AMRUTVAHINI COLLEGE OF ENGINEERING, SANGAMNER-422608

A

PROJECT REPORT

ON

"ROBOTIC CAR CONTROL USING ANDROID APPLICATION"

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Year: 2022-23

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"ROBOTIC CAR CONTROL USING ANDROID APPLICATION"

has satisfactorily completed by,

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"ROBOTIC CAR CONTROL USING ANDROID APPLICATION"

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ACKNOWLEDGEMENT

First, we would like to express our best regards to our Project Guide Prof. Ms.R.N. DEOKAR whose valuable guidance, encouragement, and provision of necessary facilities made this work possible. We are also thankful to our respected Head of the Department Dr. Ms. R. P. LABADE whose help and shared knowledge was the main support to do our project. We are also thankful to project coordinator Dr. S. R. Jondhale for his continuous support. Many thanks are owed to our classmates for their useful discussion and timely suggestions. Their technical support and encouragement helped us to finalize our project.

Our special thanks to who helped us a lot through the problems we came across. We are absolutely grateful to all non-teaching staff for their assistance which is key factor behind our project work. We would also like to express our gratitude towards the college for providing us with the best facilities and proper environment to work on our project. Last but not the least thanks to our respected Principal Dr. M. A. VENKATESH for continuous motivation.

Finally we offer our great thanks and regards to our family for their support which helped us through the difficulty and hardships of life to earn this achievement. Ultimately we would like to devote all praise and honors to supreme personality ‘God’ for grace and inspiration.

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ABSTRACT

Now day’s we seen that the human being want’s the easier life and every time peoples trying to search the several types of result to break the any problems. Sometimes we're uses the machines that will reduce the sweats as well as needed time. So for that we're enforcing a prototype of a robotic vehicle which is Electric vehicle. According to the report the tradition vehicle contributes the 20- 30% of air pollution. Electric vehicle is eco-friendly. Our proposed system works by using a Wi- Fi module for entering the Wi- Fi command being transferred by the driver. The system apply in this study uses DC motor to move the robotic vehicle to the applicable direction using Wi- Fi commands. This robotic car is solving the major problems which is occurs in traditional vehicles like packing, driving. It has capability to smell the terrain and decide the navigation path without any mortal input. So that, probability of accident is reduces. As we're controlling this robotic car using the android Smart- phone also the handicap people’s can drive this car.

LIST OF FIGURES

LIST OF TABLE

CONTENTS

CHAPTER 1
INTRODUCTION

1.1 ABSTRACT

Now day's we seen that the human being want's the easier life and every time peoples trying to search the several types of result to break the any problems. Sometimes we're uses the machines that will reduce the sweats as well as needed time. So for that we're enforcing a prototype of a robotic vehicle which is Electric vehicle. According to the report the tradition vehicle contributes the 20- 30% of air pollution. Electric vehicle is eco-friendly[1]. Our proposed system works by using a Wi- Fi module for entering the Wi- Fi command being transferred by the driver. The system apply in this study uses DC motor to move the robotic vehicle to the applicable direction using Wi- Fi commands. This robotic car is solving the major problems which is occurs in traditional vehicles like packing, driving. It has capability to smell the terrain and decide the navigation path without any mortal input. So that, probability of accident is reduces. As we're controlling this robotic car using the android Smart- phone also the handicap people's can drive this car[3].

The project involves the integration of various technologies, including robotics, mobile computing, wireless communication, and sensor systems. The robot car is equipped with a microcontroller, motor drivers, wheels, sensors, and a camera[2]. The software component of the project consists of two main parts: the Android application and the firmware running on the microcontroller. The Android application provides a user-friendly interface for controlling the car's movements, capturing images or videos through the camera, and receiving sensor data. It utilizes the smartphone's touch screen, accelerometer, and gyroscope to enable intuitive control of the robot car. The firmware on the microcontroller processes the commands received from the smartphone and controls the motors accordingly, enabling the car to move in different directions. Wireless communication plays a crucial role in this project, allowing the Android smartphone and the robot car to establish a connection. Bluetooth or Wi-Fi technology can be used for this purpose, providing a reliable and low-latency communication channel. The smartphone acts as a transmitter, sending control signals to the robot car, while the car acts as a receiver, processing these signals to perform the desired actions. The Android controlled robot car has a wide range of potential applications[4]

1.2 INTRODUCTION

The Android controlled robot car is a remarkable project that combines the power of modern technology and robotics. It is designed to be controlled using an Android device, providing a user-friendly interface and enhancing accessibility [2]. This project builds upon the advancements made in the field of robotics, enabling enthusiasts and hobbyists to explore the realm of autonomous vehicles. By integrating Android technology, users can remotely maneuver the robot car, monitor its surroundings, and even engage in real-time video streaming. This project represents a fusion of mobile computing and robotics, pushing the boundaries of innovation and paving the way for future advancements in the field of autonomous vehicles[3].

The concept of remote-controlled vehicles has been prevalent for many years, but the integration of Android technology with robotics has taken it to a whole new level. The Android Controlled Robot Car project builds upon the advancements in mobile computing and wireless communication, making it more accessible and user-friendly.

In the early stages of development, researchers and engineers explored various techniques for wireless communication and control protocols. They focused on optimizing the reliability and responsiveness of the system, allowing for real-time control and feedback. Through extensive testing and iterations, they refined the control algorithms and hardware components to ensure smooth operation and seamless integration with Android devices.

The project also involved developing a custom Android application that serves as the interface for controlling the robot car. This application provides a user-friendly dashboard with intuitive controls, allowing users to maneuver the car effortlessly. It includes features like forward, backward, left, and right movements, as well as the ability to stream live video from the car's onboard camera, providing a first-person perspective.Furthermore, the project team worked on enhancing the robot car's functionality by integrating additional sensors, such as obstacle detection and avoidance systems. These sensors enable the car to navigate autonomously, avoiding collisions with objects in its path.

A robot is a mechanical or virtual artificial agent, usually an electromechanical machine that is guided by a computer program or electronic circuitry. The first digital and programmable Robot was invented by George Devol in 1954 and was named the Unimate. [1]Apps control robot is one where the controlling is done by the smartphone apps using Bluetooth. It is possible to control of different parameters of many applications such as to control the speed, light, direction, sound and temperature. Nowadays smart phones are

becoming more powerful with reinforced processors, larger storage capacities, richer entertainment function and more communication methods [2].Recently the Bluetooth technology has become the standard for device-to-device communications for short distance. Bluetooth is an open standard specification for a radio frequency (RF) - based, short-range connectivity technology that promises to change the face of computing and wireless communication. It is designed to be an inexpensive, wireless networking system for all classes of portable devices, such as laptops, PDAs (personal digital assistants), and mobile phones. The controlling device of the whole system is a microcontroller [3-4].

The rapid development of smart phone technology, especially the promotion and application of wireless technology, provides a platform and opportunity for some basic ideas and methods in the control theory to be applied to the car.[11] Automated smooth controlled cars are required for road safety of developing Bangladesh. Still, many traffic situations remain complex and difficult to manage, particularly in urban settings. The driving task belongs to a class of problems that depend on underlying systems for logical reasoning and dealing with uncertainty[12]. So, to move vehicle computers beyond monitoring and into tasks related to environment perception or driving, we must integrate aspects of human intelligence and behaviours so that vehicles can manage driving actuators in a way similar to humans[16]

1.3 LITERATURE SURVEY:

Intelligent Transport Systems (ITS) based on Internet of Things (IoT) are getting popular and can be seen as a solution to improve the road safety. One effective technique to reduce traffic hazards and save precious lives could be to reduce the response time after an accident has occurred[5].

Some systems focus on preventive strategy because at the end, goal is to save lives. This system particularly focuses on the safety of two wheelers and checks if the driver is drowsy.

Many of the researchers have worked to bring the automation in the automobile field.Few of them are summarised here.

- The authors have developed a system for the remote controlling of a vehicle using the 8031 microcontroller technology in which author are able to control the car using the android app.

- The authors have developed a system for the Smartphone control robots through bluetooth using the Bluetooth technology in which author are able to control using the bluetooth. In which the user used the Bluetooth module for that project which is used to control the through the Smartphone[2].

- The authors have developed the Bluetooth operated robot vehicle using mobile android app which is used to control the vehicle through the android phone using the android app The authors have developed the Bluetooth based android controlled robot using the bluetooth module[6].

- The authors publish the research paper in which the author is developed one system which is “The DLR lightweight robot: design and control concepts for robots in human environments” .Based on the design and control of robot[5].

- The authors have developed the Obstacle avoidance and Android mobile phone controlled Bluetooth robot using arduino. In which the Author is works on the Arduino board and ultra-Sonic components[2].

