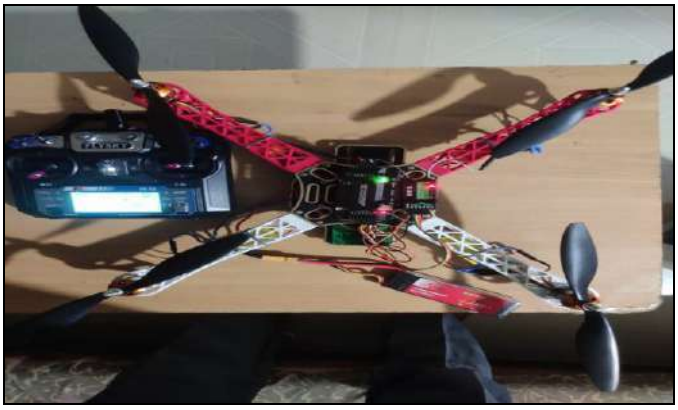

Fig 5.1 Complete Project

5.2 Discussion

In this report, the study of different domain techniques is presented. The different techniques such as hexacopter, quadcopter, are explained. The different aspects such as the temperature of the box, its effect on blood samples, and their products are studied critically. The different hybrid approaches where a combination of having a capacity of taking moderate payload with best flight time, the comparative study of various techniques mentioned above are presented in this report. The hybrid approach is proposed with a modification of making it feasible for an average amount of distance that could be covered. The different standard datasets with their values and ratings are given for this domain system. The way of using a quadcopter for the application of transporting blood samples is explained thoroughly in alignment with ethical standards in medical services.

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Corona COVID-19 Detection Device

Raj Baokar, Saurabh Bhagat, Shubham Maskar, Kiran Rasal

***Abstract*— Covid-19 has become pandemic, spreading all over the world. Scientists and engineers are working day and night to develop a vaccine, to evolve more testing facilities, and to enhance monitoring systems.Corona viruses are a famous family of viruses that cause illnessin both humans and animals. The new type of coronavirus COVID-19 was firstly discovered in Wuhan, China. However, recently, the virus has widely spread in most of the world and causing a pandemic according to the World Health Organization (WHO). Further, nowadays, all the world countries are striving to control the COVID-19. There are many mechanisms to detect coronavirus including clinical analysis of chest CT scan images and blood test results.**

The confirmed COVID-19 patient manifests as fever, tiredness, and dry cough. Particularly, several techniquescan be used to detect the initial results of the virus such as medical detection Kits. However, such devices are incurring huge cost, taking time to install them and use. Therefore, in this paper, a new framework is proposed todetect COVID-19 using Mlx90614 and Max30100 sensors. In the framework of pandemic situations, suchas COVID-19, thus avoiding any direct contact with people.

The proposal provides a low-cost and hassle-free solution since most of the people find difficulties in using infrared temperature gun and oximeter on daily-purposes. Not only that but also ordinary people can use the frameworkfor the virus detection purposes.

***Keywords*—COVID-19, Temperature, Blood Oxygen Saturation, NODE-MCU, SARA-CoV.**

I. Introduction

A coronavirus is a sort of virus that can make ailment in animals and individuals. The function of normal body is disturbed by the action of such virus which breaks into cells within their host and exploits them to replicate itself. The name of Coronaviruses was taken from Latin term 'corona', that means crown, since they are encompassed by what look like royal crown of a spiked shell shape. The World Health Organization (WHO) officially announced that a new virus had been identified which then is called by 2019-nCoV on January 2020. The virus was recognized as part of the coronavirus group, which involves SARS and the other known colds. The first reported case was from Wuhan, China and has infected 7,711 people and 170 reported deaths in China before coronavirus was declared as a global pandemic which produces a sickness authoritatively defined as COVID-19 that has diffused to a minimum 141 nations and regions, causing death over 5,700 individuals around the world. Someone who infected by coronavirus will show common symptom such as fever, dry cough, and tiredness orsome cases, infected person will feel pains & aches, runny nose sore throat, nasal congestion, or diarrhea. However, some people infected with the virus do not show any symptoms and do not feel uncomfortable. Around 80% of individuals infected by COVID-19 can get recovery without acquiring particular treatment, but it is so dangerous for older people or someone with develop serious illness.

II. Literature Survey

A. Literature Survey on "Corona Virus Disease 2019 (COVID-19)." Harapan Harapan , Naoya Itoh , Amanda Yufika Wira Winardi , synat Keam , Haypheng Te , Dewi Megawati , Zinatul Hayati , Abram L. Wagner , Mudatsir Mudatsir et al. [1]

In this paper discussed that the virus is closely related to two bat-derived SARS-like corona viruses collected in 2018 in eastern China and genetically distinct from SARS-CoV and MERs-Cov, Using the genome sequences of SARS-CoV-2, RaTG13 and SARS-CoV, . a further Study found that the Virus is more Related to BatCoV RaTG13, a bat Corona virus that was previously detected in Rhinolophus affinis from Yunnan Province, with 96.2% overall genomeseqence identity. A study found that no evidence of recombination events detectedin the genomesequence identity. A study found that no evidence of recombination events detected in the the genome of Sars-Cov-2 from other viruses originating from bats such as BatCoV RaTG13, SARS-CoV and SARSr-CoVs. Altogether, these findings suggest that bats might be the original host of Corona Virus.

B. Literature Survey on "Corona Virus Disease 2019 (COVID-19) Prevention and control Measures in Community" Bhagawaty Kalikotay et al. [2]

In this paper mentioned about the preventive measures because Preventive measures are the current strategy to limit the spread of cases. Early screening, diagnosis, isolation, and treatment are necessary to prevent further spread. Preventive strategies are focused on the isolation of patients and careful infection control, including appropriate measures to be adopted during the diagnosis and the provisional of clinical care to an infected patient.

C. Literature Survey on "Use of infrared thermometers in COVID-19 pandamic for mass screening: Understanding its implications through a case report."Ahmed Najmi , Shilpa Kaore , Avik Ray , Balakrishnan Sadashivam et al. [3]

In this paper discussed about Infrared Thermometer it says that there is a great deal of ambiguity regarding the fever threshold temperature for infrared thermometer. While one study proposed that it should be 35.6 °C (96.08°F) a more recently published article considers 36°C (96.8°F) as the cut-

off temperature. Larger multicentric studies are needed to get an accurate value. In addition to this, similar to tympanic temperature, the normal forehead temperature range might be different in neonate, children and adults.

D. Literature Survey on "A Review of the Principle of Pulse Oximetry and Accuracy of Pulse Oximeter Estimates During Exercise." Larry j Mengelkoch, Anatole Daniel Martin , John M Lawler et al.[4]

This article reviews the principles of pulse oximetry and assesses the accuracy of pulse oximeter measurements obtained during exercise, based on reports of 10 studies that evaluated 24 pulse oximeters. Nine of the studies used cycle exercise, and 1 study utilized treadmill running for mode of activity. Subject populations included patients with cardiovascular or pulmonary disorders, nondisabled individuals, and athletes. Studies were performed under normoxic and hypoxic conditions, and 5 of the 10 studies validated 18 pulse oximeters at arterial oxyhemoglobin saturation (%HbO2) levels of < or = 78%. Sixteen of the 24 pulse oximeters (67%), from 7 of the 10 studies, observed pulse oximeter estimates (%SpO2) during exercise to be accurate, at least when %HbO2 was > or = 85% in nonsmokers.

III. Summary of Related Work

System Architecture

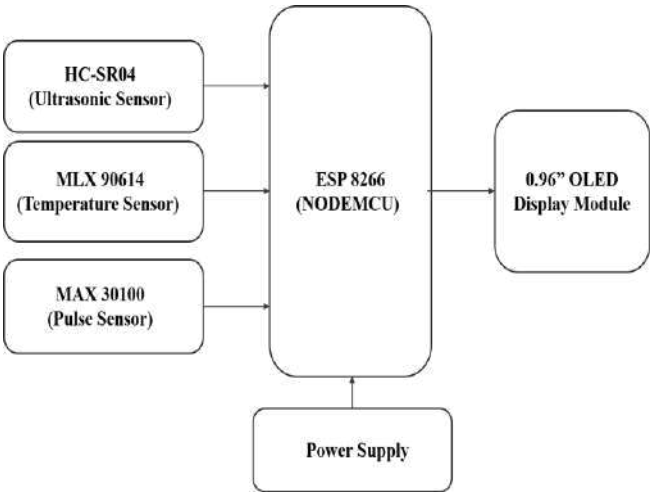

Fig. 1 Proposed system architecture

A. ESP8266 (NODEMCU)

Nodemcu has 4 Mb of flash memory and 128 Kb Ram It have 30 pins. There are Total 17 GPIO Pins There are Four POWER Pins One Vin pin and Three 3.3V Pins, , Four GND Pins, Two Reserved pins, 1 RST,1 EN pin, 1 CLK, 1 CMD.and SDO and SD1 pins. This Board also has a LED indicator which is user programable and is connected to the D0 pin of the Board.

B. Power Supply

System needs 3 to 3.3v power supply. Power to the ESP 8266 (Nodemcu) is supplied via the On-Board MicroB USB connector.Alternatively if you have a Regulated 5V Voltage Source, The Vin pin can be used to directly supply the ESP8266 and its peripheral.

C. UltraSonic Sensor (HC-SR04)

Corona Detection Device is used to take Readings of the person standing next to the device. This Ultrasonic does the work on detecting the person is stand next to device on not Trigger pin of Ultrasonic Sensor is connected to D4 Pin and Echo Pin of Ultrasonic Sensor is connected to D3 Pin.

D. Infrared Temperature Sensor (MLX 90614)

In Corona Detection Device Infrared Temperature Sensor is used to measure the temperature of the person standing in front of the Device without actual contact. The Vcc and GND Pins Connected to the Vcc and GND of NODEMCU, SDA Pin is connected to the D1 of NODEMCU and SCL Pin is connected to the D2 of NODEMCU. For accurate reading between Object and Sensor is 2 Cm-5 Cm (approx.)

E. Pulse Oximetry & Heart-Rate Monitor Sensor (MAX30100)

In Corona Detection Device Pulse Oximetery and Heart-Rate Sensor is used to measure Blood Oxygen saturation level of the person using Corona Detection Device. The Vcc and GND Pins Connected to the Vcc and GND of NODEMCU, , SDA Pin is connected to the D1 of NODEMCU and SCL Pin is connected to the D2 of NODEMCU. It works on Spectrophotometry means the relative absorption of red and infrared light of the systolic component of the absorption waveform correlates to arterial Blood Oxygen Saturations.

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F. 0.96" OLED Display Module

In Corona Detection Device 0.96" OLED Display Module is used for Displaying output of the HC-SR04, MLX 90614 & MAX30100. The Vcc and GND Pins Connected to the Vcc and GND of NODEMCU, SDA Pin is connected to the D1 of NODEMCU and SCL Pin is connected to the D2 of NODEMCU.

3.1. SOFTWARE

Integrated development environment (IDE)	Arduino IDE
Programming Language	C++

3.2. HARDWARE

Processor	Microchip 8-bit AVR®RISC-based microcontroller combines 256 KB ISP flash memory, 8 KB SRAM, 4 KB EEPROM.
Ultrasonic Sensor	+5V DC Operating voltage. Measuring angle: 30° compliant Range: 2 cm to 400 cm
Infrared Temperature Sensor	3 to 5 V Operating Voltage. Temperature Range -70°C to 382.2°C Operating Distance: 2-5 cm
Pulse Oximetry and Heart-Rate Monitoring Sensor	Operating Voltage: 1.8 V
0.96" OLED Display module	I2C 128X64 OLED Display. Operating voltage :3.3V – 5V

Table 4.2 Hardware

ACKNOWLEDGEMENT

It gives us great pleasure and immense satisfaction to present this report on our project "Corona COVID-19 Detection Device", which became possible due to the unstinted guidance and focused direction of, Prof. Meera Kharat, Electronics & Telecommunication Department.

We express our sincere gratitude to Prof. Avinash Vaidya, HOD, Electronics and Telecommunication Department without whom it would not have been possible to successfully accomplish our project.

Furthermore, we are indebted to the principal Dr. Sandeep Joshi whose constant encouragement and motivation inspired us to do our best.

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Design and Implementation of Array Antenna for UAV for Max Performance in terms of Directivity

Tejas Kupate, Harshal Jadhav, Sahil More, Darshan Khose

***Abstract*—In this paper an efficient high gain directive microstrip antenna (MSA) is proposed on UAV to establish communication and to improve performance in terms of directivity. Microstrip patch antenna is very demanded and important discussion thread in the theory of antennas like low cost, light weight, easy to feed and their attractive radiation characteristics. The antenna with 2x4 array of rectangular patch provides S_{11} less than -38.7377 dB at 2.425 Ghz. The antenna offers 9.1104 dBi gain, more than 90% antenna efficiency. The overall antenna dimensions are 268.8 mm x 155.2 mm x 1.66 mm.**

***Keywords*— Microstrip antenna; CST studio; High gain antenna; Unmanned aerial vehicle**

I INTRODUCTION

The goal of this project is to design and implement. there has been tremendous growth in wireless communication in recent years. application of wireless system includes satellite communications, wireless communications, radar communications, mobile communication, wireless local area networks (wlan), wireless area personal networks (wpan), unmanned aerial vehicle (uav) microstrip patch antenna on uav to establish communication and to improve performance in terms of directivity and in the astronom

Antennas are the most fundamental component of any wireless communication system.A antenna cluster is a bunch of at least two antennas whose signals are consolidated to improve execution over that of a solitary antenna. antenna give variety gathering, counteract obstruction and amplify the Signal to Interference in addition to Noise Ratio (SINR). A cluster of antennas is typically comprised of more than one component, however it could be made out of driven components. As these antenna components emanate exclusively and keeping in mind that in array, the radiation of the relative multitude of components summarizes, to frame the radiation beam, which has high response to input signal ratio or gain, high directivity, and better execution with least misfortunes. Like the dipole, a determined component can work as a transmitter or a collector.

Increment in information rates and a pattern of electronic circuits for remote computerized applications the antenna needed for these applications ought to be light weight, effectively mountable and expansive data transmission. These necessities can be met by utilizing microstrip antennas and microstrip patch array antennas. Microstrip single component antenna enjoys benefits yet it additionally has a few hindrances like low efficiency.

The microstrip antenna was first proposed by G.A. Deschamps in 1953 however didn't get viable until 1970s when it was grown further by analysts like Robert E. Munson. Microstrip patch antennas (MPA) are a sub-group of planar antennas which have been investigated and grown widely over the most recent forty years. They have become top choices among antenna architects and have been utilized in numerous applications in remote correspondence frameworks, both in the military area for example, multiple input multiple output (MIMO), broadcast radio, mobile frameworks, radio frequency identification (RFID), TV, global positioning systems (GPS) , vehicle impact evasion framework, satellite correspondence, observation framework and so on, and in the business area.

This project has scope because we can establish communication between uav and ground station but in future, we can change the antenna or antenna element to obtain more gain. we can make this project more advanced by establishing communication between uav to uav or by making master-slave UAV communication system.

Microstrip antenna have a tremendous application potential. We can design these antennas and used them in Personal Communication System, Mobile Satellite Communication, Direct Broadcast Satellite, Global Positioning System.

II WORKING

The microstrip comprises of a slender metallic strip put on a ground plane with a dielectric material in the middle. The emanating component and feed lines are set by the method of photoetching on the dielectric material. Typically, the patch or microstrip is picked to be square, roundabout, or rectangular fit for the simplicity of investigation and manufacture. The length of the metal patch ought to be λ/2. At the point when the antenna is energized, the waves created inside the dielectric go through reflections and the energy is emanated from the edges of the metal patch which is extremely low. The radiation example of the microstrip patch antenna is wide. It has low radiation force and thin recurrence data transmission.

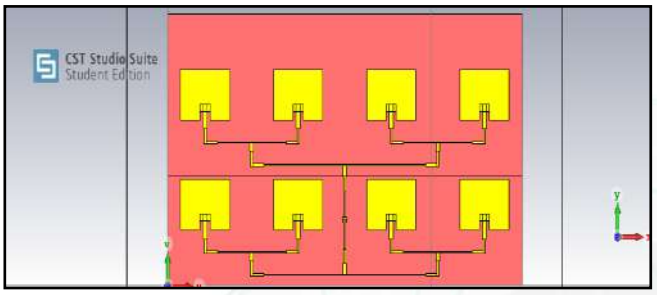

Fig.1 Front view of 2x4 microstrip patch array antenna

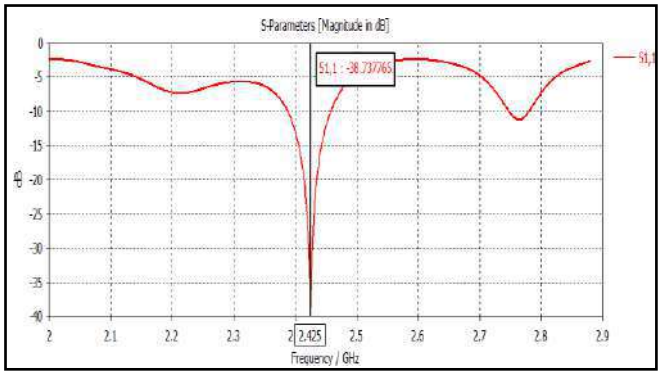

Fig.2 Return loss vs Frequency/Ghz graph

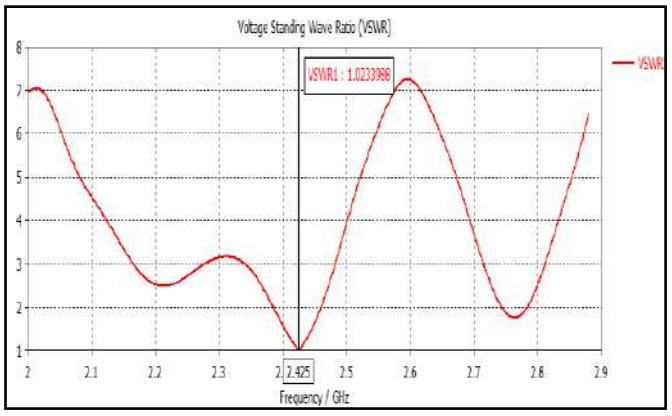

Fig.3 VSWR vs Frequency/Ghz graph

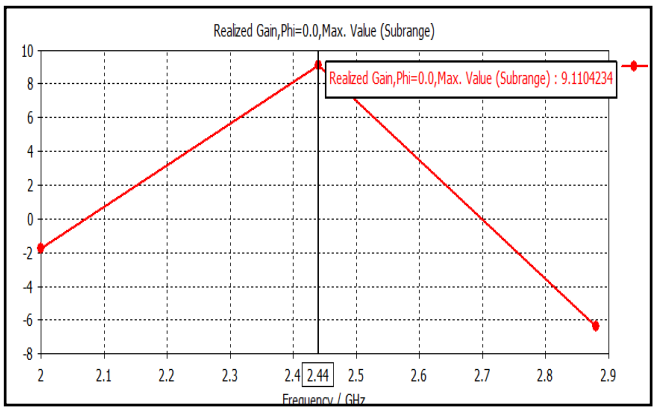

Fig.4 Gain vs Frequency/Ghz graph

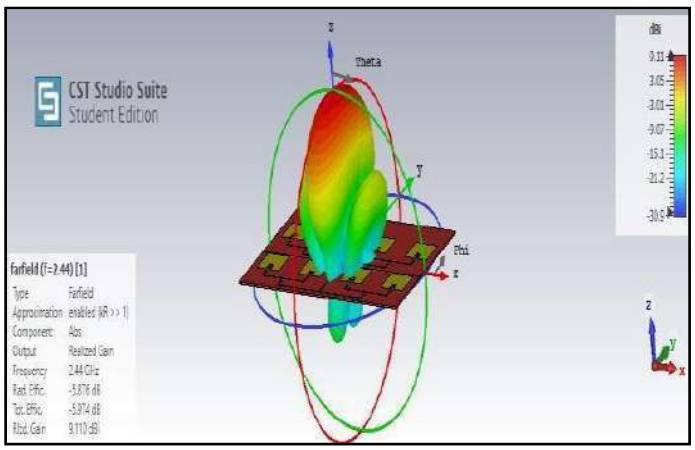

Fig.5 Radiation pattern of 2x4 microstrip patch array antenna

III RELATED WORK

An array of dipole antenna with parasitic element is proposed in [1] for broadening beam width based on linear antenna array theory. The proposed antenna offers communication with UAV at 5.09 GHz operating frequency with 10dB bandwidth 14%. The peak gain, total efficiency and HPBW are 5dBi, 84% and 161% respectively.

A low-profile broadband circularly polarized array antenna is proposed [2] for UAV ground to air communication. In which bandwidth of array element is increased by broadband phase comparator, the capacitive slotting technology and the middle air layer. The proposed antenna offers bandwidth of 0.5 GHz with VSWR > 1.25 and gain greater than 5dBi.

A circular array antenna is proposed in [3] for UAV-to-UAV communication. The proposed antenna has high quality of service, moderate bandwidth and affordable cost. The proposed antenna offers gain of 10dB with reflection coefficient < -20dB and separation between Transmitterand Receiver is > -40dB.

An array of microstrip patch antenna is proposed in [4] for Wi Max and UAV application which had single element 1*2 and 2*2 with microstrip rectangular patch. The proposed antenna outperformed single antenna in terms of directivity and gain. The proposed antenna offers max directivity and gain for 2*2 array antenna are 13.5dB and 13.2dB respectively where return loss is -18.2dB at operating frequency 3.8GHz.

An antenna of 2*2 blade MIMO is proposed in [5] to communicate with UAV. The proposed antenna consists of one vertical monopole and one horizontal dipole which offers return loss between 2.2 to 2.5 GHz at operating frequency 2.4 GHz. An array antenna is proposed in [6] for multi-UAV communication in next generation FANET's. The proposed microstrip patch antenna has its elements 1*2, 1*4 and 2*4 arrays where bandwidth of antenna is increased by 80 to 90%.

An all-around beam switched antenna having dual polarization is proposed in [7] for communicating with drone with 360-degree beam coverage. The proposed antenna is configured by 8 vertical and 8 horizontal polarization which offers max gain of 6.3dBi and min gain of 5.4dBi operated at frequency 5.5GHz where antenna to antenna performance showed the interference suppression of 20dB.

A MIMO spiral antenna is proposed in [8] for GPS, WLAN and UAV applications. The proposed antenna consists of two symmetric triangular spiral shape patches using FR4 substrate. The proposed antenna is operated at 3.79GHz. An electrically steerable passive array radiator antenna is proposed in [9] having operating frequency 1.33GHz. The proposed antenna has main goal to control the main radiation lobe direction for improving communication between antenna that is implemented on UAV and base station.

A 3D antenna array is proposed in [10] for maximum performance in terms of directivity and SLL. The proposed antenna has disc patch elements with directivity 9.31dB and8.92dB for different solutions.

IV Application

Aerial photography for journalism and film
RFID
Medical applications
Precision crop monitoring
Communication-based applications.
Used in Wi-Max

V Future Scope

This project has scope because we can establish communication between UAV and ground station but in future, we can change the antenna or antenna element to obtain more gain. We can make this project more advanced by establishing communication between UAV to UAV or by making master-slave UAV communication system.

Microstrip antennas have an enormous application potential. We can plan these antennas and utilized them in Close to home Correspondence Framework, Mobile Satellite Correspondence, Direct Transmission Satellite, Global Positioning System (GPS), Remote Local Area Network (WLAN), Astute Vehicle Expressway Framework and so

Conclusion

A rectangular single element microstrip patch antenna at both 2.45 GHz and 5.8 GHz for UAV applications was designed and simulated. The single microstrip antennas performance was then improved in terms of directivity and gain by comparing it with 1x2 array structure. The 1x2 array antenna outperformed the single antenna in terms of directivity, and gain. The simulated return loss was equal to -16.12 dB at the center frequency of 5.78 GHz and -22.57 dB at the center frequency of 2.45 GHz both achieved for single element antenna.The maximum directivity and gain achieved for 1x2 array antenna was -18.05 at center frequency 5.82 GHz.Then 1*4 and 2*4 microstrip antenna is simulated at 2.4 GHz using inset feed and probe feed techniques respectively. The simulated return loss was equal to -25.38 dB at the center frequency 2.41GHz for 1*4 and -38.73 dB at the center frequency 2.42 GHz. Realized gain obtained was 7.01db for 1*4 and 9.11 db for 2*4 array antenna.

