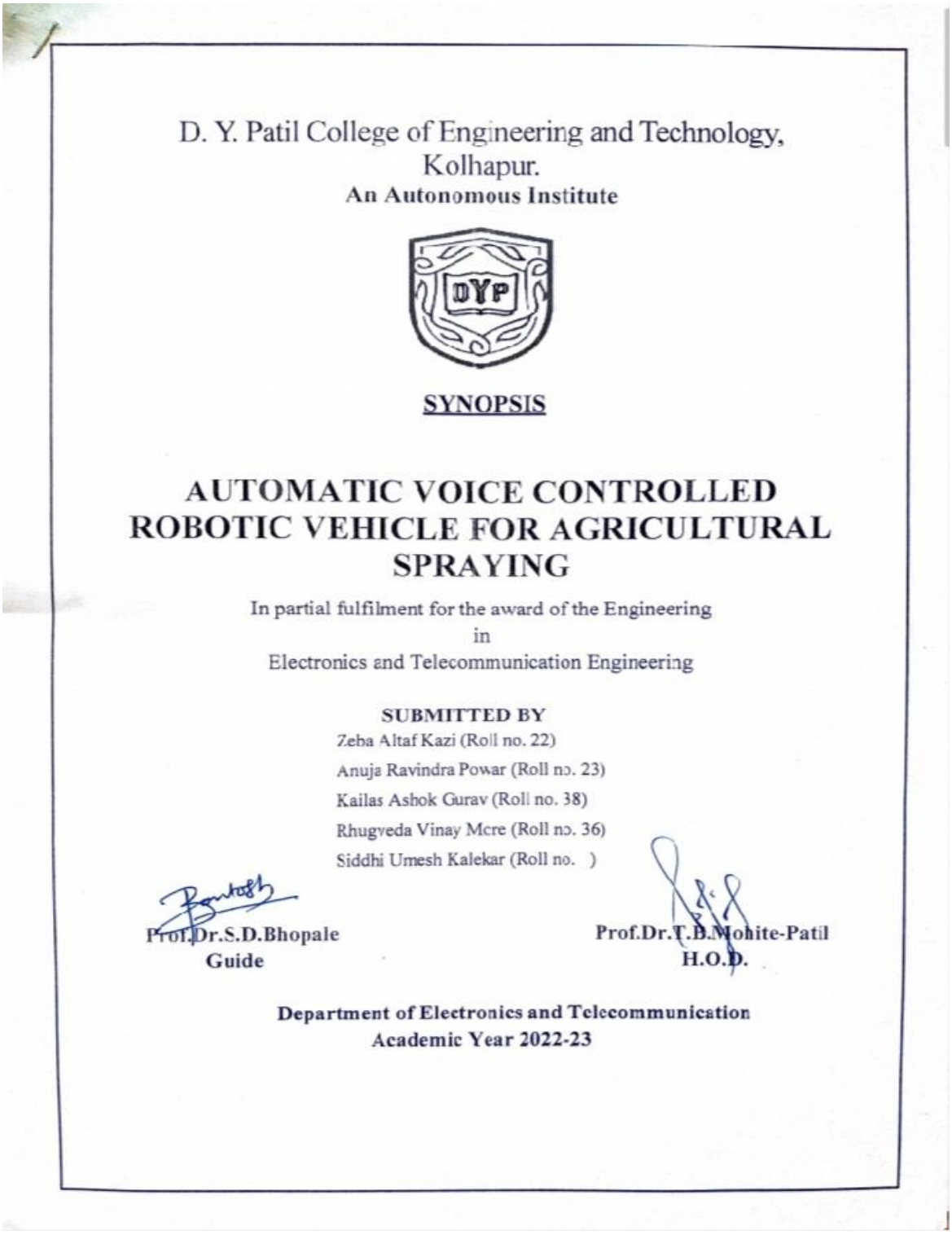
1. SYNOPSIS



D. Y. Patil College of Engineering and Technology,
Kolhapur.
An Autonomous Institute

SYNOPSIS

AUTOMATIC VOICE CONTROLLED ROBOTIC VEHICLE FOR AGRICULTURAL SPRAYING

In partial fulfilment for the award of the Engineering
in
Electronics and Telecommunication Engineering

SUBMITTED BY

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Prof.Dr.S.D.Bhopale
Guide

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H.O.D.

Department of Electronics and Telecommunication
Academic Year 2022-23

Synopsis of Proposed Work

1. Name of the College:- D. Y. Patil College of Engineering & Technology, Kolhapur.

2.Name of the Course:- B. Tech (Electronics and Telecommunication Engineering.)

3. Name of the Student :-

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4. Academic Year :- 2022-23.

5. Name of the Guide :- Prof. Dr. S. D. Bhopale

6. Proposed Title :- Automatic Voice Controlled Robotic Vehicle For Agricultural Spraying

7. Place of work :- Department of Electronics and Telecommunication Engineering, D. Y. Patil College of Engineering and Technology, Kolhapur.

Abstract:-

The population of the world is increasing rapidly. In order to fulfill their diet needs the production of food must be increased, but this must come at a cost affordable to everyone. Mechanization of agriculture enables conservation of inputs by precision in ensuring better distribution, reducing quantity required for better response or prevention of losses or waste of inputs applied. Mechanization reduces unit costs of production through higher productivity levels and the input conservation. The all agriculture equipment's often are hardly modernized due to its low productivity. In India farming is done by traditional ways, besides that there has been large development of industrial and service sector as compared to that of agriculture sector. The spraying of pesticides and insecticides is traditionally done by farm worker carrying backpack type sprayer which requires more human effort. Giving attention to these important problems an attempt is made to develop an equipment which will be beneficial to the farmer for the spraying operations. This equipment is easy to use and operate. It makes use reciprocating pump that creates the required pressure for the spraying action. This multifunction device will come in handy that can be put to use in different spraying stages of farming as per process requirement.

Introduction:-

In today's era, smart phones are becoming more powerful with reinforced processors, larger storage capacities, richer entertainment function and more communication methods. When we say voice control, the first term to be considered is Speech Recognition i.e. making the system to understand human voice. Speech recognition is a technology where the system understands the words given through speech. Speech is an ideal method for robotic control and communication. By using speech recognition technology, we can control Agricultural sprayer and controlling system. Voice controlled robotic vehicle which is control by some specified voice commands. The mobile application is capable of identifying five commands which are "Stop", "Forward", "Back", "Left", "Right". In this embedded system, we make a robotic vehicle which we can control using voice through a mobile application. Application listens and sends the instruction to the Arduino using Bluetooth and then Arduino performs the specified operations using voice recognition application.

The agricultural sprayer and controlling robotic vehicle is a project which is supposed to work on agricultural fields. Fertilizers used to kill insects or otherwise control their reproduction. The pesticides, and fertilizers are applied to agricultural crops with the help of a special device known as sprayer. Sprayer provides optimum performance with minimum efforts. By the invention of sprayers, this enables farmers to obtain the maximum agricultural output. A pesticide has to be portable and with an increased tank capacity as well as should result in cost reduction, labour and spraying time. In fertilizer distribution when the ultrasonic sensor will detect plant it will distribute liquid fertilizer to spray on specific plant so that fertilizer will not be wasted.

Literature Review :-

Objective of Pesticide Application in an average year, especially during the summer, one or more types of sprayers will be used by the average home gardener. Of the many products available, it is important to select the most efficient and easiest type for your particular need, whether it is for applying insecticides fungicides, weed killers, liquid fertilizers or wetting agents. For example, lawn sprayer is made especially for the application of liquid materials to the lawn area. They are metered to allow quick mixing and coarse spray, so it does not take as long to apply weed killers, insecticides, etc. Also, there is not as much chance of drift of the liquid into nearby flower and shrub beds. The old saying "You get what you pay for" certainly applies to sprayers. Efficiency and accuracy vary considerably, especially with the type that attaches to the garden hose. Sprayers that are used for weed killing or for applying any type of soil sterility should not be used for any other purpose. In fact, you will find it a good practice to set a sprayer aside just for the lawn area. Use a separate one for flowers and shrubs. It is a good practice to clean out your sprayer immediately after you have used it for any type of spraying. A little soapy water, swished around and through sprayer, then flushed out with warm water, does good job.

Flow Chart / Algorithm :-

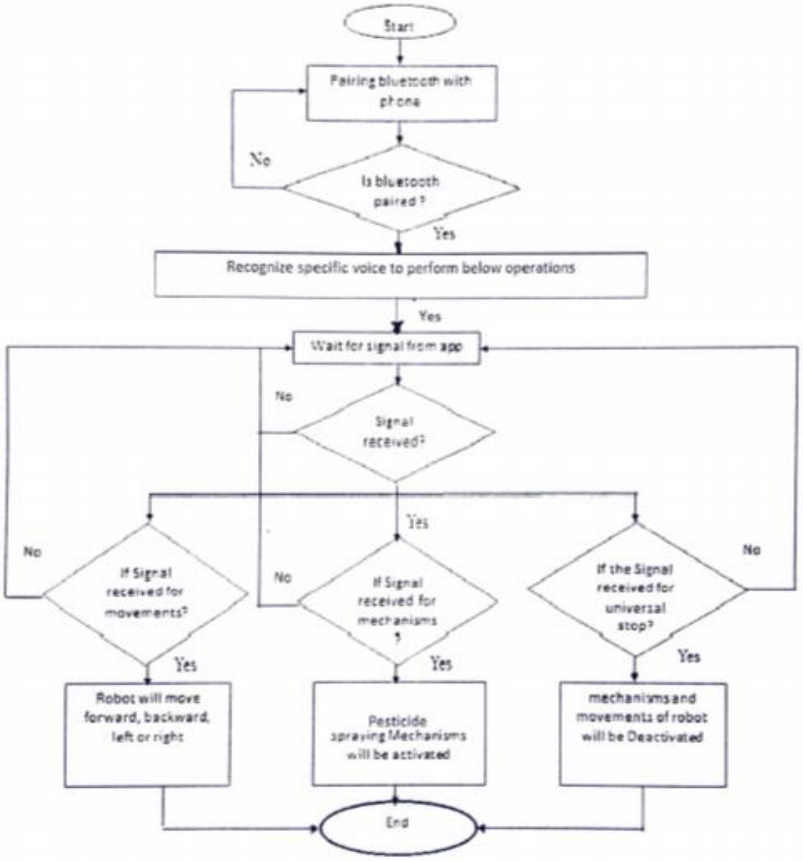
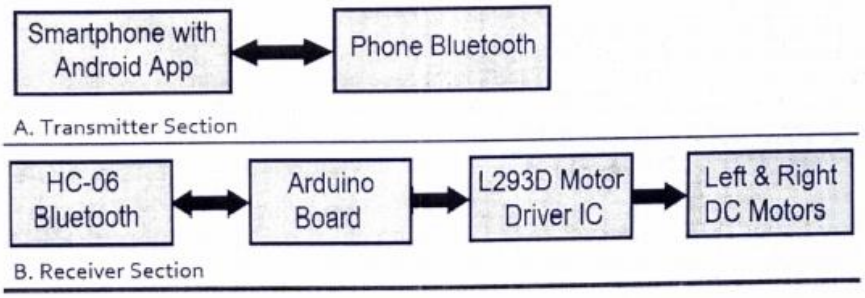


Fig: Flowchart of proposed work

Block Diagram:-



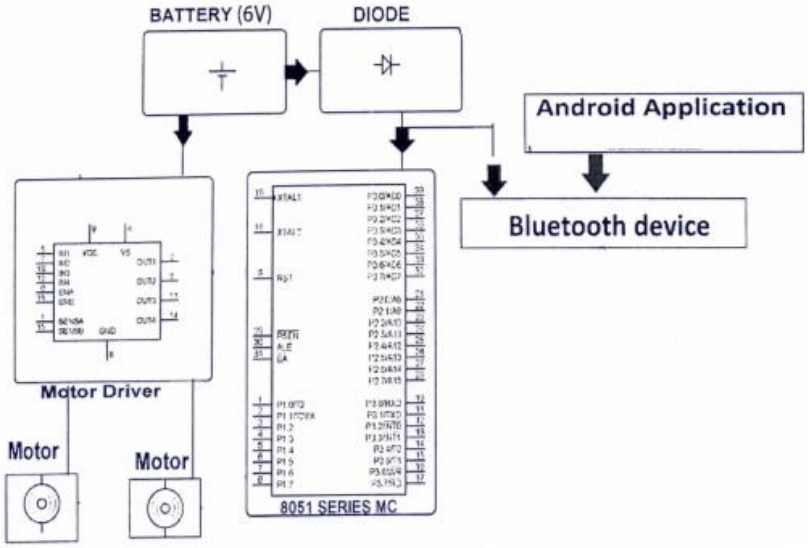


Fig: Block diagram of proposed work

Description:-

1.Arduino uno:

Arduino UNO is **a microcontroller board based on the ATmega328P**. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. Arduino UNO is a **low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects**. This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output.

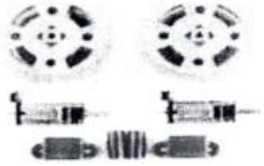
2.Breadboard:

A breadboard (sometimes called a *plugblock*) is used for building temporary circuits. It is useful to designers because it allows components to be removed and replaced easily. It is useful to the person who wants to build a circuit to demonstrate its action, then to reuse the components in another circuit. A breadboard consists of plastic block holding a matrix of electrical sockets of a size suitable for gripping thin connecting wire, component wires or the pins of transistors and integrated circuits (ICs). The sockets are connected inside the board, usually in rows of five sockets. A row of five connected sockets is filled in at the top right of the figure. The rows are 2.54 mm apart and the sockets spaced 2.54 mm apart in the rows, which is the correct spacing for the pins of ICs and many other components.

3.DC Motor

A DC motor is an electrical machine that converts electrical energy into mechanical energy. In a DC motor, the input electrical energy is the direct current which is transformed into the mechanical rotation.

4.Micro-Motors and Grippy wheels:.



These are durable **wheels** with rubber **grip**

5.Voltage Regulator,DC /DC Gate driver: The power supply unit of an electronic device converts incoming power into the desired type (AC-DC or DC-AC) and desired voltage/current characteristics. A voltage regulator is a component of the power supply unit that ensures a steady constant voltage supply through all operational conditions. It regulates voltage during power fluctuations and variations in loads. It can regulate AC as well as DC voltages. A voltage regulator usually takes in higher input voltage and emits a lower, more stable output voltage. Their secondary use is also to protect the circuit against voltage spikes that can potentially damage/fry them.

6. L293D Motor driver: The L293D is **designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V**. Both devices are designed to drive inductive loads such as relays, solenoids, DC and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications. L293D IC is a typical Motor Driver IC which **allows the DC motor to drive on any direction**. This IC consists of 16-pins which are used to control a set of two DC motors instantaneously in any direction. It means, by using a L293D IC we can control two DC motors. As well, this IC can drive small and quiet big motors.

7. Bluetooth Low Energy (BLE) module:

A BLE module is **a fully-contained BLE transceiver with controller and built-in antenna that is preprogrammed to handle all a design's radio interactions**. BLE devices are discovered through the broadcasting of advertising packets over 3 separate frequencies to reduce interference. A BLE device sends out a repetitive packet of information over one of three channels with random delays of up to 10 milliseconds. Bluetooth Low Energy (BLE) is a form of wireless communication designed especially for **short-range communication**. BLE is very similar to Wi-Fi in the sense that it allows devices to communicate with each other. However, BLE is meant for situations where battery life is preferred over high data transfer speeds.

8. Connecting cable/ Jumper wires:

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Fairly simple.

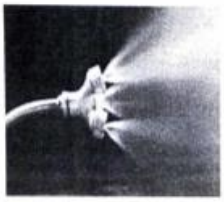
9. HC-05 Bluetooth module:

HC-05 Bluetooth Module is **an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup**. Its communication is via serial communication which makes an easy way to interface with controller or PC.

10.Battery:

A battery can be defined as **an electrochemical device (consisting of one or more electrochemical cells) which can be charged with an electric current and discharged whenever required**. Batteries are usually devices that are made up of multiple electrochemical cells that are connected to external inputs and outputs.

11.Sprayer:



A sprayer is **a device used to spray a liquid**, where sprayers are commonly used for projection of water, weed killers, crop performance materials, pest maintenance chemicals, as well as manufacturing and production line ingredients.

12.Ultrasonic Sensor:

There are many types of **Arduino distance sensors**, but in this project we have used the **HC-SR04** to measure distance in range of 2cm-400cm with an accuracy of 3mm. The sensor module consists of an ultrasonic transmitter, receiver and control circuit. The working principle of ultrasonic sensor is as follows:

1. High level signal is sent for 10us using Trigger.
2. The module sends eight 40 KHz signals automatically, and then detects whether pulse is received or not.
3. If the signal is received, then it is through high level. The time of high duration is the time gap between sending and receiving the signal.