There are no. of authors work on this topic of robot which are shows in the below comparison table as following :-

COMPARISON TABLE:

Table 1: Comparison of Existing Systems

Sr. No	Authors	Paper Title	Publisher	Year	Method Used
1	Dickmanns E	The development of machine vision for road vehicles in the last decade	IEEE	2002	Based on vehicle Control algorithm
2.	Schaffer A A, Haddadin S, Ott Ch, Stemmer A, Wimbock T and Hirzinger G	T h e D L R lightweight robot: design and control concepts for robots in human environments	Industrial Robot : A n Inter national Journal s	2007	Based on Design and Control of robot
3.	Hebah H O Nasereddin and Abdelkarim A	Smart phone control robots through bluetooth	IJRRAS	2010	Based on Bluetooth
4.	Zi-Yi, Lam, Sew-Kin, Wong, Wai- L eong , Pang , Chee-Pun, Ooi	The Design of DC Motor Driver for Solar Tracking Applications	IEEE	2012	Based o n M ic ro-con troller DC-DC buck Converter

5.	Malik A, Shrivastava A, Singh GK, Shuk A	Remote controlling of a vehicle using android app	Int. J of Res.in Eng. & Adv. Tech. &Sci	2015	Based on 8051Microcontroller technology
6.	Parmar D, Tripathi D, Sahni A, Singh P	Bluetooth operated robot vehicle using mobile android app	Int. J of Res.in Eng. &Adv Technol	2015	Based on Bluetooth
7.	Ashima, Kumar R, Nikhil T, Singh P	Obstacle avoidance and Anderoid mobile phone controlled Bluetooth robot using arduino	IJEEE	2015	Based on Arduino and Ultra-sonic
8.	Eshita R Z , Barua T, Barua A	Bluetooth based android controlled	Americ an Jou r nal of	2016	Based on Bluetooth
9.	Gandot ra S , Sharma B , Mahajan S , Motup T , Choudhary T and Thakur P	Bluetooth controlled RC car using Arduino	I m p .J of Interdisciplin-ary Research (IJIR)	2016	Based on Arduino Control

10.	N Kumar , D Acharya and D Lohani	An Iot – based vehical accident detecting on classif ication on system using senor Fusion	IEEE	2020	Based on Iot
11	KL Narayanan and CRS Ram	IoT based smart accident detection & insurance claiming system	IEEE	2021	Based on GUI and Bluetooth
12.	SR Prasath, RS Krishnan and SM Priya	IoT based Smart Accident Detection System for Hit and Run Cases	IEEE	2022	Based o n Arduino based control unit

1.4 NEED OF PROJECT

- We know that, Electric vehicles use electricity to charge their batteries instead of using fossil fuels like petrol or diesel. Electric vehicles are more efficient, and that combined with the electricity cost means that charging an electric vehicle is cheaper than filling petrol or diesel for your travel requirements.
- In this project we controlling Electric car using wirelessly through Android smart phone using the Wi-fi module through UART protocol with the Robotic mechanism[16].So, user can control the Electric car from anywhere within the rang of controlled

1.5 AIM OF THE PROJECT

- The aim of this project to designing a ROBOTI car that can be operated wirelessly through Wi-fi communication using Android Apps on smart phone.
- To avoid the vehicle/car accident by using the different-different sensor models.

1.6 OBJECTIVES OF THE PROJECT

1. To control the car with help of Android phone.
2. To Drive the car/vehicle safely and with the security.
3. To Avoid the Accidental cases.
4. To Maintain the Environmental balance(with ECO-friendly).

1.7 PLANNING

Table 2: Planning

Sr. no.	Month	Task
1	July 2022	• Formed the group. • Did the survey on problems related to renewable energy sources. • Found out the problems faced by the people. • Discussed different ideas with Guide related to Agriculture, Robotics, and Embedded. • We submitted 3 project ideas. 1) Android Controlled Robot Car 2) IOT based Green House Farming. 3) Women safety with GPS tracking and alerts using arduino.
2.	August 2022	• Given the presentation on the above three project topics • Final topic was selected : Android Controlled Robot Car. • Gave presentation on final topic. • Suggestions are given by the teachers.
3.	September 2022	• Literature survey • Block diagram implementation • Finalisation of components, downloading of datasheet of each component used for the project.
4.	October 2022	• Circuit diagram design. • Designed the Flowchart.

5.	November 2022	• Simulation on TinkerCAD simulation software. • To find the solutions for generated problems like how to avoid the obstacle in front of car, controlling issue of the caret • Layout
6.	December 2022	• Preparation of Synopsis report.
7.	January 2023	• Testing
8.	February 2023	• Real time Programming • Faults finding
9.	March 2023	• Troubleshooting and modification if necessary
10.	April 2023	• Preparation of Report

CHAPTER 2
HARDWARE DESIGN

2.1 INTRODUCTION:

I. Robotic Car Hardware:

- **Chassis:** The physical structure of the car that houses the motors, wheels, and other components.
- **Motor Control**: Motor drivers or controllers that regulate the speed and direction of the car's motors.
- **Sensors:** Various sensors such as proximity sensors, ultrasonic sensors and gas sensor to detect gases the car's surroundings.
- **Microcontroller/Controller Board:** A microcontroller or controller board that acts as the brain of the robotic car, receiving commands from the Android app and controlling the car's hardware components.

II. Android Application:

- **User Interface:** The Android app provides a user-friendly interface through which users can control the robotic car and access various functionalities
- **Wireless Communication:** The app establishes a wireless connection (e.g., Bluetooth or Wi-Fi) with the robotic car to send control commands and receive feedback.
- **Control Commands:** Users can send commands to the robotic car via the app to control its movements, speed, and other actions.
- **Feedback and Visualization**: The app receives feedback from the car's sensors, such as obstacle detection information or video streaming, and presents it to the user through visual elements.

2.2 BLOCK DIAGRAM:

Following block diagram show the actual working of the android controlled robot car. We can control the robot car by the help of android phone. As the connection shows in fig. The android phone is connected to the microcontroller by the help of wireless module to send the instruction to the microcontroller to control the speed and direction of car.

And the microcontroller is connected to the motor driver ic and then motor driver IC is connected to the motor.

This block represents the physical robot car that performs various actions based on the commands received from the Android device. It consists of a microcontroller or a dedicated control board, motor drivers, and various sensors or actuators.

Motor Driver IC: The Motor Driver IC controls the movement of the robot car's motors. It receives control signals from the control system and regulates the motor speed and direction accordingly. The Motor Driver IC is typically used to interface with the motor drivers or directly drive the motors.

The power supply block provides electrical power to all the components of the system, including the ESP8266 module, control system, motor driver IC, ultrasonic sensor, and other peripherals. It ensures a stable and regulated power output to ensure reliable operation of the entire system.

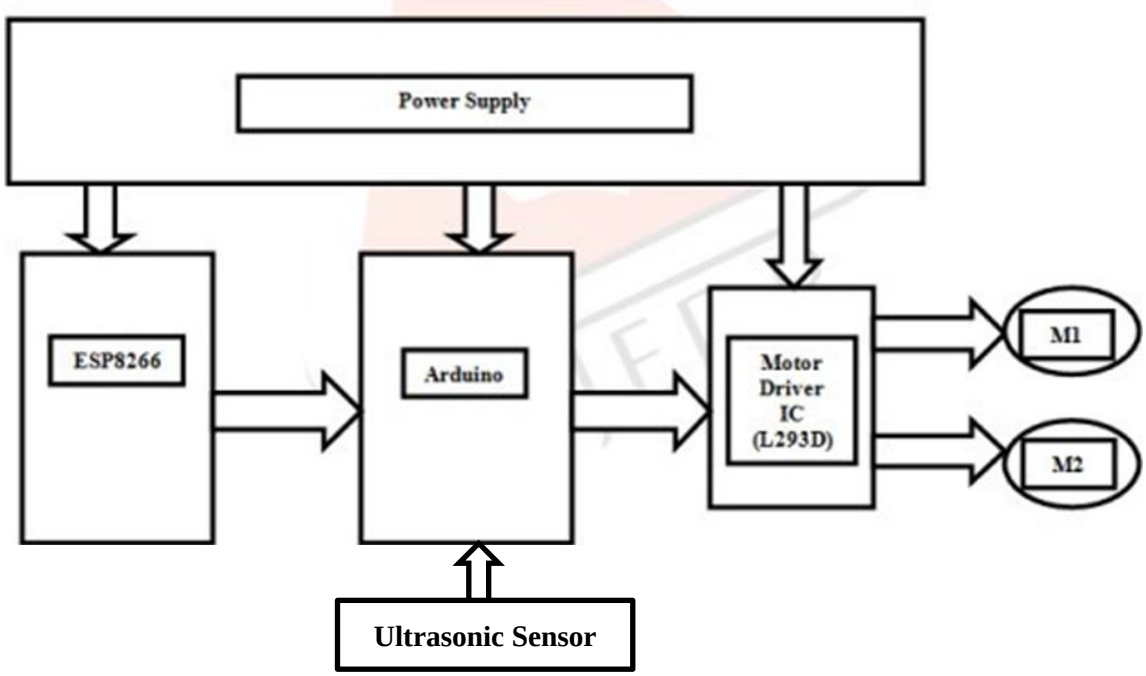


Fig. 1: BLOCK DIAGRAM ROBOTIC CAR

2.3 COMPONENTS REQUIRED

2.3.1 Node MCU:

The ESP8266 NodeMCU is a widely used development board based on the ESP8266 Wi-Fi module. It combines a microcontroller unit (MCU) with built-in Wi-Fi connectivity, making it ideal for IoT (Internet of Things) projects. The NodeMCU board is equipped with a powerful 32-bit Tensilica L106 MCU, offering ample processing power and storage space for embedded applications. It supports Lua scripting language, enabling quick and easy programming. The onboard Wi-Fi module provides seamless wireless communication capabilities, allowing the board to connect to the internet and interact with other devices. With its compact size and extensive community support, the ESP8266 NodeMCU is a popular choice for prototyping IoT solutions[8].