ACKNOWLEDGMENT

It gives us extraordinary delight and gigantic fulfillment to introduce this report on our venture "Design and Implementation of Array Antenna for UAV for Max Performance in terms of Directivity.", which got conceivable because of the unstinted direction and centered course of, Prof. Shishir Jagtap, Electronics and Telecommunication Department. We offer our earnest thanks to Prof. Avinash R. Vaidya, HOD, Electronics and Telecommunication Department without whom it would not have been feasible to effectively achieve our undertaking. Furthermore, we are indebted to the Principal Dr. Sandeep M. Joshi, whose consistent support and inspiration roused us to give a valiant effort. Last, yet not the least, we earnestly thank our relatives, partners and all the other people who straightforwardly or by implication added to making our errand simpler.

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Hand Gesture Recognition and Voice Conversion system for a differently abled person

Vishnu Nair, Abhishek Pujari, Tarun Shetty, Yash Thakur, Prof. Seema Mishra, Prof. Aboli Khedkar

***Abstract*-Communication is the only way by which every human being can convey their message and thoughts to other people. Normal people can convey their thoughts effectively by establishing the conversation between them. But in our society there are lots of people who are differently abled that means (deaf and dumb) are not able to communicate effectively. Since ordinary people are not taught sign language, communication becomes more difficult. Due to their disability they cannot compete with normal people. Often these people use sign language to communicate but find some difficulty in communicating with those who cannot understand sign language. Here we suggest a clever speaking system that helps deaf people to convey their message to ordinary people using hand and body language. The system uses a hand-held motion reading system consisting of moving and shifting instruments as well as a small controlled control circuit connected to the speaker and LCD.**

***Index Terms*-Gesture Recognition, Flex sensor Microcontroller, Accelerometer.**

I. INTRODUCTION

Smart gloves for disabled people are to remove the barrier of communication between them and normal people. This disability has a great impact on the development for each individual, because it does not just affect their communicating capability but also it alters their emotional maturity. It actually becomes the same problem of two persons which knows two different languages, not one of them knows any common language so its becomes a problem to communicate with each other and so they require a translator physically which may not be always convenient to arrange and this same kind of problem occurs in between the normal person and the disable people.

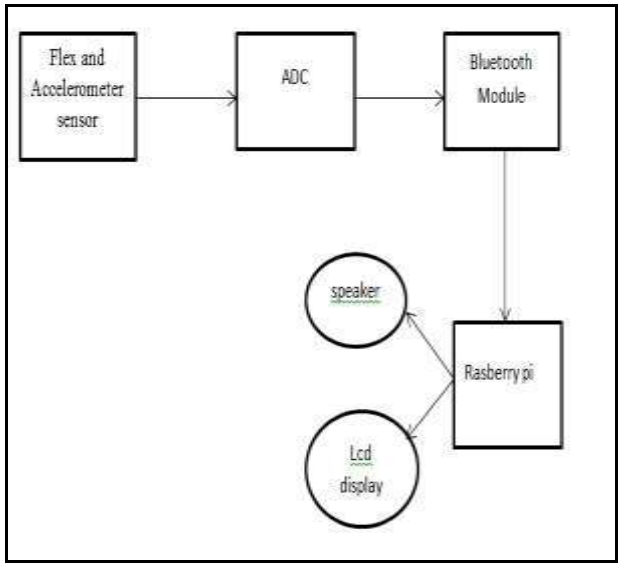

Fig. 1: Work flow

To overcome this problem, we introduce a simple application. Since a mute person cannot speak, these smart gloves help them to convert their hand gestures into pre-recorded text and voice. This helps the average person to understand what you are trying to say and to respond appropriately. This smart gloves have a home use control center where a person with a physical disability is self-sufficient for survival. The main purpose of the project was to create a reliable, easy-to-use, lightweight glove system that has the ability to reduce barriers to stopping people from running.

This will benefit ordinary communities and dump and the deaf by clearing the communication gap between them. In this project the Flex Sensor Plays play a major role, placed on the fingers, as the curved fingers change resistance depending on the degree of sensory bending.

II. METHODOLOGY

1) Proposed system consists of

a) Transmitter section
b) Receiver section

2) Transmitter section consists of

a) Gloves
b) Flex sensors
c) Accelerometer
d) Atmega 328
e) Bluetooth Module
f) Power supply
g) Reset button

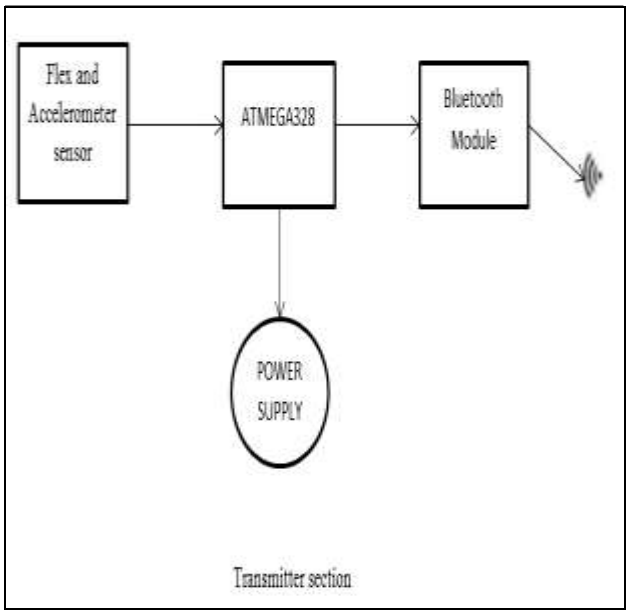

Fig 2: Block Diagram for Transmitter Section

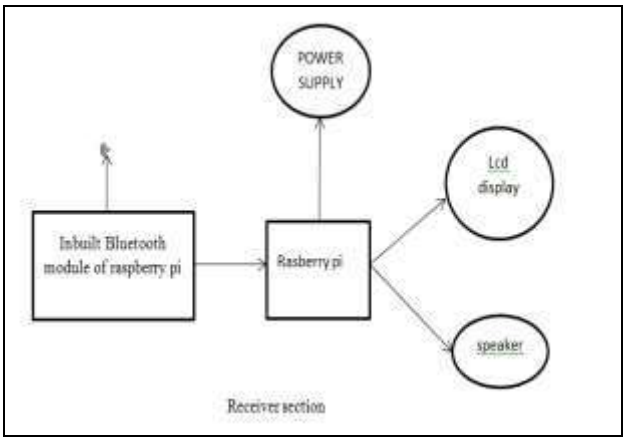

Fig 3: Block Diagram for Receiver Section

3) Receiver section consists of

a) Raspberry pi3
b) LCD display
c) Led
d) Speaker

It consists of a glove which has 2 flex sensors which are fitted on index and little finger. As we bend the finger which consists of flex sensor, there is variation in resistance as flex sensor gives output in form of resistance. Voltage divider bias is applied to flex sensors due to which the output is in the form of voltage which is given to ADC of Atmega328. For variation in output voltage there is variation in resistance for which there is variation in bend degree of flex sensors. For different angle there is different gesture recognition.
So in transmitting section the values from Atmega 328 after the analog to digital conversion is given to Bluetooth module which then transfer this value to Bluetooth module of raspberry pi in receiving section.

Depending upon the bending degree of the angle of accelerometer and flex sensor, the corresponding message is displayed on lcd and speaker.
Since the receiver section has access to Transmitter Bluetooth module and therefore any values from transmitter section are accessible to receiver section and it reads the value and displays it.

III. HARDWARE AND SOFTWARE COMPONENTS

A. Microcontroller

a) Atmega 328 Microcontroller: The Atmega328/P is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC (reduced instruction set computer) architecture. To increase performance and uniformity.
b) Raspberry pi 3: It is a Quad Core 1.2GHz Broadcom BCM2837 64bit CPU with 1GB RAM in it. It has BCM43438 wireless LAN and Bluetooth Low Energy (BLE) on board with 100 Base Ethernet and 40-pin extended GPIO.

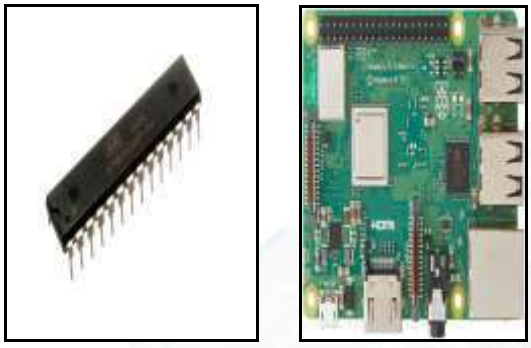

Fig .4: Microcontrollers

B. Accelerometer

It is an electromechanical device used to measure acceleration power. Such forces may be stationary, such as a constant gravitational pull or, as with most mobile devices that stimulates hearing or vibration.

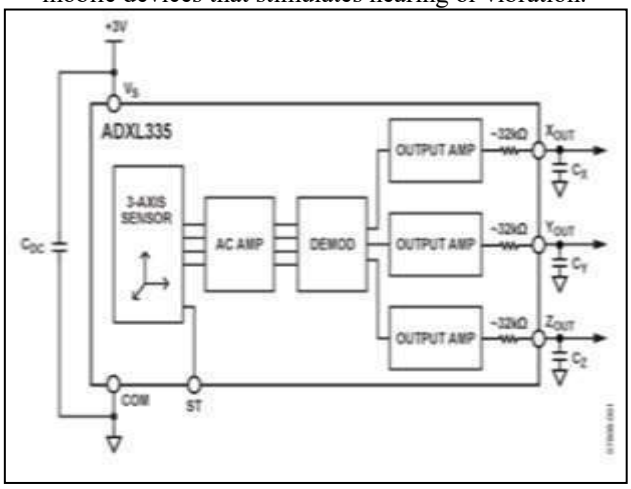

Fig. 5: Accelerometer

C. Flex Sensor

Flex sensor or bending sensor a sensor that measures the amount of deviation or bending. Normally, the sensor is attached to the surface, and the sensory resistance varies by bending the face.

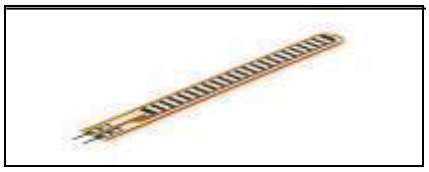

Fig. 6: flex sensor

D. HC 05 Bluetooth Module

HC-05 Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module designed for transparent wireless serial connection setup. It has a range of less than 100meters.

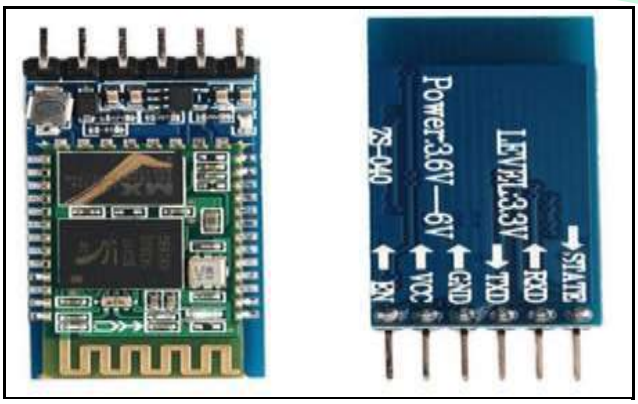

Fig. 7: Bluetooth Module

E. Software required

NOOBS and Arduino IDE is used for the programming purpose this software is very user friendly from this software we can upload the code into microcontroller and we also compile and correct the errors.

IV. FUTURE SCOPE

Completion of this project suggests that these model gloves can be used in part language recognition. In the near future it could support more number of signs and different language modes just by a few modifications. We can convert this system into wireless so that it becomes handy and quite mobile for business use. Talking wirelessly using this we could even transmit the code to a mobile phone. It also can be used for secret military messages.

V. CONCLUSION

Sign language is a very useful to make the communication between the deaf or mute community and the normal people easy. Yet there is a communication barrier between the deaf & dumb with normal people. This project aims to overcome the communication gap between the deaf or mute community and the standard world. Compare with the existing system the prototype could be quite compact and mobile, with a few more addition to the prototype. This method converts the language to associate passive voice through the speaker that is well interpretable by our special people. It is additionally helpful for speech impaired and semi-paralysed person to expression the particular emotion. This prototype can also be programmed to communicate to smart home appliances like alexa, google home, etc.

ACKNOWLEDGEMENT

We are thankful for our teaching experts of Pillai College of Engineering to promote various ideas about our project that not only boost of our own Self-confidence but also gives us a different understanding other methods that can be used in our project.

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Haptic Robotic Arm for a Certain Application

Shivam Pokhariyal, Gaurav Phalke, Om Vichare, Nishant Singh

***Abstract* - In this paper, we demonstrate robotic arm for lifting purpose. The robotic arm is made with three degrees of freedom and programmed to carry out lifting of light weight objects. The robotic arm is equipped with three stepper motors to link the parts and bring arm movements precisely. Arduino ATMEGA Microcontroller an open source computer hardware and software is applied to control the robotic arm by driving the stepper motors to be capable to modify the position. Different co-ordinate systems will define the way in which the robotic arm will move to accomplish it's task. We have used the "Articulated Robot" or "Jointed Arm Configuration". An articulated robot is a robot with rotary joints. There are minimum three such joints present in Articulated Robotic arm.**

***Keywords* - Arduino ATMEGA Microcontroller, Stepper motors, Articulated robot.**

I. INTRODUCTION

Our paper is based on Haptic robotic arm which is a type of mechanical arm, that can be programmed, and having functions similar to a human arm. The links of such a manipulator are connected by joints allowing either translational (linear) displacement or rotational motion (such as in an articulated robot). Our project is based on the Articulated robotic arm. The terminus of the kinematic chain of the manipulator is called the end effector and it is analogous to the human hand. The robotic arm is controlled through a computer by rotating the stepper motors individually. Unlike ordinary motors, stepper motors move in exact increments. This allows the computer to move the arm very precisely, thus repeating exactly the same movement over and over again. The robot uses motion sensors to make sure it moves just the right amount. The positions or the movements of the arm can be changed according to the need by changing the co-ordinates in the code as per requirement.

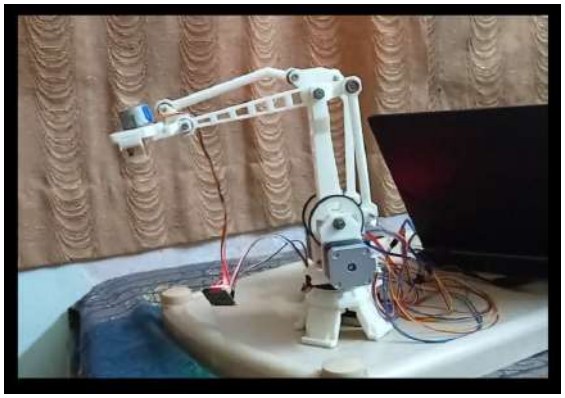

Fig 1.1 Haptic Robotic arm in home position.

II. LITERATURE SURVEY

2.1 Design Analysis of a Remote Controlled "Pick and Place" Robotic Vehicle by B.O. Omijeh : In this paper The design of Remote controlled vehicle has been completed. A prototype was built and confirmed functional. This system would make handling of suspicious objects easier, which could be hazardous in its present environment and workplace.

2.2 Robotic Arm turned into a 3D Printer (Inverse Kinematics) by 3djled : In this particular example the robotic arm is equipped to be operated as a 3D printer. This uses a technique same as that of conventional 3D printers except for the co-ordinate systems used and the inverse kinematics involved. The advantage of using such an approach is that it occupies less space and is more versatile as compared to conventional 3D printers because unlike 3D printers they can do other tasks also.

2.3 Design and operation of synchronised Robotic Arm by Goldy katal, Sahil gupta : The paper's Author suggests that the robotic arm can be designed to perform any desired task such as welding, gripping, spinning, etc., depending on the application. For example, robot arms in automotive assembly line perform a variety of tasks such as wielding, rotation of parts and placement during assembly.

2.4 Design And Implementation Of A Robotic Arm Based On Haptic Technology by A. Rama Krishna :
In this paper the Author proposes various aspects to design a robotic arm based on the haptic technology considering different aspects of it, and the basics of machine designing are observed that are explained clearly. These robots can have a varied range of applications, such as industrial and medical applications where they can be used as pick-up and **2.5** place robots, surgical robots etc.

2.5 Design and Development of Search and Rescue Robot by Khalil AzhaMohdAnnuar, Muhammad HaikalMdZi : With this robotic arm, robot can easily grab the victim in collapsed building and bring to safe place. Generally, there are a lot of robots like this that are used for rescue operations in collapsed buildings. But non of them is controlled by using mobile devices. So this paper is purposely designed to develop a prototype of robotic vehicle using mobile devices as a controller by using Bluetooth transmission.

2.6 Haptic Control Development of Robotic Arm by Mohamoud A. Hussein :
This system consists of a device which measure the position when a master system interacts with virtual or real object; the master system have actuator devices that reflect the force to the hand depending on the characteristics of the object. Impedance control was implemented based on haptic technology using LabVIEW. This system is composed of a haptic device, 5DOF robotic arm, Arduino Kit, and Laptop.

III. PROPOSED SYSTEM AND METHODOLOGY

A. Overview of System

The working of an robotic arm is similar to other CNC machines like 3D printers, welding machine, laser cutting machine, etc which use Numerical control (also computer numerical control, and commonly called CNC).
The mechanism of the CNC machines is very similar to that of the robotic arm, only difference is that, the robotic arm uses inverse kinematics for developing coordinate system of particular type of robotic arm which in our case is the "Jointed Arm Configuration". This whole process of making the machine move the way it moves to achieve a particular goal involves three procedures namely CAD, CAM & CAE.
CAD: Computer-aided design (CAD) is a software that is used to create digital 2D drawings and 3D models. This computer software is used to design a technical drawing which is used to show objects that will later be manufactured. CAD output is often in the form of electronic

Files for printing machining, or other manufacturing operations. Theequivalence of such a CAD system in our project is for the use of g code generator from a photo or AutoCAD, used to produce stl files.

CAE: Computer Aided Engineering (CAE) has no relevance in our project.

CAM: Computer-aided Manufacturing (CAM) is defined as automating the manufacturing processes with the help of a software. CAM software translates CAD designs into instructions for machines, increasing the efficiency of producing parts and optimizing the amount of materials used. The equivalence of such a CAM system in our project is use of the GRBL based firmware called Marlin firmware. The stepper motors and spindles/lasers are controlled by GRBL, which is a firmware for Arduino boards (UNO, NANO, Duemilanove). In GRBL g code is used as input and output signals via the Arduino pins. Most industrial CNC machines uses parallel port controller.

First a g code is generated or written by us according to the actions that we want the robotic arm to perform or g code is rendered using another software. The controller software Marlin (which is based on GRBL) which is installed on the Arduino based microcontroller using libraries executes this g code to convert it into the electric signals given through the controller to different stepper motors to achieve the required mechanical movements. For example to lift an object. The g code is written according to the coordinate system which suites the robotic arm in our case "Jointed Arm Configuration" also known as articulated Robot.

B. Proposed System

The existing system for robotic arms used in industries are having a very complex mechanism and architecture. It is used for dealing heavy materials at large scale with costly sensors. In our proposed system we have designed 3 DOF (Degree of Freedom) robotic arm. It contains three stepper motors. The proposed system architecture is similar to existing system architecture except for the firmware used here is an open source firmware. Feedback circuit is not used in this architecture. Instead of using the feedback circuit (sensors) the Robotic arm version of Marlin firmware has set a limit for movement of stepper motor in each direction for each stepper motor.

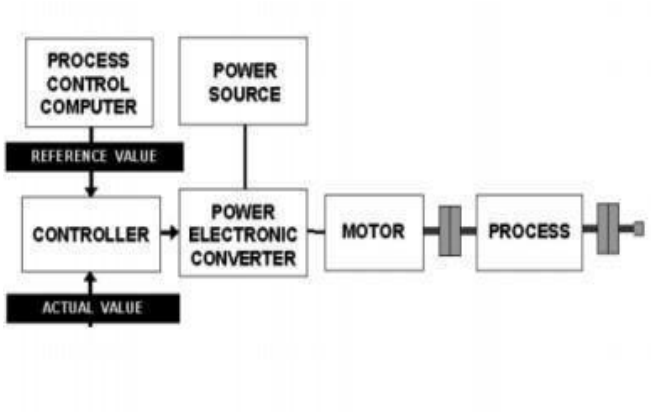

Fig 3.1Block diagram of Haptic Robotic arm.

C. Embedded Systems

An Embedded System is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function. For our Robotic Arm we have used ATMEGA 2650 Arduino micro- controller board, which has an open-source GRBL based Marlin Firmware installed on it which interprets the g code instructions and accordingly sends electrical pulses to the stepper motor. The Marlin firmware is also responsible for synchronizing the rotation of three stepper motors. It calculates the algorithm of inverse kinematics. The Robotic Arm is of 3 DOF (Degree of Freedom) and is equipped with three NEMA 17 stepper motors driven by A4899 Stepper motor drivers. These drivers are connected to output pins of the Arduino board which indeed drives the stepper motors. These drivers require an external power supply of 12v to meet high voltage requirements of stepper motors. The g code is generated using a slicer software where an jpeg or PNG image is given as input and the output is g code instructions to be executed by the Marlin firmware to draw the image. This code is uploaded into the Marlin firmware on the Arduino board using Pronterface which is a GUI host for 3D printing; it can manage your printer as well as prepare, slice, and print your STL files.

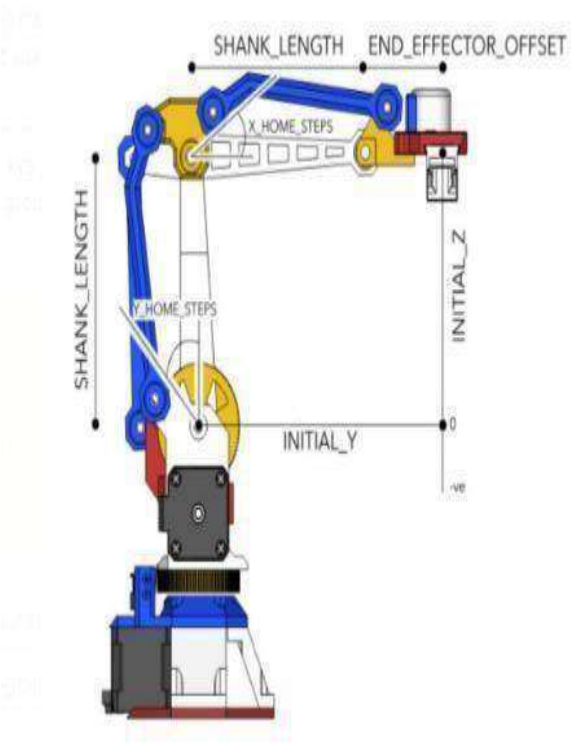

Fig 3.2 Custom parameters of Robotic arm.

The g code is simply instructions for the stepper about how much to rotate in a particular direction. Similarly a g code can be generated for moving the Robotic Arm or lifting an object. An articulated robot uses all the three revolute joints to access its work space. The joints are arranged in a “chain”, so that one joint supports another further in the chain. The main arm of the robot is mounted to a base with a twisting joint in horizontal plane. The second joint attaches the first arm to this base. This joint rotates in vertical plane. The third joint is further present between the first and second arm which also rotates in vertical plane. The end effector is end point of the second arm where the claw is present. The synchronized movement of these joints using stepper motors results in accomplishment of a particular task.

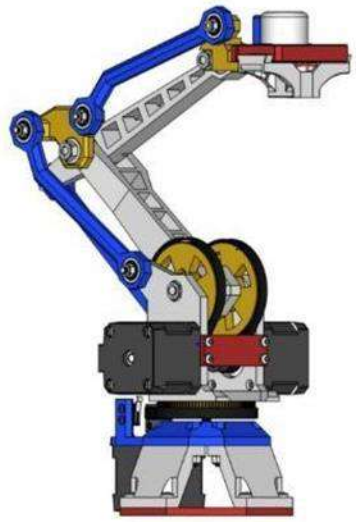

Fig 3.2 Robotic arm touching limit switch.

IV. APPLICATIONS

a. Robotic Painting

Professional painters are difficult to find and the job is a highly toxic one. As the paint job needs to be highly consistent over a large area, and reducing the amount of wasted material can add up to quite a bit of savings over time, it makes the robots perfect for this job.

b. Robotic Welding

In the automotive sector every car needs a high number of welds before it's complete. Given the high value of the finished product and as the productivity from automation is enormous, Robotic Weilding is used.

c. Robotic arm for farms

Robotic arms are used by farmers for plucking ripe fruits from small trees, ploughing soft land for small plants. They can also be used for planting purpose and cutting grass, as well detecting and uprooting particular unwanted weed plants.

d. Military Applications

In military applications Robotic Arms are used as surveillance device, to pull out casualties. It is also used to transport objects just on click of a button. It is also used to detect the mines spread in ground.

e. Robotic Assembly

In many automotive plants, robots are used for assembling components smaller in size like pumps and motors at high speeds. Often, robots are performing tasks like windshield installation and wheel mounting to increase throughput.

f. Picking, Packing and Palletizing

Most products are handled multiple times prior to final shipping. To increase speed and accuracy and also to lower production costs Robotic packing and picking is used.

g. Robotic arm for desktop

Multifunctional desktop robotic arm for practical training education purpose are used in universities. Installed with different end-tools, these can realize interesting functions such as 3D printing, laser engraving, writing and drawing.