The circuit components required are as follows:-

- Arduino Uno
- DC Motor, 12 V
- Connecting cable/ Jumper wires
- Breadboard
- HC-05 Bluetooth module
- Voltage Regulator, DC/DC Gate Driver
- L293D Motor driver
- Bluetooth Low Energy (BLE) module
- Micro motors and Grippy Wheels
- Battery, 12 V
- Sprayer
- Ultrasonic Sensor

Software:-

- Arduino IDE
- Bluetooth android app

Expected date of completion:- 31 December 2022

Approximate Expenditure: -

Components	Price
Arduino UNO with USB cable	1500/-
Breadboard	120/-
DC Motor, 12 V	220/-
Connecting cable/ Jumper wires	200/-
HC-05 Bluetooth module	700/-
Voltage Regulator, DC/DC Gate Driver	300/-
L293D Motor driver	250/-
Bluetooth Low Energy (BLE) module	230/-
Micro motors and Grippy Wheels	2500/-
Battery, 12 V	500/-
Vehicle Chassis	500/-
Infrared Sensor	400/-
Ultrasonic Sensor	300/-
Sprayer	120/-
Water Tank	200/-
Suction Pump	1000/-
Voice recognisation Kit	3000/-
Total	12,040/-

Applications of Automatic Voice controlled Robotic vehicle using Agricultural Spraying :-

➢ For the insecticides application to control insect pests on crops and in stores, houses, kitchen, poultry farms, barns, etc.

➢ For the fungicides and bactericides application to control the plant diseases.

➢ For the herbicides application, to kill the weeds.

➢ For the harmony sprays application to increase the fruit set or to prevent the premature dropping of fruits.

➢ For the application of plant nutrients as foliar spray.

➢ For applying the powdery formulation of poisonous chemicals on the crops and for any other purposes.

➢ To eliminate the difficulties faced during the use of backpack sprayers such as worker fatigue.

➢ To eliminate the need for manually pumping the sprayer to create pressure.

➢ To make the overall usage of a backpack sprayer easier by mounting it on a vehicle where the rotary motion of the wheels of the vehicle is used to generated required pressure in the pump to spray the pesticides.

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Department Of Electronics and Telecommunication Engineering,
2022-2023

2. ABSTRACT

The aim of this project is to create an intelligent spraying robot that will decrease pesticide use and human health damage, allowing farmers to be protected and labour intensity can be reduced. The robot will have full driving control, spraying mechanism and obstacle avoidance with multi-sensor module integration. The spray robot will be designed, including obstacle avoidance, spraying, and sensor integration simulations and analyses.

The population of the world is increasing rapidly. In order to fulfill their diet needs the production of food must be increased, but this must come at a cost affordable to everyone. Mechanization of agriculture enables conservation of inputs by precision in ensuring better distribution, reducing quantity required for better response or prevention of losses or waste of inputs applied. Mechanization reduces unit costs of production through higher productivity levels and the input conservation. The all agriculture equipment's often are hardly modernized due to its low productivity. In India farming is done by traditional ways, besides that there has been large development of industrial and service sector as compared to that of agriculture sector. The spraying of pesticides and insecticides is traditionally done by farm worker carrying backpack type sprayer which requires more human effort. Giving attention to these important problems an attempt is made to develop an equipment which will be beneficial to the farmer for the spraying operations. This equipment is easy to use and operate. It makes use reciprocating pump that creates the required pressure for the spraying action. This multifunction device will come in handy that can be put to use in different spraying stages of farming as per process requirement.

3. INTRODUCTION

In today's era, smart phones are becoming more powerful with reinforced processors, larger storage capacities, richer entertainment function and more communication methods. When we say voice control, the first term to be considered is Speech Recognition i.e. making the system to understand human voice. Speech recognition is a technology where the system understands the words given through speech. Speech is an ideal method for robotic control and communication. By using speech recognition technology, we can control Agricultural sprayer and controlling system. Voice controlled robotic vehicle which is control by some specified voice commands. The mobile application is capable of identifying seven commands which are "Stop", "Forward", "Back", "Left", "Right", "Start spraying" and "Stop spraying". In this embedded system, we make a robotic vehicle which we can control using voice through a mobile application. Application listens and sends the instruction to the ESP32 Wi-Fi module using mobile Wi-Fi and then ESP32 Wi-Fi module performs the specified operations using voice recognition application.

Agricultural sprayer and controlling robotic vehicle is a project which is supposed to work on agricultural fields. Fertilizers used to kill insects or otherwise control their reproduction. The pesticides, and fertilizers are applied to agricultural crops with the help of a special device known as sprayer. Sprayer provides optimum performance with minimum efforts. By the invention of sprayers, this enables farmers to obtain the maximum agricultural output. A pesticide has to be portable and with an increased tank capacity as well as should result in cost reduction, labour and spraying time. In fertilizer distribution when the ultrasonic sensor will detect plant it will distribute liquid fertilizer to spray on specific plant so that fertilizer will not be wasted.

3.1 Problem statement

On the earth 42% of population is dependent on an occupation of agriculture, they have to do a lot of work and more load on them. Spraying pesticides is one of these jobs that is risky and challenging because the chemicals used in these pesticide liquids are hazardous. It may cause breathing difficulties as well as other physical issues. As a result, our motive is to create an Automatic Voice Controlled Robotic Vehicle for Agricultural Spraying that assists farmers in pesticide spraying by using Robotic Vehicle to reduce the manual labor.

3.2 Objectives

To provide safety to the farmers and the main objective of this work is to provide precision farming. Here, Robots will be replacing laborers for the farm activities like detection of pests, spraying of pesticides/fertilizers etc. whose operations will be automated or can be controlled by the farmer.

3.3 Scope

This type of robot has a bright future because it is very useful in agriculture and reduces workload. It saves time and money by reducing the amount of pesticide liquid that needs to be sprayed. It will assist farmers in working in any season and under any conditions. It would lessen the risk of various breathing and physical problems for farmers. It can be built to grab and analyze data of the farming field and to do pre-defined tasks autonomously. Additional use of renewable resources, such as wind energy, will also help reduce the need for more batteries. Usage of voice controlled navigation for robotic movements can be used.

3.4 Methodology

How the data will be collected or generated?

• The data will be generated by sending a voice signal through Mobile device via Wi-Fi module.

And, how it will be analyzed?

• It will be analized by the people who will be operating it from the far distance.

4. LITERATURE REVIEW

1]Development of IoT Enabled Voice Controlled Robot Using Arduino May 2021 Authors: Suwarna Gothane (CMR Technical Campus)

Internet of Things allows computing devices, sensor, power-driven and digital technologies, things, creatures or persons to transmit information over a setup without requiring direct human resources interface. In this paper, we developed voice control robotic car using Arduino. The proposed system is designed based on micro controller connected to smart phone through Bluetooth device. The micro controller used here is an Arduino Uno. The Bluetooth module is used for receiving the voice commands. Commands are processed, and speech-to-text conversion is done within the app using Google's speech-recognition technology. After receiving the voice command data, the robot responses to the command by performing movement to the specified direction.

2]Voice Controlled Robotic Vehicle Dipesh Diwakar, Ashok Choudhary, Ashu Singh, Prof Nazish Fatima

Worldwide investment in industrial robots up 19% in 2003. In first half of 2004, orders robots were up another 18% to the highest level ever recorded. Worldwide growth in the period 2004-2007 forecast at an average annual rate of about 7%. Over 600,000 household robots in use – several millions in the next few years. UNECE issues its 2004 World Robotics survey We refer the navigation system from ARDUINO BASED VOICE CONTROLLED ROBOT and author of K.Kannan and Dr. J Selvakumar. They are defining the modes of speaking Robot. There are generally three modes of speaking, including: Isolated word (or phrase) mode: In which the user speaks individual words (or phrases) drawn from a specified vocabulary.

- Connected word mode: In which the user speaks fluent speech consisting entirely of words from a specified vocabulary (e.g., telephone numbers).
- Continuous speech mode: In which the user can speak fluently from a large (often unlimited) vocabulary.

3]ANDROID CONTROLLED ARDUINO BASED VOICE CONTROL ROBOT
Archana Ashok Gajare1, Amruta Anil Chandawale2, Priyanka Dhanaji Agalave3, Pallavi

Prabhakar Gurav 4, Tejaswini Ravindra Patil

M Saravanan, B Selvababu, Anandhu Jayan, Angith Anand, and Aswin Raj, “Arduino Based Voice Controlled Robot Vehicle” [1], The project was developed in such a way that the robot would be controlled by voice commands. The Android application with microcontroller is used for essential functions. The connection between the Android app and the vehicle is facilitated with Bluetooth technology. The robot is controlled by a button on the application or by the user's spoken command. The movement of the robot is facilitated by two DC servo motorsconnected by a microcontroller to the side of the receiver. The command in the application is converted into a digital signal for the right range (about 100 meters) in a robot via a Bluetooth RF transmitter. At the end of the receiver the data is decoded by the receiver and delivered to the microcontroller which drives the DC motors for the required work. The purpose of a voice controlled robotic vehicle is to perform the required functions by listening to the user's commands. A pre-preparation session is required for easy operation of the robot by the user. The same code is used to notify the controller.

4]VOICE CONTROLLED ROBOT USING ARDUINO WITH GPS SHAIK SAMIYUDDIN, REVALLA TEJESWI KUMAR, MANGALI HARI KRISHNA, JAMMULA SUJENDRA 1234 UG STUDENT DEPARTMENT OF ECE DR.K.V.SUBBA REDDY INSTITUTE OF TECHNOLOGY,KURNOOL.

Earlier the robots were controlled through wired networks but now to make robot more users friendly, they are framed to make user commanded work. There are no distance limitation issues in this project. The robot is capable to work everywhere where there is a wireless connection. This project can be used for security purposes where we need to get information about some suspicious area/people. We can do this by sitting at a far secure place and safely devise a plan to tackle their activities It acquires image from cameras through a web browser. The robot contains a PC with a web server. It receives real-time uploaded image from cameras.

5]Voice Automated Mobile Robot R. Jain, S. Saxena Published 28 February 2011 Computer Science International Journal of Computer Applications

This paper elucidates the research and implementation of voice automated mobile robot. The robot is controlled through connected speech input. The language input allows a user to interact with the robot which is familiar to most of the people. The advantages of speech activated robots are hands-free and fast data input operations. In future, it is expected that speech recognition systems will be used as man-machine interface for robots in rehabilitation, entertainment etc. In view of this, aforementioned system is a source of learning process for a mobile robot which takes speech input as commands and performs some navigation task through a distinct man- machine interaction with the application of the learning.

6] "Robot Control Design Using Android Smartphone" by Mrumal.K.Pathak, Javed Khan, Aarushi Koul, Reshma Kalane, Raunak Varshney

This paper explains the controlling of robot through phone adopting Bluetooth technology and some of its features, mobile component and robot. The solutions derived are very much comfortable and they act as platform for robot building. The cost is very less, computation speed and sensing of the control device, smartphone are good The paper aims to provide simple robot hardware architecture with sophisticated android domain which is powerful enough.

7] "Smart Phone Controlled Robot Using ATMEGA328 Microcontroller " by Aniket R. Yeole, Sapana M. Bramhankar,Monali D. Wani, Mukesh P. Mahajan

The paper is about robot designing making use of the application of android phone. In this paper, the direction of the robot and what is the distance of the robot from the obstacle will be communicated. This information shared through phone through Bluetooth. The control commands are sent incorporating features like motor speed control and sensing the data.

8] "Android Mobile Phone Controlled Bluetooth Robot Using 8051 Microcontroller" by Ritika Pahuja, Naren.

A robot can be defined as electro-mechanical machine governed by programming computer and electronic hardware. Robots are been used in factories all over the world in the Manufacturing units. In this paper, motion of the robot is controlled by the buttons of the android application. Bluetooth module is used for interfacing of smartphone and the controller. This is done through the help of UART protocol.

9] "Robot Controlled Car Using Wi-Fi Module" by S R Madkar, Vipul Mehta, Nitin Bhuwania, Maitri Parida

In this paper, robot controlled car designed in android application making use of Wi-Fi in the smartphone. The devices can be controlled even though android phone is not physically present through the SMS. In this project, inclusion of spy camera using which live videos can be streamed to the user making use of Wi-Fi. Instead of using normal lithium ion battery, this project makes use of solar cells leading to energy efficiency.

10] "Implementation and Testing of Voice Control in a Mobile Robot for Navigation" by Sudeep Sharan, Trung Quoc Nguyen, Peter Nauth1 and RuiAraujo

This paper is about integration of a voice control software system done for the robot mobile system named as ROSWITHA.The integration is with the SLAM algorithm of Robotic Operating Systems The robot is also been controlled in numerous ways through the development of Graphical User Interface (GUI). There are many tabs for controlling like to start the navigation on the map which may be created or available , for the detection of voice, in order to enter the location to which we are intended to go and for the immediate stopping of the system in emergency. In real time and in numerous environments, and with differentiation in the speaker, the experimentation and testing is carried out. This is done to improve the accuracy of the designed system.

11] "A Voice Command Detection system for controlling Movement of SCOUT Robot" by S. Azargoshasb, A. H. Korayem, Sh. Tabibian.

The robot termed as SCOUT robot is controlled through the detection system using voice commands. Hidden Markov model is used for the implementation of the detection system for the transmission of voice commands. A database for speech is created incorporating needed commands. The database is non-nativeand it has different commands like ready, left, right, stop, forward, backward, fast, slow and go. Twenty Persian language speakers have uttered each of the command. Among them ten are male and ten are female. On the basis of HMM, the detection of voice commands done. The Bluetooth is used for the transmission of detected command to the robot. The evaluation results of the designed system shows the performance improvement in the interaction of human and robot.

12] "Design and Implementation of a Voice Controlled Robot with Human Interaction Ability" by Humayun Rashid, Iftekhar Uddin Ahmed, Sayed Bin Osman, Qader Newaz, Md. Rasheduzzaman and S M Taslim Reza.

The system of design involves microcontroller connected to the smart phone through Bluetooth module for the transmission and reception of the commands in voice mode. The movement of the robot can be controlled through the transmission of the voice command which is converted to text using the app of the smartphone and for transmission of data to the microcontroller. The data reception is followed by the responses of the robot which are given corresponding to the voice commands. Voice commands are used to make specified movement in the specified direction. The talking system of the robot is developed with the SD card consisting of pre-recoded human voice. This audio file is then made use in talking system of the robot. The robot will speak the sentences , will operate based on the instruction after receiving each of the commands from the device.

13] "Voice Control Robot Using Android Application" , by Soniya Zope, Preeti Muluk, Rupali Mohite, Aishwarya Lanke, Megha Bamankar.

Controlling the robotic device or vehicle through the voice commands and remote operation control in the manual method is designed in the project. The microcontroller ATMEGA32 and Bluetooth device is used incorporating interfacing of control unit and sense the signals which will be sent by the android app. The Android app sends the serial data received from the Bluetooth module which is interfaced to the ATMEGA32. The paper deliberates the controlling of robot car making use of Wi- Fi module and android application of the smartphone.

14] International Research Journal of Engineering and Technology (IRJET) Robot Controlled Car Using Voice and Wi-Fi Module Sowmya B J, Supriya M [Aug 2021]

In this Paper, Arduino microcontroller is used in our design of the robot .The reason for the usage of the Arduino microcontroller is due to its features which are multifaceted with many advantages on the basis of ESP32.Physical computation is incorporated with the platform of open source. The SPI which is the general communication platform together with Bluetooth are been used in designing the system. The radio waves are used by Bluetooth and safely, consuming very less power and doing the connection of device , enabling exchange of data

between the devices and without the usage of physical wires and cables. SPI interface , used for interaction with one or greater than one peripheral components rapidly in the limited region is the synchronous serial data process communicator used by microcontrollers. The two basic applications of robot are performing voice controlled action and manually controlling the robot using an application called BLYNK it is an android application where we can develop the interface according to the user requirements.

15] M Saravanan developed "Arduino Based Voice Controlled Robot Vehicle" (October 2020)

The main goal of this device is to create a robot vehicle that can be powered by a person's voice order. These systems are commonly referred to as Speech Controlled Automation Systems (SCAS). The abovementioned device is a prototype of our design. The concept is to build a robot that will be controlled by voice commands. A cell phone is used to operate the robot; there are several articles that demonstrate the contact between a robot and a smart phone. For remotely automating the robot, a smart phone is an excellent interface. It has a lot of functionality that can be useful. The specified task is carried out in this design using an android application and a microcontroller. Bluetooth technology facilitates communication between the software and the robot. The module will receive the commands that are sent over the channel. The aim of a voice-controlled robotic vehicle (VCRV) is for it to listen to and respond to the user's commands.

16] H. Jagadish Kumar wrote "Voice Controlled Car using Arduino and Bluetooth Module" (December 2019).

The objective of this report is to build a voice-activated car that reacts speech commands. Enhancements in the areas of disturbance and range handling are, nevertheless, needed. Simple voice commands such as left, right, forward, back, and stop are used to navigate the vehicle. These signals are sent to the Bluetooth module by an Android application. A Bluetooth module and a control device are used to record and analyse the voice input. In this suggested method, they conducted research on the different control type configurations for robots. It shows that real-world manuscripts can be effectively researched and replicated using only speech (human voice) as a means of control. The aim of this lookup is to develop a basic robotic hardware

implementation so that this structure can concentrate on Bluetooth smart grids. When the app is running, a transmitter on the smartphone is used to identify user voice commands. The app characterizes commands and translates voice to text using Google's speech-recognition technology. The text would then be transmitted through Bluetooth to the receiver component.