Fig. 2: Node MCU

Feature:

- Microcontroller: ESP-8266 32bit
- Node MCU Model: Amica
- USB Connector: Micro USB
- Operating Voltage: 3.3V
- Input Voltage: 4.5V- 10V
- Flash Memory: 4 MB
- Digital I/O Pins: 11
- Analog In Pin: 1

2.3.2 L293D MOTOR DRIVER:

The L293D motor driver is a popular integrated circuit used for controlling DC motors and stepper motors in a wide range of applications. It features four high-current half-H drivers, allowing bidirectional control of two DC motors or a single stepper motor. Each motor channel can handle a continuous current of up to 600mA and a peak current of 1.2A, making it suitable for driving small to medium-sized motors. The L293D also offers built-in protection features such as thermal shutdown and output clamp diodes to prevent damage to the driver and the motors. With its straightforward pin configuration and compatibility with microcontrollers, the L293D motor driver provides a reliable and convenient solution for motor control.

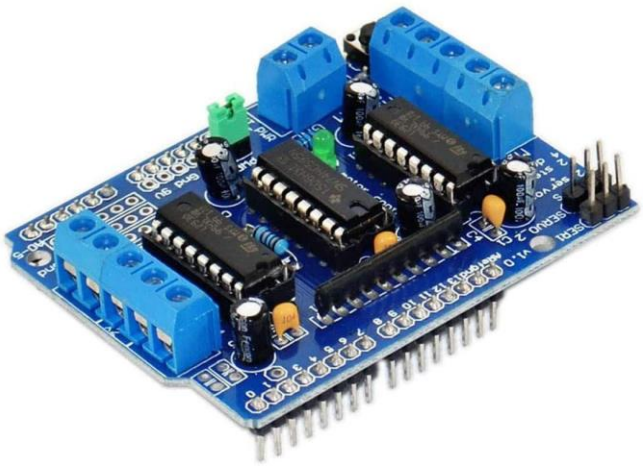


Fig. 3: L293D MOTOR DRIVER

Specification:

- Input Voltage: 4.5 - 36V
- Number of channel: 4(Two H-bridges)
- Output Voltage: 1.2V - Vcc
- Current: 16mA(typical)
- Package Type: 16-pin DIP
- Thermal shutdown Protection: yes

Pin Name	Description
VCC1	Power supply for the logic circuitry (5V)
VCC2	Power supply for the motor (can range from 4.5V to 36V)
| GND	Ground connection
Enable 1, 2	Enable pins for motor channel 1 and 2 respectively. A logic high on these pins enables the motor.
Input 1, 2	Input pins for controlling the direction of motor rotation for channel 1 and 2 respectively.
Output 1, 2	Output pins for motor channel 1 and 2 respectively. Connect these pins to the motor terminals.
Motor 1, 2	Motor supply pins for channel 1 and 2 respectively. Connect these pins to the motor power supply.
Enable 3, 4	Enable pins for motor channel 3 and 4 respectively. A logic high on these pins enables the motor.
Input 3, 4	Input pins for controlling the direction of motor rotation for channel 3 and 4 respectively.
Output 3, 4	Output pins for motor channel 3 and 4 respectively. Connect these pins to the motor terminals.
Motor 3, 4	Motor supply pins for channel 3 and 4 respectively. Connect these pins to the motor power supply.

2.3.3 DC Motor:

A DC motor is any of a class of rotary electrical motors that converts direct current (DC) electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic. To periodically change the direction of current in part of the motor. DC motors were the first form of motor widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, andappliances.

The Universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills. Working principle of DC motor is that When kept in a magnetic field, a current-carrying conductor gains torque and develops a tendency to move. In short, when electric fields and magnetic fields interact, a mechanical force arises. This is the principle on which the DC motors work.

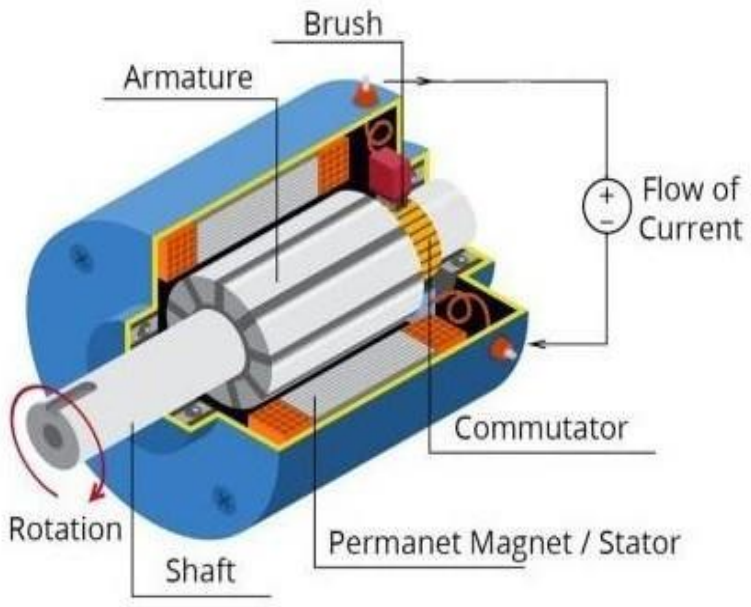


Fig.4: DC Motor.

2.3.4 Ultrasonic Sensor:

The ultrasonic sensor is a popular electronic device used for distance measurement and object detection in various applications. It utilizes ultrasonic waves, which are sound waves with frequencies above the human hearing range, typically around 40 kHz. The sensor emits ultrasonic pulses and measures the time it takes for the waves to bounce back after hitting an object. By calculating the time difference, the distance to the object can be determined accurately. Ultrasonic sensors are commonly employed in robotics, automation, parking systems, security systems, and even in medical devices. They offer non-contact sensing capabilities, high accuracy, and reliable performance, making them an essential component in many projects.

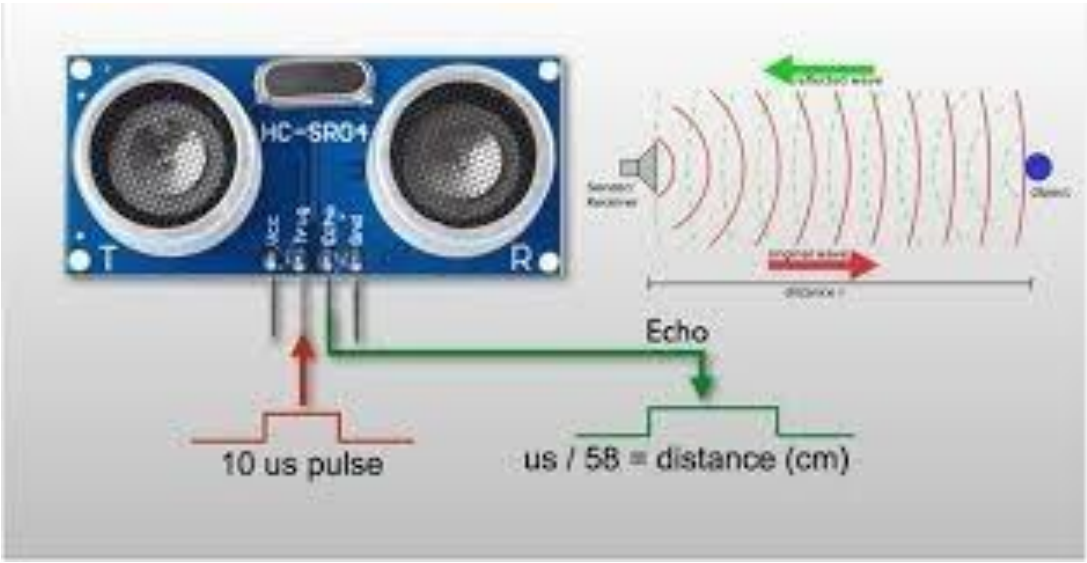


Fig. 5(A): Ultrasonic sensor

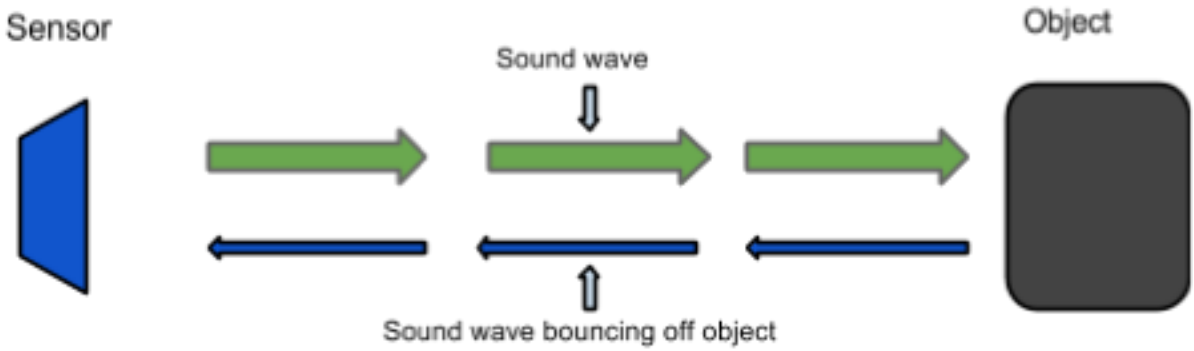


Fig. 5(B): Actual Working of Ultrasonic sensor

Module Pin Assignments:

	Pin Symbol	Pin Function Description
1	VCC	5V power supply
2	Trig	Trigger Input pin
3	Echo	Receiver Output pin
4	GND	Power ground

Specification:

Electrical Parameters	HC-SR04 Ultrasonic Module
Operating Voltage	5VDC
Operating Current	15mA
Operating Frequency	40KHz
Max. Range	4m
Nearest Range	2cm
Measuring Angle	15 Degrees
Input Trigger Signal	10us min. TTL pulse
Output Echo Signal	TTL level signal, proportional to distance
Board Dimensions	1-13/16" X 13/16" X 5/8"
Board Connections	4 X 0.1" Pitch Right Angle Header Pins

2

2.3.5 Gas Sensor:

The MQ3 gas sensor is a popular sensor used to detect alcohol vapor concentrations in the air. It is commonly employed in breathalyzer devices and alcohol detection systems. The sensor operates based on the principle of a tin dioxide (SnO2) sensing element, which changes its resistance when it comes into contact with alcohol vapors. The MQ3 sensor has a high sensitivity to alcohol, allowing it to detect even small amounts of alcohol in the air. It is compatible with various microcontrollers and can be easily integrated into electronic projects. The sensor provides an analog output that can be measured and processed to determine the alcohol concentration level.

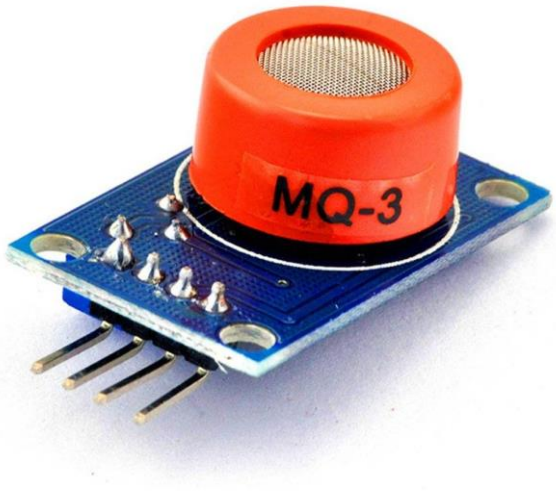


Fig. 6: Gas Sensor MQ3

Specification:

- Sensing Element: Tin dioxide (SnO2)
- Detection Gas: Alcohol vapor
- Operating Voltage: 5V DC
- Heater Voltage: 5V DC
- Load Resistance (RL): Adjustable, typically around 5K ohm
- Sensitivity: High sensitivity to alcohol vapor
- Response Time: <10 seconds
- Operating Temperature: 10°C to 50°C
- Humidity Range: 95% RH (non-condensing)

2.3.6 9V Battery:

A 9V battery is a compact and portable power source commonly used in various electronic devices and small-scale projects. It typically consists of six smaller 1.5V cells connected in series, providing a total voltage of 9 volts. These batteries are popular in applications such as smoke detectors, remote controls, guitar effects pedals, and small electronic circuits[17]. The 9V battery's rectangular shape and snap connector make it easy to install and replace. It offers a reliable and consistent power supply, allowing devices to operate efficiently. However, due to its relatively small capacity, the 9V battery is best suited for low-power devices with intermittent usage or short-duration tasks[18].

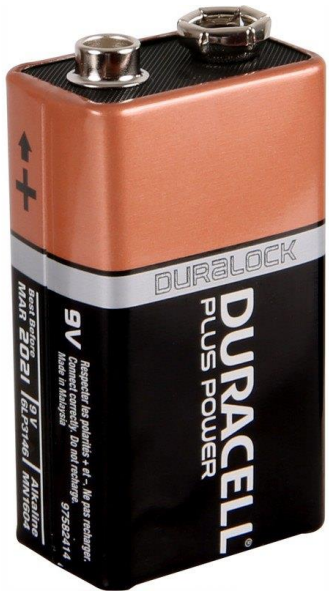


Fig. 7: 9V Battery

Features:

- Can be mounted in any orientation.
- Computer designed lead, calcium tin alloy grid for high power density.
- Long service life, float or cyclic applications.
- Maintenance-free operation.
- Low self- discharge.

2.3.7 Light-Emitting Diode:

LED, short for Light Emitting Diode, is a semiconductor device that emits light when an electric current passes through it. LEDs are widely used in various applications due to their efficiency, durability, and versatility. These small, solid-state devices offer numerous advantages over traditional light sources .LEDs are available in a range of colors, including red, green, blue, and white, allowing for a wide spectrum of lighting possibilities. They have a long operational life, typically lasting tens of thousands of hours, which makes them highly reliable and cost-effective. LEDs also consume significantly less power compared to incandescent or fluorescent bulbs, resulting in energy savings.
One of the key advantages of LEDs is their ability to produce directional light, meaning they emit light in a specific direction. This directional nature makes them ideal for applications such as indicator lights, automotive lighting, and display screens.

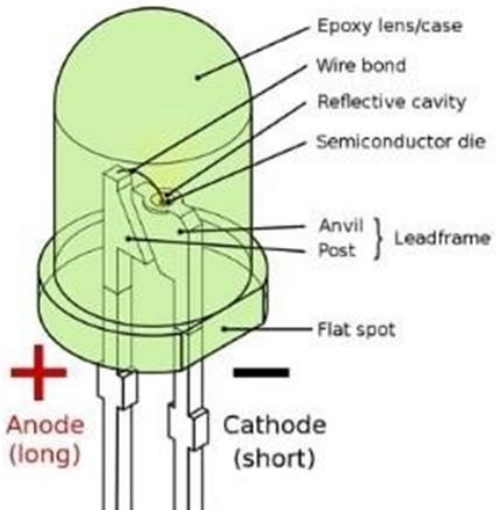


Fig. 8: Light-Emitting Diode

Specification:

- Light Output: Brightness or intensity of emitted light (lm/cd)
- Color Temperature: Warmth or coolness of the light (Kelvin)
- Power Consumption: Energy consumed by the LED (W)
- Operating Voltage: Voltage range at which the LED operates (V)
- Environmental Impact Eco-friendliness & absence of hazardous materials

2.3.8 JUMPER WIRE:

A jump wire (also known as jumper, jumper wire, DuPont wire) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them–simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

There are different types of jumper wires. Some have the same type of electrical connector at both ends, while others have different connectors. These wires typically consist of a thin conductor, such as copper, that is encased in an insulating material, such as plastic or silicone. The insulation helps prevent short circuits and electrical interference between adjacent wires or components. The ends of the jumper wires are often fitted with connectors, such as pin headers, alligator clips, or banana plugs. Jumper wires come in various lengths, color and types.

Fig. 9: Jumper wire

Specification	Description
Length	Length of the jumper wire (e.g., 10cm, 20cm, etc.)
Wire Gauge	Thickness of the wire (e.g., 22 AWG, 26 AWG, etc.)
Conductor Material	Material used for the wire conductor (e.g., copper)
Insulation Material	Material used to insulate the wire (e.g., PVC)
Color	Color of the wire insulation (e.g., red, black, etc.)
Flexibility	Degree of flexibility or rigidity of the wire

2.3.9 DIODE:

A diode is an electronic device that allows the flow of electric current in only one direction. It is a fundamental component in electronic circuits and finds applications in a wide range of fields, including telecommunications, power electronics, and signal processing.At its core, a diode consists of a semiconductor material, typically silicon or germanium, with two terminals: an anode and a cathode. These terminals determine the direction of current flow. The anode is the positive terminal, while the cathode is the negative terminal.The primary function of a diode is to enforce a one-way flow of current, allowing it to act as a rectifier. When a voltage is applied across the diode in the forward direction (anode positive, cathode negative), it conducts current with very low resistance. This allows the current to flow freely through the diode. However, when the voltage is reversed (anode negative, cathode positive), the diode blocks the flow of current and acts as an insulator.

In addition to rectification, diodes have other important properties. For instance, they exhibit a reverse breakdown voltage, beyond which the diode starts conducting in reverse. This characteristic is utilized in applications such as voltage clamping and voltage regulation.

Fig. 10: Diode

Features:

1. One-Way Current Flow: Diodes allow current to flow in only one direction, from the anode (positive terminal) to the cathode (negative terminal).

2. Rectification: Diodes are commonly used as rectifiers to convert alternating current (AC) to direct current (DC) by blocking the reverse current flow.

3. Voltage Drop: Diodes have a forward voltage drop, typically around 0.6 to 0.7 volts for silicon diodes, which occurs when current flows through them in the forward direction.