V. HARDWARE DESCRIPTION :

1. Arduino Mega 2560 :

The Arduino Mega 2560 is a microcontroller board using the ATmega2560 processor. In this project it does the job of interpreting the codes and channeling them properly to the drivers while controlling other functions like fans ,reading limit switches etc. 54 digital i/o pins are present on this board out of which 14 are used as output PWM pins, 16 analog input pins, 4 serial hardware ports, a 16 MHz oscillator, USB port, power input, Header ICPS, and a button to reset. The Mega is compatible with most shields designed for the Arduino like the one we are using that is Ramps 1.4. The Mega 2560 is updated version of the Arduino Mega, which it replaces. The board uses an external supply of 6 - 20V. The ATmega2560 uses 256 KB of flash memory for code storing out of which 8 KB is used for the bootloader.

2. Ramps 1.4 board :

RAMPS, is a circuit board that acts as the middleman between the Arduino Mega — the processing computer — and the electronic devices on the robot arm like stepper motors. The computer extracts information from files containing data about the object you want to lift and translates it into digital events, like supplying a voltage pulses to a specific pin. It uses many such pins for turning them on and off to tell a robot what to do. But the Arduino mega itself cannot provide or operate at that huge power. Here the RAMPS circuit board steps in. It organizes and amplifies the information coming from the Mega so that they're directed down properly to the correct channels. This board is conventionally a 12V board but can be modified to work even at 24V.

3. A4988 & ULN-2003 Driver :

While building a robotic arm or a CNC machine, one will need to control a bunch of stepper motors. Having one Arduino Mega control all of them is not possible and will take up a lot of the processing and not leave you enough space to do anything else so we use a self-contained dedicated stepper motor driver called – A4988. It can control both spinning direction and speed of a stepper motor like NEMA 17 with just two pins as it's inputs from the Arduino. The A4988 is a whole small Microstepping Motor Driver with built-in translator for ease of operation. The driver provides a maximum output power of 35 V and ± 2 A. It can operate bipolar stepper motors in full-, half-, quarter-, eighth- and sixteenth-step modes. The ULN2003 is a 16-pin IC driver used to drive the 28 Byj stepper motor, a motor that requires 5V 80mA to run cannot be provided by an Arduino I/O so we use this IC to supply enough current and voltage for the load.

4. Nema 17 & 28BYJ Motors :

Nema 17 is a stepper motor with a 1.8° step angle hence In addition, his support allowed our team the valuable opportuneity to experiment with different and distinct ideas. 200 steps per revolution. Each phase or coil of the motor draws 1.2 A at 4 V, allowing for a holding torque of 3.2 kg-cm to 4.2 kg-cm. NEMA 17 Stepper motors are generally used in Printers, CNC machines and Robotics. It has six wires, connected to two split/ center tapped windings.Whereas Byj is a smaller bipolar stepper motor with a single center tap winding. It has step angle of 0.176° hence providing 2048 steps per revolution thereby reducing its speed. It has a rated voltage of 5V.

VI. CONCLUSION

The Robotic arm is of great use and future of all manufacturing domains. It works effortlessly. This project tries to give insights into the Robotic accuracy which is demanded almost everywhere and make it more efficient there by reducing human time and effort. This implementation brings together all the features which can be needed to make sure that the services provided by it can be used by a layman. It will provide ease to individual users like students, shopkeepers etc and help them from desktop to kitchen work and can also provide great benefit to physically challenged people thereby resolving their dependencies on others. It adds just another innovation to your table and factories which will help to pave the way for development of more sophisticated robots and become part of human life.

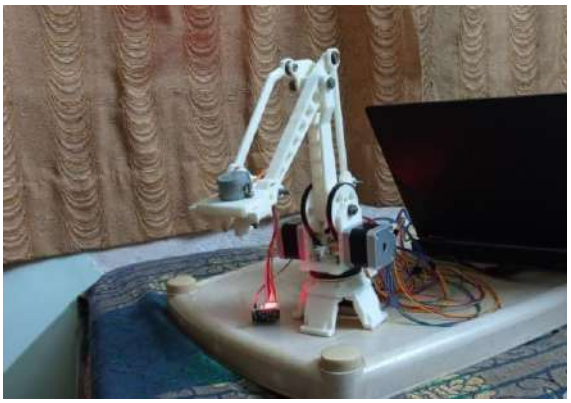

Fig 6.1Robotic arm in active state with gripper ON

ACKNOWLEDGEMENT

This project required a lot of guidance and assistance and we are extremely privileged to have got this all along the journey of completing our project.

Firstly we would like to thank project guides Professor Padmaja Bangade and Professor Florence Simon for their kind and generous hosting of our team and guidance throughout the process. The team obtained valuable knowledge from the process of making the project under their guidance.

We thank our project coordinator Professor Ajit Saraf for his very needed time to time guidance and instructions. The clarity of instructions provided by him eased the process of making the project.

We also would like to thank and greet our HOD Dr. Avinash Vaidya for his support and effort from day one of our PBL projects that paved the way for this project to succeed.

Finally, we would like to give principal of our college Dr. Sandeep Joshi a special thanks for being such a gracious host and bringing flexibility to the process. The university and its students under his guidance played a big role in helping our team complete this project.providing

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Horizontal trident shaped antenna for GSM and WLAN applications

Samina Yasmin, Floyd Abraham, Sandeep Unnikrishnan, Shikare Dimple Kishore, Prof. Jayashri Bhosale

***Abstract*—A tri-band microstrip patch antenna for GSM and WLAN application is presented. This paper presents a design having a horizontal trident shape for the radiating patch. It has three strips resonating at different frequencies. The antenna structure is designed on an FR-4 substrate. The antenna design exhibits good return loss performance (-19dB<S11<-28dB) for all operating frequencies with acceptable radiation patterns. The simulated results are delineated in the paper. CST Studio Suite software system is employed to get simulation results.**

***Keywords*—trident shaped, triband antenna, microstrip antenna, WLAN, GSM.**

I. Introduction

Microstrip patch antennas have several benefits such as lightweight, low profile, low cost, easy fabrication. However, it suffers from a low potency and narrow bandwidth. Modern technology needs a very small antenna and also the need for a multiband antenna is increased to avoid the usage of multiple antennas and hence large space requirement in wireless devices.

Various multiband microstrip patch antenna designs have been investigated. A tri-band antenna with 20 dB return loss is presented in [3], the triband operation is achieved using three arms, and isolation is achieved using a ground stub and a feed stub. A tri-band planar inverted F antenna with less than -10 dB return loss has been proposed in [4], multiple frequencies are realized using a dual L-shaped slot on the patch. A novel tri-band planar inverted F antenna is proposed in [5], a quadratic Koch shape slit, and a parasitic strip is used to obtain triple-band resonant frequencies. A tri-band dual-polarized patch antenna is proposed in [6], a rectangular ring patch and notch rectangular patch is designed to make it operable on the first two frequencies, then the dimensions and placement are altered and modified to provide operation for the third frequency. A tri-band notch antenna is proposed in [7], A T-shaped stub and two C-shaped slots are implemented to obtain triple-band resonant frequencies. In [8], the folded open stub and long and short L-shaped strips are used to realize resonance at multiple frequencies. A compact dipole antenna is presented in [9], it consists of two-third iteration triangle fractal arms to make it operable for two resonant frequencies. In [10], resonance at three frequencies is realized by using a toothbrush-shaped patch, a meander line, and an inverted U-shaped patch. In [11], symmetrical Y-shaped and asymmetrical U-shaped slots is used to realize tri-band characteristics. In [12], the desired tri-band operation has been achieved by using slots and truncation along the side of rectangular patch width. Changing the patch dimensions results in resonant frequency changes.

In this paper, a horizontal trident antenna is presented to resonate at 900 MHz, 1.8 GHz and 2.4 GHz for GSM and WLAN applications. The operating frequencies can be steered by changing the length of the respective arms of the antenna. The longest arm resonates at the lowest frequency (900 MHz), while the shortest arm resonates at the highest frequency (2.4 GHz) and the middle one resonates at 1.8 GHz.

II. Antenna Design

The measurement of the proposed antenna is shown in fig. 1. The antenna structure has three resonant strips joined with the CPW feed line. FR-4 is used as a substrate whose relative permittivity is 4.3, thickness is 1.6 mm, and dielectric loss tangent 0.02. The aim is to obtain resonance at multiple frequencies i.e. 900 MHz, 1.8 GHz, and 2.4 GHz. To optimize the dimensions of strips are varied using CST Studio Suite software.

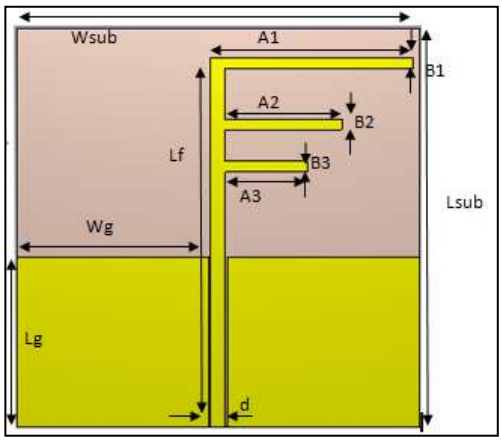


Fig.1 Proposed Antenna Geometry Layout

A. Patch Design and Configuration

The proposed horizontal trident microstrip patch antenna has resonance at 900 MHz, 1.8 GHz, and 2.4 GHz and used dielectric substrate FR-4 to design this antenna. CPW feeding technique have been used to design the horizontal trident microstrip patch antenna.

The dimensions of the antenna are calculated using the following formulas:

Width Calculation (W):

$$W = \frac{\lambda_{eff}}{2} = \frac{v_o}{2 f_o \sqrt{\frac{2}{\varepsilon_r + 1}}} \quad \text{... (1)}$$

Where C is the speed of light, ε_r is FR-4 substrate's dielectric constant, f_o is the frequency at which the antenna will radiate, W is the patch's width, and calculation of the effective dielectric constant, ε_{reff} is given below.

Effective dielectric constant calculation (ε_{eff}):

$$\varepsilon_{eff} = \frac{\varepsilon_r + 1}{2} + \frac{\varepsilon_r - 1}{2}\left[1 + 12\frac{h}{W}\right]^{1/2} \quad \text{... (2)}$$

The size of the patch along its length has been increased on each side by a distance ΔL, which depends on the effective dielectric constant and the width-to-height ratio (W/h)

Calculation of the length (L):

$$\Delta L = 0.412 \cdot h \frac{\left(\varepsilon_{eff} + 0.3\right)\left(\frac{W}{h} + 0.264\right)}{\left(\varepsilon_{eff} - 0.258\right)\left(\frac{W}{h} + 0.8\right)} \quad \text{... (3)}$$

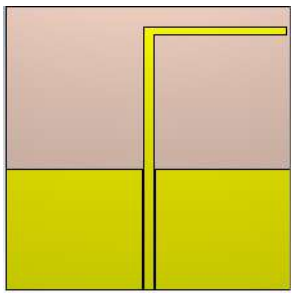
$$L = \frac{v_o}{2 f_o \sqrt{\varepsilon_{eff}}} - 2\Delta L \quad \text{... (4)}$$

The dimension of the proposed antenna is listed in Table 1.

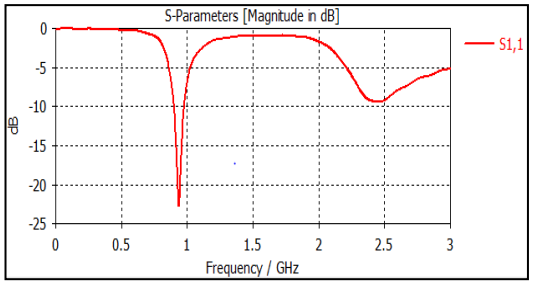
Table 1: Antenna Design Dimensions

Parameter	Value(mm)	Parameter	Value(mm)
Lsub	75	***d***	2.7
Wsub	76	***A1***	35.5
Lg	32	***A2***	22
Wg	36.3	***A3***	15.5
Lf	69.6	***B1=B2=B3***	2

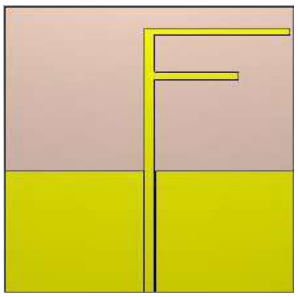
III. Parametric Study



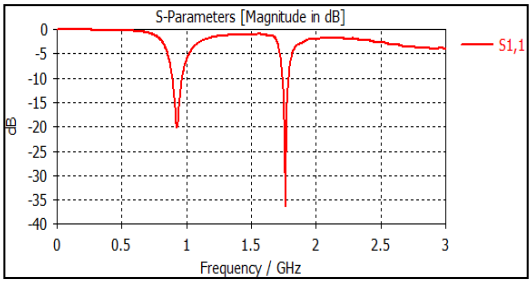
(a)



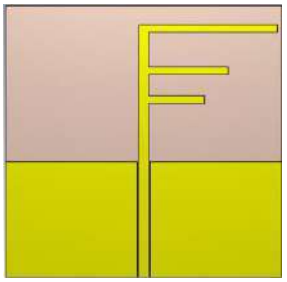
(b)



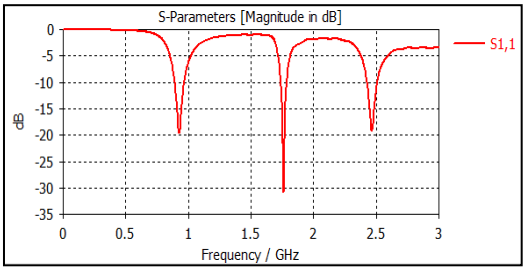
(c)



(d)



(e)



(f)

Fig. 2: Design steps with its reflection coefficient results at each stage. **(a)** Antenna design for 900 MHz. **(b)** S Parameter for antenna design in fig. 2(a). **(c)** Antenna design for 900 MHz and 1.8 GHz. **(d)** S Parameter for antenna design in fig. 2(c). **(e)** Antenna design for 900 MHz, 1.8 GHz and 2.4 GHz. **(f)** S Parameter for antenna design in fig. 2(e).

IV. Experimental Results

A. Simulated Input Voltage Standing Wave Ratio

The simulated VSWR of the proposed antenna is (1<VSWR<2) for all resonant frequencies as shown in fig. 3, which reveals effective filtering behavior and minimum reflection coefficient at the required frequencies.

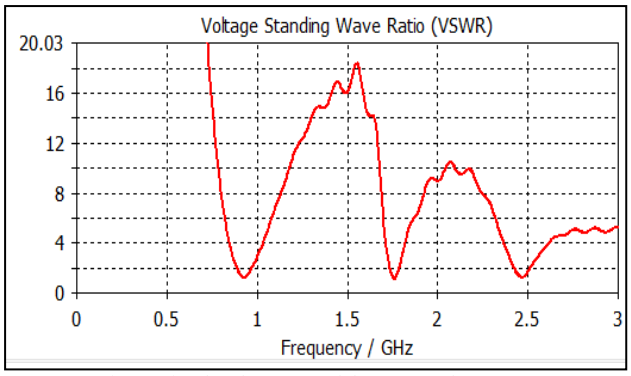
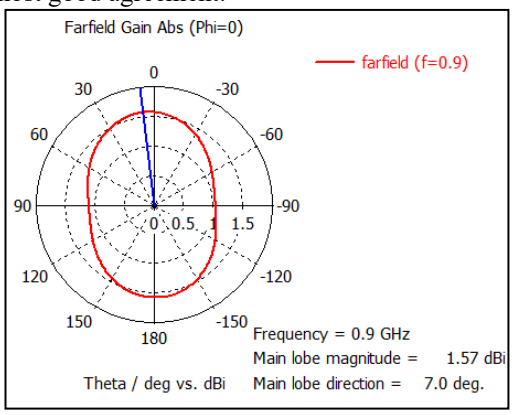


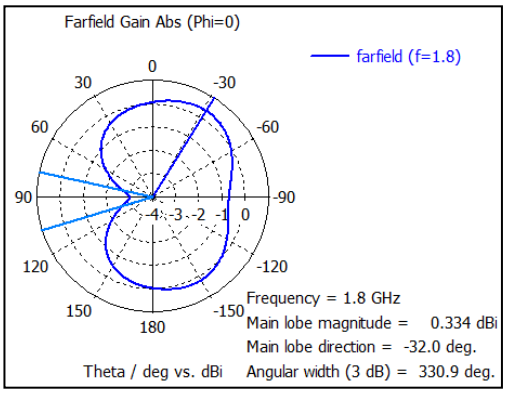
Fig. 3: Simulated VSWR of the proposed Antenna

B. *Antenna Farfield Gain Plot*

The simulated antenna farfield gain Plot is shown below in Fig. 4 for each frequency. The simulated results are found in almost good agreement.



(a)



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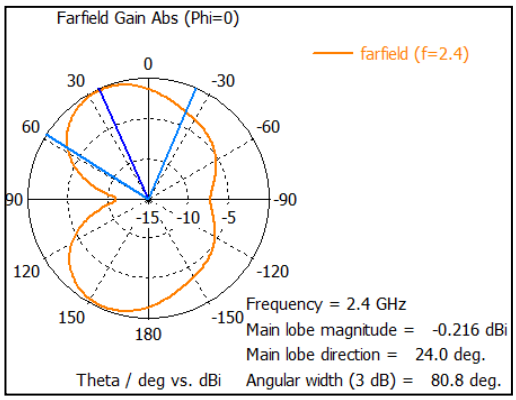
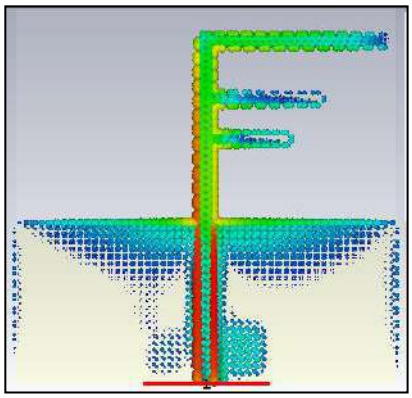


(c)

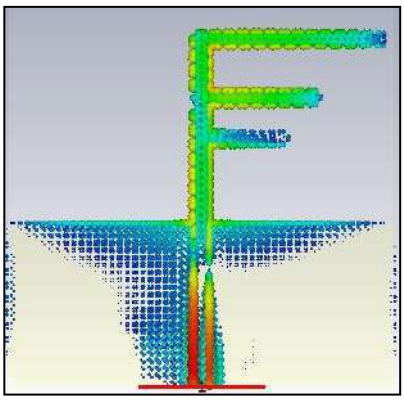
Fig. 4: Farfield Gain Plot at **(a)** 900 MHz **(b)** 1.8 GHz **(c)** 2.4 GHz

C. *Surface Current Distribution*

Surface current distribution is simulated for the antenna design. As shown in figure 5, the currents are mainly concentrated at these frequencies around their respective primary radiator.



(a)



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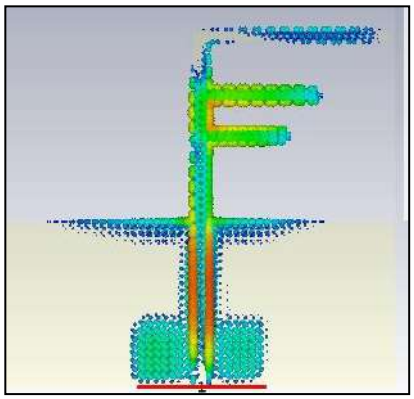

(c)

Fig. 5: Surface Current distribution pattern at the resonant frequencies **(a)** 900 MHz **(b)** 1.8 GHz **(c)** 2.4 GHz

V. CONCLUSION

In this work, a horizontal trident antenna operating at three frequencies is proposed. By simply changing the dimensions of the three arms of the antenna, the antenna is resonating at three frequencies (900 MHz, 1.8 GHz, and 2.4

GHz) with good rejection characteristics. The antenna possesses an acceptable radiation pattern with desired reflection coefficient at operating frequencies. Hence, the proposed antenna is suitable for GSM and WLAN applications.

ACKNOWLEDGMENT

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Last Mile Delivery Drone

Nikita Bhintade, Dhanraj Gaikwad, Neha Shinde, Savitri Kengar

***Abstract* - Drones became a very important aspects in logistics industry. Rapid technological developments in drones and an evolving legislation may soon open the way for his or her large-scale implementation within the walk delivery of products. The employment of drones could drastically decrease labour costs and has been hyped as a possible disruptor to the parcel delivery industry. Online retailers and delivery companies like Amazon, are already filing up patents for the event of multi-level fulfilment centres for unmanned aerial vehicles or "drone-beehives" that may allow the deployment of this technology within built environment.**

***Keywords* – Drones, Delivery Drones, Unmanned Aerial Vehicle, Logistics Industry**

I. INTRODUCTION

A. Fundamentals

Nowadays, online shopping is one in every of the best ways to buy at your fingertip. A last Mile Delivery Drone could be a special idea which can make home delivery easy and unmanned. The most aim of this delivery drone is to deliver the merchandise safe and fast as compared to Bike and car at lesser cost and environment friendly technology. Drones refers to the act of moving a package from point A to B using unmanned aerial vehicle(UAVs). Such UAVs are either autonomous or remotely controlled by human pilots.

B. Scope

As helicopters are distinguished themselves from airplane by flight flexibility. Drones not only provides the identical opportunities but have lesser possibilities of losing human operator. Another big advantage is their price, and thus their extreme high availability. Therefore, it's reasonable to forecastthat drones will decrease the necessity for helicopters, and was able to conduct operations where the employment of helicopter was too expensive and dangerous .Drones are small in size and can't transport heavier objects. Hence, it's expectedwithin the future that other form of drones like cargo drones, which are unmanned are operated on ardupilot or remote.[1]

C. Outline

- Drones are allowed to fly at a particularly height because of which humans will not come easily in contact with it.
- The Delivery using drone will deliver the object one at a time.

II. LITERATURE REVIEW

Literature on drones has been thriving within the last years. Hassanalian and Abdelkefi provide taxonomy of drones and propose and discuss solutions for various design challenges form the implementation of the drones on safety, security, privacy, ownership, liability and regulation. De Miguel Molina and Seggera OA provide an summary of the drone industry within the Worldwide, including data of manufacturers, revenues and forecast.

In the paper titled "Analysis of Unmanned Aircraft Systemsand Application in the Civil Field", Kharchenko and Prusov(2012) considered various uses of drones by breaking them down into three groups namely safety control, scientific research, and commercial.

Peter Tatham (2009) in his article "An Investigation into the Suitability of the Use of Unmanned Aerial Vehicle Systems(UAVS) to Support the Initial Needs Assessment Process in Rapid Onset Humanitarian Disasters" addresses the uses of UAVS in drones in providing aerial surveillance and reconnaissance within the areas that need immediate action.[4]

According to Hall and Coyne (2014), world governments spent over $6.6 billion on "drone" technology in 2012. Thenumber is expected to extend upto $11.4 billion a year overthe following decade for a worldwide UAV market worth over $89 billion. Some of the economist have studied aboutvarious commercial and civil application the drones. Many startup companies are also progressing to offer the drone delivery service.

III. SYSTEM OUTLOOK

A. Overview

Delivery Drones are unmanned aerial vehicle (UAVs) that can deliver light weighted objects. Delivery Drones can be operate autonomous or remotely.