17] Aditya Chaudhry implemented "Arduino based voicecontrolled Robot" (June 2019)

This research paper proposes a method that focuses on the idea of controlling a robot with a voice signal. The voice control robot is merely an example of how to control the movements of a simple robot using common voice commands. In this system they have used ATmega3898P It's a microcontroller on a single chip. It has an 8-bit RISC processor core based on Harvard architecture. To monitor a robotic vehicle with our voice, we used a very reliable interface. First, all user signals are converted to script using Google's speech to text converter, that is built into the app. The command's text form will be sent to the robotic car's Bluetooth module. This Bluetooth module enables the car's microcontroller to the Android app for transmitting data. Whenthe micro-controller receives the text signal, it directs the robotic car to drive in the appropriate direction**.**

18] Parichart Leechor wrote "Operation of a Radio-Controlled Car by Voice Commands" (March 2010)

The purpose of this research is to drive a radio-controlled car via voice commands (RC car). The experiment involved sending a user's voice commands to a device, which then converted them into digital data. Thereafter, the data output was converted into radio signal commands. Finally, an RC car was functioned using radio wave commands. The first feature is voice command recognition, for that they have adopted the Hidden Markov Model (HMM), which is one of multiple voice recognition technologies. The second part is the hardware, which involves a system dual port and RC car communication. To commence, we use signal processing theory to convert the human voice into a system digital signal. After that, the digital signal is converted to radio waves and used to power an RC vehicle.

19] Vipul Mehta gave "Robot Controlled Car Using Wi-Fi Module" (May 2016)

In this review, we'll glance at using a WiFi module and an Android phone program to command

a robotcontrolled vehicle. We'll also demonstrate how to operate the appliances without an Android phone by sending a regular SMS. The aim of this paper is to show how to operate a robotcontrolled vehicle using a Wi-Fi module and an Android Smart Phone application. It also demonstrates that the devices can be operated by sending a regular SMS even if the user does not have an Android phone. This role can be easily modified to include a covert agent camera that streams the recordings to the client through Wi-Fi. Instead of the usual lithium-ion battery, the venture would use sunlight-based batteries.

20] Mrumal.K. Pathak wrote "Robot Control Design Using Android Smartphone" (February 2015)

The objective of this project is to build a robot which can be powered by an Android phone. An Android phone is used to command the robot using Bluetooth. In this design, the Android phone works as a remote control for the Robot. The overall system is connected to a microcontroller. Bluetooth module and DC motors are interfaced to the microcontroller. The Bluetooth module sends the information from the Android phone to the controller. The controller is in charge of the robot's DC motors. In order to execute the project, the controller is loaded with a programming language in the Embedded "C" language. The goal of this article is to develop exceptional functional android stages using less complex and confusing robot equipment. This paper describes how to monitor a robot with a handheld using Bluetooth communication, as well as some of the core concepts of Bluetooth technology and the compact and robot segments. It shows an analysis of robots enabled by a smartphone by moving the robot forward, backward, left, and right with an Android software like Micro controller or Bluetooth.

21] Shubh Srivastava contributed "Voice controlled robot car using Arduino" (May 2020)

The project's goal is to build a voice-controlled robotic car. Arduino microcontroller, motor drivers, and a Bluetooth module are used to power the device. Arduino is a piece of open-source hardware that can be used to create digital gadgets. A Bluetooth module is used to capture and read voice commands, allowing the control unit to communicate with the Bluetooth device. The controlling remote is a Bluetooth-enabled smart android smartphone. It is given a simple voice activated robotic vehicle. It constitutes of a mobile device that accepts voice commands and transmits them through Bluetooth to the Bluetooth module HC05. At a certain point, the module

transfers the order to information, and the character sequence is sent to the Arduino for processing. As a method of decoding the string, the Arduino microcontroller implements additional tasks. The commands are sent to the generator, which powers and drives the attached motors.

22] "Agriculture robotic vehicle based pesticide sprayer with efficiency optimization"

This paper deals with explanation of how robotics are often applied to different fields of agriculture. The foremost important occupations in a developing country like India is agriculture. It's important to boost the effectiveness and productivity of agriculture by swapping laborers with intelligent machines like robots using new technologies. The paper proposes a brand new strategy to interchange humans in various agricultural operations like detection of presence of pests, spraying of pesticides, spraying of fertilizers, etc. there by providing safety to the farmers and precision agriculture. The developed system involves developing a prototype which uses simple cost effective elements like microprocessors, wireless camera, different motors and terminal elements which helps the farmers in different crop field activities.

23] "Agricultural robotics, unmanned robotic service units in agricultural tasks"

The usage of agricultural appliances into precision agriculture has accomplished a rise in investment and exploration because of the utilization of robotics applications within the machinery development and task executions. Precision autonomous farming is that the functioning, counselling, and control of autonomous machines to hold out agricultural tasks. It inspires agricultural robotics. It's expected that, within the near future, autonomous vehicles are at the guts of all precision agriculture applications. The goal of agricultural robotics is over just the appliance of robotics technologies to agriculture. Nowadays, most of the automated agricultural appliances used for weed spotting, agrochemical dispersal, terrain levelling, irrigation, etc. are human controlled. An autonomous execution of such vehicles can give the continual supervision of the farm, because information related to the environment is autonomously acquired, and therefore the vehicle can then perform its task accordingly.

24] "An advance air-induced-assisted electrostatic nozzle with enhanced performance"

There is an important need of latest chemical implementation sprayer for tiny scale farmlands

in Indian agricultural pesticides spraying. A replacement air-assisted electrostatic nozzle has been designed and developed for tiny scale farms with a selected specialise in Indian agricultural and rural developing economies. Air-assisted based electrostatic nozzle combines of an induction depend electrostatic charging system and airassisted nozzle. Spray particles are electrified to over 10 mC/kg charge-by-mass proportion by charging voltage minimum to 2.5 kV at liquid flow of 150 ml/min and power consumption minimum to 75 mW. Greater charge-to-mass ratio guaranteed the long range spraying distance to beat the charge neutralization process by recombination of naturally occurring ions present within the environment and charged liquid droplets. The outcomes of applied induction electrification process were identified by a charge-to-mass ratio and also the outcomes are in nice accordance with the theoretical matters. There is 2–3 times rise of liquid discharge with better equivalence on the hidden along with front target. This nozzle is low weight, extremely efficient, decreases pesticide usage and human health risks, and is eco-friendly.

25] "Review of electrostatic system parameters, charged droplets characteristics and substrate impact behaviour from pesticides spraying"

Electrostatic spraying application is adopted in crop protection to forestall pest infestation, to boost product quality and to maximise yield. It involves a superposition of charges to pesticide spray droplets to draw in substrate ions at obscured surfaces. The droplets wraparound effect decreases off-course deposition, enhances on-course spray and invariably improves spray efficiency. Electrostatic spraying system functions productively at ideal parameters together with charging voltages, application pressures, spraying height regimes, flow rate, travel speed, electrode material, and nozzle orientation. Many groups of system parameter settings are systematically utilized by scientists for electrostatic application, yet there are unsure specific optimum parameters groups for pesticide spraying. Since droplets chargeability effects the efficacy of the electrostatic spraying process, the specifications that generate optimum charge by mass ratio decide the functionality of spraying deposition, retention and surface coverage. This paper, hence, examines electrostatic system parameters which generate suitably charged droplets attributes for successful impacting behaviour of pesticides on the substrates. Increasing applied voltages accordingly increases charge-by-mass ratio to ideal and starts decreasing beyond more increase in voltages beyond a juncture. This paper further proposes the choice of an ideal electrostatic parameters combination which gives best droplets chargeability in the

pesticide application. Also, it's necessary to research the charge characteristics of the substrates before pesticide application so as to superpose the proper opposite charge on the spray droplets at burst time during electrostatic spraying system.

26] Pesticide spraying

With flourishing technology that is introduced in this 21st century, there is numerous types of robots been used in agricultural activity starting from the cultivation process to the production process. The autonomous robot had been introduced in various application such is in underwater, rescue, line following robot based on metal detection. In agriculture field, the usage of robotics in agriculture operation able to help to increase the production process and improve efficiency. One of the types of the robot used in agriculture is for the purpose of pesticide spraying with the ability to navigate in the farm, recognize the target and regulate the spraying mechanism. The use of autonomous robot pesticide sprayer as the substitution of the worker who used conventional pesticide sprayer can be applicable. Besides, the demand for the agriculture robot also stimulates the consciousness of how important its role in the current and future generations. The survey conducted shows that the demand for robots and drones in agriculture will be expected to be rose from 2018 to 2038. Hence, the usage of the autonomous robot is assumed to rise thus replacing the current labor worker. This granular20 years market forecast covers all the aspect of the agricultural robots and drones for 16 market categories with the expectation by the end of 2038, market of the robots and drones in these categories is predicted will close to 35 billion with the viable technology and ongoing market demand by considering its technology and application. Nevertheless, the common problem with an autonomous robot use in agricultural activity is the navigation method used to able the robot fully-operated with decision making capability. In order to navigate through all the field, there are some research has been done. It can be done through infrastructure ready or to be without infrastructure. Some research on RFID based navigation are conducted to be implemented as navigation tools. As artificial intelligence (AI) starts to emerge, the current robot should be able to navigate the next movement by the adaptation of the surrounding environment and decide which path it will take. The typical method used in the detection is based on the targeted object orientation or repelled signal emits from the sensor itself then calculates the distance in between it. Other than that, there is also the robot that uses the vision observation then accumulates all the acquired data to generate the data fusion that enables the robot to navigate itself through the

farm. The second problem with the agricultural robot is due to the dissemination of the pesticide to the crops. Unregulated spraying during the disposition of the pesticide to the crop can lead to the low rate of coverage on leaves, wastage of pesticide and hazardous exposure to workers due to disperse pesticide to the desired target. With regulated spraying by the pump, the higher coverage of dissemination to the crops can be achieved whereby the positioning of each crop was varied from one another in the farm. Furthermore, instead of hiring the workers to do miscellaneous work on the farm which can affect themselves, it can be done by an autonomous agriculture robot thus save the expenses on the labor worker. Lastly, the designed robot used in agriculture having the difference performance index depends on the variable they want to achieve. Certain researchers may focus on UAV based pesticide spraying, localization and motion control of agriculture mobile robot, pest image identification and else. This also same goes to the type of the plant being used as the target which differs from one another in terms of size, leaves density and height. Hence, it would be difficult to decide which designed robot was most successful at the time being. In this research, the aim of this study is to design and develop an autonomous pesticide sprayer for the chili fertigation system. Then, this study intends to implement a flexible sprayer arm to spray the pesticide under the crop's leaves, respectively. This study involves the development of unmanned pesticide sprayer that can be mobilized autonomously. It is because the pesticide is a hazardous component that can be affected human health in the future if it exposed during manual spraying method especially in a closed area such as in the greenhouse. The flexible sprayer boom also can be flexibly controlled in the greenhouse and outdoor environment such as open space farms. It is expected to have a successful pesticide management system in the fertigation-based farm by using the autonomous pesticide sprayer robot.

5. DETAILED DESIGNS

5.1 Block Diagram

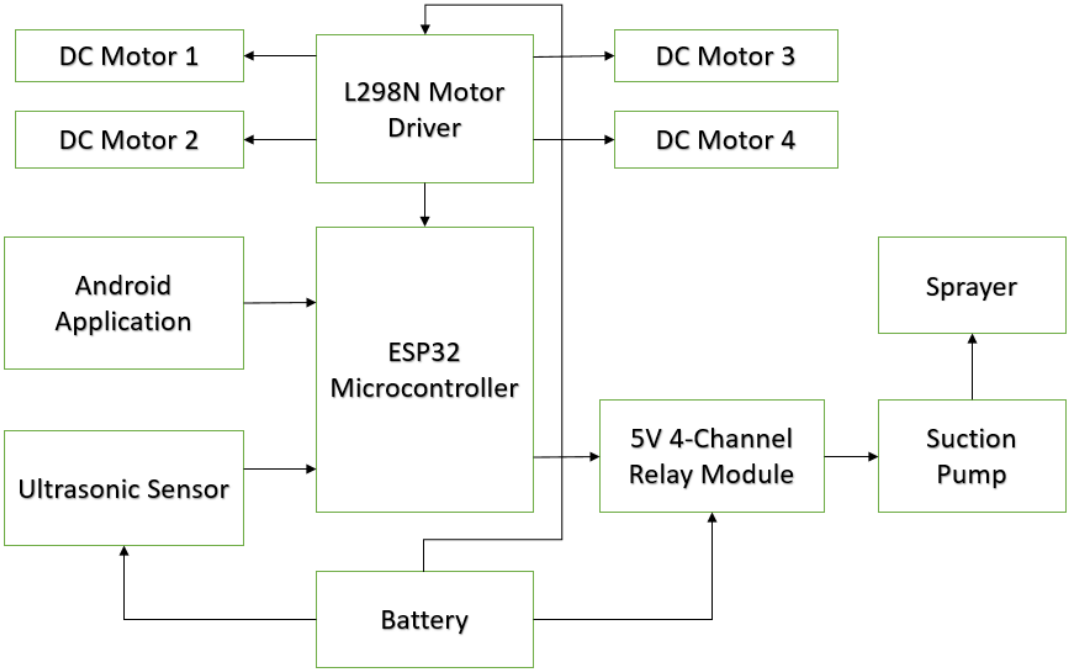


Figure 5.1.1: Block Diagram of Proposed Work

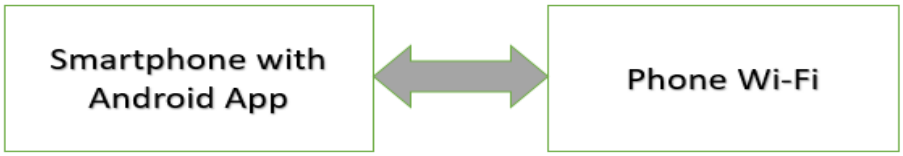


Figure 5.1.2: Transmitter Section

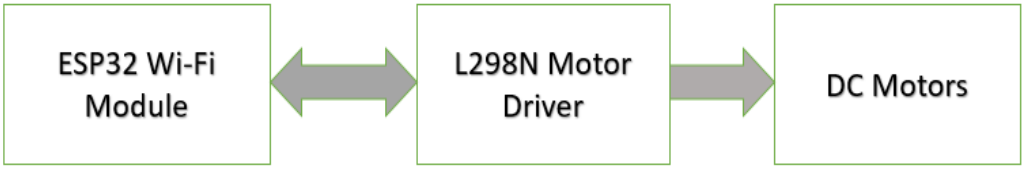


Figure 5.1.3: Receiver Section

5.2 Component Description

1. Breadboard

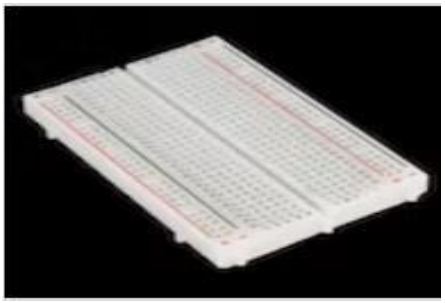


Figure 5.2.1: Breadboard

A breadboard (sometimes called a *plugblock*) is used for building temporary circuits. It is useful to designers because it allows components to be removed and replaced easily. It is useful to the person who wants to build a circuit to demonstrate its action, then to reuse the components in another circuit. A breadboard consists of plastic block holding a matrix of electrical sockets of a size suitable for gripping thin connecting wire, component wires or the pins of transistors and integrated circuits (ICs). The sockets are connected inside the board, usually in rows of five sockets. A row of five connected sockets is filled in at the top right of the figure. The rows are 2.54 mm apart and the sockets spaced 2.54 mm apart in the rows, which is the correct spacing for the pins of ICs and many other components.

2. 12V DC Motors

Figure 5.2.2: 12V DC Motor

A DC motor is an electrical machine that converts electrical energy into mechanical energy. In a DC motor, the input electrical energy is the direct current which is transformed into the mechanical rotation.

3. Wheels

Figure 5.2.3: Wheels

These are durable wheels with rubber grip.

4. Jumper wires

Figure 5.2.4: Jumper wires

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Fairly simple. Jumper wires typically come in three versions: male-to-male, male-to-female and female-to-female. The difference between each is in the end point of the wire. Male ends have a pin protruding and can plug into things, while female ends do not and are used to plug things into. Male-to-male jumper wires are the most common and what you likely will use most often. When connecting two ports on a breadboard, a male-to-male wire is what you'll need.