4. Reverse Voltage Protection: Diodes offer reverse voltage protection by blocking the flow of current when a reverse bias voltage is applied, safeguarding circuits from potential damage.

5. **Nonlinear Current-Voltage Characteristic:** Diodes exhibit a nonlinear relationship between current and voltage. They have a low resistance (forward bias) and act as an insulator (reverse bias) based on the applied voltage polarity.

6. Switching Speed: Diodes have fast switching speeds, allowing them to quickly turn on and off in response to changes in the applied voltage or current.

7. Temperature Dependence: The performance of diodes is influenced by temperature changes. The forward voltage drop decreases with increasing temperature, while the reverse leakage current increases.

2.3.10 CAPACITOR:

A capacitor is an electronic component that stores and releases electrical energy. It consists of two conductive plates separated by a dielectric material. When a voltage is applied across the plates, an electric field is created, causing positive and negative charges to accumulate on each plate. The capacitance of a capacitor, measured in Farads (F), determines its ability to store charge. A higher capacitance means the capacitor can store more charge for a given voltage. Capacitors are available in a wide range of capacitance values, from picofarads (pF) to farads (F), depending on the application. Capacitors have various uses in electronic circuits. They can act as energy reservoirs, smoothing out voltage fluctuations and providing stable power to sensitive components. Capacitors are commonly employed in power supply filters, decoupling circuits, and voltage regulators. In addition to their energy storage and timing functions, capacitors are vital in signal processing and coupling applications. They can block direct current (DC) while allowing alternating current (AC) to pass through, enabling them to couple signals between different parts of a circuit without disturbing the DC bias.

Fig. 11: CAPACITOR

Specification	Discription
Capacitance	The measure of a capacitor's ability to store charge, expressed in Farads (F).
Voltage Rating	The maximum voltage that can be applied across the capacitor without causing damage, specified in volts (V).
Tolerance	The allowable deviation from the stated capacitance value, typically given as a percentage (%).
Leakage Current	The small amount of current that flows through the dielectric, even when the capacitor is fully charged. It is usually specified in microamps (μA).
Lifespan	The expected operational lifetime of the capacitor, typically given in hours or cycles.

CHAPTER 3

MRTHODOLOGY

3.1 STEPS IN PROJECT IMPLEMENTATION:

The steps taken in the implementation process are :

1. Circuit development and design.

2. Writing and developing code on ARDIUNO IDE.

3. WI FI testing and configuration IP Address.

4. Programming the Microcontroller.

5. Bread board testing of circuit.

6. Building and soldering circuit.

7. Troubleshooting and testing.

8. Writing code to control the Car.

9. Writing code to add the Ultrasonic Sensor and Gas Sensor.

10. Simulating circuit with the new code.

11. Reprogramming the microcontroller.

12. Further troubleshooting and testing.

13. Casing design and construction.

14. Final testing of circuit.

CHAPTER 4

SOFTWARE DEVELOPMENT

4.1 SELECTION OF MICROCONTROLLER DEVELOPMENT TOOLS:

Once microcontroller is selected, selecting a perfect development tools is most important. For develop every microcontroller based system, a set of software and hardware tools are required. Software tools for editing and debugging and troubleshooting the microcontroller program. W9/hile hardware tools for burning computer code into microcontroller and testing microcontroller hardware. A good development tools must have following properties:

1. Simple to use.
2. Not many steps execution.
3. Inexpensive.
4. Must include basic functions like editor, debugger, compiler.
5. Must include power supply and basic hardware required and I/O pins connector facility.
6. Cross-platform development.
7. Must support different programming language and computer operating system.

4.2 EMBEDDED C

Embedded C is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations.

Embedded C uses most of the syntax and semantics of standard C, e.g., main() function, variable definition, datatype declaration, conditional statements (if, switch, case), loops (while, for), functions, arrays and strings, structures and union, bit operations, macros, etc

ARDUINO IDE SOFTWARE:

1. Overview: The Arduino IDE is an open-source software that supports the Arduino programming language, which is based on C and C++. It is compatible with various Arduino boards, including the popular Arduino Uno, Arduino Mega, and Arduino Nano.
2. Features: The Arduino IDE offers several features to facilitate the development of Arduino projects:

- Code Editor: It provides a text-based editor with syntax highlighting and auto-completion features to assist in writing code.
- Library Manager: It includes a library manager that allows users to easily search, install, and manage third-party libraries, expanding the functionality of Arduino projects.
- Serial Monitor: The IDE includes a built-in Serial Monitor tool that enables real-time communication between the Arduino board and the computer, facilitating debugging and data exchange.
- Board Manager: It supports a wide range of Arduino boards and allows users to install additional board definitions to work with different models and variants.
- Examples: The IDE comes with a collection of example sketches that showcase various functionalities of Arduino boards, providing a starting point for beginners and reference for more advanced users.
- Tools: The IDE integrates tools for compiling and uploading code to Arduino boards seamlessly.
- Debugging: While the Arduino IDE doesn't have an extensive debugging feature, users can incorporate serial print statements or use external debuggers to monitor code execution and troubleshoot issues.

3. Cross-platform Compatibility: The Arduino IDE is available for Windows, macOS, and Linux operating systems, making it accessible to a wide range of users across different platforms.
4. Community and Resources: Arduino has a large and active community of users and developers who share their projects, code, and expertise. This vibrant community provides forums, online tutorials, documentation, and a wealth of resources that can help beginners get started and support advanced users in tackling complex projects.
5. Extensibility: The Arduino IDE is highly extensible, allowing users to add custom libraries, boards, and tools. This flexibility makes it possible to adapt the IDE to suit specific project requirements or to work with non-Arduino compatible hardware.
6. Integration with Arduino Ecosystem: The Arduino IDE is an integral part of the larger Arduino ecosystem, which includes the Arduino hardware platform and a vast array of shields, sensors,

and actuators. The tight integration with Arduino boards and components ensures a seamless development experience.

In conclusion, the Arduino IDE is a user-friendly, open-source software platform designed specifically for programming Arduino microcontrollers. It offers features such as a code editor, library manager, serial monitor, and board manager, making it easy to write, compile, and upload code to Arduino boards. With cross-platform compatibility, a thriving community, and extensive resources, the Arduino IDE provides an accessible and powerful tool for creating a wide range of electronic projects.

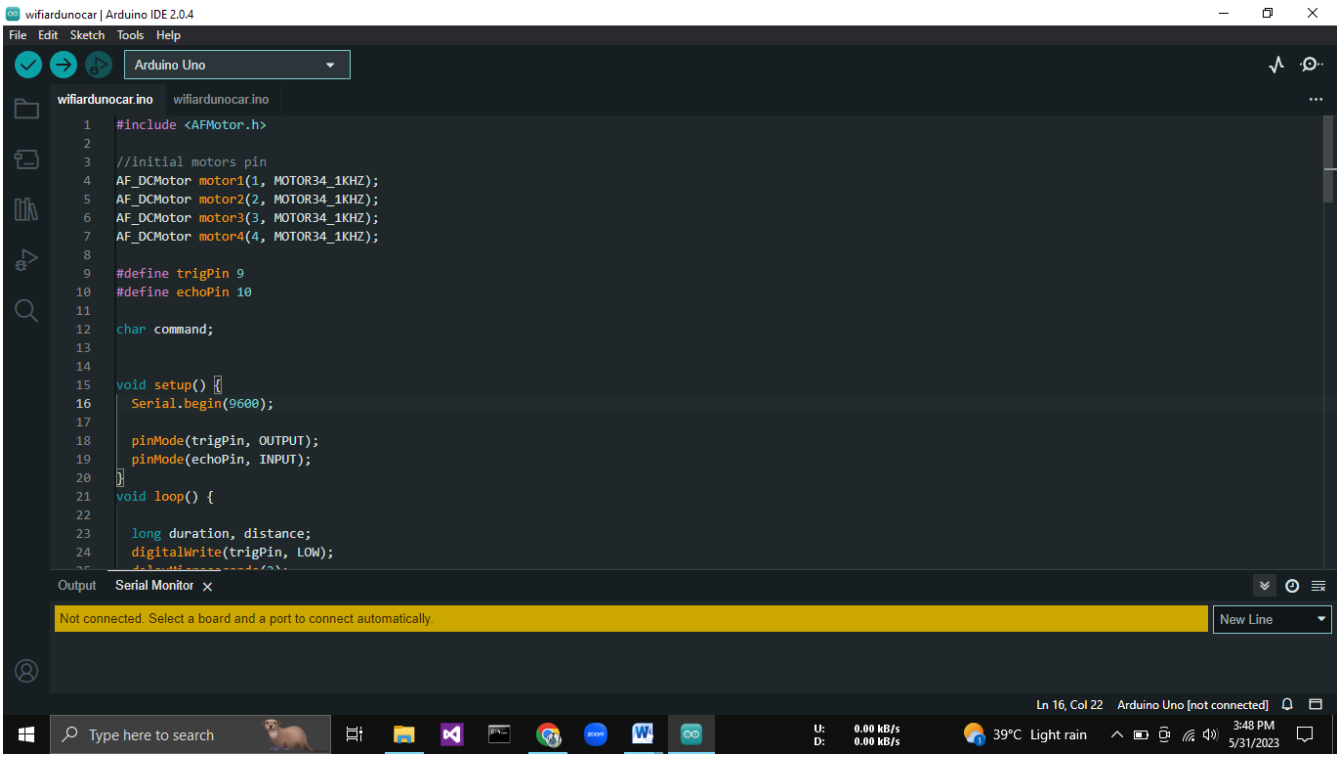


Fig 12. ARDUINO IDE SOFTWARE

STEPS OF ARDUINO IDE USE:

1. Install Arduino IDE: Download and install the latest version of the Arduino IDE from the official Arduino website (https://www.arduino.cc/en/software).
2. Connect the Arduino board: Connect your Arduino board to your computer using a USB cable. Ensure that the board is properly connected and recognized by your computer.
3. Launch Arduino IDE: Open the Arduino IDE that you installed in Step 1.
4. Select the board: From the "Tools" menu, navigate to the "Board" submenu, and select the appropriate Arduino board you are using. For example, if you have an Arduino Uno, select "Arduino/Genuino Uno."
5. Select the port: From the same "Tools" menu, navigate to the "Port" submenu, and select the port to which your Arduino board is connected. The specific port name may vary depending on your operating system.
6. Open the sketch: Either create a new sketch or open an existing one from the "File" menu. A new sketch is a blank canvas for your code.
7. Verify the sketch: Click on the "Verify" button (checkmark icon) to compile your code. This step ensures that there are no syntax errors in your program.
8. Upload the sketch: Click on the "Upload" button (right-arrow icon) to upload the compiled code to your Arduino board. The IDE will compile the code again and then transfer it to the board. You can monitor the progress in the status bar at the bottom of the IDE.
9. Wait for the upload to complete: Once the upload process starts, the Arduino IDE will display messages about the progress. Wait for the process to complete successfully. You may see a "Done uploading" message when it finishes.
10. Verify the upload: After the upload is complete, the program will start running on your Arduino board. You can check the behavior of your program by observing any connected sensors, LEDs, or other outputs.

CHAPTER 5

CONNECTION DIAGRAM

5.1 CIRCUIT DIAGRAM:

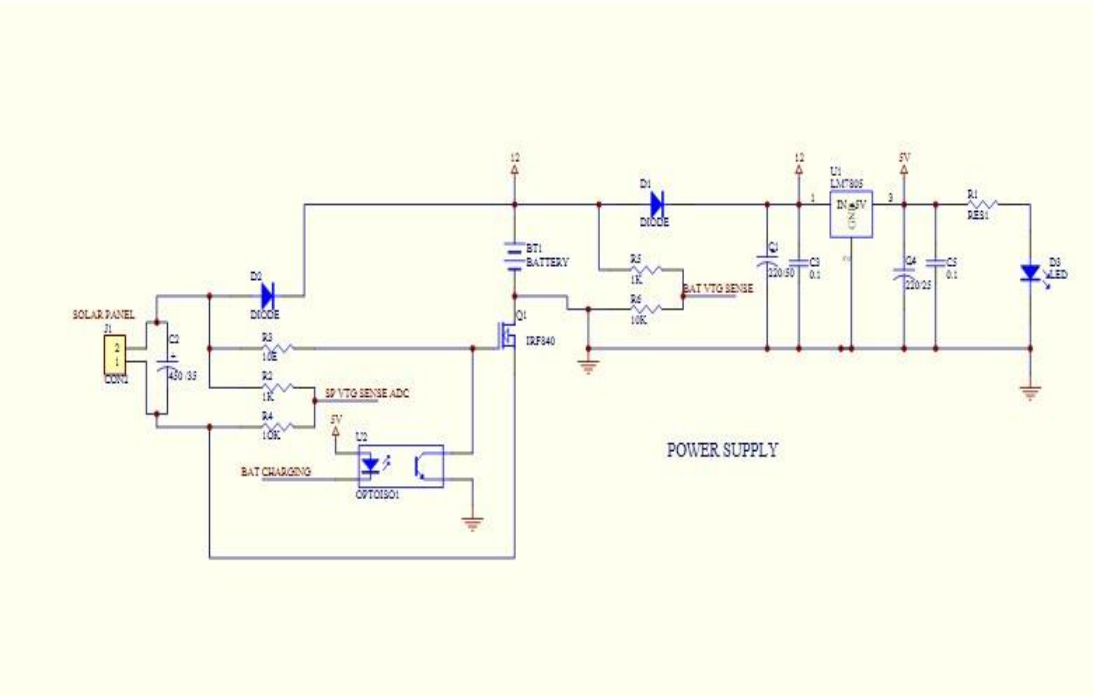


Fig. 12: Circuit Diagram of Power Supply

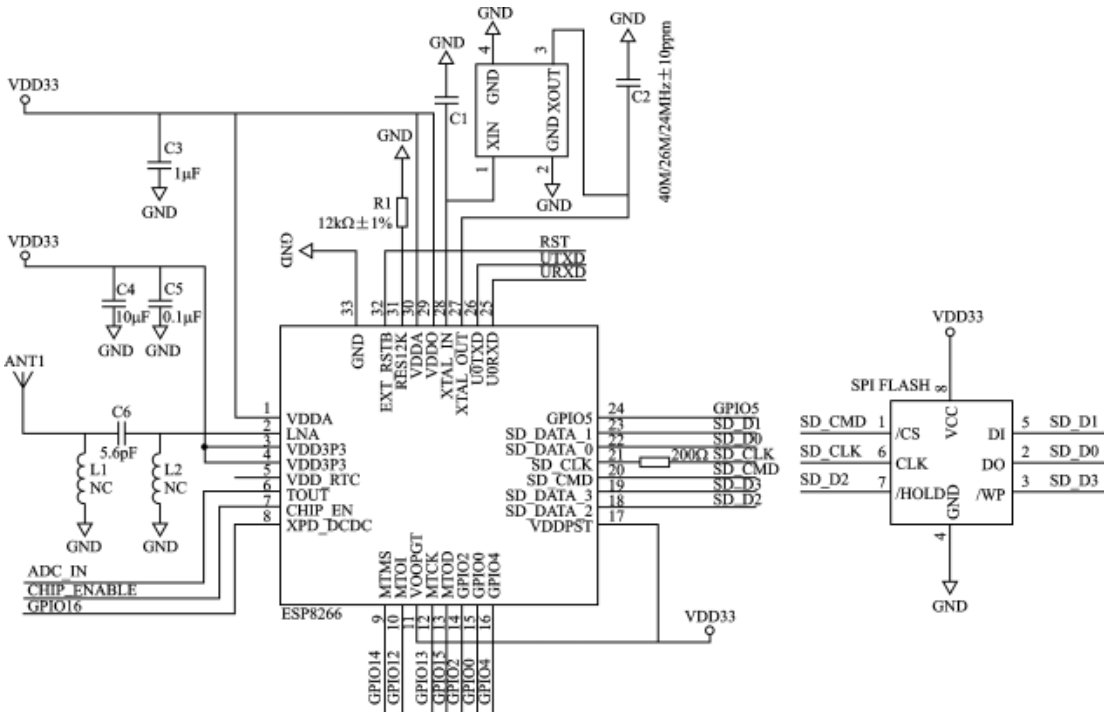


Fig. 13: Circuit Diagram of controller

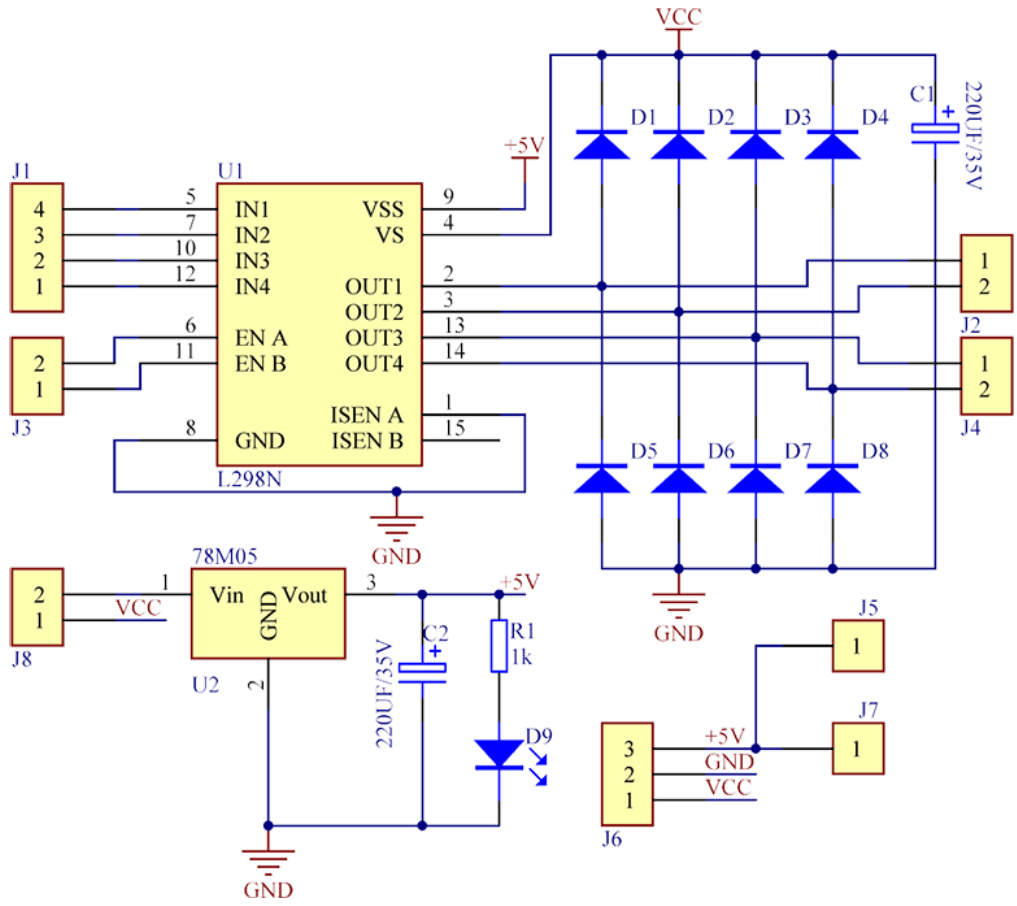


Fig. 14: Circuit Diagram of L293D Motor Driver

CHAPTER 6

6.1 ALGORITHM

6.1.1 Algorithm of Nodemcu

Step 1: Start.