The use of drones for commercial package delivery has some of advantages. One in all advantage is that the speed. Although, the car, bus, truck and other transport can travel fast because of blocked roads or bad roads, there would be chances of changingthe route to the destination which might be lengthy. But the drone can eliminate all this problems, it can transverse difficult terrain with relative ease and, in many cases, takes much shorterroute. [5]

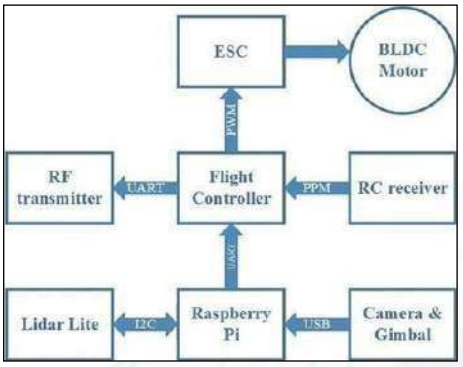

Figure. 1: Basic Block Diagram

B. Existing System

In the existing technology drones could deliver the package in an exceedingly particular area. Drones with last mile delivery is that the interesting topic for research with real world application. McKinsey which is service industry company identifies autonomous unmanned aerial vehicle (UAVs) is that the dominant option for last mile deliveries, especially of parcels, for the areas with density smaller than 50,000 inhabitants. Since it is expected that very same day or instant delivery will grow within the future, home deliveries using drone is being promoted and researched by many growing companies.
Companies like Amazon, Google have been testing drones for delivery purpose since a few years. Most recently, Amazon is planning to use drones for 30 min delivery directly to home, and has begun private trials in England. [6]

C. Proposed System

As keeping above points from existing system in mind, we've got also done the identical. By keeping deliveries of an object or a package as an vital motive, we have designed a drone. The drone is capable for making deliveries of an object. Also, one in every of the target of is to test that how many users can have benefits of this service.

IV. SAMPLE COMPONENTS USED

A. Raspberry Pi

Raspberry Pi is credit sized computer that is used for various applications. We have used Raspberry Pi for designing the drone. Raspberry Pi has been used because it has some of advance technology that offers HDMI ports, USB ports and one Ethernet Port. The figure shown below is sample for Raspberry Pi.

Figure. 2: Raspberry PI

B. Frame Kit

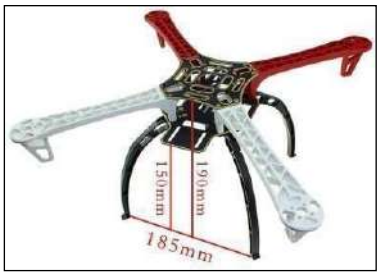

Figure. 3: Frame

A drone frame is a special frame that is used to mount Motors, Speed Controllers, Flight Controller and other hardware components.

C. Electronic Speed Controller (ESC)

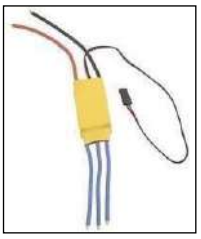

Figure. 4: ESC

An electronic speed controller is an electronic circuit that is used to control the speed of electric motors. It may also provide reversing of the motor and the dynamic braking. Miniature electronic speed controller are used in electrically powered radio controlled models.

E. Brushless DC Motor

Figure. 5: Brushless DC Motor

The figure shown for DC Motor is a sample. A brushless DC electric motor, also known as electronically commutated motor powered by direct current (DC) electricity via inverter or switching power supply which produces electricity in the form of alternating current (AC) to drive each phase of the motor via a closed loop controller. The controller which has been used like in our case, it is Raspberry PI, it provides pulses of current to the motor windings that controls the torque and speed of the motor.

F. Multirotor Propeller

The purpose of the propellers is to generate thrust and torque to keep your drone flying. And maneuver. Two pair of propellers are used in which two are rotating in a clockwise manner and another two are rotating in anticlockwise manner in order to keep the drone stable. The speed of the propellers are decided as per the speed of the motor. The propellers are used to fly, yaw and hover at a particular point.

Figure. 6: Propellers

Torque is generated as the propeller accelerate up or down. This force is responsible for the ability of the drone to rotate on the yaw axis. Torque is an effect of Newton's third law, where every action has equal and opposite reaction. As the propeller rotates, and pushes through the air, the air pushes back and causes a counter rotation on the body of the drone.

G. Flight Controller

The figure shown is for flight controller that we have used for designing a drone. In this case, we have used ArducopterAPM 2.8 flight controller. A flight controller is a small circuit board of varying complexity. Its function is to direct the RPM

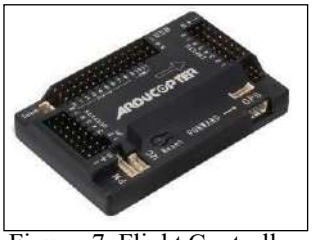

Figure. 7: Flight Controller

of each motor in response to input. A command from the pilot for the multi rotor to move forward is fed into the flight controller, which means how to manipulate the motors. No human is capable of controlling two or more motors simultaneously with enough precision to balance a drone in the air. So, in order to fulfill this requirement the flight controller is used.

V. ESTIMATION FOR SELECTING MOTORSTHRUST TO WEIGHT RATIO

With multi-rotors i.e. propellers its important to make sure that motors can produce a minimum of 50% more thrust than the full weight of the drone. This is often a very important rule to follow is it implies that the motors will have enough extra thrust to regulate the multi-rotors in wind and through aggressive flight manuevers. We are able to increase the burden to the drone if it flies gently and smoothly. The motors we would have liked must produce a minimum of twofold of the thrust in So, if the load of the drone is around 680g then we want to possess motors producing total thrust of 1.3kg or 340g max thrust per motor.

VI. WORKING DONE

After selecting required components as shown in sample dataset. The Motors are selected as per overall weight and thrust calculated. we've also selected RC to regulate the drone because it isn't autonomous. The drone is fully operated by the operator using remote. As shown below the ESCs are soldered to the plate and therefore the same is attached to the drone frame.

Figure. 8: Basic Connection of Components

The connection of flight controller is done with motors at the output port pins and receiver to input port pins.
The below figure shows the connection of Raspberry PI. Once, the connection of Raspberry PI with flight controller is done. All the components will be fitted on the frame. The Raspberry PI will be fitted below the flight controller and will be tested at indoor without connecting propeller to the motors.

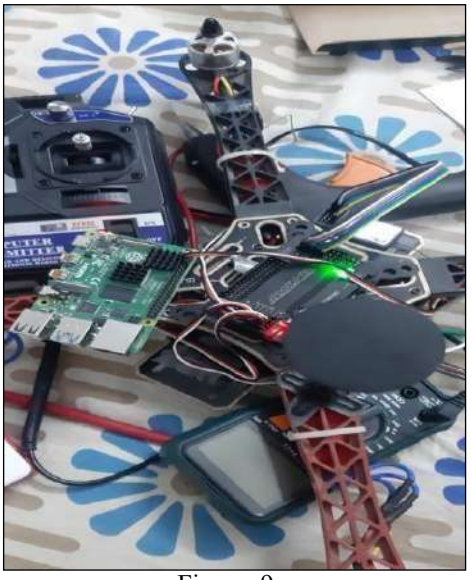

Figure. 9

VII. KEY ISSUES IN DRONE MAINTENANCE AND SUPPORT

A. Battery

The current disadvantage of for transportation/delivery drone is battery life. The drone battery offers about 10 to 20 minutes of flight time and if the load on the drone increases, the motors must produce high thrust based upon the weight. Because, as the thrust increases, it'll consume more power from the battery which results in reduction of battery life or flight time. [9].

B. Management and Monitoring

In order to make the delivery drone at major scale, the following factors must be followed by the company or any individual:

Integrated flight planning
Air traffic management
Flight operation and logging report
Asset management
[9].

VIII. APPLICATIONS

There are various applications of this domain systems. Some of the applications are listed below in table.

INDUSTRY	USE
Infrastructure	Building, Bridge Inspection Other inspections (road, dam, etc.)
Transport	Traffic Surveillance
Agriculture	To spray pesticides on fields

Security	Surveillance monitoring
Medical	Can transport emergency medical goods to hospitals

Table 1

IX. FUTURE PROSPECTS

As discussed earlier, drones are small in size and can't transport heavier packages or objects. It's expected within the future that the drones of the dimensions are going to be big. Taking for an example of cargo drone, it will carry the massive or heavier packages and therefore the transportation of the identical are going to be done at lesser cost.

Several technologies are improving the protection of unmanned commercial/aerial drones by providing better visibility and surroundings. one amongst the technology is that the automatic dependent surveillance-broadcast (ADS-B). It determines a drone's own position in space via satellite and periodically broadcasts its position and direction. While ADS- B is already in use in manned commercial aviation. Another technology within the drone is additionally sense and avoid situational awareness technology, which allows the drone to scan its surroundings so it can identify and avoid the obstacle within the air and while takeoff and landing. [9]

X. CONCLUSION

In this paper the study about delivery drone using various modules and techniques is presented. With the latest technological advancement, the employment of drone has emerged an innovation and viable business solution for last mile distribution. There are various operating model for adrone based last mile delivery system from a pure drone delivery mode where customers are served by drone (no trucks) to a shared truck drone delivery model where customers c be served either by truck/drone. This thesis highlights these different drone model based last mile delivery systems and compare theirrelative benefits and shortcomings under variousoperating models.

The goal of this thesis is to help the industry understand use case of drones in last mile delivery systems.

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Motion controlled pick and place Robotic vehicle

Kiranraj Pillai, Sandra Radhakrishnan, Sandeep Prajapati, Vikas Verma

***Abstract*—In today's world, robotics is a fast growing and interesting field. Robot has sufficient intelligence to cover the maximum area of provided space. The design analysis of a Remote Controlled "Pick and Place" Robotic vehicle has been presented in this paper. This project proposes Motion Controlled Robotic Vehicle with obstacle avoider identifies trends in technology applications and usability. A remote-controlled vehicle can be a mobile device that is controlled by a means that does not restricts its motion with an origin external to the device. This is often a radio control device or infrared or Bluetooth controller. A remote-control vehicle is always controlled by a human and takes no positive action simultaneously. In this work, a miniature Remote Control Robotic Vehicle (RCRV) with robotic arm has been designed and developed. The objective is to produce a basic model with four wheels, standard sensors and a robotic arm with the vehicle acting as a base for it mobility. It is also intended that the structure of the robot should be simple to facilitate easy adaptation and upgrading. The remote used in this project which has a Bluetooth feature built in it. In one embodiment, the design in this work, includes a Robotic arm with its base resting directly on top of the vehicle, a body having four drive wheels coupled to the ends thereof. The wheels are selectively powered to propel the vehicle. In this project we present a generalized concept of sensor integration into the robot motion control.**

***Keywords*—Arduino Uno Microcontroller, Dc Motor Driver, Robotic Hand Gripper.**

I. INTRODUCTION

A robot is an electromechanical machine that is controlled by computer program to perform various operations. Pick and Place robots are widely used in material handling applications in manufacturing applications. Typically pick and place robots need a repetitive motion. The evolution and improvement in the field of robotics and artificial intelligence made this scientific world automated. The robotics reduces the human efforts in the risky operations and for lifting heavy weights. For example, in manufacturing process, to pick the items from the conveyer belt and place them for packaging. A robot is a reprogrammable, multifunctional manipulator designed to move the parts, items, and many special things based on a programmatical motion to perform different tasks. In industrial applications, there are some conditions where human can't be involved such as hazardous environmental conditions, in a repetitive task to be done many times, and where accuracy should be maintained every time in a single task. While implementing the robotic systems, the cost also will be important concern based on the requirement. A Bluetooth application is used to control the movement of the vehicle.

II. LITERATURE SURVEY

a) Design Analysis of a Remote Controlled "Pick and Place" Robotic Vehicle by B.O. Omijeh, IJECT vol. 12, Issue 5, 2014. In this paper, the design of a Remote-Controlled Robotic Vehicle has been completed. A prototype was built and confirmed functional. This system would make it easier for man to unrivalled the risk of handling suspicious objects which could be hazardous in its present environment and workplace. Complex and complicated duties would be achieved faster and more accurately with this design. The use of Robots is highly recommended for industries especially for safety and productivity reasons. In their design work, they included a Robotic arm of five Degree of Freedom with its base resting directly on top of the vehicle, a body having four drive wheels coupled to the ends.

b) Design analysis of Pick and Place Robotic Using Arduino by Harish K, Amit K , Chaitanya K, IRJET, vol. 7, Issue 3, March 2020. A robotic arm having two degree of freedom was mounted on robotic vehicle chassis. For picking and placing application. In this paper a system of Pick and Place Robot is designed using Arduino which is implemented via RF signal. Here, the input signal or controlling signal is given from a wireless play station, which is interfaced with the microcontroller by a RF receiver module. When the signal is sent from the play station it is decoded in the controller and proper controlling signal is sent to actuators (dc motors or servo motor) in the system.

c) Design of Gesture Controlled Mobile Robotic Arm Using Accelerometer by Vivek Bhojak, Girish Kumar Solanki, IJIRSET, vol.4, Issue 6, June 2015. In this paper we have presented a model to Control Robotic Arm through Human Gestures using Accelerometer. A three-axis accelerometer is mounted on human hand in order to perform the action of robotic arm according to the action of human hand. Accelerometer is connected to the At mega 16 Microcontroller which is programmed to take analog readings from accelerometer and transmit them using RF transmitter to the receiving unit at robotic arm. The main aim is to control the robotic arm using human gestures wirelessly with smooth movement over a range. This control mechanism provides an easy movement & control

of arm but doesn't facilitate the teaching and learning. Thus, a cheap and easy way of control using popular AVR - 13 microcontrollers and RF devices is implemented. The structure of arm and mobile platform works efficiently replicating the gestures of human arm.

d) Design of All Terrain Robotic Vehicle with Robotic Arm for dangerous object disposal by Vidyashree. H, Chaithra K B, Umesh S, Nagamayuri B S, IJTSRD, vol. 9, 2018. A robotic vehicle along with robotic arm was built, for dangerous object disposal. It had roger bogie suspension.

e) S.H. Sushmitha, Uma Priyadarsini P.S, "Sensor Guided Pick and Place Robot", International Journal of Pure and Applied Mathematics, Volume 119 No. 16 , 2018. The proposed model will be in no need of remote to control the vehicle but will purely depend on the internal coding that is set up in the robot to detect obstacle and to avoid it in the moving path. In this paper, we design a project to avoid the obstacle and detection and also pick and place the goods in a specific place. And also find the path that the robot will find the path and travel among that. If any obstacle is on the path then the ultrasonic sensors detect the obstacle and the robot will pick and place or flows off the obstacle on one side. If obstacle is on the side of the robot then the speed of the robot is increased and it will travel quick in that path before the obstacle hit the robot. By doing so we can easily safeguard the robot as well as we can avoid the obstacle. This will used in industry for goods carrying.

III. PROPOSED SYSTEM AND METHODOLOGY

A. Overview System

The system architecture consists of the main parts included in our robotic system. The below given diagram shows the block diagram of the pick and place robot. The microcontroller in the system used is LPC2148 which is a 32-bit microcontroller having ARM 7 core in it. The LPC2148 is having total two IO ports and each having 32 pins. Among the 64 pins, 48 pins are usable as general-purpose input/output operations. The microcontroller will do all the controlling operations of the robotic system such as wheels control, pick and place arms moving instructions, etc. The DC motors are connected with pick and place arms for open close of the arms and also moving up and down the arms. The DC motors require the voltage as same as other IO devices, but they need more current than other devices. So the current drawn from the Microcontroller port pin will not be sufficient for running the DC motor. Here we need to amplify the current from the microcontroller output. For that, we are using a driver IC L293D. It will drive the output current of the microcontroller to the required current level for the motor

B. Proposed System

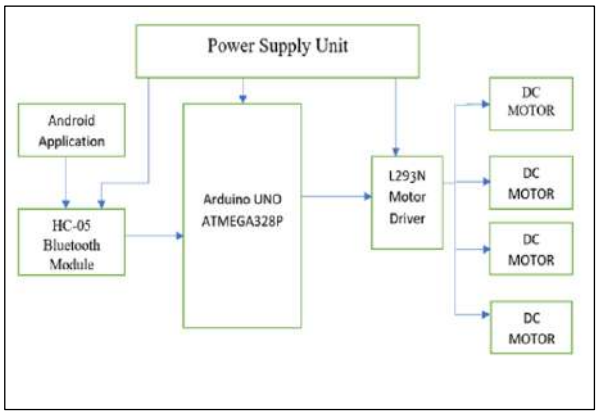

Fig.1

Fig.2

The Pick and Place robot working starts from getting the instruction from the android app installed in a smart phone. The android app consists of dedicated buttons to move the robot according to our requirement. As well, there will be buttons to control the pick and place functionality of arms. The below figure shows the android app how it looks like. The Bluetooth module is interfaced with microcontroller and connected to smart phone via Bluetooth. While pressing the corresponding button in the application, the app will send an ASCII command to the Bluetooth module, the controller will compare the received characters. and perform the corresponding functions on the robotic wheels and pick and place arms. For example, if the user pressed a forward button in the application, it will send an ascii character to the Bluetooth module, the microcontroller compares the received character in programming, if it is matched then it will give the corresponding logic voltage levels to the port pins. While robot moving or doing the pick and place functionality, if any fire is detected by the fire detection sensor, immediately it will ring a buzzer, the robot will stop moving further and the

microcontroller will send the information to the user who operates the android phone.

IV. APPLICATIONS

a) It can be used in various industries where human intervention is not desired.
b) Robot is used Place the things in correct Order and this can be used in Homes and Industry to place things
c) Robot is also used in Libraries to Place the books in correct order
d) With tremendous smart phone in markets, it is bound to have many more applications in near future.

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ACKNOWLEDGEMENT

It gives us great pleasure and immense satisfaction to present this report on our project "Motion Controlled Pick and Place Obstacle Avoider Robotic Vehicle", which became possible due to the unstinted guidance and focused direction of, Prof. Deepti Nair, Electronics & Telecommunication Department. We express our sincere gratitude to Prof. Avinash Vaidya, HOD, Electronics & Telecommunication Department without whom it would not have been possible to successfully accomplish our project. Furthermore, we are indebted to the Principal Dr Sandeep Joshi whose constant encouragement and motivation inspired us to do our best. Last, but not the least, we sincerely thank our family members, colleagues and all the others who directly or indirectly contributed in making our task easier.

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Object Detection and Labelling using Tensorflow.

Vaibhav Kushwaha, Deepak Jha, Ahmad Najeeb, Moin Khan

***Abstract*—Our World is filled with a lot of visual information. As technology progresses the amount of knowledge that we can collect or obtain from images also increases. We can use the science of object recognition for many useful applications in order to enhance the knowledge obtained from digital data. We can use these techniques to train machines to act or react based on the captured visual data. For all these activities a basic necessity is to identify different type of objects in a given image. Considering the root of all we must first know how to identify a single object in a single Image and only then we can enhance the system to be more artificially intelligent. To identify a single Object in an Image is easy as it can be done easily by comparing spatial data of multiple images of similar type. Similarly multiple objects in an image can be recognized by using multiple different models for different type of objects. Here we are going to recognize single object in an image using an efficient repository Tensorflow. Using the proposed method, we would obtain more efficiency in storing the data and will allow us to use the same data for multiple applications if needed**

***Keywords*—component, formatting, style, styling, insert (key word)**

I. Introduction

Object recognition is to describe a collection of related computer vision tasks that involve activities like identifying objects in digital photographs. Image classification involves activities such as predicting the class of one object in an image. Object localization refers to identifying the location of one or more objects in an image and drawing a bounding box around their extent. Object detection does the work of combining these two tasks and localizes and classifies one or more objects in an image. When a user or practitioner refers to the term "object recognition", they often mean "object detection". It may be challenging for beginners to distinguish between different related computer vision tasks..

II. Literature Review

A. Zhong Qiu Zhao, Peng Zheng, Shau Tao Xu and Xingdong Wu's, "Object Detection with Deep Learning: A Review", accepted and published by IEEE on 16 April 2019

According to this research Paper, we provide a review on deep learning-based object detection frameworks. Our review begins with a brief introduction on the history of deep learning and its representative tool, namely Convolutional Neural Network (CNN). Then we focus on typical generic object detection architectures along with some modifications and useful tricks to improve detection performance further. As distinct specific detection tasks exhibit different characteristics, we also briefly survey several specific tasks, including salient object detection,

face detection and pedestrian detection. Experimental analyses are also provided to compare various methods and draw some meaningful conclusions. Finally, several promising directions and tasks are provided to serve as guidelines for future work in both object detection and relevant neural network-based learning systems.

B. Mason Liu, Menglong Zhu,Marie White,Yinxiao Li and Dmitry Kalenichenko,"Looking Fast and Slow: Memory-Guided Mobile Video Object Detection".Published on 25 March,2019.

According to this paper addresses the analogous question of whether using memory in computer vision systems can not only improve the accuracy of object detection in video streams, but also reduce the computation time. By interleaving conventional feature extractors with extremely lightweight ones which only need to recognize the gist of the scene, we show that minimal computation is required to produce accurate detections when temporal memory is present. In addition, we show that the memory contains enough information for deploying reinforcement learning algorithms to learn an adaptive inference policy. Our model achieves state-of-the-art performance among mobile methods on the Imagenet VID 2015 dataset, while running at speeds of up to 70+ FPS on a Pixel 3 phone.

C. P. Viola and M. Jones, "Rapid object detection using a boosted cascade of simple features", Computer Vision and Pattern Recognition 2001. CVPR 2001. Proceedings of the 2001 IEEE Computer Society Conference on, vol. 1, pp. 1–511-1-518, 2001

According to this research paper, This paper describes a machine learning approach for visual object detection which is capable of processing images extremely rapidly and achieving high detection rates. This work is distinguished by three key contributions. The first is the introduction of a new image representation called the Integral Image which allows the features used by our detector to be computed very quickly. The second is a learning algorithm, based on AdaBoost, which selects a small number of critical visual features from a larger set and yields extremely efficient classifiers.The third contribution is a method for combining increasingly more complex classifiers in a cascade which allows background regions of the image to be quickly discarded while spending more computation on promising object-like regions.

The cascade can be viewed as an object specific focus-of-attention mechanism which unlike previous approaches provides statistical guarantees that discarded regions are unlikely to contain the object of interest. In the domain of face detection, the system yields detection rates comparable to the best previous systems. Used in real-time applications, the detector runs at 15 frames per

second without resorting to image differencing or skin color detection.

D. Ji Lin, Chuang Gan and Song Han," TSM: Temporal Shift Module for Efficient Video Understanding". Published on 22 August,2019.

In this paper, we propose a generic and effective Temporal Shift Module (TSM) that enjoys both high efficiency and high performance. Specifically, it can achieve the performance of 3D CNN but maintain 2D CNN's complexity. TSM shifts part of the channels along the temporal dimension; thus, facilitate information exchanged among neighboring frames. It can be inserted into 2D CNNs to achieve temporal modeling at zero computation and zero parameters. We also extended TSM to online setting, which enables real-time low-latency online video recognition and video object detection. TSM is accurate and efficient: it ranks the first place on the Something-Something leaderboard upon publication; on Jetson Nano and Galaxy Note8, it achieves a low latency of 13ms and 35ms for online video recognition.