5. Ultrasonic Sensor

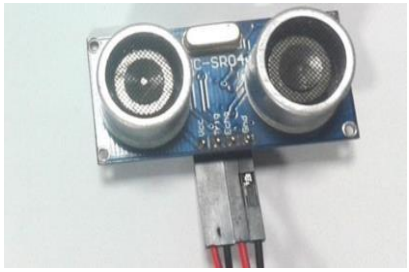


Figure 5.2.5: HC-SR04 Ultrasonic Sensor

There are many types of Arduino distance sensors, but in this project we have used the HC-SR04 to measure distance in range of 2cm 400cm with an accuracy of 3mm. The sensor module consists of an ultrasonic transmitter, receiver and control circuit. The working principle of ultrasonic sensor is as follows:

1. High level signal is sent for 10us using Trigger.
2. The module sends eight 40 KHz signals automatically, and then detects whether pulse is received or not.
3. If the signal is received, then it is through high level. The time of high duration is the time gap between sending and receiving the signal.

6. Sprayer

Figure 5.2.6: Sprayer

A sprayer is a device used to spray a liquid, where sprayers are commonly used for projection of water, weed killers, crop performance materials, pest maintenance chemicals, as well as manufacturing and production line ingredients.

7. Battery

Figure 5.2.7: Battery

A battery can be defined as an electrochemical device (consisting of one or more electrochemical cells) which can be charged with an electric current and discharged whenever required. Batteries are usually devices that are made up of multiple electrochemical cells that are connected to external inputs and outputs.

8. L298N Motor driver

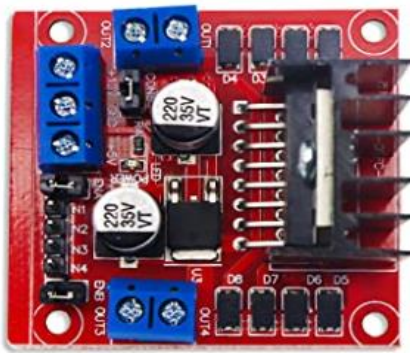


Figure 5.2.8: L298N Motor driver

The L298N 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. On the other hand, for controlling the rotation direction, we just need to inverse the direction of the current flow through the motor, and the most common method of doing that is by using an H-Bridge. An H-Bridge circuit contains four switching elements, transistors or MOSFETs, with the motor at the center forming an

H-like configuration. By activating two particular switches at the same time we can change the direction of the current flow, thus change the rotation direction of the motor. So if we combine these two methods, the PWM and the H-Bridge, we can have a complete control over the DC motor. There are many DC motor drivers that have these features and the L298N is one of them.

9. ESP32

Figure 5.2.9: ESP32

ESP32 is a series of low-cost, low-power system on a chip microcontrollers with integrated Wi-Fi and dual-mode Bluetooth. The ESP32 series employs either a Tensilica Xtensa LX6 microprocessor in both dual-core and single-core variations, Xtensa LX7 dual-core microprocessor or a RISC V microprocessor and includes built-in antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power-management modules. ESP32 is created and developed by Espressif Systems, a Shanghai-based Chinese company, and is manufactured by TSMC using their 40 nm process.[2] It is a successor to the ESP8266 microcontroller.

10. 5V 4 Channel Relay Module

Figure 5.2.10: 5V 4 Channel Relay Module

This relay module is 5v active low. Low active means relay will get trigger when low voltage/signal supplied to in pin. This is a 5v 4-channel relay interface board, be able to

control various appliances, and other equipments with large current. It can be controlled directly by microcontroller (arduino, 8051, avr, pic, dsp, arm, arm, msp430, TTL logic). 5v 4-channel relay interface board, and each one needs 15-20ma driver current equiped with high-current relay, AC 250v 10a DC30v 10a the 8550 transistor drive, drive ability working voltage 5 v.

11. Zero PCB

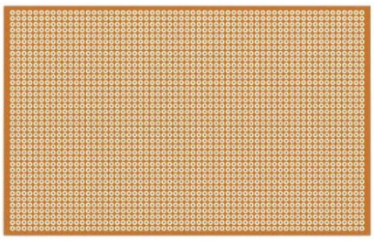


Figure 5.2.11: Zero PCB

Zero PCB is basically a general-purpose printed circuit board (PCB), also known as perfboard or DOT PCB. It is a thin rigid copper sheet with holes pre-drilled at standard intervals across a grid with 2.54mm (0.1-inch) spacing between holes. Each hole is encircled by a round or square copper pad so that component lead can be inserted into the hole and soldered around the pad without short-circuiting the nearby pads and other leads. For connecting the lead of component with another lead, solder these together or join these using a suitable conducting wire.

5.3 Circuit Diagram

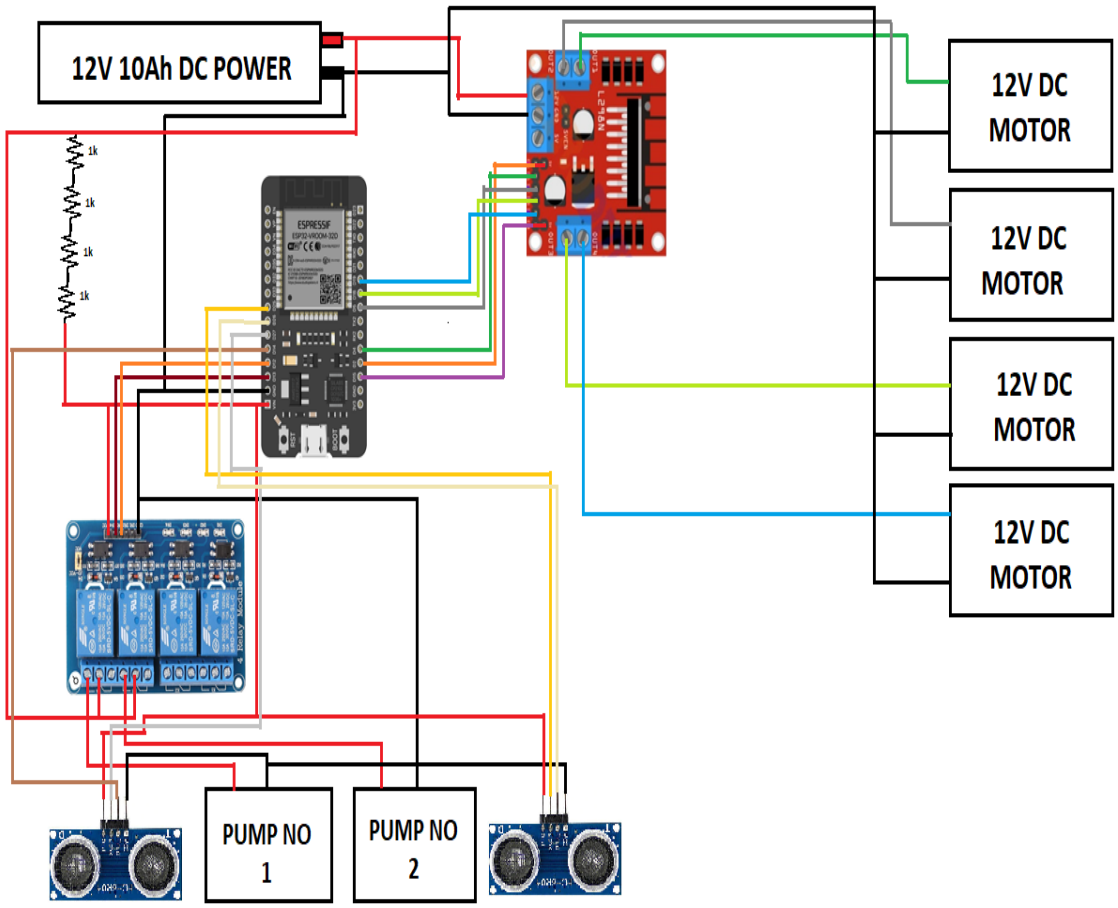
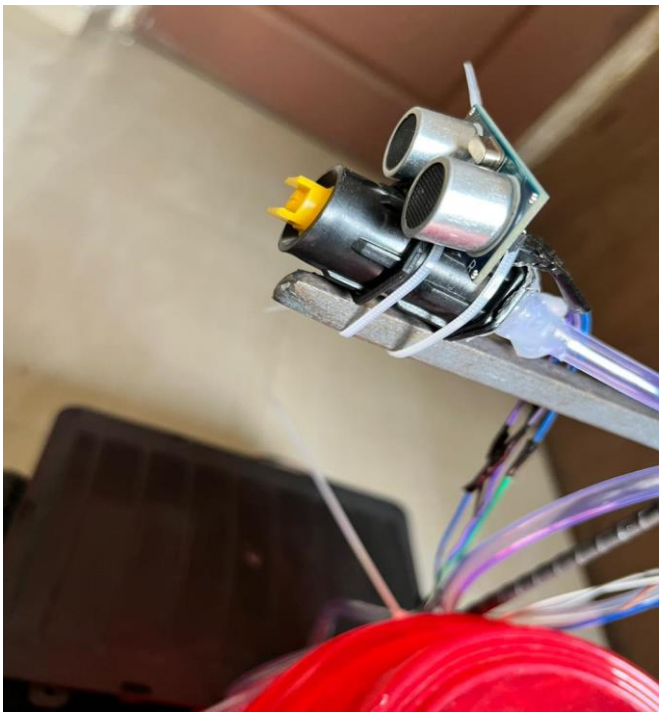


Figure 5.3.1: Circuit Diagram of proposed work

6. HARDWARE IMPLEMENTATION

6.1 Spraying mechanism



Left Side Sprayer with HC-SR04 Ultrasonic sensor for detection of crop to decide start or stop spraying mechanism.

Figure 6.1.1: Left sprayer with HC-SR04 sensor

Right Side Sprayer with HC-SR04 Ultrasonic sensor for detection of crop to decide start or stop spraying mechanism.

Figure 6.1.2: Right sprayer with HC-SR04 sensor

6.2 Vehicle design

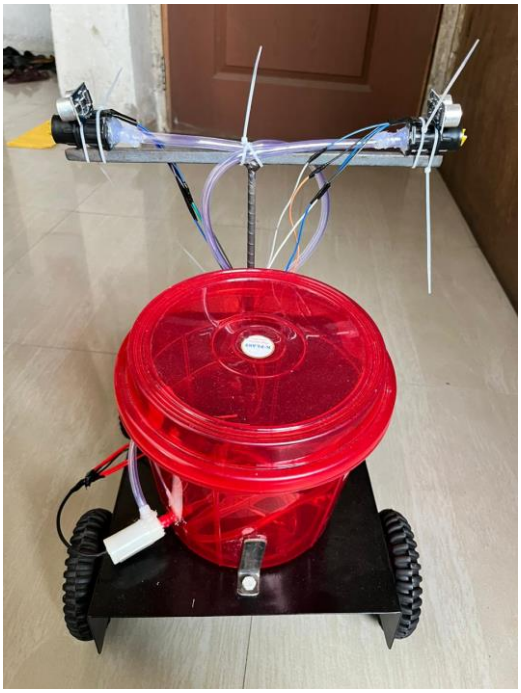


Figure 6.2.1: Top view of Vehicle

Figure 6.2.2: Side view of Vehicle

7. SOFTWARE IMPLEMENTATION

7.1 ARDUINO IDE (Integrated Development Environment) and MIT Inventor app for controlling robot using voice commands

It is used to write the code and for uploading on the ESP32 Microcontroller. The program is written in C language.

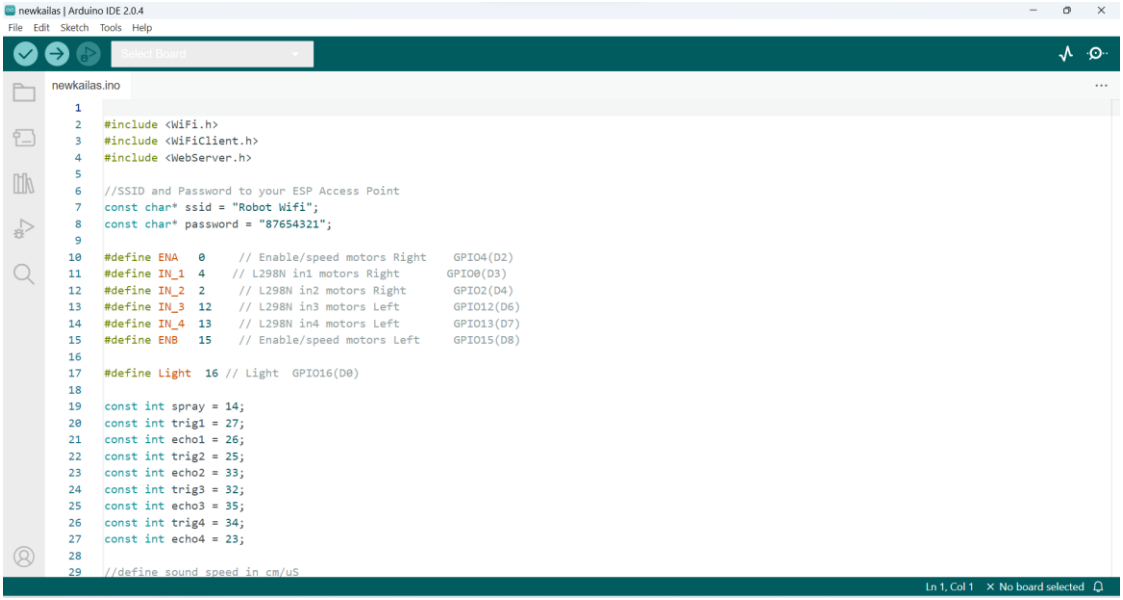


Figure 7.1.1: Arduino IDE code writing page

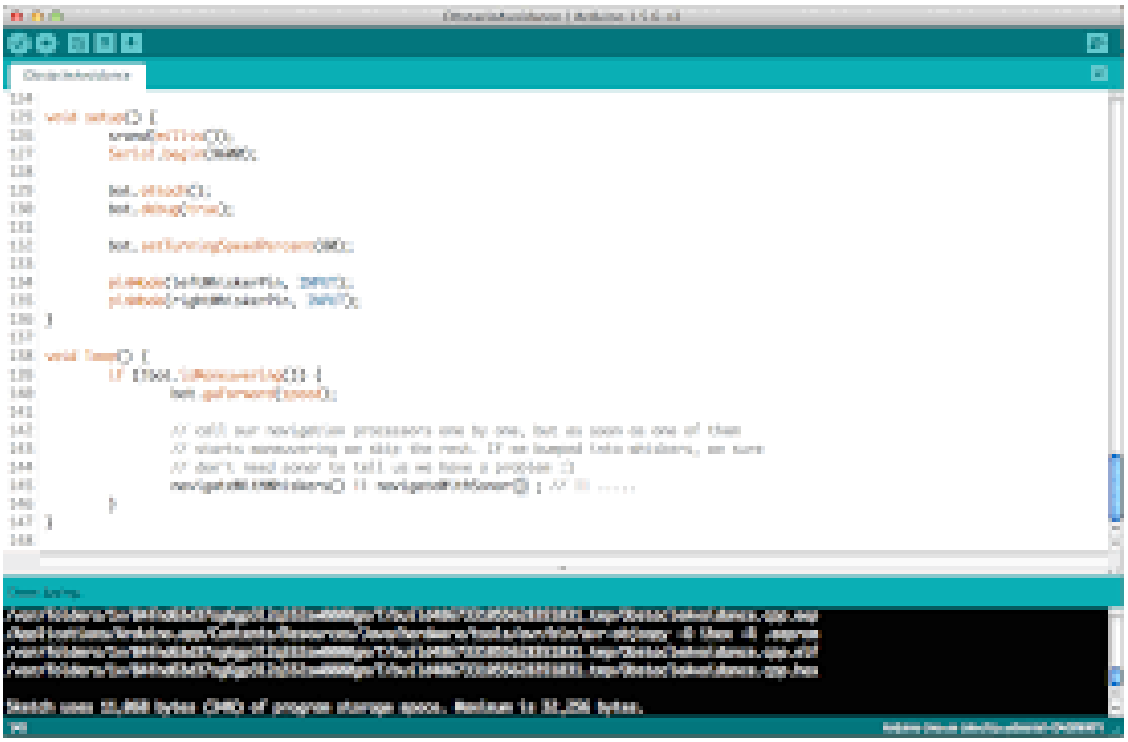


Figure 7.1.2: Compile code before upload on ESP32

MIT App:

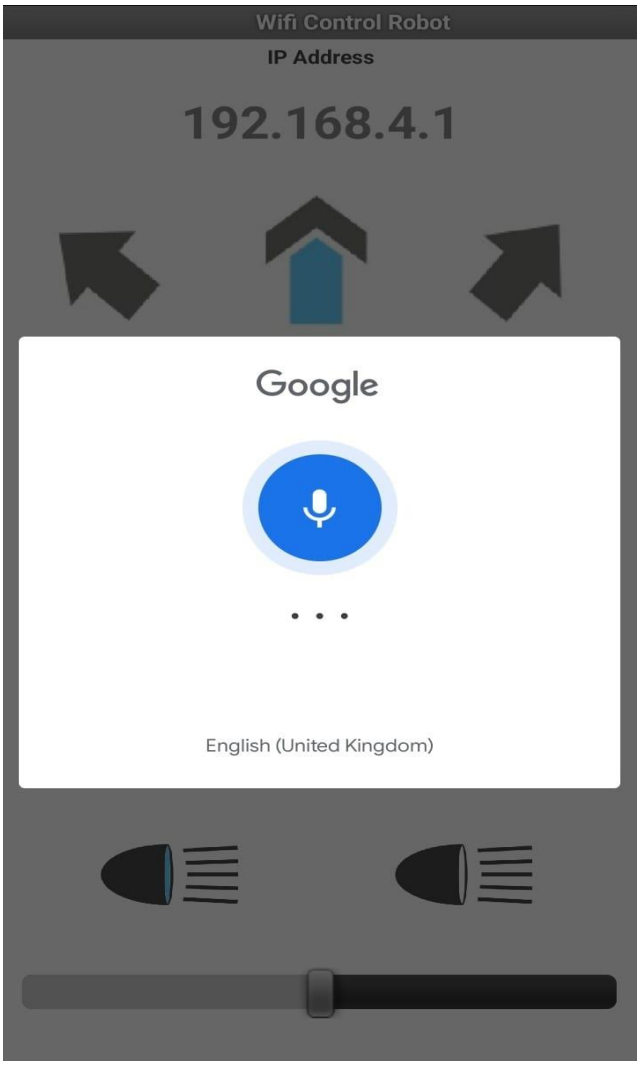


Figure 7.1.3: MIT App For Voice Control

This app is used for control robotic vehicle and spraying mechanism. Voice commands are listen by this app and it will convert commands in text i.e. speech to text conversion is done by this app. Output is pass via Wi-Fi to ESP32 were code is stored it checks command and perform operations accordingly.