Step 2: Initialize connection.

Step 3: get the input from Android app.

Step 4: send the signal to the motor driver ic.

Step 5: received the input from ultrasonic sensor.

Step 6: stop

6.1.2 Algorithm for motor Driver IC

Step 1: Start.

Step 2: receive the input from node mcu.

Step 3: send the power to the motor.

Step 4: control the rotation speed.

Step 5: control the motor direction ex. Backward or forward

Step 6: stop.

6.1.3 Algorithm for ultrasonic sensor

Step 1: Start.

Step 2: send the ultrasonic waves.

Step 3: received the waves after some micro time.

Step 4: change in resistance.

Step 5: send the signal to the node-mcu.

Step 6: Stop.

6.2 ALGORITHM FOR ALL PROJECT

Step 1: Start.

Step 2: Initialize connection of node-mcu.

Step 3: get the input from Android app.

Step 4: send the signal to the motor driver ic.

Step 5: received the input from ultrasonic sensor.

Step 6: if (1) stop car.

Step 7: else send signal to the motor driver ic

Step 8: control motor direction speed .

Step 9: drive the car using the android .

Step 10: stop car.

Step 11: disable connection.

Step 12: Stop.

6.3 FLOWCHART

6.3.1 Flowchart of Motor Driver IC

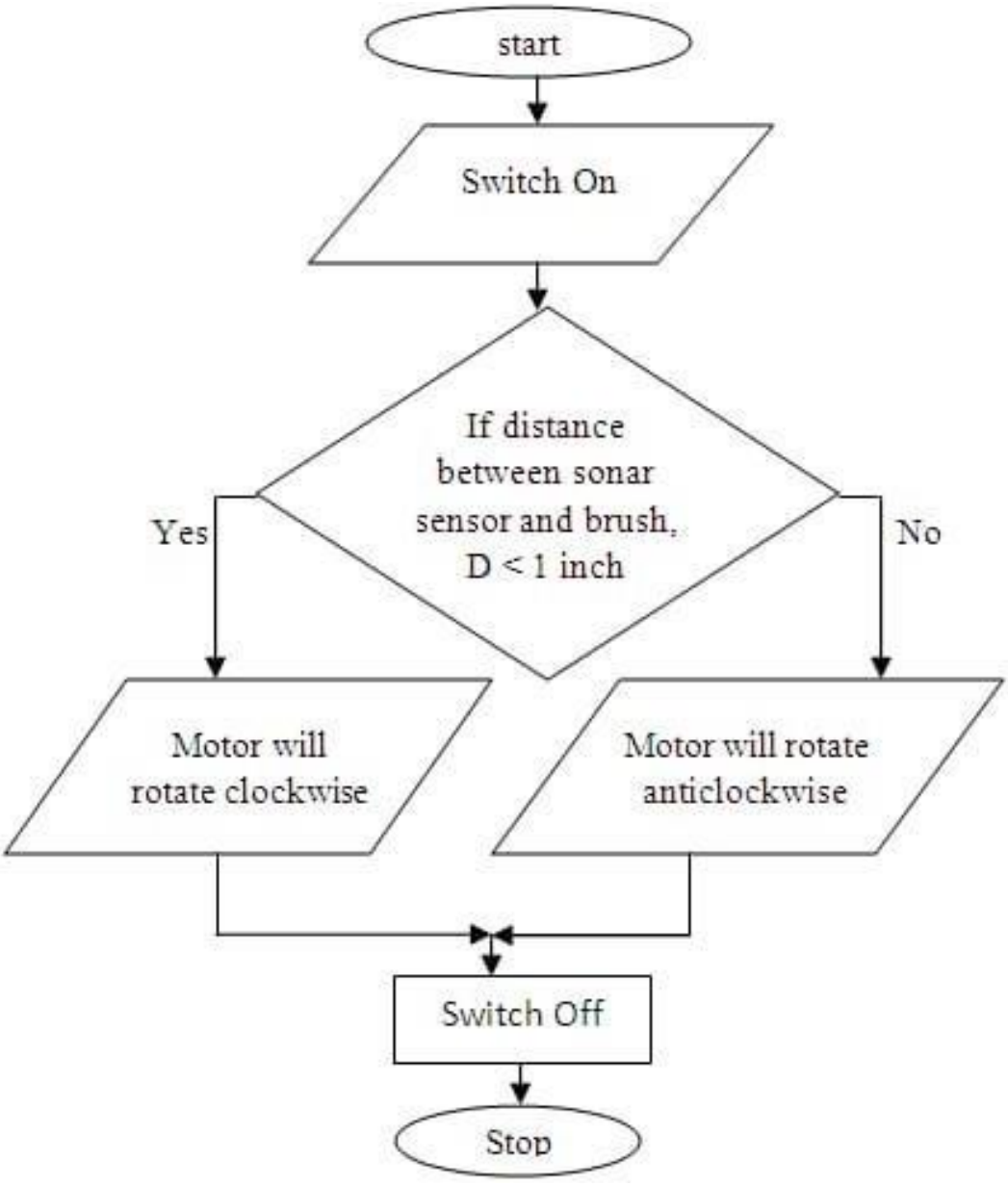


Fig. 16: Flowchart of Motor Driver IC

6.3.2 Flowchart for Ultrasonic Sensor

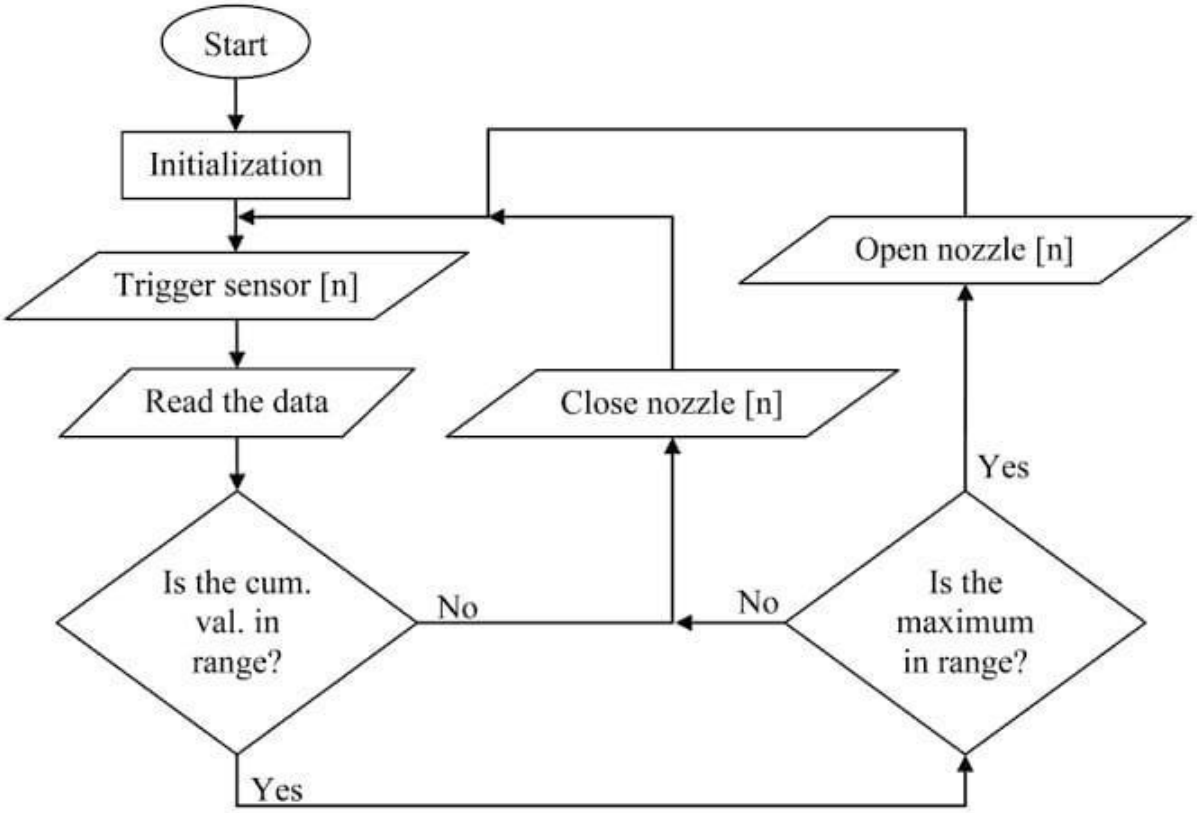


Fig. 17: Flowchart of Ultrasonic Sensor

6.3.3 Flowchart of Robotic Car

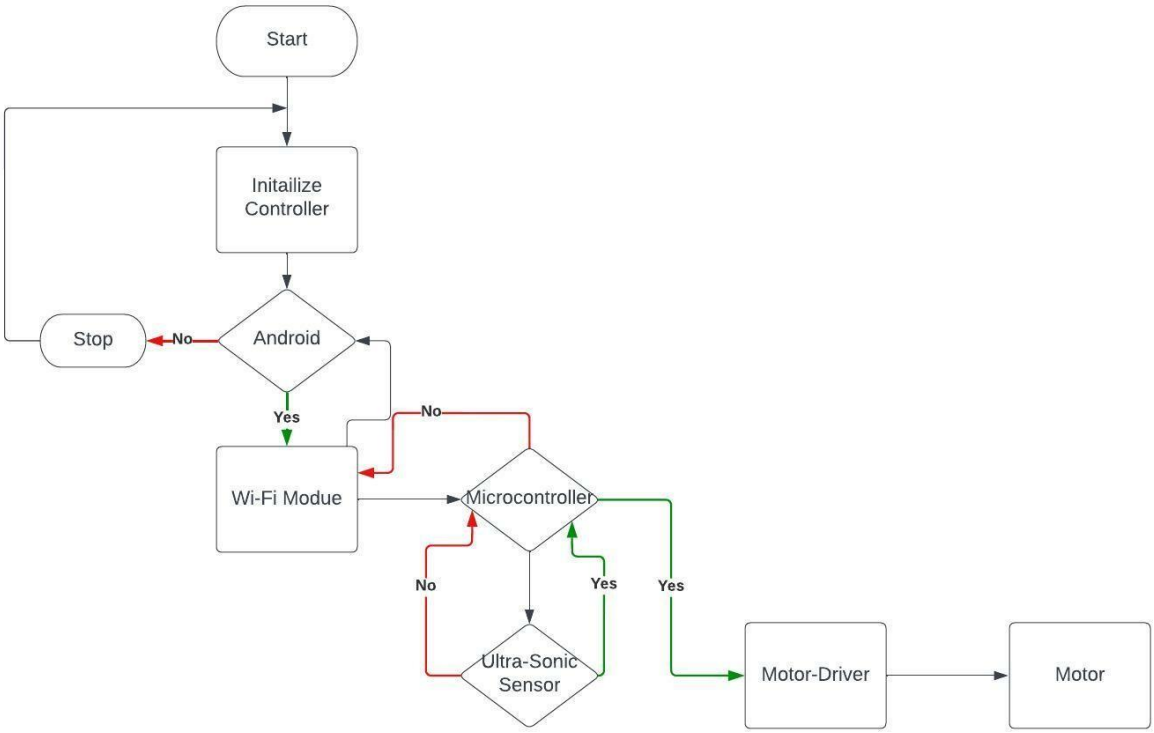


Fig. 18: Flowchart of Robotic Car

CHAPTER 7
PROGRAMING

7.1 PROGRAM

Arduino UNO Code:

```
#include <AFMotor.h>

//initial motors pin
AF_DCMotor motor1(1, MOTOR34_1KHZ);
AF_DCMotor motor2(2, MOTOR34_1KHZ);
AF_DCMotor motor3(3, MOTOR34_1KHZ);
AF_DCMotor motor4(4, MOTOR34_1KHZ);

#define trigPin 9
#define echoPin 10

char command;



void setup() {
  Serial.begin(9600);

  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
}
void loop() {

  long duration, distance;
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
```

```
digitalWrite(trigPin, LOW);
duration = pulseIn(echoPin, HIGH);
distance = (duration / 2) / 29.1;
if(distance < 20)
{
  Stop();
}
if (Serial.available() > 0 && distance > 20 ) { // Check if there is data in the serial buffer
  String data = Serial.readStringUntil('\n'); // Read the data until the newline character
  Serial.print("Received data: ");
  Serial.println(data);
    Serial.println(distance);
   // Print the received data to the serial monitor
 // if(data=="R") {
       // right();
 // } else {
    command = data[0]; // Get the first character of the received string
    switch (command) {
      case 'F':
        forward();
        break;
      case 'B':
        back();
        break;
      case 'L':
        left();
        break;
      case 'R':
        right();
        break;
      default:
        Stop();
        break;
    }
```

```
    }
 // }
}

void forward(){
    motor1.setSpeed(255); //Define maximum velocity
   motor1.run(FORWARD);  //rotate the motor clockwise
   motor2.setSpeed(255); //Define maximum velocity
   motor2.run(FORWARD);  //rotate the motor clockwise
   motor3.setSpeed(255); //Define maximum velocity
    motor3.run(FORWARD);  //rotate the motor clockwise
    motor4.setSpeed(255); //Define maximum velocity
    motor4.run(FORWARD);  //rotate the motor clockwise
}

void back()
{

  motor1.setSpeed(255); //Define maximum velocity
  motor1.run(BACKWARD); //rotate the motor anti-clockwise
  motor2.setSpeed(255); //Define maximum velocity
  motor2.run(BACKWARD); //rotate the motor anti-clockwise