III. Implementation

```
import numpy as np
import os
import six.moves.urllib as urllib
import sys
import tarfile
import tensorflow as tf
import zipfile
from collections import defaultdict
from io import StringIO
from matplotlib import pyplot as plt
from PIL import Image
from utils import label_map_util
from utils import visualization_utils as vis_util
MODEL_NAME='ssd_mobilenet_v1_coco_11_06_2017'
MODEL_FILE = MODEL_NAME + '.tar.gz'
DOWNLOAD_BASE='http://download.tensorflow.org/
PATH_TO_CKPT=MODEL_NAME+
'/frozen_inference_graph.pb'
PATH_TO_LABELS=os.path.join('data','mscoco_label_
map.pbtxt')
NUM_CLASSES = 90
opener = urllib.request.URLopener()
opener.retrieve(DOWNLOAD_BASE + MODEL_FILE,
tar_file = tarfile.open(MODEL_FILE)
for file in tar_file.getmembers():
file_name = os.path.basename(file.name)
if 'frozen_inference_graph.pb' in file_name:
tar_file.extract(file, os.getcwd())
detection_graph = tf.Graph()
with detection_graph.as_default():
od_graph_def = tf.GraphDef()
with tf.gfile.GFile(PATH_TO_CKPT, 'rb') as fid:
serialized_graph = fid.read()
od_graph_def.ParseFromString(serialized_graph)
tf.import_graph_def(od_graph_def, name='')
label_map=
label_map_util.load_labelmap(PATH_TO_LABELS)
categories =
label_map_util.convert_label_map_to_categories(label_
map, max_num_classes=NUM_CLASSES,
use_display_name=True)
category_index =
label_map_util.create_category_index(categories)
def load_image_into_numpy_array(image):
(im_width, im_height) = image.size
return np.array(image.getdata()).reshape(
(im_height, im_width, 3)).astype(np.uint8)
PATH_TO_TEST_IMAGES_DIR = 'test_images'
TEST_IMAGE_PATHS= [
os.path.join(PATH_TO_TEST_IMAGES_DIR, '
image{}.jpg'.format(i)) for i in range(1, 3) ]
IMAGE_SIZE = (12, 8)
with detection_graph.as_default():

with tf.Session(graph=detection_graph) as sess:
 i = 0
for image_path in TEST_IMAGE_PATHS:
image = Image.open(image_path)
image_np= load_image_into_numpy_array(image)
image_np_expanded=np.expand_dims(image_np, axis=0)
image_tensor=detection_graph.get_tensor_by_name('imag
e_tensor:0')
boxes=detection_graph.get_tensor_by_name('detection_bo
xes:0')
scores=detection_graph.get_tensor_by_name('detection_sc
ores:0')
classes=detection_graph.get_tensor_by_name('detection_cl
asses:0')
num_detections=detection_graph.get_tensor_by_name('nu
m_detections:0')

(boxes, scores, classes, num_detections)=sess.run( [boxes,
scores, classes, num_detections],

feed_dict={image_tensor:image_np_expanded})
vis_util.visualize_boxes_and_labels_on_image_array(

image_np,
np.squeeze(boxes),
np.squeeze(classes).astype(np.int32),
np.squeeze(scores),
category_index,
use_normalized_coordinates=True,
line_thickness=8)
plt.figure(figsize=IMAGE_SIZE)
plt.imshow(image_np)
plt.savefig("outputs/detection_output{}.png".format(i))
i= i+1
```

IV. Results

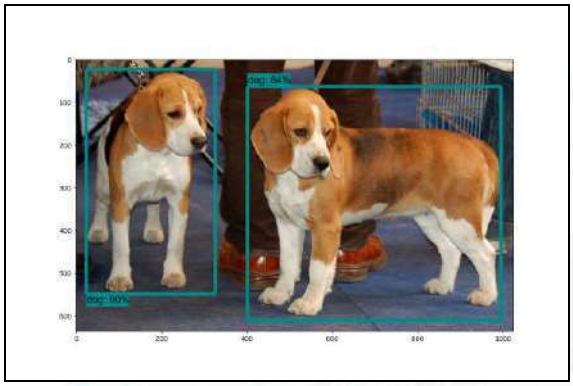

Fig. 1. Test image 1

Fig. 2. Test image 2

V. CONCLUSION

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

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Object Tracking With Camshift Algorithm

Samir Dhadve, Shubham Jadhav, Nikhil Gaikwad, Sushant More

***Abstract*—Continuously adaptive mean- shift(CAMShift) is an efficient and light-weight tracking algorithm developed based on mean-shift. While color based CAMShift is suitable for tracking targets in simple cases, it fails to track objects in more complex situations. In this paper we review our low cost extension to improve the traditional CAMShift algorithm. Combining the original algorithm with a motion segmentation phase, we proposed an improved CAMShift algorithm to cope with CAMShift`s tracking problems. We evaluated the efficiency of our approach by comparing our tracking results with the traditional algorithm`s results in several cases.**

***Keywords*: Target tracking, mean-shift, probability distribution image.**

I INTRODUCTION

Object tracking is a key task in the field of computer vision. An efficient tracking algorithm will lead to the better performance of higher level vision tasks such as automated surveillance, human computer interaction, behaviour analysis and activity recognition. Various approaches of object tracking have been proposed in the literature. Real time performance and low computation requirements, are two key features of a practical tracking algorithm in real world applications .

Mean-shift is a kernel-based tracking method which uses density-based appearance models to represent targets. The method tracks targets by finding the most similar distribution pattern in a frame sequences with its sample pattern by iterative searching. It has been widely used because of its relative simplicity and low computational cost, but mean-shift would fail in changing the track window`s scale, as targets move toward or away from the camera .

Based on mean-shift, continuous adaptive mean- shift (CAMShift) was proposed to overcome the problem. CAMShift adaptively adjusts the track window`s size and the distribution pattern of targets during tracking. CAMShift algorithm can be used to track the distribution of any kind of feature that represents the target in a lightweight, robust and efficient way. Most researchers though, use color data to represent targets for CAMShift,this would give a low complexity and practical performance to the methodWhile CAMShift performs well with objects that have a simple and constant appearance, it is not robust in more complex scenes. For example, when background has similar color distribution with a target, or when a target moves in front of different color background objects, the tracker is very likelyto fail. In another case, when the initial search window contains some parts of the background, due to poor object detection, it would normallycausetheCAMShift`s.

This might be an intense problem because the traditional CAMShift algorithm usually starts with manually selecting a target region by a user , and a human user may not be able to fully segment the target region form the background. The problem of search window drift is inherent to many probability-based trackers, since these techniques only track the peak of a probability distribution – not taking into account the composition of probabilities .

II LITERATURE SURVEY

Object detection has been a rapidly growing technique over the past few years and the use of deep learning techniques like Convolutional Neural Networks has also been increasing.
The CAMShift algorithm derived from the mean shift algorithm, which is responsible for finding the centre of the probability distribution of the object totrack.

a) Object Detection

To be able to have a functional tracking system it requires an object detection system to be able to detect the object that will be tracked. Depending on the type of object detection is being used the system uses a single frame or a sequence of frames to spot the object .

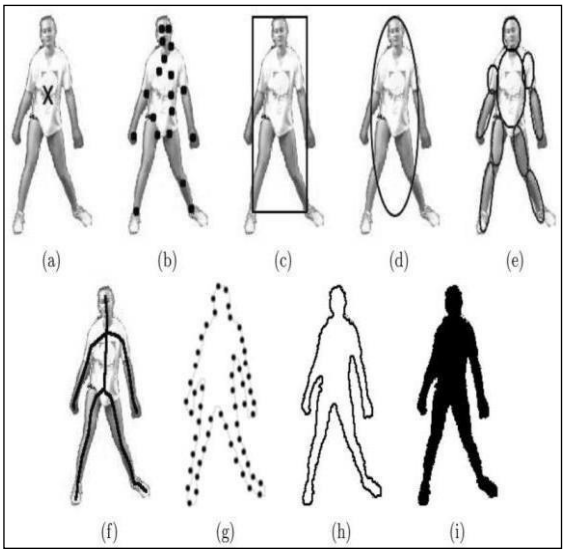


Figure 1 Object representations

. (a) Centroid, (b)multiple points, (c) rectangular patch, (d) ellipticalpatch, (e) part-based multiple patches, (f) objectskeleton, (g) control points on object contour, (h) complete object contour, (i) object silhouette .
The object detection system uses a representation ofan object for the recognition based on the shape and appearance of the object. The different kinds of object representation can be seen in Figure and are PointsPrimitive geometric shapes ,Contours, Articulatedshape,models,Skeletalmodels.
The appearance representation are Probability densities of object appearance TemplatesActive appearance models Multiview appearance models.
Choosing the object representation is mostly connected with application and the tracking algorithm since they are strongly related. For example, when tracking small objects in a scene a point representation might be appropriate, track cars in an aerial view using point representation

b) Color-based Recognition

As one of the most used features to track is color- based recognition. Unlike more original ideas such as snakes, which uses an active contour model requiring a lot of processing, aren't as complex in terms of processing and therefore making color- based features faster to track . There are also some costs for the speed advantage as color-based recognition is sensitive to changes in illumination.

This might cause problems in tracking and recognition as the color being tracked or recognized changes appearance with the lightning. Using a combination with another feature for recognition might be a solution for occurring problems caused by changing illumination but increases the data being processed.

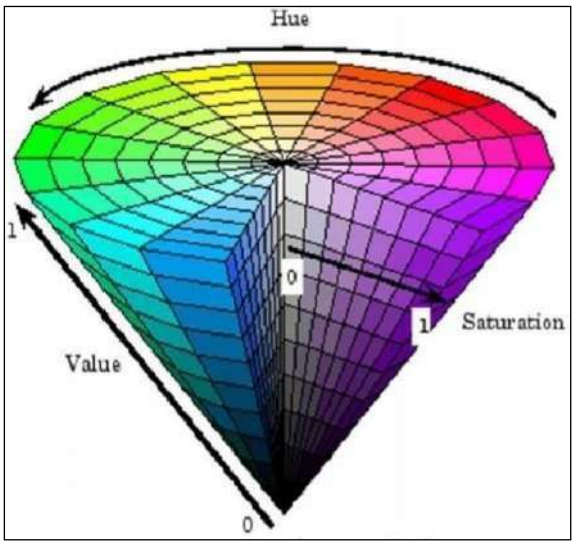


Figure 2 HSV color space

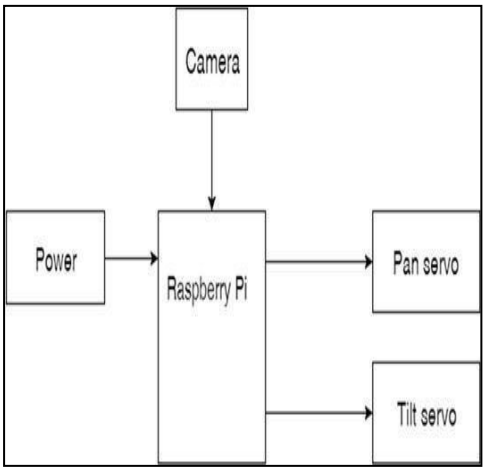
The color-based recognition often use color histograms as a feature used for appearance Representation, probability densities of object appearance . A histogram Can either be one- dimensional or two-dimensional and contains the probability Distribution of the colors in the ROI in the image . The colors are in their turn Represented in some color space such as RGB and HSV, as seen in Figure 4. The color Space used for the feature tracking is usually varied as there are strengths and Weaknesses for them all. For example meanwhile RGB is a perceptually non-uniform Color space the uniform color spaces CIELUV, CIELAB and the approximatively uniform HSV are more sensitive for noise .

c) Object Tracking

The different approaches for object tracking differs by the kind of representation is Appropriate for tracking an object, the image features being used and how the objects Motion, appearance and shape should be modeled as mentioned. The Representation of the object limits the transformation the object being tracked in the Image can go through without not losing it. For example, if the representation model is a Point only translational movement can be tracked. If the representation model is a Geometric shape, such as a rectangle, an affine or projective transformation can be used. The tracker either use a detecting stage and tracking stage separately or use them jointly And not as separate stages. The detecting stage uses an objectdetection algorithm to Identify the object and the tracking stage follow the object using either a different Algorithm, separately, or detects the object all the time, jointly.

III PROPOSED WORK

a) system architecture



b) Raspberry Pi 4 Model B

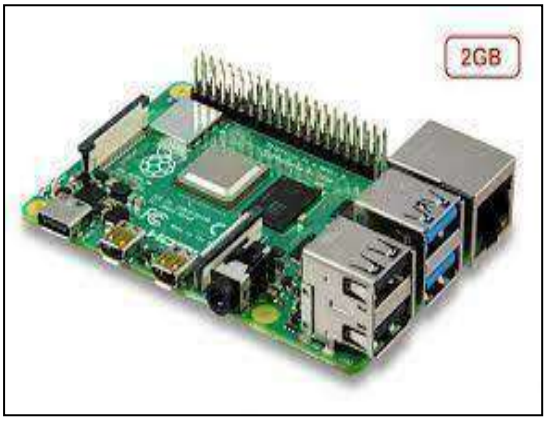


Figure 3 Raspberry Pi 4 Model B

The Raspberry pi 4 Model B was launched in june 2019. It uses 1.5GHz 64-bit quad-core Arm Crtex- A72CPU it has three RAM option (2GB,4GB,8GB),gigabit Ethernet ,integrated
802.11 ac/n Wireless LAN and Bluetooth 5.0.This makes Raspberry Pi 4 an interesting platform to use in this project since the high popularity, low cost and powerful enough to use in these kind of applications.

The electronic components, such as sensors and servos, can be utilized over the GPIO pins on the Raspberry Pi. It also use a dedicated Camera serial interface for the raspberry camera module to access the camera

c.Raspberry Pi Camera Module

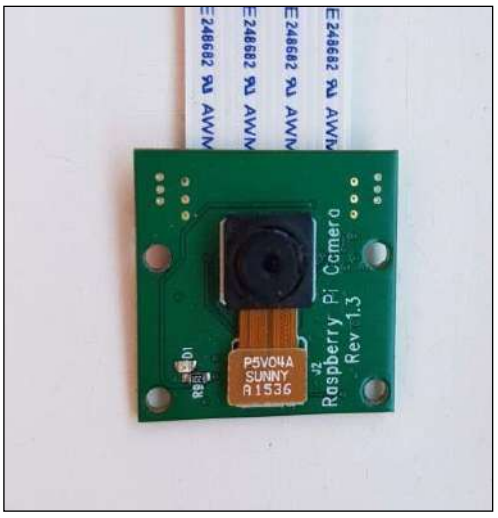


Figure 4 . Raspberry Pi Camera Module

The camera used for the tracking is the Raspberry Pi Camera Module and uses the previously talked about CIS to connect to the Raspberry Pi. It can handle up to 1080p in 30 fps, which is more than needed for the demonstrator, and uses fixed focus. The camera module has become popular in home security applications and wildlife cameratraps and there

d) SG90 SERVO MOTOR

Figure 5. Picture SG90 Servo

The servos used for the project are two the Tower Pro SG90, which is a small micro servo yet has a high output power. The two servos are used for

panning and for tilting. The SG90 makes it able to pan or tilt 180 degrees in 0.3 seconds .

The SG90 is powered through ~5V and is controlled by a PWM signal of 50Hz. To turn the servo from 0 to 180 degrees the pulse should be changed from

~1ms pulses to ~2ms pulses. Angles between 0 and 180 are linearly distributed between 1ms and 2ms . The servo can be seen in Fig.

1 SOFTWARE

Software used	Thonny 3.3.7, Visual studio code
Programming Language	Python IDE, C++

Table 1 Software

2 HARDWARE

Raspberry pi 4 model B	It uses 1.5GHz 64-bit quad-core Arm Crtex-A72CPU it has 2GB RAM.A
Raspberry pi camera module	The camera used for the tracking the object.
Motor	Used two SG90 Servos forpan and tilt . this motor used to contoll the camera module.
Mini usb cable	Power for Raspberry pi 4
Wiring Cable	Used to interface the raspberry pi 4 with motor

Table 2 hardware

IV. CONCLUSION

We proposed an efficient color based CAMShift algorithm for target tracking in this paper. Combined with low-cost motion segmentation techniques, we improved the traditional CAMShift`s performance and showed how our approach can solve its drawbacks. Applying motion segmentation in thealgorithm reduces the undesirable effects of background color information on the tracking performance and eases target localization in the probability distribution image. We finally evaluated our algorithm`s performance in practice, and showed how our approach can stand tracking failures in various situations in which traditional CAMShift would normally fail. For motion segmentation we used simple background differencing in our implementation, more efficientmotion segmentation techniques may perform better depending on the video data and the scene complexity. In the future works we are going to work on the occlusion handling of our algorithm. We believe our algorithm, with a few changes,would promisingly be able to handle occlusions, especially when targets are occluded by staticobjects

ACKNOWLEDGEMENT

It gives us great pleasure and immense satisfaction to present this report on our project “Object tracking with camshift algorithm”, which became possible due to the unstinted guidance and focused direction of, Prof.Ujwal harode, Electronics & Telecommunication Department.
We express our sincere gratitude to Prof.Avinash Vaidya, HOD, Electronics & Telecommunication Department without whom it would not have been possible to successfully accomplish our project.
Furthermore, we are indebted to the Principal Dr.Sandeep Joshi whose constant encouragement and motivation inspired us to do our best.
Last, but not the least, we sincerely thank our family members, colleagues and all the others who directly or indirectly contributed in making our task easier.

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Parameters Enhancement in MIMO Antenna

Shubham Ubale, Aman Shaikh, Saurabh Pande, Sharique Shaikh

***Abstract*—A Dual-band MIMO antenna for the 5Gcommunication is proposed in this paper. The proposed antenna consists of four antenna, it operating at 3300-3600MHz and 4800-5000 MHz. The antenna designed in this letter are different from traditional 5G antennas, the antenna of this paper is perpendicular to the edge of the system circuit board, it can be applied to the popular full- screen mobile phone. According to the simulation results, reflection coefficient of the modulus is less than -6 dB, andthe isolation is better than 12 dB over the band- frequencyof 3300-3600 MHz and 4800-5000 MHz, it will met the needs of future 5G applications.**

***Keywords*—smartphone, 5G operation, MIMOantenna**

I. INTRODUCTION

In order to meet the needs of modern 5G wirelesscommunication system, study of the 5G smartphoneantenna has great application value. 5G has become a hot spot in the field of mobile communications bothat home and abroad. In early 2013, the EU launched the METIS (mobile and wireless communications enablers for the 2020 information society) project for5G in the 7th framework plan[1], China and South Korea set up IMT-2020 (5G) Propulsion Team and 5G Technology respectively. At present, various countries in the world are conducting extensive discussions on the development vision, application requirements, key technical indicators and enabling technologies of 5G[2].

With the development of mobile 4G communication system, people's requirements for thespeed of mobile communication are rapidly increasing. In order to meet these needs, the researchand development of the fifth generation (5G) antenna has been carried out[3-5]. Miniaturization and multi-cell array antennas offer the possibility of high-speed data transmission, but pose challenges for cell phone antenna designs. Recently, the research of 5G mobile phone antenna is increasing day by day. In the future multi-mode 4G / 5G multi- antenna in smart phone applications, A multi-unit operate in the 3400-3600MHz single-band traditional 5G antenna was proposed[6]. An 8- element PIFA-based MIMO antenna system was proposed in [7], it only covers a single 3.5GHz band,And the minimum isolation between the various antenna elements only 7.4dB.

In this paper, a dual-band MIMO antenna which consist of four elements is proposed. The proposed antenna not only can operating in the dual frequencyband of 3300-3600 MHz and 4800-5000 MHz. but also a 12 dB of isolation is obtained, the four antennas are disposed along two side edges of the smartphone, meet the requirements of a full screen smartphone antenna design in line with the current trend of full-screen smartphone.

II. DESIGN AND CHARACTERISTICS OF THE ANTENNA

The structure and dimensions of the proposed antenna array is shown in Fig.1. As is seen, the antenna system consisting of four bent lines and floorprotruding branches as smartphones. The single antenna is designed and can be operated in the bandsof 3300-3600 MHz and 4800-5000 MHz. The antennas are printed on the inner and outer surfaces of the side frame of the smartphone system circuit board. In order to meet the trend of modern ultra-thin smartphones, the height of the edge frame of the mobile phone is only 5 mm. The antenna elements have the same structure and dimensions. The side frames are orthogonal to the system ground plane, and the area of each antenna on the side frames is 3.9mm x17 mm. The system circuit board is selected to have a sizeof 130mm x 74mm, which is reasonable for the 5-in smartphone. Both the side-edge frame and the systemcircuit board are fabricated using 0.8-mm-thick FR4substrate of relative permittivity 4.4 and loss tangent 0.02. The radiation part of the antenna can be dividedinto two parts: front radiation part is a bending line monopole, feed part as shown in Fig.1 (c) below; theback of the radiation part is a L-shaped short-circuit stub. The monopole adopts the bent line structure, and the coupling capacitance generated by the L- shaped branch behind helps to match the impedance of the low frequency band so that the low frequency can cover the frequency band of 3.5GHz better, the front feeder belt and monopole lengths resonate around 4900MHz and the coupling capacitors createdby the back L- shaped branches and the front bend line contribute to high-frequency impedance matching.

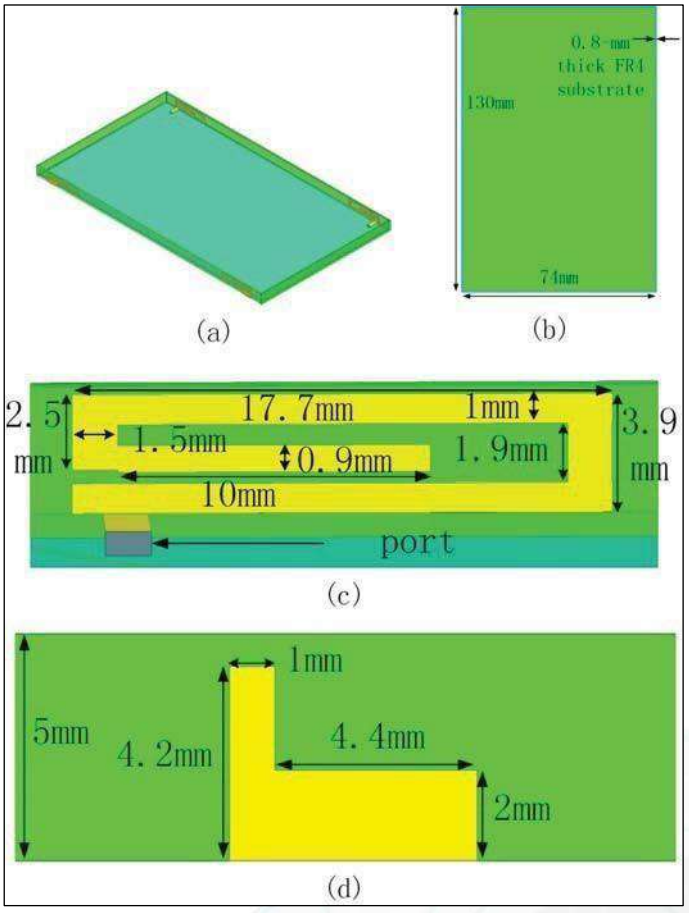

Fig. 1. The proposed antenna array structure. (a) Antenna3D model. (b) Antenna model top view. (c) Antenna element model main view. (d) Antenna element model rear view.

III. SIMULATED RESULTS

The simulated results were performed by using CST Studio Suite. Fig.2 shows the simulated S parameters for the proposed antenna array. As seen in Fig.2, the reflection coefficients (S11,S22,S33,S44) of four antennas are less than - 6 dB (3:1 VSWR) in the desired frequency range of 3.3-3.6 GHz and 4.8-5.0 GHz , indicating that acceptable impedance matching is obtained. The transmission coefficient between antennas are presented in Fig.3, it shows a dip (about -15 dB) at about 3.5GHz and less than -12dB at about 4.9 GHzand is less than -10 dB for frequencies in the operating band., which is acceptable for smartphone applications. For the antenna efficiency shown in Fig.4, it is all above 50% in the operation band.

The obtained ECC of the four antennas is presented in the Fig.5. The obtained ECC is all muchless than 0.1 in the operation band ,which is good forthe MIMO operation. The result suggest that the proposed antenna array are suitable for practical MIMO operation and can be used as a building blockin forming the MIMO array with eight or more antennas in the future smartphones.

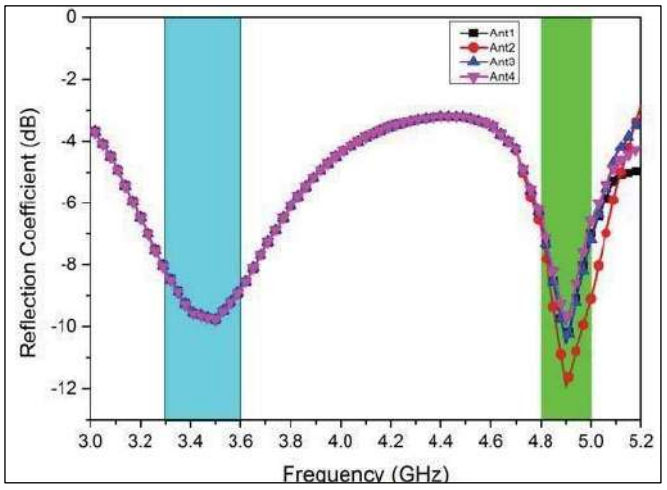

Fig. 2. Simulated Reflection Coefficient.