7.2 Flow chart

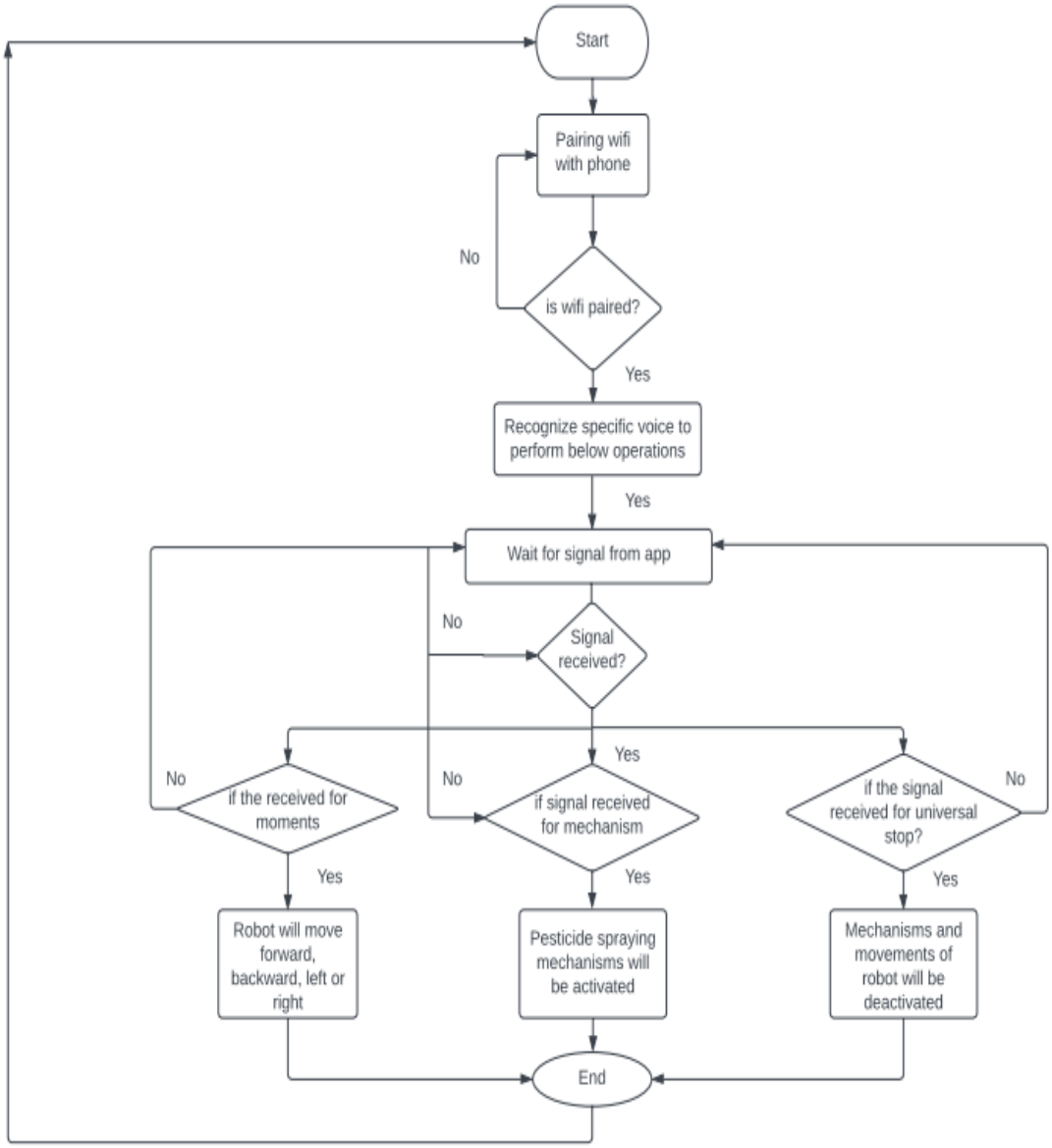


Figure 7.2.1: Flow Chart Of Proposed Work

8. RESULT

This agriculture vehicle proves to be an effective and efficient machine which can be easily navigated and controlled. The robot can traverse a variety of terrains and soils. The android application is used to control the robot's movement as well as spray pesticides. As a result, the robot's control is simple, and farmers can easily operate this intelligent vehicle. The application was build by using MIT app Inventor. This robot focuses on farmers spraying pesticides from a distance without coming into direct contact with them. Because the task's complexity is reduced and the manned task is converted to an unmanned task, this feature would encourage more people to take up agriculture.

Figure 8.1: Group photograph with Guide

9. ADVANTAGES

- Reducing direct Exposure to pesticides and the human body and improve production efficiency.
- They can operate with closer tolerances.
- They produce fewer errors and at higher speeds, and the machines can reliably detect higher-quality goods.
- The robots can reduce up to 30% of farm's use of pesticide.
- Robots have the potential to create jobs for those who must build and repair them.
- The robots are not getting sick or tired, and the time off is not needed.
- With higher speeds and closer tolerances, they can operate with fewer errors.
- They make fewer errors and operate at higher velocities and higher quality.
- The robots can reduce the use of pesticides by up to 80% of the farm.
- In different fields, robots are more efficient and can work around trees, rocks, ponds, and other obstacles easily.
- For technicians, the robots can create jobs that can fix the robots.
- The robots can deliver products of high quality and lower the cost of production.

10. APPLICATION

- For the insecticides application to control insect pests on crops and in stores, houses, kitchen, poultry farms, barns, etc.
- For the fungicides and bactericides application to control the plant diseases.
- For the herbicides application, to kill the weeds.
- For the harmony sprays application to increase the fruit set or to prevent the premature dropping of fruits.
- For the application of plant nutrients as foliar spray.
- For applying the powdery formulation of poisonous chemicals on the crops and for any other purposes.
- To eliminate the difficulties faced during the use of backpack sprayers such as worker fatigue.
- To eliminate the need for manually pumping the sprayer to create pressure.
- To make the overall usage of a backpack sprayer easier by mounting it on a vehicle where the rotary motion of the wheels of the vehicle is used to generated required pressure in the pump to spray the pesticides.

11. CONCLUSION

In this project, we have implemented a pesticide spraying robot. A robot for use in agriculture An Agricultural robot is a concept for improving the product's performance and cost, which, once optimized, would show to be useful in agricultural spraying operations. Farmer’s workloads are reduced, as are health issues. Successfully constructed a robot that can travel on rough surfaces as well as carry a sufficient load of tank and other equipment. The main objective of this project work is spraying through Robotic Vehicle. Here, Robots will be replacing spraying labor for spraying of pesticides/fertilizers etc. whose operations will be automated or can be controlled by the farmer.

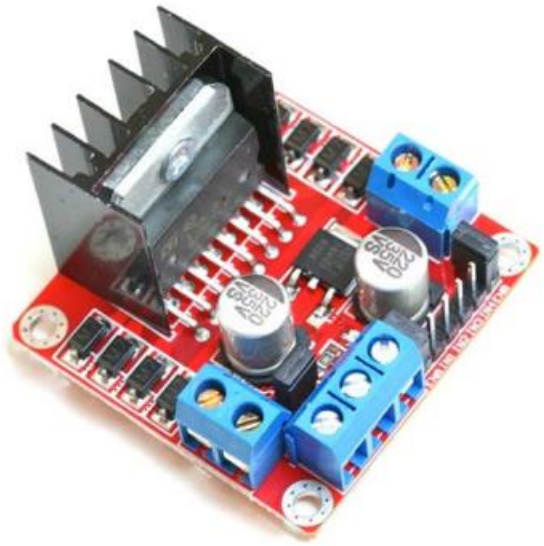
12. FUTURE SCOPE

- This type of robot has a bright future because it is very useful in agriculture and reduces workload.
- It saves time and money by reducing the amount of pesticide liquid that needs to be sprayed. It will assist farmers in working in any season and under any conditions.
- It would lessen the risk of various breathing and physical problems for farmers.
- It can be built to grab and analyze data of the farming field and to do pre-defined tasks autonomously.
- Additional use of renewable resources, such as wind energy, will also help reduce the need for more batteries.
- Usage of voice controlled navigation for robotic movements can be used.

13. ANNEXURE

1. L298N Dual H-Bridge Motor Driver

This dual bidirectional motor driver, is based on the very popular L298 Dual H-Bridge Motor Driver Integrated Circuit. The circuit will allow you to easily and independently control two motors of up to 2A each in both directions.It is ideal for robotic applications and well suited for connection to a microcontroller requiring just a couple of control lines per motor. It can also be interfaced with simple manual switches, TTL logic gates, relays, etc. This board equipped with power LED indicators, on-board +5V regulator and protection diodes.



SKU: MDU-1049

Brief Data:

- Input Voltage: 3.2V~40Vdc.
- Driver: L298N Dual H Bridge DC Motor Driver
- Power Supply: DC 5 V - 35 V
- Peak current: 2 Amp
- Operating current range: 0 ~ 36mA
- Control signal input voltage range :

  Low: -0.3V ≤ Vin ≤ 1.5V.

  High: 2.3V ≤ Vin ≤ Vss.

• Enable signal input voltage range :

Low: -0.3 ≤ Vin ≤ 1.5V (control signal is invalid).

High: 2.3V ≤ Vin ≤ Vss (control signal active).

• Maximum power consumption: 20W (when the temperature T = 75 ℃).

• Storage temperature: -25 ℃ ~ +130 ℃.

• On-board +5V regulated Output supply (supply to controller board i.e. Arduino).

• Size: 3.4cm x 4.3cm x 2.7cm

Figure 13.1.1: Schematic Diagram of L298N Motor Driver

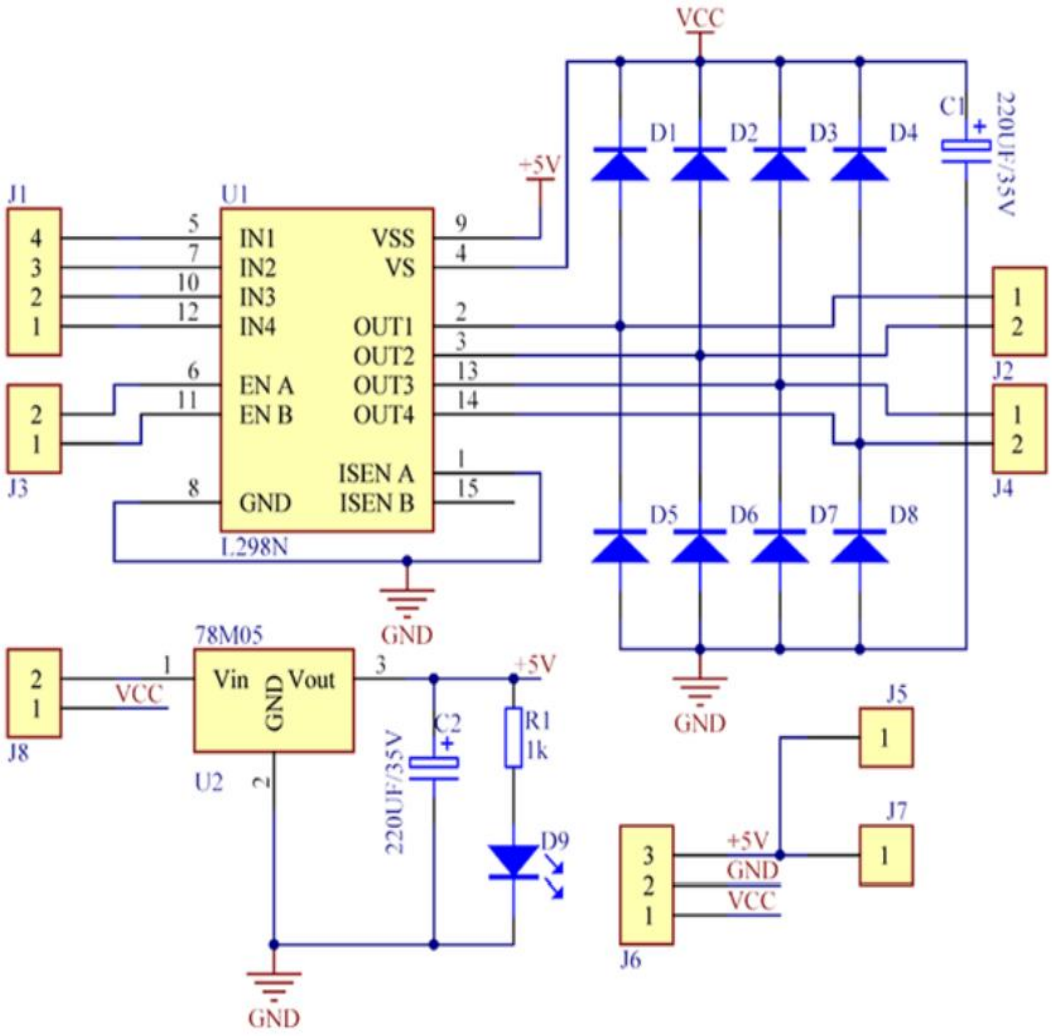


Figure 13.1.2: Board Dimension & Pins Function of L298N Motor Driver

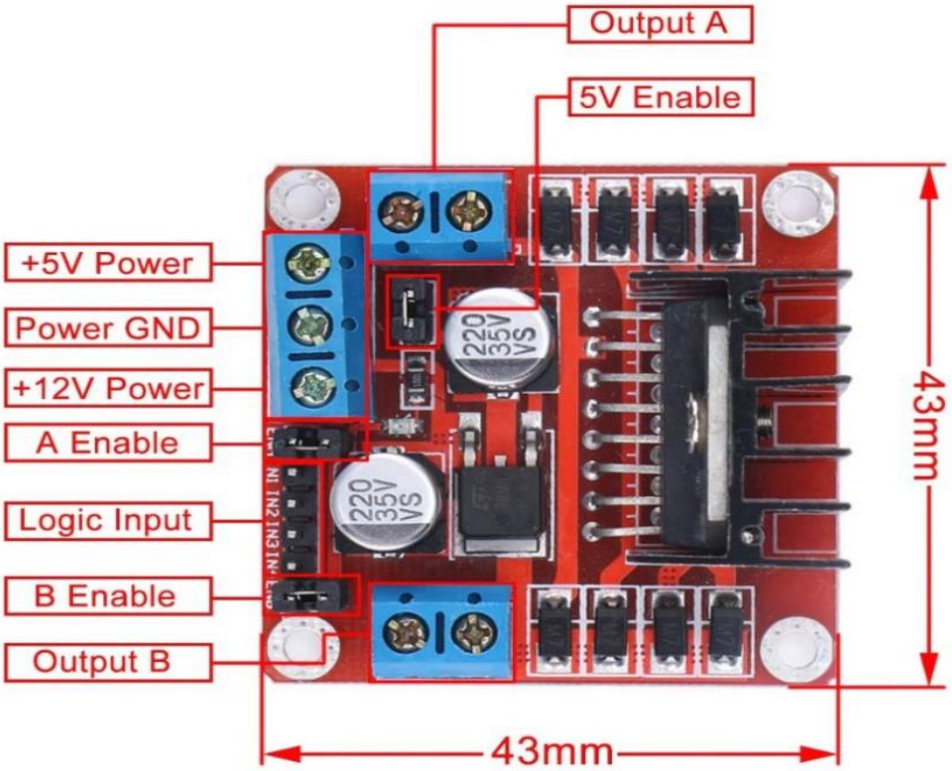


Figure 13.1.3: L298N Motor Driver Pins

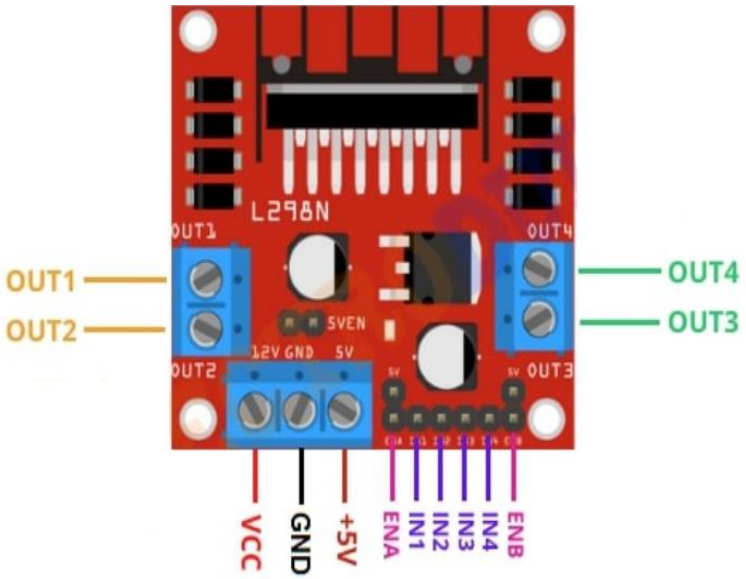


Table 1: **L298N Motor Driver**

Table 13.1.1: **Power Supply Pins of L298N Motor Driver**

Pin no.	Pin Name	Description
1	VCC	VCC pin is used to supply power to the motor. Its input voltage is between 5 to 35V.
2	GND	GND is a ground pin. It needs to be connected to the power supply ground(negative).
3	+5V	+5V pin supplies power for the switching logic circuitry inside the L298N IC. If the 5V-EN jumper is in place, this pin acts as output and can be used to power up a microcontroller or other circuitry (sensor). If the 5V-EN jumper is removed, you need to connect it to the 5V power supply of the microcontroller.