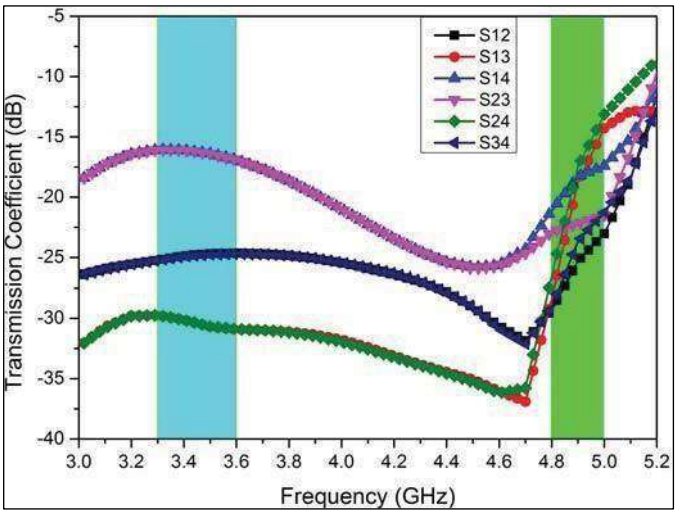

Fig. 3. Simulated Transmission Coefficient

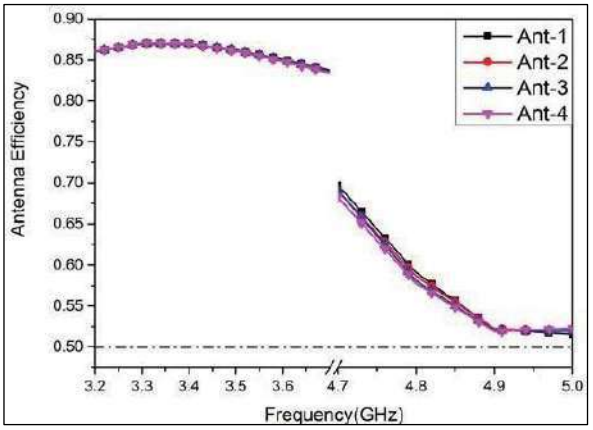

Fig. 4. Simulated Antenna Efficiency

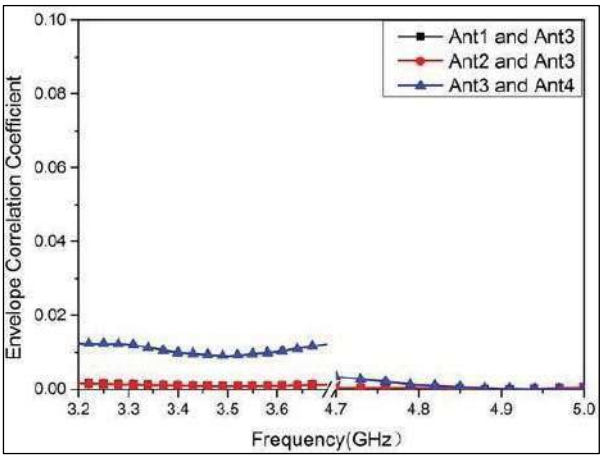

Fig. 5. Simulated ECC of the MIMO antenna

IV. CONCLUSION

A dual-band four-antenna MIMO array for 5G smartphone applications is proposed. The proposed antenna is located in the side frame, in line with the trend of a full screen smartphone antenna design, in the premise of the reflection coefficient to meet the requirements, to achieve a relatively high isolation, the antenna size is relatively small, ideal for today's ultra-thin smartphone communications.

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Plant Disease Recognition Using Machine Learning

Akshay Sathoo , Rupal R.C.Verma , Rishabh G.Shetty , Abhilasha Sharma

***Abstract*— In these years we get to know that agriculture is the main source of national income for most developing countries. Thus, this is one of the important and main reasons to be considered for the detection of plant disease, as disease is the main cause of rottening of fruits or vegetables or crops. Thus we can assume that if proper care is not taken regarding this thing then it leads to loss of money, time, quality, quantity, etc. While production is growing up and also exports are growing, there is also growing distrust among the farmers. Agriculture accounts for 54.6% of total employment. The Public investment in Agriculture has never been more than approx. 0.3% of the GDP. Thus, the main motive is to reduce the use of pesticides and thus yield a good crop and increase the production rate. Plant disease can be detected by using various methods like image processing, Matlab. As per that, this will follow some steps like image processing, feature extraction, different classifications, and prediction of classified diseases.**

***Index terms*— Disease Detection, Machine Learning Algorithms, Deep Learning, Feature extraction, Plant leaf disease, Diseased Leaf.**

I. INTRODUCTION

Crop diseases are a major threat to food security, but their rapid identification remains difficult in many parts of the world due to the lack of the necessary infrastructure. The combination of increasing global smartphone penetration and recent advances in computer vision made possible by Machine learning has paved the way for simpler methods of disease diagnosis.The proposed approach uses deep learning convolution neural networks for classification of diseases in citrus leaves. In the near future, the proposed methodology can be integrated with other yet to be developed methods for disease recognition and classification using color and texture analysis to develop an expert system, where the disease type can be identified by colour and texture analysis and the severity level estimation by the method of machine learning. The performance of the system can be improved in the future by using advanced technology further improved in image processing and extraction techniques. This review briefly describes the various techniques used for plant disease diagnosis and their evolution to meet the contemporary challenges. The purpose of this review is to present the application of machine learning in plant resistance genes discovery and plant diseases classification. The proposed system has lower complexity, fewer parameters and cost-effective computation. This review explained DL approaches for the detection of plant diseases. Moreover, many visualization techniques/mappings were summarized to recognize the symptoms of diseases.

II. LITERATURE REVIEW

1. Mustafa Merchant, Vishwajeet Paradkar, Meghna Khanna, Soham Gokhale Department of Computer Engineering,MES College of Engineering, Savitribai Phule Pune University, Pune, India proposed "Mango Leaf Deficiency Detection Using Digital Image processing and Machine Learning used various methods of deficiency detection.M V Latte has developed an algorithm which calculated different colours(red,green and blue)indexes of defected paddy leaf. They use image processing technique for segmentation techniques that are applied to detect defected leaf image. They convert the RGB color indexes to grayscale and find different texture indexes in it.They used segmentation and clustering for image segmentation and SVM classifier for classification of healthy and unhealthy leaves.
2. Monalisa Saha, E. Sasikala Department of Computer Science and Engineering, SRM Institute of Science and Technology proposed "Identification of Plants leaf Diseases using Machine Learning Algorithms "and considering the researches done by- Sherly et.al. (2019) that many disease that caused by different types of bacterias and fungus in different plant leaves which can be detected by the prediction algorithm which is used in machine learning. They found that the algorithm is hard to classify the disease as it does not give correct accuracy which is mainly the reason for the different input data to the algorithm .They work on mulberry plants to identify the disease using CNN technique.
3. Journal of Electrical and Computer Engineering, 2018 by Editor: Jose R. C. Piqueira proposed Plant Disease Recognition Based on Image Processing Technology. In this system it is based on image processing techniques and uses MATLAB as the main processing tool. They used to compare the traditional image recognition, to innovate in image segmentation and system construction. They used histogram segmentation method which is based on Multiple Linear recognition systems .
4. Plant Disease Classification Using Convolutional Networks and Generative Adversarial Networks Emanuel Cortes Stanford University journal- 2017. In the research article, Images are transformed using Polar Fourier Transform to achieve translational and rotational invariance. Features, such as SIFT, HoG, and SURF, there are still a variety of techniques to help deep learning networks extract important features, such as Background segmentation. In the research paper, Plant Leaf and Disease Detection by Using HSV Features and SVM, the researchers proposed using a neural network to classify whether a leaf was infected or not. If a leaf was infected, the images were further processed by a neural network, where a genetic algorithm was implemented to optimize the SVM loss to determine the type of disease

III. ALGORITHM DESCRIPTION

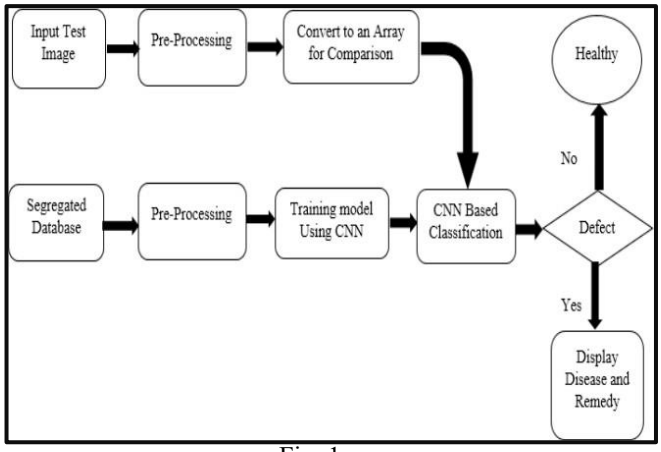

Fig. 1

DESCRIPTION:

To demonstrate and classify plant diseases and to give solutions out of it by developing a model that can be used by developers to create web applications to detect leaf diseases using Convolutional Neural Network (CNN). We take images as an input as our very first step. This image then undergoes pre-processing. Images come in different shapes and sizes, which come through different sources. This block makes the images of the same size. The next block converts the string data into an array as a computer functions on binary data. The output of this block is applied for CNN classification. In a convolutional layer, neurons only receive input from a subarea of the previous layer. In a fully connected layer, each neuron receives input from every element of the previous layer. A CNN works by extracting features from the images. A machine learning algorithm builds a model by examining many examples and attempting to find a model that minimizes loss. In order to train a model using the processed data, it is split into two subsets i.e. training data and testing data. The combined output (from previous blocks) is applied to the 'defect' block which mainly does the comparison of the received output (combined output from previous blocks) with data set of a healthy plant. Hence, we get the result of the disease that has affected the plant leaf.

IV. SOFTWARE

As our project is completely software based, programming is done in python 3.6 as version 3.6.0 is used specifically for operating tensor flow as it helps to create graphs of computations. Under python 3.6 we have used flask as our main library for developing web applications. Flask supports extensions that can add application features. Execution of the whole backend program is done in google colab because it inbuilt provides 12 GB of RAM, pre-installed libraries and free GPU and TPU use. For image recognition, classification and processing convolutional neural networks are used as an algorithm under deep learning.as this specific type of AI helps to recognize objects in images. Machine learning acts in data analysis, analytical model building due to which system can learn from data, identify patterns and make decisions.

V. BLOCK DIAGRAM

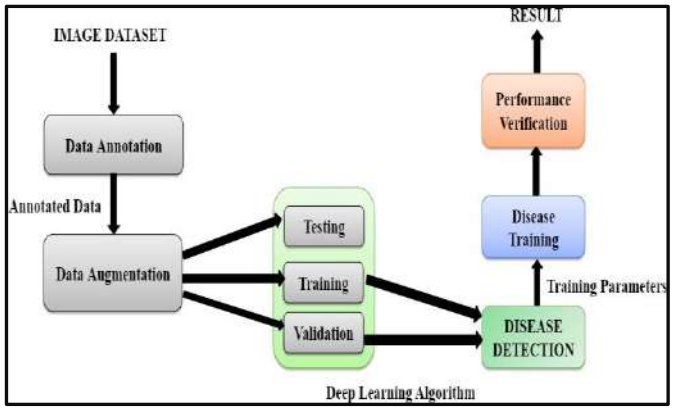

Fig. 2

VI. RESULT

Figure 3: Tomato Early Blight (output)

Figure 4. Pepper bell Bacterial spot (output)

VII. CONCLUSION

Agriculture is mostly compensating the economic development of the nation. It is considered as a vital part of society. Thus the main aim of proposed work is to decrease the use of pesticides to decrease cultivation cost and save our environment. This project has various methods for the identification and classification of plant leaf detection like pattern recognition method, back propagation, neural network, support vector machine etc. The proposed work also discusses the basic concept of plant leaf disease detection and various leaf diseases symptoms. As per our project we started our research on every crop and every part of it

but soon we realized that it is not possible for us right now in this period of span as we were in our learning and practicing stage So specifically we shifted our goal with our very own country's staple crop 'tomato' and started to figure out all the diseases and causes of it that can be predicted from the changes developed in the leaves.

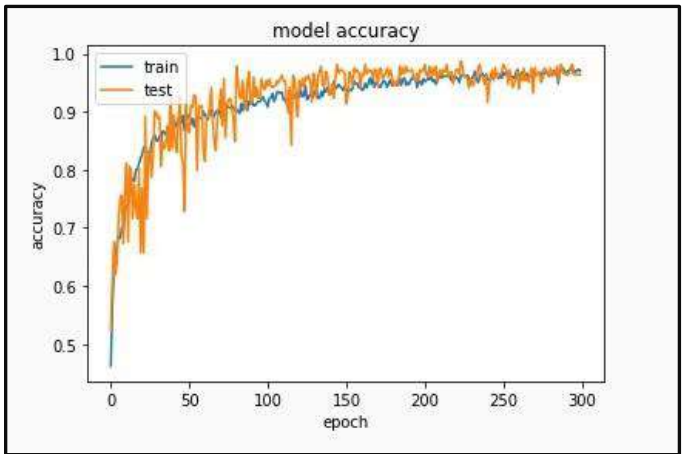

Figure 5. Model Accuracy

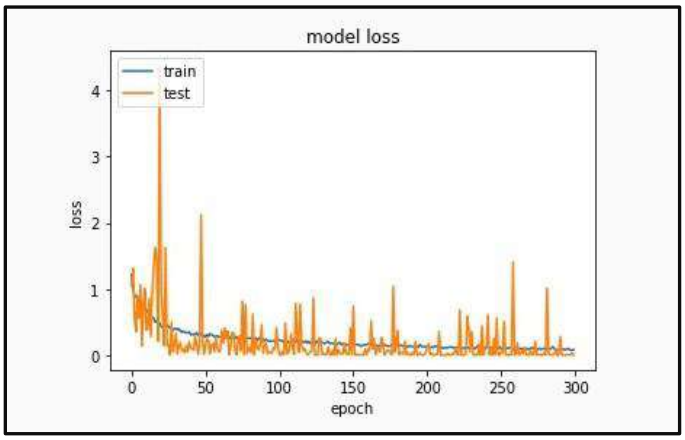

Figure 6. Model Loss

ACKNOWLEDGEMENT

We have immense pleasure in expressing our thanks and deep sense of gratitude to our guide Prof. Apeksha Chauhan, Department of Information technology for her guidance throughout this project. We also express our sincere thanks to Dr. Avinash Vaidya, Head of the Department, Electronics and Communication for extending his help.We wish to express our profound sense of gratitude to Dr. Sandeep Joshi, Principal of Pillai College of Engineering, New Panvel for encouraging us. Finally we express our sincere gratitude to all the members of faculty who contributed their valuable advice
and helped to build the idea of this project.

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RF Filter Design and Implementation

Shivani Gupta, Omkar Sonawane, Rigvedi Patil, Shubham Thakur, Dr. Avinash R Vaidya, Prof. Harsha Ghadge

***Abstract*—Filters play as essential role in signal processing and thus are an essential part of the communication system. Filters are necessary or filtering or removing out unwanted signals from radio signals. They are used in combination of various electronics and wireless communication systems. RF filters of all types are required in a wide range of applications from audio signals along a wide range of frequencies. It enables the user to allow only desired frequency depending on the application, while rejecting the others which are not needed, RF filters are used in wireless technology. They are used with radio-receivers allowing a particular range of frequency. Filters are mainly classified in two types – active filters constitute of active elements and passive filters constitutes of passive elements. The filter topology is subdivided to four main types defined as – low pass filters, high pass filters, bandpass filters and band reject filters. It is also termed as microwave filters, which is a two-port network used to control the frequency response in communication system. Due to the used of RF filters, the wireless communication technology is advanced which has enabled the users with the facility at any point around the globe. We are using this technology to design a band-pass filter for WLAN application. WLAN is a wireless communication server which provides internet access to user without any wired medium.**

***Keywords*—RF Filter, Low pass Filter, filter prototyping, filter simulation, Chebyshev filter**

I. INTRODUCTION

THE WLAN is widely used around the globe. The mainframe structure of application of WLAN came into existence because of filters. As they have capability to allow desired frequency range for desired output according to particular applications. In this project our aim is to design a filter allowing center frequency of 2.2GHz over bandwidth of 80MHz. Chebyshev filter design method is proposed to achieve maximum efficiency and minimum error in the designing process. RF filters have a wide range of applications. Especially in wireless communication it is used for Bluetooth, WLAN, WIFI, GSM, etc. WLAN stands for Wireless local area network. It is a device that allows other devices to connect to internet wirelessly. It is an internet service provider. Thus, various devices can be connected together through WLAN over enabling devices to connect over the specified range of frequency.

II. RELATED WORKS

A. Problem Definition

Electrical filters are mainly classified as passive filters and active filters. Their main applications are in audio equalizers and sensitive electronic devices. Passive filters are made up of resistors, capacitors and inductors (passive elements). They do not contain any amplifying elements hence; output signal amplitude is always less than the applied input signal. The gain is less than unity and this shows that the gain of signals cannot be improved by passive filters. If we see active filters they are made up of both active and passive elements. These filters overcome the drawbacks of passive filters but are quite sensitive. The output can be affected due to changing environmental conditions too. Thus, this is not desirable in communication system. RF filters of all types are required in a wide range of applications from audio signals to rf signals along a wide range of frequency. It enables only the required frequencies to be passed through the circuit while rejecting the others which are not needed.

B. Related Theory

The filter theory came into existence in the 19th century. After the World War II, development and advancement in the filter theory took place. The pioneer work was established by Mason, Sykes, Darlington, Fano, Lawson, and Richards. In 1930, the image parameter method of filter design was developed and it was used for low-frequency filters in radio and telephony. In 1950s, a group of Stanford Research Institute produced active research in microwave filter and coupler development. This work resulted in voluminous handbooks on filters and couplers. In today's world, microwave filter design is mostly done using CAD (computer-aided design) based on insertion loss method. Due to continuous advances in network synthesis with distributed elements, the use of low-temperature superconductors and various other materials, microwave filter design in an active research area in the electronics field. The filter is a sensitive circuit in which output components are only frequency terms. Filters are two-port networks used to control the frequency response in an RF or microwave system. They allow transmission of signal frequencies within their pass band and attenuate signals outside their pass-band.
Filters are mainly classified in two types:

1. Active Filter
2. Passive Filter
3. Couple Lines Bandpass Filter

1) Active Filters –
These filters consist of active components like transistors and op-amps along with passive components like resistors and capacitors in their circuits. These filters overcome the drawbacks of passive filters but are quite sensitive. The output can be affected due to changing environmental conditions too. Thus, it is ideally not desirable in communication system.
2) Passive Filter –
Passive filters are made up resistors, capacitors and inductors (passive elements). They do not contain any amplifying elements, hence, output signal amplitude is always less than the applied input signal. The gain is less than unity and this shows that the gain of signals cannot be improved by passive filters.
3) Coupled Lines Bandpass Filter
Bandpass filter are designed using micro strip coupled lines. This design has a low insertion loss on the desired frequency bands.

The filters can be further classified on the basis of their operating frequency for a particular circuit:
1. Low-pass filter
2. High Pass Filter
3. Band Pass Filter
4. Band Stop Filter

C. Filter Design

The Principles of Filter Design are as follows:

Specification

The following Specifications lay the foundation for principles of Filter Design:

- Cutoff Frequency $f_c = 2.2$ GHz
- Impedence $Z_0 = 50\ \Omega$
- RPL = 0.5 dB
- Bandwidth = 2.1(F_L) to 2.3 (F_H)
- F = 2.4 GHz
- IL (Attenuation in dB) = 20 dB at

  $a = \sqrt[2]{10^{\frac{0.5}{10}} - 1}$,

  where IL= =10 log $[1 + a^2 T_N^2(\Omega)]$
- Since, T_N= cosh (N $\cosh^{-1}(\Omega)$)
- ∴T_N= cosh (N $\cosh^{-1}$(3))
- Hence IL= =10 log $[1 + \sqrt[2]{10^{\frac{0.5}{10}} - 1}]$ {cosh (N $\cosh^{-1}$(3)}
- BPF = 1.9167

Low Pass filter Prototype

- $Z_0 = g_0$
- $L_1 = g_1$
- $L_3 = g_3$
- Assume, $g_0 = 1$

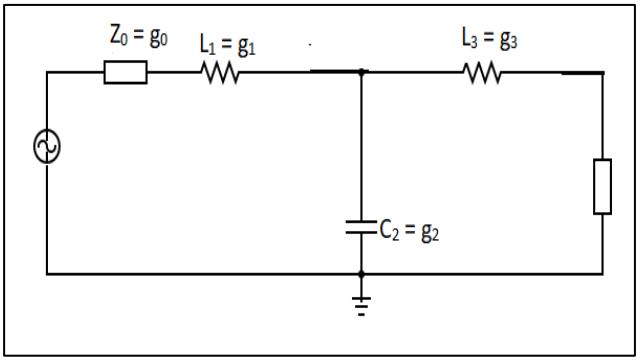

Fig1: Low Pass Filter Prototype

Normalized Components Value

The Following are normalized components values:

- $g_0 = 1$
- $g_1 = 1.5963$
- $g_2 = 1.0967$
- $g_3 = 1.5963$

Impedance Transform

The Impedance transform has the following values:

- $L'_3 = 79.815\ \Omega$
- $Z'_G = 50\ \Omega$
- $L_1' = 79.815\ \Omega$
- $C'_2 = 0.0219\ \Omega^{-1}$

III. Simulated Outputs

Design Layout on ADS Software

The first layout will be simulated with G terminals at the two ends. The visual orientation is:

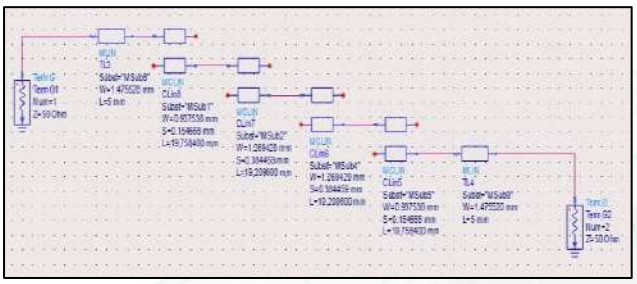

Fig.2

Frequency Response of the Observed Orientation

As, we have designed a bandpass filter suing Chebyshev method, we have obtained the output at 2.2GHz.

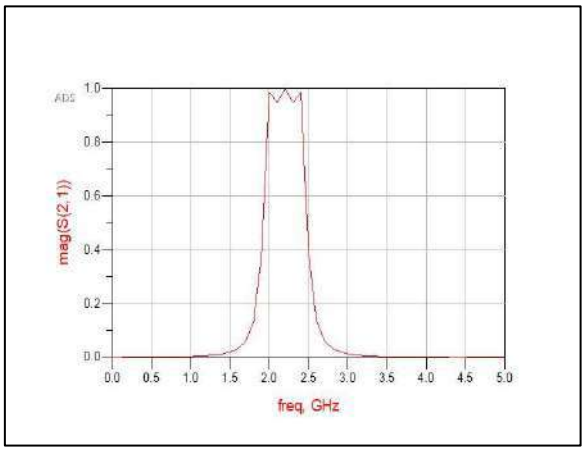

Fig.3

Filter Layout

The layout of coupled lines microstrip between the two ports is observed by the following representation:

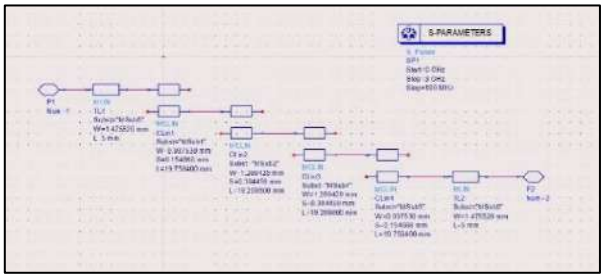

Fig.4

Visualization of the Schematic Layout

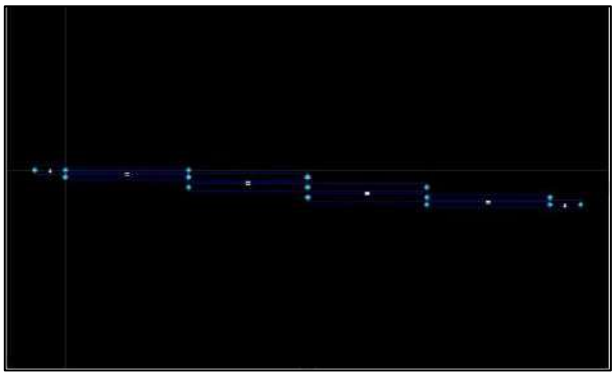

Fig.5

Simulated Output for Center Frequency

The simulated output for center frequency 2.2GHz with a bandwidth of 440MHz, minimum attenuation at 20dB and pass-band ripple equal to 0.5dB. Here, the parameter S11 denotes the insertion loss at port 1 and the parameter S21 represents the insertion loss from port1 to port 2.

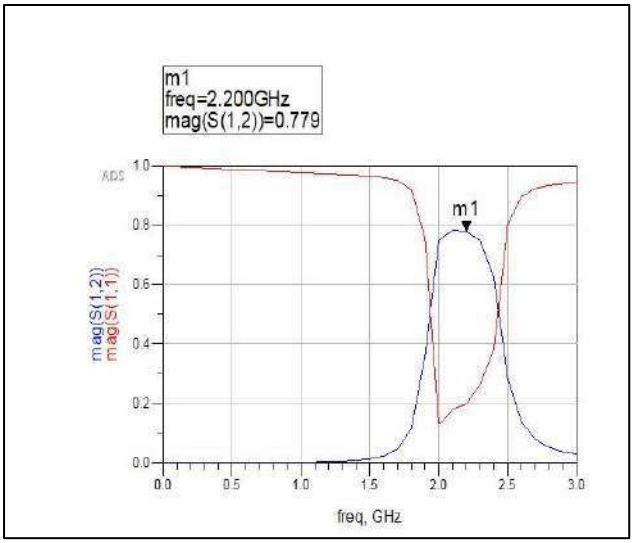

Fig.6

IV. Conclusion

The setup produces a microcontroller based smart device which can store audio message of a visitor to desired location after the visitor stores the message in the device. Our system will ask to write his name through the keyboard. As soon as the name is typed and pressing the enter key the signal goes to the owner and the owner will receive a SMS which will give him the details of the visitor. After the owner returns back, he can listen to the audio messages in the device

The audio message is stored using a voice IC APR6900.The SMS is sent using a GSM modem. This project is implemented in different applications of homes, offices and even in industries.

This microcontroller based smart device is designed to send message to the owner but it is to be implemented for the number of applications. The design concept is microcontroller based so the security for the system is maintained.

The 3G GSM technology is used for communication between two devices i.e. to receive message from visitor This concept is to be widely used in future to execute different application in the field of medical and so on.

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Robotic Shopping Cart

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Prof. Deepti Nair

***Abstract*— Carts are used at airports, shopping malls, and many other places and many people around are having problems by carrying heavy loads on their shoulders and traveling around with trolleys. In supermarkets, a shopping cart or trolley is an essential tool for purchasing. Usually, it is used by customers in the stores to transport the required material to the cash counter. It is inconvenient for customers to find the desired product in the store having the shopping trolley in their hands. The robotic cart proposed here focuses on reducing the human efforts to pull the cart. This reduces the tiring experience faced by people and makes them stress-free. The loads can also be secured by proper security measures. The application of the robotic cart can be extended to a wide range of fields as in the porters at railway stations, loading and unloading goods at factories (civil and industrial fields), and as a helping hand for elderly people. Thus, this will allow them to avoid the heavy loads they have to carry along.**

***Keywords*— Ultrasonic, IR sensors, Shopping Cart, Reduce human effort, avoid physical contact.**

I. INTRODUCTION

Human-computer interaction technology is very well developed in this current era. Robotic shopping cart is designed to automatically follow the user along with carrying the luggage. It develops a platform capable of sending and receiving signals that would provide a simple and practical means to follow the user and to avoid obstacles. Conventional shopping has started to reduce after the arrival of online shopping and after the pandemic, it has reduced a lot. A state has occurred now where we could order everything online which requires less effort. To make traditional shopping interesting we could implement new technologies in shopping. A Robotic shopping cart would be such an implementation where people could enjoy shopping. The proposed Robotic cart could follow the customer using an ultrasonic sensor which reduces their effort of pulling them and it even ensures a contactless procedure. Here the customer doesn't want to touch the cart again and again which ensures more safety to them. The robotic shopping cart should be able to detect and follow the person's movements. IR sensors, motors, and an Arduino are used to construct this robot. Following the target person requires a continuous study of the distance between the target person and the robot. IR sensors are used to connect this basic line follower robot. These sensors detect and follow the road. A predetermined path is needed for a line follower robot. We used ultrasonic sensors to clear the obstacles. Ultrasonic sensors are fast and common in distance measurement applications. The datafrom the ultrasonic sensor is processed by the microcontroller, which determines the cart's movement.

II. SYSTEM OVERVIEW

This section discusses the block diagram as well as some basic information regarding the components used in the proposed system's architecture. Figure 1 depicts the proposed model's overall block diagram. IR sensors are used to determine the direction that the robot can take in this proposed prototype

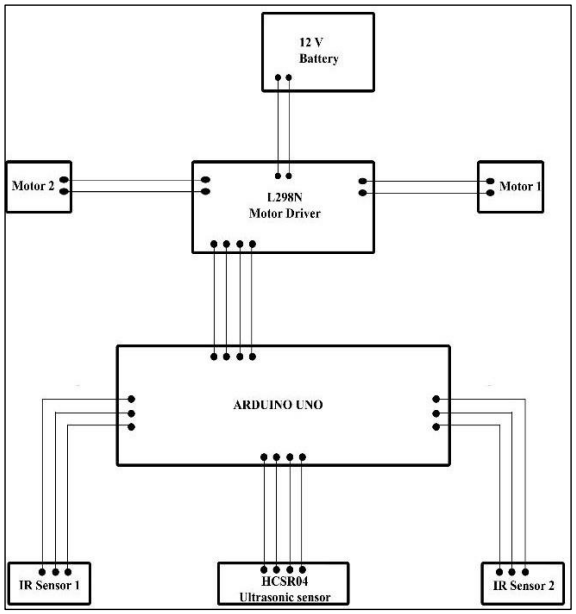

Figure 1. Overall Block Diagram

This robot's flawless operation necessitated the use of several components. The key components used in this prototype are depicted in the diagram above, and the following are brief descriptions of such components:

1. ARDUINO UNO

A regular Arduino board is the Arduino UNO. It wasArduino's first USB board, and it uses the Arduino IDE programme to operate. There are six analogue pin inputs, fourteen digital pins, a USB connector, a power port, and an ICSP (In-Circuit Serial Programming) header on this board. It can be seen in both online and offline environments. The movement of the cart is controlled by the Arduino. This Arduino controls the IR sensor which detects the path to follow, the ultrasonic sensor which is used to detect anobstruction, and the dc motor driver which is used to controlthe dc motors. All these tasks are executed with the help of C++ programming.

2. *ULTRASONIC SENSORS*

HC-SR04 Ultrasonic distance sensor consists of two ultrasonic transducers. The one acts as a transmitter which converts electrical signal into 40 KHz ultrasonic sound pulses. The receiver listens for the transmitted pulses. If it receives them, it generates an output pulse whose diameter can be used to calculate the pulse's travel speed. The ultrasonic sensor is used to detect the obstruction in the path and avoid it accordingly.

3. *IR Sensor*

The IR sensor is known as the infrared sensor that detects infrared radiation in its surrounding. It detects the heat

and moves in that direction. As black is a good conductor of heat there is a black tape placed in the environment where the robot should work and halt at the white space as white color reflects heat. The IR sensor is used for the cart to follow.

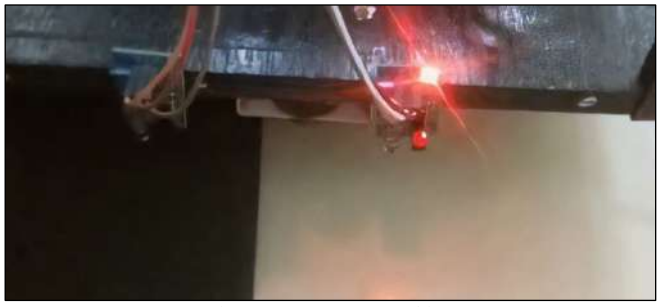

Figure 2. IR Sensor Working

4. *DC Motors*

A motor is a kind of electrical system that converts electrical energy into mechanical energy. A rotor, stator, bearings, conduit case, enclosure, and eye bolt are all used inthe engine. In a large variety of applications, electric motors are used, from simple devices to the most sophisticated computers. As opposed to pneumatic or hydraulic equivalents, these engines are capable of performing thetasks. These motors are used to commute or relay power to the wheels, causing them to spin. For the base's use, two DCmotors with a voltage of 12V and a speed of 300 rpm were used in this prototype.

5. *DC Motor Driver*

This L298N Motor Driver Module is a high- performance motor driver for DC and Stepper Motors. An L298 motor driver IC and a 78M05 5V regulator make up thismodule. Up to four DC motors can be controlled by the L298N Module, or two DC motors with directional and speedcontrol. As a result, the driver transforms the Arduino's low current signals into high current signals that the motors can use to operate effectively. One DC motor driver is used to power the two DC motors that make up the robot's base in this prototype.

This section was all about the overview of the system. The next section gives details about the algorithm andthe path flow used in this designed prototype.

III. ALGORITHM

This part is all about the robot's algorithm and the direction it takes to get there. When the robot is powered up,it has an algorithm that keeps repeating itself in a loop. It's a really easy algorithm to adopt since the robot's architecture isbased on it. The algorithm for following is as follows:

Algorithm to be followed:

1. Follow the customer along the black taped line.
2. Stops when the customer stops moving.
3. Wait for the customer to add things to the shopping cart.
4. Start moving when the customer moves forward.
5. Go to step 1.

According to the algorithm, the robot follows a basicpath flow that allows it to continue running when the black tape feels heat and stop when an object appears. This principle helps the robot to function effectively since black isa strong conductor of heat. This algorithm's map resembles ablack strip, allowing the robot to travel along the black path.

The flow chart followed by the cart is shown in figure 4 given below.

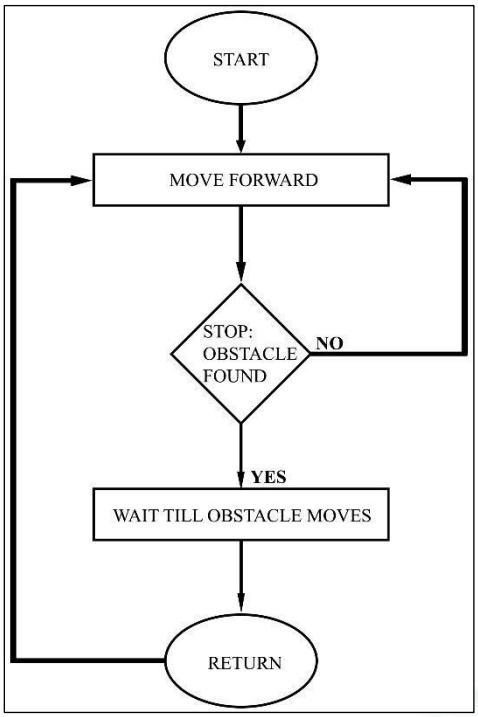

Figure 4. Flow Chart followed by the cart

This section explained the path flow and the algorithm used in this prototype while the next section will explain the implementation of the hardware and software part of this model.

IV. IMPLEMENTATION

This section contains the programme used to build the cart as well as a final overview of the prototype. The Arduino UNO was used in this robot build, and the Arduino IDE programme was used for coding. This programme is used to code the robot's navigation in a certain direction as well as its rotation in the black strip algorithm. This software follows the C programming language which can be used to create a variety of robots in the construction field. If you know C programming, this app is very easy to use. This prototype's code is written in the C++ programming language. The successful execution of the code is shown in figure 5.

Figure 5. Successful Code Compilation

The hardware component is implemented until the firmware is saved in the Arduino, and the model is then testedto see how it works. The experimental working model of theproposed robotic shopping cart is shown in figure 6.1,6.2

Figure 6.1 Experimental Model

Figure 6.2 Experimental Model

There are many existing models out there and their performances are based on different algorithms proposed by the respective authors.

This section provided the implementation of hardware and software. The next section concludes the entire proposed system and also mentions its future scope.

V.CONCLUSION AND FUTURE WORK

The key goal was to develop and incorporate a robotic shopping cart using the black strip algorithm that could hold customers' products and be operated by software. The suggested prototype in this paper was introduced successfully. The suggested algorithm is also tested using the Arduino IDE programme. The future potential of this cart can be enhanced by incorporating a billing system into the cart, allowing customers to save time at the billing counter. We should add a facial recognition feature to the cart to make it more secure by allowing only the cart's current user to open it.

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Satellite Image Classification Using CNN

Abhijit Satpute, Abhishek Salekar, Akshay Vaidya, Akash Shinde

***Abstract*— Satellite imagery is important as it finds many applications including disaster response, law enforcement, environmental monitoring, etc. The applications require the manual identification of objects in the imagery. Because the geographical area to be covered is extremely large and therefore the analysts available to conduct the searches are few, thus automation is required. The traditional object detection and classification algorithms are too inaccurate and unreliable to unravel the matter. Deep learning may be a a part of a broader family of machine learning methods that have shown promise for the automation of such tasks. The method has achieved success in image understanding by means of convolutional neural networks. The problem of object and facility recognition in satellite imagery is taken into account. The system consists of an ensemble of convolutional neural networks and extra neural networks that integrate satellite metadata with image features. Convolutional neural networks are successfully applied on multimedia approaches and wont to create a system ready to handle the classification with none human interactions. In this report, we produce effective methods for satellite image classification that are based on convolutional neural networks**.

***Index Terms*-- Deep Learning, Convolutional Neural Networks, Spectral-Spatial, Remote Sensing, satellite image classification.**

I. INTRODUCTION

Image classification entails the important part of digital image and has been very essential within the application of remote sensing systems, thus the demand for research to seek out advanced algorithms and tools to unravel problems experienced in classification has shown a steady rise in interest over the years. Remote sensing has globally being applied with the use of current advanced satellite systems and sensors, but they need to provide analysis and decision making has been a challenge. The project will focus on devising the algorithms for classification based on machine learning techniques. Applying machine learning techniques for the aim of classification are going to be of great importance. Deep learning may be a class of machine learning models that represent data at different levels of abstraction by means of multiple processing layers. CNN has achieved astonishing success in object detection and classification by combining neural network models, called CNN with powerful GPU.

CNN-based algorithms have dominated the annual Image Net Large Scale Visual Recognition Challenge for detection and classification of objects in photographs. This success has caused a revolution in image understanding, and thus the main technology companies, including Google, Microsoft, and Facebook, have already deployed CNN-based products and services. A CNN consists of a series of processing layers known as pooling, convolution, and fully connected layer. Each layer is a family of convolution filters that detects and learns image feature. The network learns the features which are to extracted and detected during the training phase. The Convolutional Neural Network (CNN) has become very fashionable thanks to drastic performance gain over the hand-designed features. The CNN has shown a very promising performance in many applications where visual information science is required, like image classification object detection semantic segmentation, the colon cancer classification depth estimation face anti-spoofing etc. In recent years, enormous progress is additionally made in the field of deep learning for hyperspectral image analysis. A dual-path network (DPN) by combining the network residual and dense amount of convolutional network is proposed for the Hyperspectral image classification

II. Literature Survey

Cracknell and Hayes, (1991) discussed the various ways during which satellite systems and aircraft applications are often used and applied in fields like land use land cover, oceanography, meteorology, climatology, natural disasters, water resources, engineering , and much of more areas RS has got to do with photographic instruments which will capture a picture without being in touch with it. within the current study the interest is predicated more on image classification of satellite imagery type in RS and checking out which machine learning technique can accurately classify images.

Traditional classification techniques can yield incorrect and incomplete results (Xu et.al. 2014) a huge effort has been taken in generating effective classification approaches and techniques that are able to produce better classification accuracy. ML algorithms are researched over the years, and been identified as capable of handling RS data, with the assistance of latest generation satellite data. Classification methods include unsupervised and supervised approaches in RS environments.

Camps-Valls and Bruzzone, (2009), in their book describe supervised classification as a casewhere a labelled set of samples, which is implemented on the training data by having the target of predicting the worth y like a replacement sample , watching the category membership of . They however describe unsupervised classification method as a case that involves the sort of knowledge , that's unknown and wishes to be how of describing how the info is organized and clustered because the major objective.

Alqurashi and Kumar, (2014) mention that in making an honest decision, it is vital to attenuate the common sources of errors, thus the quality of thematic information and maps from remotely sensed data is significant . the matter encountered is that the accuracy results alone cannot be used as an honest measure or final conclusion, in determining the proper prediction or accuracy in classification of images. The accuracy results obtained from the classification experiments, can only indicate what percentage times any algorithm performs accurately, but we'd like how of watching each algorithm because it performs throughout each class level of accuracy while measuring the model's performance. An evaluation or assessment of the performance of the supervised classifiers compared and investigated during this study, and different classifiers are getting to be used to analyze which one are getting to be more superior in terms of performance than the other . the general accuracy of the classification methods don't give satisfactory analysis in terms of evaluating comparisons of the given supervised classifiers.

Lu and Weng, (2007) discuss how important it's to possess a transparent understanding of varied sensor data, while taking into account their weaknesses and strengths within the choice of remotely sensed data, while they highlight that airborne and space borne sensor data vary in spatial, radiometric, spectral and temporal resolution. Properly selecting sensor data is taken into account to be the primary step to a successful classification therein case. While data pre-processing is a component of the method image classification, a really critical factor like feature extraction and election may be a vital aspect in selecting variables for classification of the image.

Lu and Wu, (2017) an inventory of potential variables for image classification which can be used is indicated,where they mentioned spectral signatures, vegetation indices, textural, transformed images, contextual information, multi-temporal images, multisensory images and ancillary. Although various literature have indicated different approaches to performance evaluation, having quite one performance measure will yield better results.

Powell, (2004) Accuracy is suffering from many errors found within the results of the classification experiments.it is discussed how it's important to understand the sources of errors, which inother cases may include interpretation errors, poor quality of coaching done or errors in training samples, which all form a part of factors that affect accuracy.
Twala and Nkonyana, (2013) also presented a study that researched on incomplete data using supervised classification methods.

III. SYSTEM REQUIREMENT

The experiment setup is carried out on a computer system which has the different hardware and software specifications as given in Table (1) and Table (2) respectively.

Table(1) Hardware components

Processor	2.3 GHz Intel i-5
GPU	NVIDIA-2GB
RAM	8 GB

Table (2) Software details

Operating System	Windows 10, HOME ,64-Bit
Programming Language	Python [3.9]
IDE	Google Colaboratory
Library	Keras

3.2.1 Python

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed.

3.2.2 Google Colaboratory

Colaboratory, or "Colab" for short, allows you to write and execute Python in your browser, with

- Zero configuration required
- Free access to GPUs
- Easy sharing

Whether you're a student, a data scientist or an AI researcher, Colab can make your work easier.

3.2.3 Keras

Keras is an Open Source Neural Network library written in Python that runs on top of Theano or Tensorflow. It is designed to be modular, fast and easy to use. It was developed by François Chollet, a Google engineer. Keras doesn't handle low-level computation. Instead, it uses another library to do it, called the "Backend. Keras is high-level API wrapper for the low-level API, capable of running on top of TensorFlow, CNTK, or Theano. Keras High-Level API handles the way we make models, defining layers, or set up multiple input-output model

IV. WORKING OF CNN

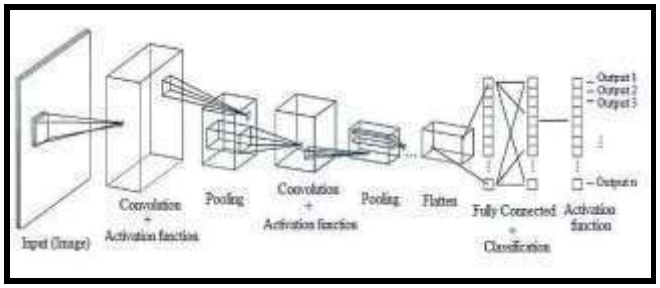

Fig. 1: Proposed CNN Model for Satellite Image Classification.

The name "convolutional neural network" indicates that the network employs a mathematical process called convolutions. Convolutional networks are a specialized sort of neural networks that use convolution in place of general matrix operation in a minimum of one among their layers.

A convolutional neural network consists of an input and an output layer, also as multiple hidden layers. The hidden layers of a CNN typically contains a series of convolutional layers that convolve with a multiplication or other scalar product . The activation function is usually a ReLU layer, and is subsequently followed by additional convolutions like pooling layers, fully connected layers and normalization layers, mentioned as hidden layers because their inputs and outputs are masked by the activation function and final fully connected layer. The layers of a conv net are :

Convolutional layer: Convolutional layers convolve the input and pass its result to subsequent layer. a convolution may be a linear operation that involves the multiplication of a group of weights with the input, very similar to a standard neural network. The multiplication is performed between an array of input file and a two-dimensional array of weights, called a filter or a kernel. The convolution operation reduces the amount of free parameters, allowing the network to be deeper with fewer parameters.

Pooling layer: it's common to periodically insert a Pooling layer in-between successive Conv layers during a ConvNet architecture. Its function is to progressively reduce the spatial size of the representation to scale back the quantity of parameters and computation within the network, and hence to also control overfitting. pooling may compute a max or a mean . Max pooling uses the maximum value from each cluster of neurons at the prior layer. Average pooling uses the average value from each cluster of neurons at the prior layer.

Fully connected layer: Fully connected layers connect every neuron in one layer to each neuron in another layer and is generally placed as the last layer of CNN. In theory it is equivalent to the traditional multi-layer perceptron neural network (MLP). The flattened matrix goes through a totally connected layer to classify the pictures .

V. Overview

Let the spectral-spatial hyperspectral data cube be denoted by I RM×N×D, where I is the original input, M is the width, N is the height, and D is the number of spectral bands/depth. Every HSI pixel in I contains D spectral measures and forms a one-hot label vector Y = (y1, y2, . . . yC) R1×1×C , where C represents the land-cover categories. However, the hyperspectral pixels exhibit the mixed land-cover classes, introducing the high intra-class variability and interclass similarity into I. It is of great challenge for any model to tackle this problem. To remove the spectral redundancy first the traditional principal component analysis (PCA) is applied over the original HSI data (I) along spectral bands. The PCA reduces the number of spectral bands from D to B while maintaining the same spatial dimensions (i.e., width M and height N). We have reduced only spectral bands such that it preserves the spatial information which is very important for recognising any object. We represent the PCA reduced data cube by X RM×N×B, where X is the modified input after PCA, M is the width, N is the height, and B is the number of spectral bands after PCA.

Layer (type)	Output Shape	# Parameter
input 1 (InputLayer)	(25, 25, 30, 1)	0
conv3d 1 (Conv3D)	(23, 23, 24, 8)	512
conv3d 2 (Conv3D)	(21, 21, 20, 16)	5776
conv3d 3 (Conv3D)	(19, 19, 18, 32)	13856
reshape 1 (Reshape)	(19, 19, 576)	0
conv2d 1 (Conv2D)	(17, 17, 64)	331840
flatten 1 (Flatten)	(18496)	0
dense 1 (Dense)	(256)	4735232
dropout 1 (Dropout)	(256)	0
dense 2 (Dense)	(128)	32896
dropout 2 (Dropout)	(128)	0
dense 3 (Dense)	(16)	2064
Total Trainable Parameters: 5, 122, 176		

Table (3)Model Used

The The layer wise summary of the proposed CNN architecture with window size 25×25. The last layer is based on the Indian Pines dataset

In order to utilize the image classification techniques, the HSI data cube is divided into small overlapping 3D-patches, the truth labels of which are decided by the label of the centred pixel. We have created the 3D neighboring patches P RS×S×B from X, centered at the spatial location (α, β), covering the S×S window or spatial extent and every one B spectral bands. The total number of generated 3D-patches (n) from X is given by (M − S + 1) × (N − S + 1). Thus, the 3D - patch at location (α β), denoted by Pα,β, covers the width from α − (S − 1)/2 to α + (S − 1)/2, height from β − (S − 1)/2 to β + (S − 1)/2 and all B spectral bands of PCA reduced data cube X.

In 2D-CNN, the input file are convolved with 2D kernels. The convolution happens by computing the sum of the dot product between input data and kernel. The kernel is strided over the input file to hide full spatial dimension. The convolved features are skilled the activation function to introduce the non-linearity within the model. In 2D convolution, the activation value at spatial position (x, y) in the j th feature map of the i th layer, denoted as v x,y i,j , is generated using the following equation,

where φ is the activation function, bi,j is the bias parameter for the j th feature map of the i th layer, dl−1 is the number of feature map in (l − 1)th layer and the depth of kernel wi, j for the j th feature map of the i th layer, 2γ + 1 is the width of kernel, 2δ + 1 is that the height of kernel, and wi,j is that the value of weight parameter for the j th feature map of the i th layer. The 3D convolution [32] is done by convolving a 3D kernel with the 3D-data. In the proposed model for HSI data, the feature maps of convolution layer are generated using the 3D kernel over multiple contiguous bands in the input layer; this captures the spectral information. In 3D convolution, the activation value at spatial position (x, y, z) in the j th feature map of the i th layer, denoted as v x,y,z i,j , is generated as follows, where 2η + 1 is that the depth of kernel along spectral dimension and other parameters are an equivalent as in (Eqn. 1).