Table 13.1.2: **Control pins of L298N Motor Driver**

Pin no.	Pin Name	Description
1 & 2	IN1 & IN2	These pins are input pins of **Motor A**. These are used to control the rotating direction of Motor A. When one of them is HIGH and the other is LOW, Motor A will start rotating in a particular direction. If both the inputs are either HIGH or LOW the Motor A will stop.
3	IN3 &	These pins are input pins of **Motor B**. These are

& 4	IN4	used to control the rotating direction of Motor A. When one of them is HIGH and the other is LOW, Motor A will start rotating in a particular direction. If both the inputs are either HIGH or LOW the Motor A will stop.

Table 13.1.3: **Speed Control Pins of L298N Motor Driver**

Pin no.	Pin Name	Description
1	ENA	ENA pin is used to control the speed of **Motor A**. If a jumper is present on this pin, so the pin connected to +5 V and the motor will be enabled, then the Motor A rotates maximum speed. if we remove the jumper, we need to connect this pin to a PWM input of the microcontroller. In that way, we can control the speed of Motor A. If we connect this pin to Ground the Motor A will be disabled.
2	ENB	ENB pin is used to control the speed of **Motor B**. If a jumper is present on this pin, so the pin connected to +5 V and the motor will be enabled, then the Motor B rotates maximum speed. if we remove the jumper, we need to connect this pin to a PWM input of the microcontroller. In that way, we can control the speed of Motor B. If we connect this pin to Ground the Motor B will be disabled.

Table 13.1.4: **Output Pins of L298N Motor Driver**

Pin no.	Pin Name	Description
1	OUT1 and OUT2	This terminal block will provide the output for **Motor A**.
2	OUT3 and OUT4	This terminal block will provide the output for **Motor B**.

How Motor Driver Module Works

This module uses two techniques for the control speed and rotation direction of the DC motors. These are H-Bridge – For controlling rotation direction and PWM – For controlling the speed.

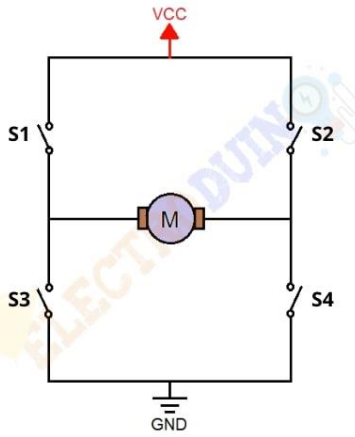
H-Bridge Techniques

L298n motor driver module uses the H-Bridge technique to control the direction of rotation of a DC motor. In this technique, H-Bridge controlled DC motor rotating direction by changing the polarity of its input voltage.

An H-Bridge circuit contains four switching elements, like transistors (BJT or MOSFET), with the motor at the center forming an H-like configuration. Input **IN1, IN2, IN3, and IN4** pins actually control the **switches** of the H-Bridge circuit inside L298N IC. We can change the direction of the current flow by activating two particular switches at the same time, this way we can change the rotation direction of the motor.

Case 1

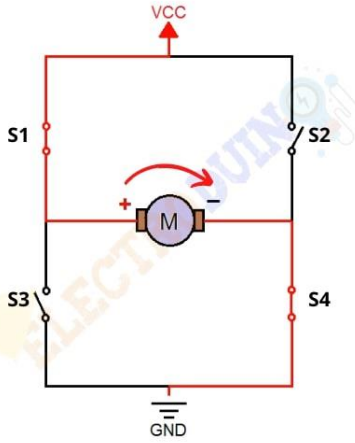
When S1, S2, S3, and S4 all switches are open then no current goes to the Motor terminals. So, in this condition, the motor is stopped (not working).



L298N Motor Driver Module Working of H-Bridge Case 1

Case 2

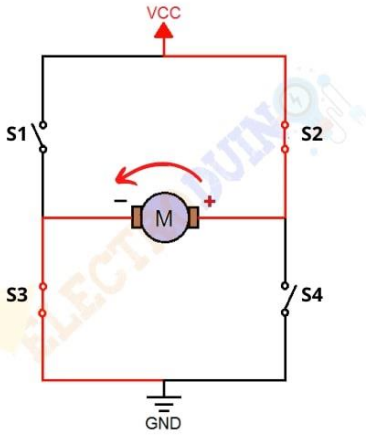
When the switch S1 and S4 are closed, then the motor left terminal is getting a positive (+) voltage and the motor right terminal is getting a negative(-) voltage. So, in this condition motor start rotating in a particular direction (clockwise).



L298N Motor Driver Module Working of H-Bridge Case 2

Case 3

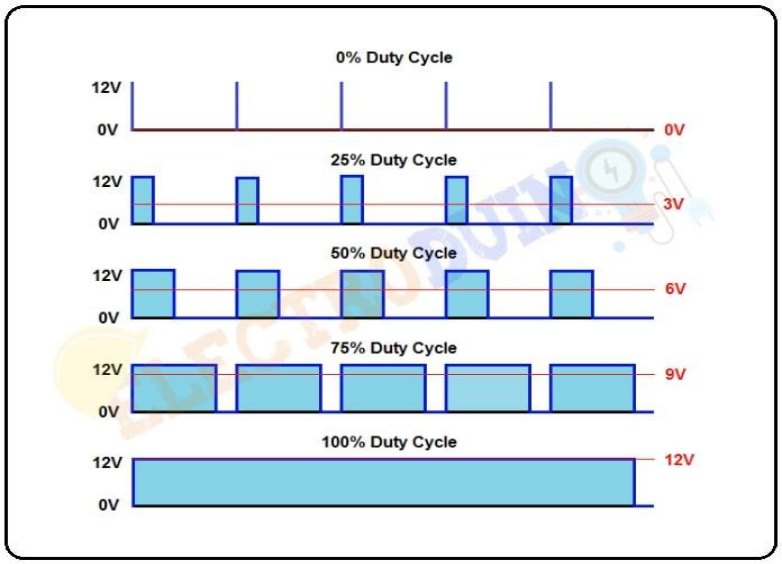
When S2 and S3 switches are closed, then the right motor terminal is getting a positive (+) voltage and the left motor terminal is getting a negative (-) voltage. So, in this condition motor start rotating in a particular direction (anticlockwise).



L298N Motor Driver Module Working of H-Bridge Case 3

PWM (Pulse Width Modulation) Techniques

L298n motor driver module uses the PWM technique to control the speed of rotation of a DC motor. In this technique, the speed of a DC motor can be controlled by changing its input voltage. Pulse Width Modulation is a technique where the average value of the input voltage is adjusted by sending a series of ON-OFF pulses. The average voltage is proportional to the width of the pulses, these pulses known as Duty Cycle. If the duty cycle higher, then the average voltage is applied to the DC motor (High Speed), and the lower the duty cycle, the less the average voltage being applied to the dc motor(Low Speed).



L298N Motor Driver Module Pulse Width Modulation (PWM) technique

Applications

- Control DC motors.
- Control stepping motors
- In Robotics

2. ESP32 WIFI MODULE

ESP32-WROOM-32 is a powerful, generic Wi-Fi+BT+BLE MCU module that targets a wide variety of applications, ranging from low-power sensor networks to the most demanding tasks, such as voice encoding, music streaming and MP3 decoding. At the core of this module is the ESP32-D0WDQ6 chip. The chip embedded is designed to be scalable and adaptive. There are two CPU cores that can be individually controlled, and the CPU clock frequency is adjustable from 80 MHz to 240 MHz. The user may also power off the CPU and make use of the low-power co-processor to constantly monitor the peripherals for changes or crossing of thresholds. ESP32 integrates a rich set of peripherals, ranging from capacitive touch sensors, Hall sensors, SD card interface, Ethernet, high-speed SPI, UART, I²S and I²C.

The integration of Bluetooth, Bluetooth LE and Wi-Fi ensures that a wide range of applications can be targeted, and that the module is all-around: using Wi-Fi allows a large physical range and direct connection to the Internet through a Wi-Fi router, while using Bluetooth allows the user to conveniently connect to the phone or broadcast low energy beacons for its detection. The sleep current of the ESP32 chip is less than 5 uA, making it suitable for battery powered and wearable electronics applications. The module supports a data rate of up to 150 Mbps and 20 dBm output power at the antenna to ensure the widest physical range. As such the module

does offer industry-leading specifications and the best performance for electronic integration, range, power consumption, and connectivity.

The operating system chosen for ESP32 is freeRTOS with LwIP; TLS 1.2 with hardware acceleration is built in as well. Secure (encrypted) over the air (OTA) upgrade is also supported, so that users can upgrade their products even after their release, at minimum cost and effort.

Table 13.2.1: Provides the specifications of ESP32-WROOM-32

Categories	Items	Specifications
Certification	RF certification	FCC/CE-RED/IC/TELEC/KCC/SRRC/NCC
	Wi-Fi certification	Wi-Fi Alliance
	Bluetooth certification	BQB
	Green certification	RoHS/REACH
Test	Reliablity	HTOL/HTSL/uHAST/TCT/ESD
Wi-Fi	Protocols	802.11 b/g/n (802.11n up to 150 Mbps)
		A-MPDU and A-MSDU aggregation and 0.4us guard interval support
	Frequency range	2.4 GHz ~ 2.5 GHz
Bluetooth	Protocols	Bluetooth v4.2 BR/EDR and BLE specification
	Radio	NZIF receiver with –97 dBm sensitivity
		Class-1, class-2 and class-3 transmitter
		AFH
	Audio	CVSD and SBC

Hardware	Module interfaces	SD card, UART, SPI, SDIO, I_2C, LED PWM, Motor PWM, I_2S, IR, pulse counter, GPIO, capacitive touch sensor, ADC, DAC
	On-chip sensor	Hall sensor
	Integrated crystal	40 MHz crystal
	Integrated SPI flash	4 MB
	Operating voltage/Power supply	3.0 V ~ 3.6 V
	Operating current	Average : 80 mA
	Minimum current delivered by power supply	500 mA
	Recommended operating tem-perature range	–40 °C ~ +85 °C
	Package size	(18.00±0.10) mm × (25.50±0.10) mm × (3.10±0.10) mm
	Moisture sensitivity level (MSL)	Level 3

Pin Layout:

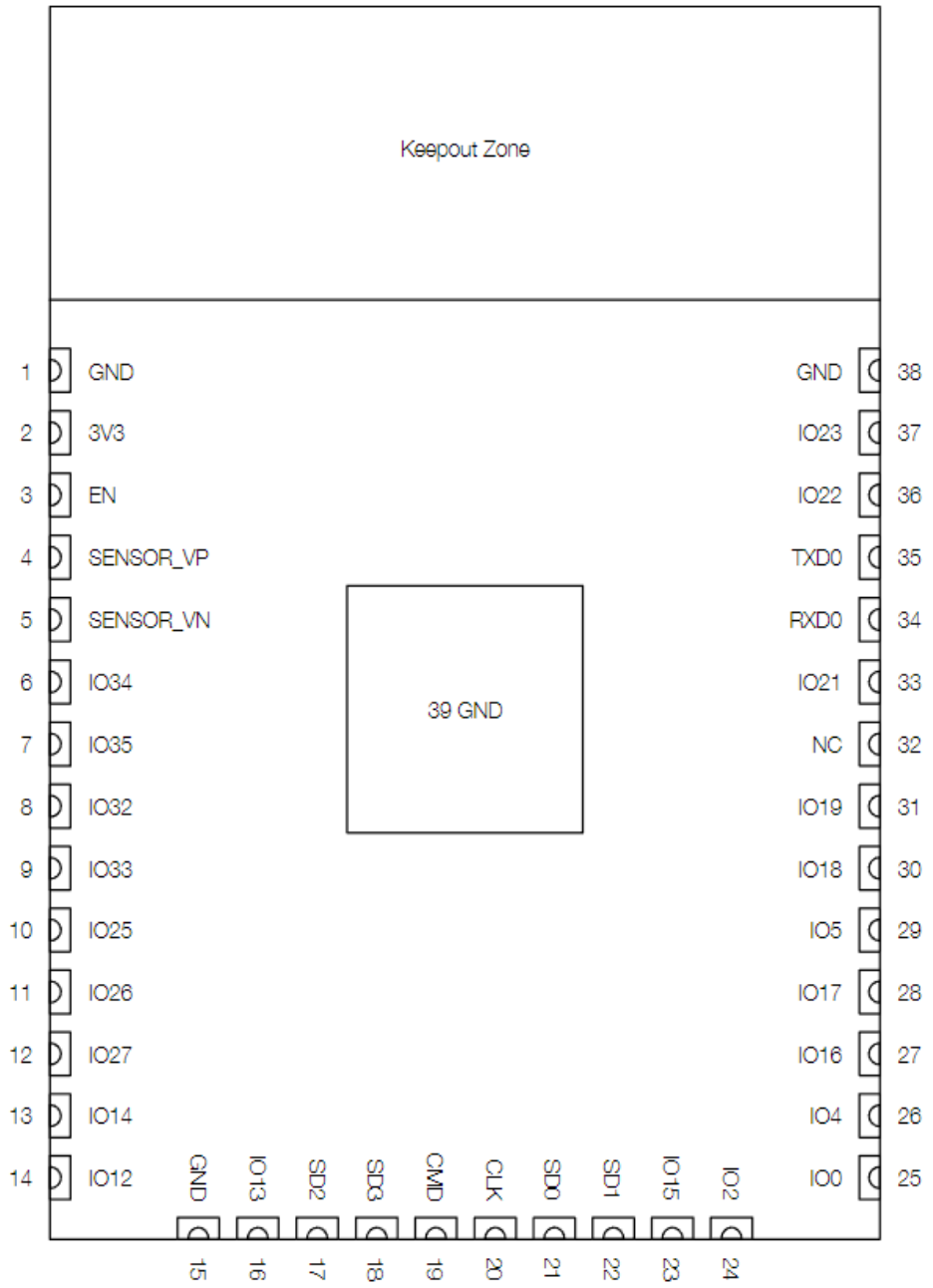


Figure 13.2.2: ESP32-WROOM-32 Pin Layout (Top View)

Pin Description:

Table 13.2.3: Pin functions of ESP32

Name	No.	Type	Function
GND	1	P	Ground
3V3	2	P	Power Supply
EN	3	I	Module-enable signal. Active high.
SENSOR_VP	4	I	GPIO36,ADC1_CH0,RTC_GPIO0
SENSOR_VN	5	I	GPIO39,ADC1_CH3,RTC_GPIO3
IO34	6	I	GPIO34,ADC1_CH6,RTC_GPIO4
IO35	7	I	GPIO35,ADC1_CH7,RTC_GPIO5
IO32	8	I/O	GPIO32, XTAL_32K_P (32.768 kHz crystal oscillator input), ADC1_CH4,TOUCH9, RTC_GPIO9