The parameters of CNN, such as the bias b and the kernel weight w, are usually trained using supervised approaches [12] with the help of a gradient descent optimization technique. In conventional 2D CNNs, the convolutions are applied over the spatial dimensions only, covering all the feature maps of the previous layer, to compute the 2D discriminative feature maps. Whereas, for the HSI classification problem, it's desirable to capture the spectral information, encoded in multiple bands along side the spatial information. The 2D-CNNs are not able to handle the spectral information. On the opposite hand, the 3D-CNN kernel can extract the spectral and spatial feature representation simultaneously from HSI data, but at the value of increased computational complexity. In order to take the advantages of the automatic feature learning capability of both 2D and 3D CNN, we propose a hybrid feature learning framework called Hybrid SN for satellite image classification. The flow diagram of the proposed Hybrid SN network is shown in Fig. 1. It comprises of three 3D convolutions (Eqn. 2), one 2D convolution (Eqn. 1) and three fully connected layers.

$$v_{i,j}^{x,y,z} = \phi\left(b_{i,j} + \sum_{\tau=1}^{d_{l-1}} \sum_{\lambda=-\eta}^{\eta} \sum_{\rho=-\gamma}^{\gamma} \sum_{\sigma=-\delta}^{\delta} w_{i,j,\tau}^{\sigma,\rho,\lambda} \times v_{i-1,\tau}^{x+\sigma,y+\rho,z+\lambda}\right) \quad (2)$$

In Hybrid SN framework, the dimensions of 3D convolution kernels are 8 × 3 × 3 × 7 × 1 (i.e., K1 1 = 3, K1 2 = 3, and K1 3 = 7 in Fig. 1), 16×3×3×5×8 (i.e., K2 1 = 3, K2 2 = 3, and K2 3 = 5 in Fig. 1) and 32×3×3×3×16 (i.e., K3 1 = 3, K3 2 = 3, and K3 3 = 3 in Fig. 1) in the subsequent 1 st , 2 nd and 3 rd convolution layers, respectively, where 16×3×3×5×8 means 16 3D-kernels of dimension 3×3×5 (i.e., two spatial and one spectral dimension) for all 8 3D input feature maps. Whereas, the dimension of 2D convolution kernel is 64 × 3 × 3 × 576 (i.e., K4 1 = 3 and K4 2 = 3 in Fig. 1), where 64 is the number of 2D-kernels, 3 × 3 represents the spatial dimension of 2D-kernel, and 576 is the number of 2D input feature maps. To increase the number of spectral-spatial feature maps simultaneously, 3D convolutions are applied thrice and can preserve the spectral information of input HSI data in the output volume. The 2D convolution is applied once before the flatten layer by keeping in mind that it strongly discriminates the spatial information within the different spectral bands without substantial loss of spectral information, which is very important for HSI data. A detailed summary of the proposed model in terms of the layer types, output map dimensions and number of parameters is given in Table I. It can be seen that the highest number of parameters are present in the 1 st dense layer. The number of node in the last dense layer is 16, which is same as the number of classes in Indian Pines dataset. Thus, the total number of parameters in the proposed model depends on the number of classes in a dataset. The total number of trainable weight parameters in HybridSN is 5, 122, 176 for Indian Pines dataset. All weights are randomly initialised and trained using back-propagation algorithm with the Adam optimiser by using the sof tmax loss. We use minibatches of size 256 and train the network for 100 epochs with no batch normalization and data augmentation.

VI. DISCUSSION AND RESULTS

1. Dataset Description and Training Details

We have used one publicly available hyperspectral image datasets1 , namely Indian Pines. The Indian Pines (IP) dataset has images with 145 × 145 spatial dimension and 224 spectral bands in the wavelength range of 400 to 2500 nm, out of which 24 spectral bands covering the region of water absorption have been discarded. The ground truth data that is available is designated into 16 classes of vegetation. We have chosen the optimal learning rate of 0.001, supported the classification outcomes. In order to form the fair comparison, we've extracted an equivalent spatial dimension in 3D-patches of input volume for various datasets, like 25× 25× 30 for IP respectively.

2. Classfication Details

The ground truth available is designated into 16 classes of vegetation. We have a designated different color for different classes. Details about these classification can be seen in the figure given below.

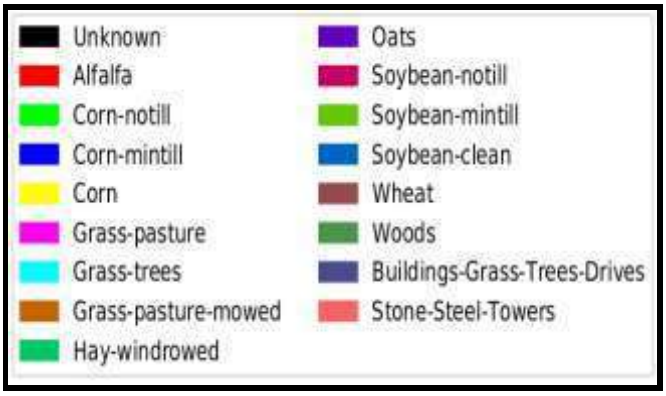

Fig . 2.1: Classification Details

3. Classification Accuracy

The classification accuracy of each class was obtained which can be seen in the figure given below

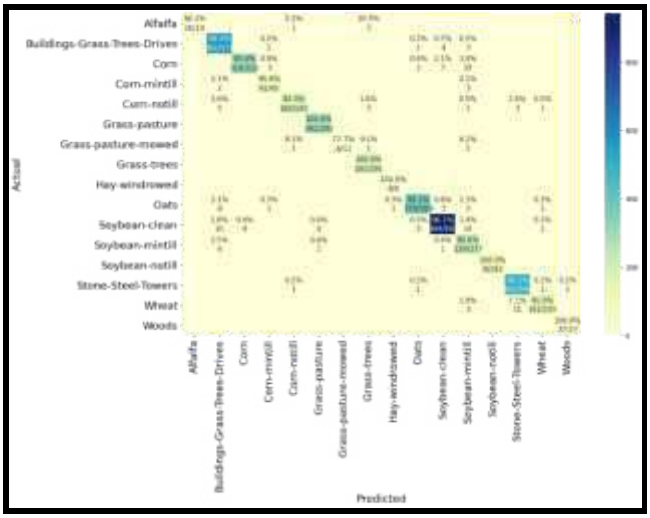

Fig. 3.1: Classification accuracy of each class

4. Classification Result

Fig. 4.1: The classification map for Indian Pines, (a) False color image (b) Ground truth (c) Predicted classification maps for proposed CNN model.

VII. CONCLUSION

Basically we have designed a model using CNN which will classify the satellite images which are given to it into different classes. These satellite images are in a dataset which contains various satellite images . In this project we have used publicly available dataset of Indian Pines At first we will upload the Indian Pines Dataset in our code, then our model which we have created using CNN will perform the classification operation on the dataset and at the output we get our classified image. .This letter has introduced a hybrid 3D and 2D model for satellite image classification. The proposed HybridSN model basically combines the complementary information of spatio-spectral and spectral in the form of 3D and 2D convolutions, respectively. The experiments over these datasets compared with recent state-of-the-art methods confirm the superiority of the proposed method. The proposed model is computationally efficient than the 3D-CNN and 2D-CNN model. It also shows the superior performance of the model for small training data.

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Sentiment Analysis Project in R

Aditi Hemant Patil, Arya Ramesh Patil, Sayali Satish Sangare, Sachi Pratosh Singh

***Abstract*—Sentiment Analysis or text analysis is all about finding polarity (positive or negative) in narrative of script. The scripts or text can be as short as a sentence and as large as a paragraph or even a book for that matter. With growing age of technology, it is evident that data is being generated at almost every click and is studied to improve the quality of certain product or service. An extensive research work is being carried out in these areas by using different technologies. The two main methodologies used for opinion mining are lexicon-based approach and machine learning approach. A hybrid approach is a combination of both lexicon-based and machine learning approach for the optimum results. In this paper, sentiment analysis is carried out on janeaustenr dataset using lexicon-based approach in R language. The tidytext package is used which consists of all three lexicons used to retrieve sentiments from the dataset. The sentiment polarity would be visualized using wordcloud.**

Keywords—sentiment analysis, lexicons, reviews, extraction, polarity, visualization.

I. INTRODUCTION

Sentiment Analysis is the procedure of recognizing and then classifying the opinions that are conveyed in a text to decide the frame of mind of the writer with regard to a particular text or a product whether it is negative, positive or neutral.

It helps us to determine the opinion that is contemplated in the websites, social media feed etc. In sentiment analysis the classification is performed on the data which is further divided in different classes. These classes can be binary in nature that is it can be classified as negative or positive, or it can have numerous classes for example sad, happy, disgust, etc.

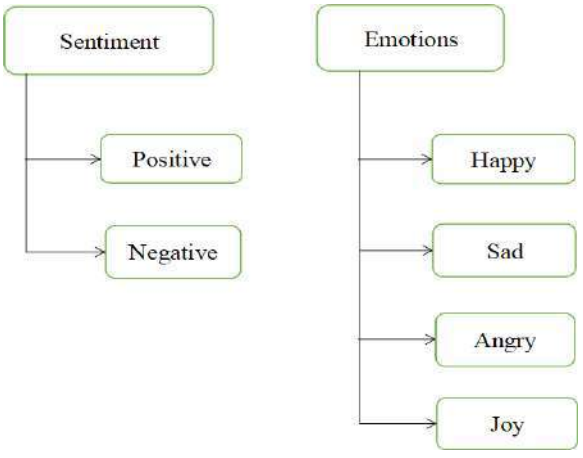

Fig 1.1: Classification of sentiments

The fig1.1 indicates the positive and the negative sentiments. Customers have started expressing their opinions and feelings more openly and thus sentiment analysis has become a crucial tool to interpret the sentiments of the customers. It is used to provide better customer service because it helps to analyze the reviews towards the brands by automatically analyzing the customer feedbacks given with the help of the surveys conducted, the recommendation system or the reviews given by the customers on the various social media platforms and websites.

Sentiment analysis is executed on the data to help out the businesses to analyze the sentiments behind the customer reviews, understand the needs of the customer and to provide the insight about the way a consumer is feeling towards their brand. By monitoring this data, we can perceive the overall opinion of the customer to provide a better service.

It has wide ranging applications in various industries such as retail, entertainment, restaurant, hospitality, travel, finance, product-based industries, sales-based companies etc. It has various real-world applications such as KFC, Google, Apple, TripAdvisor etc.

Sentiment Analysis is generally applied on the comments and posts on the social media sites, product reviews, comments on blogs and online datasets. It is mainly used to make correct future predictions.

Every sentiment analysis project has a basic framework of collecting data, cleaning it, analyzing it and then visualizing it. Sentiment Analysis approach is classified in the following manner:

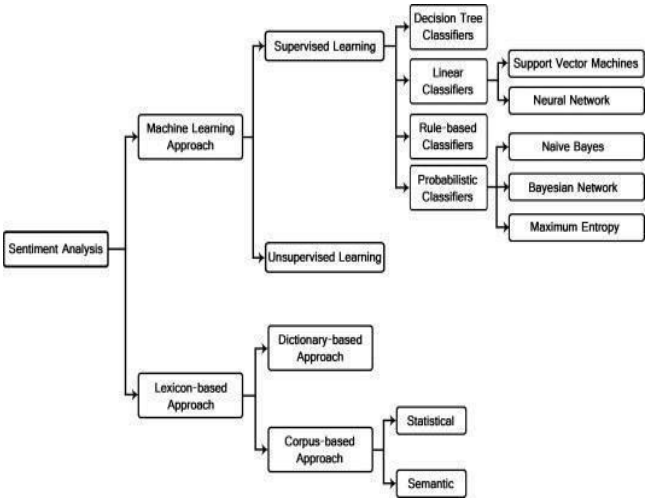

Fig. 1.2 Classification of domain techniques

The present study has adopted lexicon-based approach which makes use of lexicons (“Afinn”, “bing”, “nrc”) to analyze the sentiments of the books written by Jane Austen. These lexicons are based on unigrams that is on single words. All these lexicons contain many English words and each word is pre-tagged with some sentiment values.

Section II gives the methodology that has been adopted for the analysis of six novels written by Jane Austen. Section III presents the application of experimental implementation of the study. Section IV describes the result of the main framework and the application. Section V concludes the study and Section VI gives the future scope of the present study.

II. METHODOLOGY

To be able to apply the analytical tools to practical applications, the foundational understanding of sentiment analysis is of utmost importance. The aim is to analyze the

emotional quotient of the books written by Jane Austen. In our approach, we are making use of 'janeaustenR' package in R. This package consists of the six novels (namely: "Pride and Prejudice", "Sense and Sensibility", "Mansfield Park", "Emma", "Northanger Abbey", "Persuasion") written by Jane Austen. The proposed methodology is illustrated in form of flowchart below.

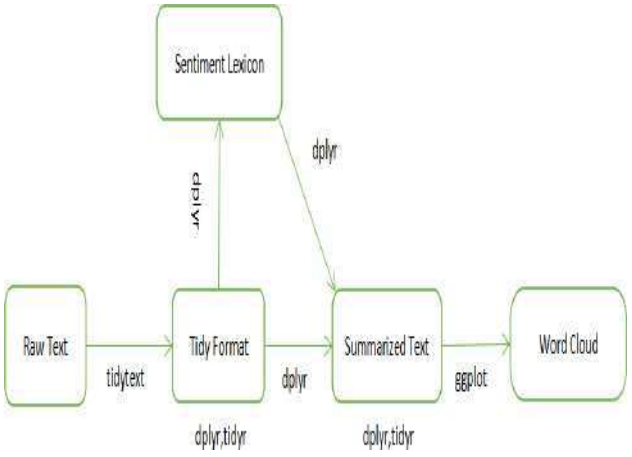

Fig. 2.1 Proposed system architecture

The methodology consists of five steps:

1. Tokenization

Tokenization is the process of splitting of text into words with each word per row. Tokenization even strips off the punctuation marks and converts the text into lowercase.

For example: The movie is great!
Output: the
movie
is
great

2. Cleaning of data

The books are in their original format which is raw in the context of the project. The text written in the books need to be converted into structured format. Cleaning involves removal of stop words (Antijoin). Stop words consists of articles, nouns, pronouns and conjunctions. This process of converting unstructured data to structured format is called tidying.

Output: movie
great

3. Applying Sentiment Lexicons

Lexicons are very similar to dictionaries; however, it consists of meaningful units of words pertaining to certain application like in this case of Natural Language Processing. These lexicons consist of sentiment words, its synonyms and antonyms. Applying these lexicons to the tidy format data, we will be able to gauge the emotional quotient behind the text.

4. Using innerjoin

By definition, it returns all rows from x where there are matching values in y and all columns from x and y. If there are multiple matches between x and y, all combination of the matches is returned. The output obtained after analyzing the sentiments is then summarized using functions from dplyr and tidyr packages.

5. Visualization – Wordcloud

Tidy text mining approach works well with ggplot2 that is the output can be visualized using plots. However, we make use of Wordcloud for visualization. There are two ways in which the words can be displayed. It displays the words in different sizes depending upon the frequency of each word occurring in the text and divides the positive and negative words in upper and lower half of the window.

III. EXPERIMENTAL IMPLEMENTATION

The present research is carried out in R language. R is a functional programming language developed by Hadley Wickham. R is mainly used for statistical inference, data analysis, data visualization and many more. It offers multiple packages and has a huge community.

Here, we made use of a referenced dataset from a repository which consists of 1000 amazon reviews. Alternatively, the reviews can be scrapped using a selector gadget and then creating a dataset in the desired file such as .txt file or a .csv file. Methodology adopted is identical as the main research of Jane Austen novels. Elaboratively, procedure starts by importing the dataset, tokenizing it, cleaning the imported dataset, and applying the three lexicons ("Afinn", "bing", "nrc") and analyzing the opinions of user reviews.

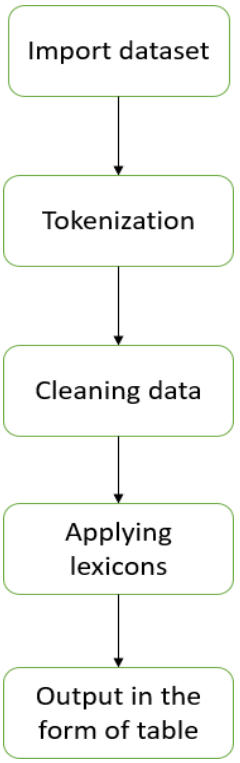

Fig 3.1 Amazon reviews methodology

R consists of numerous libraries, packages and functions for natural language processing. Here, we present some of them which have been used to carry out the research around opinion mining of Jane Austen novels and the amazon reviews.

Libraries and Packages	Usage
library(janeaustenr)	Provides the six novels written by Jane Austen.
library(tidytext)	Provides conversion of text to and from tidy formats.
library(stringr)	Provides functions to work with strings.
library(dplyr)	Provides ease for data manipulation.
library(ggplot2)	It is dedicated for data visualization.
library(wordcloud)	Helps to analyze text and visualize keywords.
library(tm)	Provides functions foe text mining.

Fig.3.2 Table of libraries and packages

Functions	Usage
unnest_tokens()	Split a column into tokens with each token per row.
mutate()	Adds new variables and preserves the existing ones.
group_by()	Groups by one or more variables.
ungroup()	Removes grouping.
anti_join()	Return all row from x where there are not matching values in y.
inner_join()	Joins tables.
filter()	Used to subset dataframe.

Fig.3.3 Table of some of the functions

IV. RESULT

This section presents the result of comprehensive study of the Jane Austen novels and its experimental implementation on amazon reviews. The study is adopted using lexicon-based approach. Describing the lexicons namely: affin lexicon ranges the words in the range of -5 to 5 where negative range indicates negative words and positive range indicates positive words; bing lexicon gives binary output that is, it categorizes the words into positive and negative sentiment; nrc lexicon is an elaborative lexicon since it presents the words into various sentiments such as happy, anger, joy, surprise and many more. It has been observed out of all the three lexicons, bing seems to be more accurate and reliable. The final result is visualized using wordcloud.

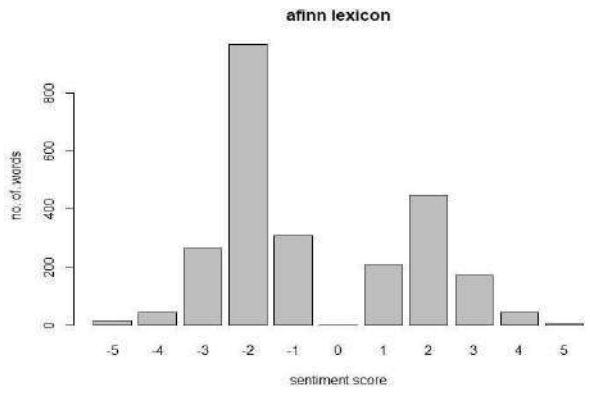

Fig. 4.1 Sentiment score of afinn lexicon

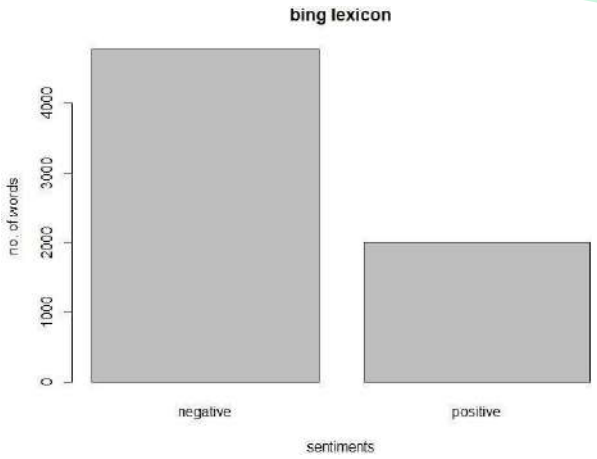

Fig.4.2 Sentiment presentation of bing lexicon

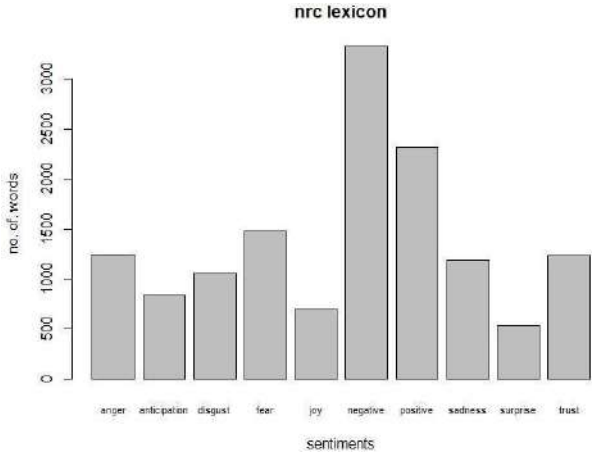

Fig.4.3 Sentiment presentation of nrc lexicon

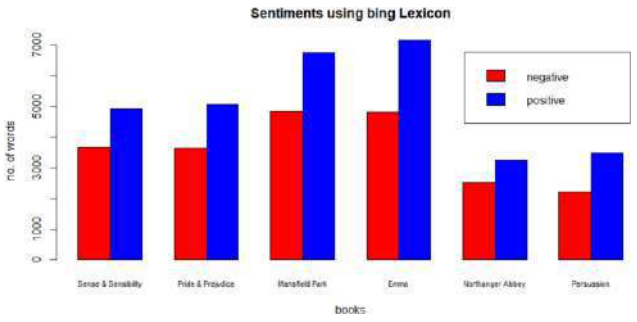

Fig.4.4 Bing lexicon over all six novels

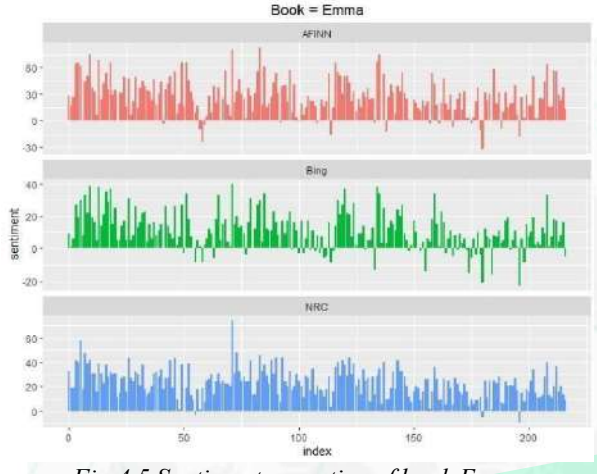

Fig.4.5 Sentiment narrative of book Emma

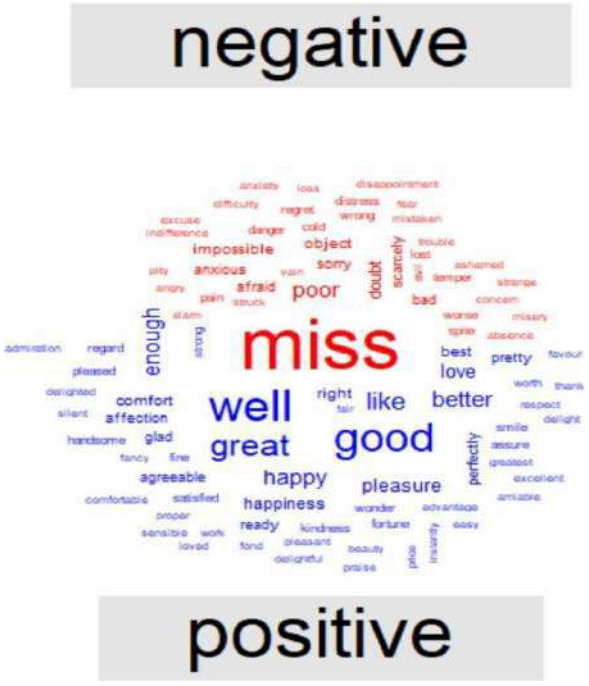

Fig.4.6 Wordcloud

```
> table(amazon_sent$bing_judgement,amazon_sent$actual_sentiment)

          negative positive
  negative      251       14
  neutral       150       65
  positive       99      421
> table(amazon_sent$nrc_judgement,amazon_sent$actual_sentiment)

          negative positive
  negative      183       53
  neutral       217      229
  positive      100      218
> table(amazon_sent$afinn_judgement,amazon_sent$actual_sentiment)

          negative positive
  negative      212       18
  neutral       187      105
  positive      101      377
```

Fig. 4.7 Tabled output of Amazon Reviews

V. CONCLUSION

In this paper, the study of sentiments existing in the janeaustenr dataset is presented using sentiment analysis. The sentiment analysis of the six novels of the Jane Austen has been performed using tidytext package in R language. The study is carried out using lexicon-based approach. The sentiment lexicons such as afinn, bing, nrc are described and implemented. All the three lexicons have different sentiment intensities and methods of giving value to the words. The bing lexicon gives the result in positive and negative category; afinn lexicon gives score-based values to the words. Similarly, nrc lexicon gives result in different categories of sentiments like happiness, joy, anger, fear, anticipation etc. It is evident that the choice of lexicons is subjective to the user and should be implemented optimally. The sentiment analysis approach is proposed with innerjoin modification. Innerjoin is used to match every token with the lexicons to access the sentiments in the dataset.

VI. FUTURE SCOPE

Sentiment Analysis is a very active area of research and development in the field of Data Science. Natural Language Processing has been and will be an exquisite field of opinion mining. Sentiment Analysis can be carried out using different techniques including machine learning and updated packages in R. The future applications include social media monitoring, businesses, public actions, recommendation system etc.

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