IO33	9	I/O	GPIO33, XTAL_32K_N (32.768 kHz crystal oscillator output), ADC1_CH5,TOUCH8, RTC_GPIO8
IO25	10	I/O	GPIO25,DA C_1,ADC2_ CH8,RTC_G PIO6, EMAC_RXD 0
IO26	11	I/O	GPIO26,DA C_2,ADC2_ CH9,RTC_G PIO7, EMAC_RXD 1
IO27	12	I/O	GPIO27,AD C2_CH7,TO UCH7RTC_ GPIO17,EM AC_RX_DV
IO14	13	I/O	GPIO14, ADC2_CH6, TOUCH6, RTC_GPIO16, MTMS, HSPICLK, HS2_CLK, SD_CLK, EMAC_TXD2
IO12	14	I/O	GPIO12, ADC2_CH5, TOUCH5, RTC_GPIO15, MTDI, HSPIQ, HS2_DATA2, SD_DATA2, EMAC_TXD3

GND	15	P	Ground
IO13	16	I/O	GPIO13, ADC2_CH4, TOUCH4, RTC_GPIO14, MTCK, HSPID, HS2_DATA3, SD_DATA3, EMAC_RX_ER
SHD/SD2*	17	I/O	GPIO9, SD_DATA2, SPIHD, HS1_DATA2, U1RXD
SWP/SD3 *	18	I/O	GPIO10, SD_DATA3, SPIWP, HS1_DATA3, U1TXD
SCS/CMD *	19	I/O	GPIO11, SD_CMD, SPICS0, HS1_CMD, U1RTS
SCK/CLK *	20	I/O	GPIO6, SD_CLK, SPICLK, HS1_CLK, U1CTS
SDO/SD0*	21	I/O	GPIO7, SD_DATA0, SPIQ, HS1_DATA0, U2RTS
SDI/SD1*	22	I/O	GPIO8, SD_DATA1, SPID, HS1_DATA1, U2CTS
IO15	23	I/O	GPIO15, ADC2_CH3, TOUCH3, MTDO, HSPICS0, RTC_GPIO13, HS2_CMD, SD_CMD, EMAC_RXD3
IO2	24	I/O	GPIO2, ADC2_CH2, TOUCH2, RTC_GPIO12, HSPIWP, HS2_DATA0, SD_DATA0
IO0	25	I/O	GPIO0, ADC2_CH1, TOUCH1, RTC_GPIO11, CLK_OUT1, EMAC_TX_CLK

IO4	26	I/O	GPIO4, ADC2_CH0, TOUCH0, RTC_GPIO10, HSPIHD, HS2_DATA1, SD_DATA1, EMAC_TX_ER
IO16	27	I/O	GPIO16, HS1_DATA4, U2RXD, EMAC_CLK_OUT
IO17	28	I/O	GPIO17, HS1_DATA5, U2TXD, EMAC_CLK_OUT_180
IO5	29	I/O	GPIO5, VSPICS0, HS1_DATA6, EMAC_RX_CLK
IO18	30	I/O	GPIO18, VSPICLK, HS1_DATA7
IO19	31	I/O	GPIO19, VSPIQ, U0CTS, EMAC_TXD0
NC	32	-	-
IO21	33	I/O	GPIO21, VSPIHD, EMAC_TX_EN
RXD0	34	I/O	GPIO3, U0RXD, CLK_OUT2
TXD0	35	I/O	GPIO1, U0TXD, CLK_OUT3, EMAC_RXD2
IO22	36	I/O	GPIO22, VSPIWP, U0RTS, EMAC_TXD1
IO23	37	I/O	GPIO23, VSPID, HS1_STROBE
GND	38	P	Ground

Strapping Pins

ESP32 has five strapping pins:

3. MTDI
4. GPIO0
5. GPIO2
6. MTDO
7. GPIO5

Software can read the values of these five bits from register ”GPIO_STRAPPING”.

During the chip’s system reset release (power-on-reset, RTC watchdog reset and brownout reset), the latches of the strapping pins sample the voltage level as strapping bits of ”0” or ”1”, and hold these bits until the chip is powered down or shut down. The strapping bits configure the device’s boot mode, the operating voltage of VDD_SDIO and other initial system settings.

Each strapping pin is connected to its internal pull-up/pull-down during the chip reset. Consequently, if a strapping pin is unconnected or the connected external circuit is high-impedance, the internal weak pull up/pull-down will determine the default input level of the strapping pins.

To change the strapping bit values, users can apply the external pull-down/pull-up resistances, or use the host MCU’s GPIOs to control the voltage level of these pins when powering on ESP32.

After reset release, the strapping pins work as normal-function pins.

Refer a detailed boot-mode configuration by strapping pins.

Table No. 13.2.4: Strapping Pins

Voltage of Internal LDO (VDD_SDIO)			
Pin	Default	3.3 V	1.8V
MTDI	Pull-down	0	1
Booting Mode			
Pin	Default	SPI Boot	Download Boot
GPIO0	Pull-up	1	0
GPIO2	Pull-down	Don’t care	0
Enabling/Disabling Debugging Log Print over U0TXD During Booting			
Pin	Default	U0TXD Active	U0TXD Silent
MTDO	Pull-up	1	0

Timing of SDIO Slave					
Pin	Default	Falling-edge Sampling Falling-edge Output	Falling-edge Sampling Rising-edge Output	Rising-edge Sampling Falling-edge Output	Rising-edge Sampling Rising-edge Output
MTDO	Pull-up	0	0	1	1
GPIO5	Pull-up	0	1	0	1

Functional Description:

CPU and Internal Memory

ESP32-D0WDQ6 contains two low-power Xtensa ® 32-bit LX6 microprocessors. The internal memory includes:

•448 KB of ROM for booting and core functions.

•520 KB of on-chip SRAM for data and instructions.

•8 KB of SRAM in RTC, which is called RTC FAST Memory and can be used for data storage; it is accessed by the main CPU during RTC Boot from the Deep-sleep mode.

•8 KB of SRAM in RTC, which is called RTC SLOW Memory and can be accessed by the co-processor during the Deep-sleep mode.

•1 Kbit of eFuse: 256 bits are used for the system (MAC address and chip configuration) and the remaining 768 bits are reserved for customer applications, including flash-encryption and chip-ID.

External Flash and SRAM

ESP32 supports multiple external QSPI flash and SRAM chips. More details can be found in Chapter SPI in the ESP32 Technical Reference Manual. ESP32 also supports hardware encryption/decryption based on AES to protect developers' programs and data in flash.

ESP32 can access the external QSPI flash and SRAM through high-speed caches.

The external flash can be mapped into CPU instruction memory space and read-only memory space simultaneously.

–When external flash is mapped into CPU instruction memory space, up to 11 MB + 248 KB can be mapped at a time. Note that if more than 3 MB + 248 KB are mapped, cache performance will be reduced due to speculative reads by the CPU.

–When external flash is mapped into read-only data memory space, up to 4 MB can be mapped at a time. 8-bit, 16-bit and 32-bit reads are supported.

•External SRAM can be mapped into CPU data memory space. Up to 4 MB can be mapped at a time. 8-bit, 16-bit and 32-bit reads and writes are supported.

ESP32-WROOM-32 integrates a 4 MB SPI flash, which is connected to GPIO6, GPIO7, GPIO8, GPIO9, GPIO10 and GPIO11. These six pins cannot be used as regular GPIOs.

Crystal Oscillators

The module uses a 40-MHz crystal oscillator.

RTC and Low-Power Management

Withtheuseofadvancedpower-managementtechnologies,ESP32canswitchbetweendifferentpowermodes.

For details on ESP32's power consumption in different power modes, please refer to section "RTC and Low-Power Management" in ESP32 Datasheet.

Electrical Characteristics

Absolute Maximum Ratings

Stresses beyond the absolute maximum ratings listed in Table 4 below may cause permanent damage to the device. These are stress ratings only, and do not refer to the functional operation of the device that should follow the recommended operating conditions.

Table 13.2.5: Absolute Maximum Ratings

Symbol	**Parameter**	**Min**	**Max**	**Unit**
VDD33	Power supply voltage	-0.3	3.6	V

Ioutput	Cumulative IO output current	-	1100	mA
Tstore	Storage temperature	-40	150	°C

Recommended Operating Conditions

Table 13.2.6: Recommended Operating Conditions

Symbol	**Parameter**	**Min**	**Typical**	**Max**	**Unit**
VDD 33	Power supply voltage	3.0	3.3	3.6	V
IV DD	Current delivered by external power supply	0.5	-	-	A
T	Operating temperature	-40	-	85	°C

DC Characteristics (3.3 V, 25 °C)

Table 13.2.7: DC Characteristics (3.3 V, 25 °C)

Sym -bol	**Parameter**	**Min**	**Typ**	**Max**	**Unit**
CIN	Pin capaci-tance	-	2	-	pF
VIH	High-level input voltage	0.75×VDD 1	-	VDD 1 +0.3	V
VIL	Low-level input voltage	- 0.3	-	0.25×VDD 1	V
IIH	High-level input current	-	-	50	nA
IIL	Low-level input current	-	-	50	nA
VOH	High-level output voltage	0.8×VDD 1	-	-	V

VOL	Low-level output voltage	-	-	0.1×VDD 1 -		V
IOH	High-level source current(VDD1=3 .3V,VO H >=2.64V ,output drive strength set to the maximu m)	VDD3P3_CPU power domain 1 ; 2	-	40	-	m A
		VDD3P3_RTC power domain 1 ; 2	-	40	-	m A
		VDD_SDIO power domain 1 ; 3	-	20	-	m A

IOL	Low-level sink current (VDD 1 = 3.3 V, V OL = 0.495 V, output drive strength set to the maximum)	-	28	-		m A
RP U	Resistance of internal pull-up resistor	-	45	-		k Ω
RP D	Resistance of internal pull-down resistor	-	45	-		k Ω
V IL _ nRST	Low-level input voltage of CHIP_PU to power off the chip	-	-	0.6		V

Wi-Fi radio: Table 13.2.8: Wi-Fi Radio Characteristics

Parameter	Condition	Min	Typical	Max	Unit
Operating frequency range *note1*	-	2412	-	2484	MHz
Output impedance *note2*	-	-	*note 2*	-	Ω
TX power *note3*	11n, MCS7	12	13	14	dBm
	11b mode	17.5	18.5	20	dBm
Sensitivity	11b, 1 Mbps	-	–98	-	dBm
	11b, 11 Mbps	-	–89	-	dBm
	11g, 6 Mbps	-	–92	-	dBm
	11g, 54 Mbps	-	–74	-	dBm
	11n, HT20, MCS0	-	–91	-	dBm
	11n, HT20, MCS7	-	–71	-	dBm
	11n, HT40, MCS0	-	–89	-	dBm
	11n, HT40, MCS7	-	–69	-	dBm
Adjacent channel rejection	11g, 6 Mbps	-	31	-	dB
	11g, 54 Mbps	-	14	-	dB
	11n, HT20, MCS0	-	31	-	dB
	11n, HT20, MCS7	-	13	-	dB

1.Device should operate in the frequency range allocated by regional regulatory authorities. Target operating frequency range is configurable by software.

2.For the modules that use IPEX antennas, the output impedance is 50Ω. For other modules without IPEX antennas, users do not need to concern about the output impedance.

3.Target TX power is configurable based on device or certification requirements.

BLE Radio

Receiver

Table 13.2.9: Receiver Characteristics – BLE

Parameter	Conditions	Min	Typ	Max	Unit
Sensitivity @30.8% PER	-	-	–97	-	dBm
Maximum received signal @30.8% PER	-	0	-	-	dBm
Co-channel C/I	-	-	+10	-	dB
Adjacent channel selectivity C/I	F = F0 + 1 MHz	-	–5	-	dB
	F = F0 – 1 MHz	-	–5	-	dB
	F = F0 + 2 MHz	-	–25	-	dB
	F = F0 – 2 MHz	-	–35	-	dB
	F = F0 + 3 MHz	-	–25	-	dB
	F = F0 – 3 MHz	-	–45	-	dB
Out-of-band blocking performance	30 MHz ~ 2000 MHz	–10	-	-	dBm
	2000 MHz ~ 2400 MHz	–27	-	-	dBm
	2500 MHz ~ 3000 MHz	–27	-	-	dBm
	3000 MHz ~ 12.5 GHz	–10	-	-	dBm
Intermodulation	-	–36	-	-	dBm

Transmitter

Table 13.2.10: Transmitter Characteristics – BLE

Parameter	Conditions	Min	Typ	Max	Unit
RF transmit power	-	-	0	-	dBm
Gain control step	-	-	3	-	dBm
RF power control range	-	–12	-	+9	dBm
Adjacent channel transmit power	F = F0 ± 2 MHz	-	–52	-	dBm
	F = F0 ± 3 MHz	-	–58	-	dBm
	F = F0 ± > 3 MHz	-	–60	-	dBm
$\Delta f1_{avg}$	-	-	-	265	kHz
$\Delta f2_{max}$	-	247	-	-	kHz
$\Delta f2_{avg}/\Delta f1_{avg}$	-	-	–0.92	-	-
ICFT	-	-	–10	-	kHz
Drift rate	-	-	0.7	-	kHz/50 μs
Drift	-	-	2	-	kHz

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15. SOURCE CODE

```
#include <WiFi.h>
#include <WiFiClient.h>
#include <WebServer.h>

//SSID and Password to your ESP Access Point
const char* ssid = "Robot Wifi";
const char* password = "87654321";

#define ENA   0     // Enable/speed motors Right    GPIO4(D2)
#define IN_1  4    // L298N in1 motors Right       GPIO0(D3)
#define IN_2  2     // L298N in2 motors Right       GPIO2(D4)
#define IN_3  12    // L298N in3 motors Left        GPIO12(D6)
#define IN_4  13    // L298N in4 motors Left        GPIO13(D7)
#define ENB   15    // Enable/speed motors Left     GPIO15(D8)

#define Light  16 // Light  GPIO16(D0)

const int spray1 = 14;
const int spray2 = 23;
const int trig1 = 27;
const int echo1 = 26;
const int trig2 = 32;
const int echo2 = 35;

//define sound speed in cm/uS
#define SOUND_SPEED 0.034
#define CM_TO_INCH 0.393701

long duration1,duration2;
float distanceCm1,distanceCm2;
```

```
//float distanceInch;

String command;  //String to store app command state.
int speedCar = 150; // 0 to 255
int speed_low = 60;
WebServer server(80);

void setup() {

Serial.begin(115200);
pinMode(trig1, OUTPUT); // Sets the trig1 as an Output
pinMode(echo1, INPUT); // Sets the echo1 as an Input
pinMode(trig2, OUTPUT); // Sets the trig2 as an Output
pinMode(echo2, INPUT); // Sets the echo2 as an Input

pinMode(spray1, OUTPUT);
pinMode(spray2, OUTPUT);
 pinMode(ENA, OUTPUT);
 pinMode(IN_1, OUTPUT);
 pinMode(IN_2, OUTPUT);
 pinMode(IN_3, OUTPUT);
 pinMode(IN_4, OUTPUT);
 pinMode(ENB, OUTPUT);

 pinMode(Light, OUTPUT);

// Connecting WiFi

  WiFi.mode(WIFI_AP);           //Only Access point
  WiFi.softAP(ssid, password);  //Start HOTspot removing password will disable
security

  IPAddress myIP = WiFi.softAPIP();
```

```
  Serial.print("AP IP address: ");
  Serial.println(myIP);

 // Starting WEB-server
     server.on ( "/", HTTP_handleRoot );
     server.onNotFound ( HTTP_handleRoot );
     server.begin();
}
void loop() {
   server.handleClient();

      command = server.arg("State");
          if (command == "F") goForword();
      else if (command == "B") goBack();
      else if (command == "L") goLeft();
      else if (command == "R") goRight();
      else if (command == "I") goForwordRight();
      else if (command == "G") goForwordLeft();
      else if (command == "J") goBackRight();
      else if (command == "H") goBackLeft();
      else if (command == "W")digitalWrite(Light, HIGH); // light is on
      else if (command == "w")digitalWrite(Light, LOW);  // light is off
      else if (command == "0") speedCar = 100;
      else if (command == "1") speedCar = 120;
      else if (command == "2") speedCar = 140;
      else if (command == "3") speedCar = 160;
      else if (command == "4") speedCar = 180;
      else if (command == "5") speedCar = 200;
      else if (command == "6") speedCar = 215;
      else if (command == "7") speedCar = 230;
      else if (command == "8") speedCar = 240;
      else if (command == "9") speedCar = 255;
      else if (command == "S") stopRobot();
```

```
 ultra1();
 ultra2();

 if((distanceCm1<30))
 {
  digitalWrite(spray1,HIGH);

  }
 else
 {
  digitalWrite(spray1,LOW);
 }
 if((distanceCm2<30))
 {
  digitalWrite(spray2,HIGH);
  }
 else
 {
  digitalWrite(spray2,LOW);
 }

}

void HTTP_handleRoot(void) {

if( server.hasArg("State") ){
     Serial.println(server.arg("State"));
 }
 server.send ( 200, "text/html", "" );
 delay(1);
}
```

```
void goForword(){

Serial.println("Moving Forward");
    digitalWrite(IN_1, HIGH);
    digitalWrite(IN_2, LOW);
    analogWrite(ENA, speedCar);

    digitalWrite(IN_3, LOW);
    digitalWrite(IN_4, HIGH);
    analogWrite(ENB, speedCar);
 }

void goBack(){
Serial.println("Moving Backward");
    digitalWrite(IN_1, LOW);
    digitalWrite(IN_2, HIGH);
    analogWrite(ENA, speedCar);

    digitalWrite(IN_3, HIGH);
    digitalWrite(IN_4, LOW);
    analogWrite(ENB, speedCar);
 }

void goRight(){
Serial.println("Moving Right");
    digitalWrite(IN_1, LOW);
    digitalWrite(IN_2, HIGH);
    analogWrite(ENA, speedCar);

    digitalWrite(IN_3, LOW);
    digitalWrite(IN_4, HIGH);
    analogWrite(ENB, speedCar);
 }
```

```
void goLeft(){
Serial.println("Moving Left");
    digitalWrite(IN_1, HIGH);
    digitalWrite(IN_2, LOW);
    analogWrite(ENA, speedCar);

    digitalWrite(IN_3, HIGH);
    digitalWrite(IN_4, LOW);
    analogWrite(ENB, speedCar);
 }

void goForwordRight(){
    Serial.println("Bottom 360 moved");
    digitalWrite(IN_1, HIGH);
    digitalWrite(IN_2, LOW);
    analogWrite(ENA, speedCar-speed_low);

    digitalWrite(IN_3, LOW);
    digitalWrite(IN_4, HIGH);
    analogWrite(ENB, speedCar);
  }

void goForwordLeft(){
    Serial.println("Down Joint");
    digitalWrite(IN_1, HIGH);
    digitalWrite(IN_2, LOW);
    analogWrite(ENA, speedCar);

    digitalWrite(IN_3, LOW);
    digitalWrite(IN_4, HIGH);
    analogWrite(ENB, speedCar-speed_low);
 }
```

```
void goBackRight(){
Serial.println("Upper Joint");
    digitalWrite(IN_1, LOW);
    digitalWrite(IN_2, HIGH);
    analogWrite(ENA, speedCar-speed_low);

    digitalWrite(IN_3, HIGH);
    digitalWrite(IN_4, LOW);
    analogWrite(ENB, speedCar);
 }

void goBackLeft(){
Serial.println("Gripper");
    digitalWrite(IN_1, LOW);
    digitalWrite(IN_2, HIGH);
    analogWrite(ENA, speedCar);

    digitalWrite(IN_3, HIGH);
    digitalWrite(IN_4, LOW);
    analogWrite(ENB, speedCar-speed_low);
 }

void stopRobot(){

    digitalWrite(IN_1, LOW);
    digitalWrite(IN_2, LOW);
    analogWrite(ENA, speedCar);

    digitalWrite(IN_3, LOW);
    digitalWrite(IN_4, LOW);
    analogWrite(ENB, speedCar);
}
```

```
void ultra1()
{

 digitalWrite(trig1, LOW);
 delayMicroseconds(2);
 // Sets the trig1 on HIGH state for 10 micro seconds
 digitalWrite(trig1, HIGH);
 delayMicroseconds(10);
 digitalWrite(trig1, LOW);

 // Reads the echo1, returns the sound wave travel time in microseconds
 duration1 = pulseIn(echo1, HIGH);

 // Calculate the distance
 distanceCm1 = duration1 * SOUND_SPEED/2;

 // Convert to inches
 //distanceInch = distanceCm * CM_TO_INCH;

 // Prints the distance in the Serial Monitor
 Serial.print("Distance of 1 (cm): ");
 Serial.println(distanceCm1);
 //Serial.print("Distance (inch): ");
 //Serial.println(distanceInch);

}

void ultra2()
{

 digitalWrite(trig2, LOW);
 delayMicroseconds(2);
```

```
// Sets the trig1 on HIGH state for 10 micro seconds
digitalWrite(trig2, HIGH);
delayMicroseconds(10);
digitalWrite(trig2, LOW);

// Reads the echo1, returns the sound wave travel time in microseconds
duration2 = pulseIn(echo2, HIGH);

// Calculate the distance
distanceCm2 = duration2 * SOUND_SPEED/2;

// Convert to inches
//distanceInch = distanceCm * CM_TO_INCH;

// Prints the distance in the Serial Monitor
Serial.print("Distance of 2 (cm): ");
Serial.println(distanceCm2);
//Serial.print("Distance (inch): ");
//Serial.println(distanceInch);
}
```

16. PGCS APPLICATION

D. Y. PATIL COLLEGE OF ENGINEERINGANDTECHNOLOG

Kasaba Bawada, Kolhapur

Project Grant to College Students(PGCS) Scheme 2022-23

Department : Electronics & Telecommunication Engineering

Sr. no	Name of Students	Sign
1	Zeba Altaf Kazi	
2	Anuja Ravindra Powar	
3	Rhugveda Vinay More	
4	Kailas Ashok Gurav	
5	Siddhi Umesh Kalekar	

Title of Project: AUTOMATIC VOICE CONTROLLED ROBOTIC VEHICLE FOR AGRICULTURAL SPRAYING.

Abstract:

The population of the world is increasing rapidly. In order to fulfill their diet needs the production of food must be increased, but this must come at a cost affordable to everyone. Mechanization of agriculture enables conservation of inputs by precision in ensuring better distribution, reducing quantity required for better response or prevention of losses or waste of inputs applied. Mechanization reduces unit costs of production through higher productivity levels and the input conservation. The all agriculture equipment's often are hardly modernized due to its low productivity. In India farming is done by traditional ways, besides that there has been large development of industrial and service sector as compared to that of agriculture sector. The spraying of pesticides and insecticides is traditionally done by farm worker carrying backpack type sprayer which requires more human effort. Giving attention to these important problems an attempt is made to develop an equipment which will be beneficial to the farmer for the spraying operations. This equipment is easy to use and operate. It makes use reciprocating pump that creates the required pressure for the spraying action. This multifunction device will come in handy that can be put to use in different spraying stages of farming as per process requirement.

Keywords:

- Can be operated 24/7, 365 days a year.
- Agricultural use.
- Unlike human labour , they do not need to be paid -just maintained.
- Pesticide sprayer.

1

Introduction / Background:

In today's era, smart phones are becoming more powerful with reinforced processors, larger storage capacities, richer entertainment function and more communication methods. When we say voice control, the first term to be considered is Speech Recognition i.e. making the system to understand human voice. Speech recognition is a technology where the system understands the words given through speech. Speech is an ideal method for robotic control and communication. By using speech recognition technology, we can control Agricultural sprayer and controlling system. Voice controlled robotic vehicle which is control by some specified voice commands. The mobile application is capable of identifying five commands which are "Stop", "Forward", "Back", "Left", "Right". In this embedded system, we make a robotic vehicle which we can control using voice through a mobile application. Application listens and sends the instruction to the Arduino using Bluetooth and then Arduino performs the specified operations using voice recognition application.

The agricultural sprayer and controlling robotic vehicle is a project which is supposed to work on agricultural fields. Fertilizers used to kill insects or otherwise control their reproduction. The pesticides, and fertilizers are applied to agricultural crops with the help of a special device known as sprayer. Sprayer provides optimum performance with minimum efforts. By the invention of sprayers, this enables farmers to obtain the maximum agricultural output. A pesticide has to be portable and with an increased tank capacity as well as should result in cost reduction, labour and spraying time. In fertilizer distribution when the ultrasonic sensor will detect plant it will distribute liquid fertilizer to spray on specific plant so that fertilizer will not be wasted.

Literature Review:

Objective of Pesticide Application in an average year, especially during the summer, one or more types of sprayers will be used by the average home gardener. Of the many products available, it is important to select the most efficient and easiest type for your particular need, whether it is for applying insecticides fungicides, weed killers, liquid fertilizers or wetting agents. For example, lawn sprayer is made especially for the application of liquid materials to the lawn area. They are metered to allow quick mixing and coarse spray, so it does not take as long to apply weed killers, insecticides, etc. Also, there is not as much chance of drift of the liquid into nearby flower and shrub beds. The old saying "You get what you pay for" certainly applies to sprayers. Efficiency and accuracy vary considerably, especially with the type that attaches to the garden hose. Sprayers that are used for weed killing or for applying any type of soil sterility should not be used for any other purpose. In fact, you will find it a good practice to set a sprayer aside just for the lawn area. Use a separate one for flowers and shrubs. It is a good practice to clean out your sprayer immediately after you have used it for any type of spraying. A little soapy water, swished around and through sprayer, then flushed out with warm water, does good job.

Problem Definition :

From 1999 to 2018, farmers used to spray the pesticides through the pumps which was very harmful to their eyes as well as the body and skin. Due to this many of the farmers have the problem of eyesight and they face the skin problems. Our motive is to reduce the labour at the agricultural field and work more efficiently.

Objectives:

To provide safety to the farmers and the main objective of this work is to provide precision farming. Here, Robots will be replacing laborers for the farm activities like detection of pests, spraying of pesticides/fertilizers etc. whose operations will be automated or can be controlled by the farmer.

Methodology

How the data will be collected or generated?

- The data will be generated by sending a voice signal through Mobile device via Bluetooth module

And, how it will be analyzed?

- It will be analized by the people who will be operating it from the far distance.

Expected Outcomes :

In our work were presented Automatic Voice controlled Robotic Vehicle for Agricultural Spraying'. Using Bluetooth module we can give voice commands for the vehicle for spraying pesticides in the field . Hence, In this work, we tried to design a Voice Controlled robotic Vehicle for Agricultural spraying, which ensures several benefits.

Details of Financial Requirements

Sr.no	ITEM	AMOUNT
1	Arduino UNO with USB cable	1500/-
2	Breadboard	120/-
3	DC Motor, 12 V	220/-
4	Connecting cable/ Jumper wires	200/-
5	HC-05 Bluetooth module	700/-
6	Voltage Regulator, DC/DC Gate Driver	300/-
7	L293D Motor driver	250/-
8	Bluetooth Low Energy (BLE) module	230/-
9	Micro motors and Grippy Wheels	2500/-
10	Battery, 12 V	500/-
11	Vehicle Chassis	500/-
12	Infrared Sensor	400/-
13	Ultrasonic Sensor	300/-
14	Sprayer	120/-
15	Water Tank	200/-
16	Suction Pump	1000/-
17	Voice recognisation Kit	3000/-
	ESTIMATED PRICE	12,040/-

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[3] P. Mahesh Reddy, Suram Pavan Kalyan Reddy, G R Sai Karthik, Priya B.K,2020, Intuitive Voice Controlled Robot for Obstacle, Smoke and Fire Detection for Physically Challenged People.

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Prof.S.D.Bhopale
(Guide)

Prof.S.B.Patil.
(DRC Coordinator)

Dr.T.B.Mohite-Patil.
(H.O.D)

DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERING

D. Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY,

KASABA BAWADA, KOLHAPUR.

Academic Year 2022-2023

PGCS APPROVAL

D.Y.Patil College of Engineering & Technology,Kolhapur.

Academic Year 2022-2023

PGCS Final Sheet SHEET

Group No	Name of candidate	Dept.	Name of Project	Name of guide	Funding Sanctioned
1	Satyajit Jadhav	Architecture	Kalaripayattu Center at Kerala	Prof. Supriya M. Patil	10000
2	Sourav Roy	Architecture	TheLiterary Hub at Kolkata.	Prof. M. A. Mithari.	8500
3	Rupesh Chougule	Architecture	Incubation center at kolhapur	Prof. Bela Joshi	9500
7	Yash Laxman Patil Sangramsinh Sanjay Rode Patil Ashish Rajendra Ayarekar Prathmesh Ashokkumar Powar Pushkar Rajesh Chavan Prathamesh Baburao Wangale Rahul Ramhari Nishad Prasad Sanjay Kadam	Civil Engg.	Study on Partial Replacement of Cement with Various Industrial Waste Products in Geopolymer Concrete	Prof. Dr. K. M. Mane	15000
8	Harshwardhan B. Shinde Sanket S. Dhotre Ketan B. Kumbhar Ram V. Suryawanshi Shrikant B. Waykar	Civil Engg.	To study the effect of Nano silica and fly ash on durability properties of concrete.	Mr. Amit R. Patil	10000
9	Siddhesh T. Lohar Niraj N. Patil Siddharth V. Paswan Mandar Y. Kumbhar Vaibhav A. Kumbhar Manish N. Kumbhar Shreeraj G. Sahotre	Civil Engg.	To study the effect of Nano silica and fly ash on mechanical properties of concrete.	Mr. Amit R. Patil	15000
12	Abhishek R. Bhandare Pranav H. Khardekar Nikhil M. Jadhav Pratik R. Kamble Yash R. Khiratkar Amey V. Patil Sameer S. Sayyad Suhas T. Desai	Civil Engg.	Experimental investigation on properties of concrete.	Prof. P. A. Nadgouda	7000

13	Shivani Dnyaneshwar Pawar Samruddhi Hari Patil Jay Dnyaneshwar Thite Sharad Bhanu Pawar Neha Sandip Patil Sana Zhakirhusan Kazi Pranali Babasaheb Budhale Priyanka Sanjay Hatkar	Civil Engg.	Partial Replacement of Cement using Hyposludge.	Prof. Varsha V. Doijad	10000
14	Vaibhav S. Akkole Karan S. Shedge Akash D. Salavi Aniket M. Khatangale	Chemical	Ultrasound assisted removal of heavy metals from	PROF. K.M.PATIL	10000
15	Akshay S. Karande Amol A. Thavare Kshiteej V. Naik Sanket S. Chougale	Chemical	Synthesis of cobalt doped nickel vanadate electrocatylyst for oxyzen evolution reaction with application.	Dr. A. L. Jadhav	15000
16	Shubham S. Katale Dhairyesheel P. Ghorpade Shrikant S. Khaire Mayur B. Chile	Chemical	Adsorption of malachite green dye from aqueous solution on the biofertilizer as low-cost adsorbent	Mrs. P. R. Mandale	9000
17	Pratham B Patil Pranav Chandrakant Mane Shivani Dhanaji Farakate Sakshi Sanjay Pujari Mrunmai Subhash Vhatkar	Computer Science & Engg	Aptister, An Aptitude Game	Prof. A.J.Jadhav	15000
18	Chaitanya A. Joshi Pranav U. Pise Shweta S. kadam Anushri S. Vhanmane Hrithik S. Ghorapade	Computer Science & Engg	Algorithm trading	Prof. A. R. Chougule	9500
19	Mayur S. Mahadeshwar Abhishek A. Parab Mousami S. Pawar Disha D. Malgavi Pranav U. Malvi-Patil	Computer Science & Engg	Safety Band For Children	Prof. S. B. Patil.	10000
20	Zeba A. kazi Anuja R. Powar Rhugveda V. More Kailas A. Gurav Siddhi U. Kalekar	Electtronics and Tele. Engg	Automatic Voice Controlled Robotic Vehicle For Agricultural Spraying	Dr. S.D.Bhopale	10000

21	Aditya R. Ulegaddi Mayur S. Kaware Amey A. Khot Abhay G. Mudgal Sayali S. Jadhav	Electtronics and Tele. Engg	Automated Drone For College Campus Surveillance	Dr. S. D. Chede	12000
22	Mayuri S. Mahadeshwar Riddhi S. Nalawde Shruti S. Kamble Bhakti R. Patil Aditya D. Shinde	Electtronics and Tele. Engg	Advanced Military Spying & Bomb Disposal Robot	Prof. Ms. N.S.Vatkar	11000
23	Amrut Uttam Narke Sourabh Vasant Kesarker Suyog jagadale Rushikesh powar Prathmesh Arage Pratik Eknath Patil Ruturaj Rahul Sase Shreyash Girish Mali Rajat Vaibhav Jadhav Parth Santosh Patil Sairaj Mahesh Bhise Mayuresh Arun Gawade Pratik Uday Chodankar Navman Momin Sakib Momin	Mechanical Engineering	Design and manufacturing of ceramic/clay 3D printer	Dr. S. J. Raykar	30000
24	Vishwajeet Thombare 2. Vikas Vasant Durge 3. Abulhasan Arshad Shaikh 4. Madhumati Arvind Desai 5. Sakshi Nandkumar Potdar	Mechanical Engineering	3D Filament from PET bottle and analysis	Mr. A. R. Matkar	15000
25	Premdeep Rajkumar Pandit . Saurabh Suresh Pendhari Shweta Sanjay Jadhav Sanket Shankar Patil Yashshri Sunil Jadhav	Mechanical Engineering	Design and development of drone for crop health monitoring and land mapping using 3D printing technology.	Mr. P. B. Nandgave	15000

PGCS COORDINATOR

DEAN R AND D

PRINCIPAL

PGCS FUND RECEIVED

		Merchant					Data Center
04/03/2023	NEFT	NEFT 000827772464 D Y PATIL COLLE MAHB230634525929	000827772464		5,000.00	5,664.00	
12/03/2023		UPI 343794192621UPI	343794192621	666.00		4,998.00	11111-Central Data Center
13/03/2023		UPI 307229540646Petrol	307229540646		100.00	5,098.00	11111-Central Data Center