  motor3.setSpeed(255); //Define maximum velocity
  motor3.run(BACKWARD); //rotate the motor anti-clockwise
  motor4.setSpeed(255); //Define maximum velocity
  motor4.run(BACKWARD); //rotate the motor anti-clockwise
}

void left()
{

  motor1.setSpeed(255); //Define maximum velocity
  motor1.run(BACKWARD); //rotate the motor anti-clockwise
  motor2.setSpeed(255); //Define maximum velocity
```

```
  motor2.run(BACKWARD); //rotate the motor anti-clockwise
  motor3.setSpeed(255); //Define maximum velocity
  motor3.run(FORWARD);  //rotate the motor clockwise
  motor4.setSpeed(255); //Define maximum velocity
  motor4.run(FORWARD);  //rotate the motor clockwise
}

void right()
{
  motor1.setSpeed(255); //Define maximum velocity
  motor1.run(FORWARD);  //rotate the motor clockwise
  motor2.setSpeed(255); //Define maximum velocity
  motor2.run(FORWARD);  //rotate the motor clockwise
  motor3.setSpeed(255); //Define maximum velocity
  motor3.run(BACKWARD); //rotate the motor anti-clockwise
  motor4.setSpeed(255); //Define maximum velocity
  motor4.run(BACKWARD); //rotate the motor anti-clockwise
}

void Stop()
{
  motor1.setSpeed(0);  //Define minimum velocity
  motor1.run(RELEASE); //stop the motor when release the button
  motor2.setSpeed(0);  //Define minimum velocity
  motor2.run(RELEASE); //rotate the motor clockwise
  motor3.setSpeed(0);  //Define minimum velocity
  motor3.run(RELEASE); //stop the motor when release the button
  motor4.setSpeed(0);  //Define minimum velocity
  motor4.run(RELEASE); //stop the motor when release the button
}
```

ESP8266 CODE:

```
#include <ESP8266WiFi.h>
#include <SoftwareSerial.h>

const char* ssid = "Vivo Y35";
const char* password = "Abhigade";
const char* serverIP = "192.168.1.100"; // IP address of the ESP 8266
const int serverPort = 9600; // serial port baud rate

SoftwareSerial espSerial(2, 3); // create a software serial port on pins 2 and 3

void setup() {
  Serial.begin(9600); // initialize serial communication at 9600 baud
  espSerial.begin(9600); // initialize software serial communication at 9600 baud
  WiFi.begin(ssid, password); // connect to WiFi network

  while (WiFi.status() != WL_CONNECTED) { // wait until connected to WiFi
    delay(1000);
    Serial.println("Connecting to WiFi...");
  }
}
```

CHAPTER 8

ADVANTAGES, DISADVANTAGES, APPLICATIONS

8.1 ADVANTAGES

1. Intuitive Control Interface: Using an Android device as the control interface provides a familiar and user-friendly experience. The touch-based controls and graphical user interface make it easy for users to navigate and operate the robot car.
2. Wireless Control: The Android-controlled robot car eliminates the need for physical connections, allowing for wireless control. This enhances flexibility and mobility, as the user can control the car from a distance without any restrictions.
3. Accessibility: Android devices are widely available and accessible to a large number of users. This makes it convenient for anyone with an Android smartphone or tablet to control the robot car, increasing its reach and potential audience.
4. Advanced Functionality: Android devices offer a wide range of features and capabilities that can be harnessed in the robot car project. For example, users can utilize the device's built-in sensors, such as accelerometers and gyroscopes, to control the car's movements or enable features like tilt-based steering.
5. Integration with other Android Apps: The Android platform allows for seamless integration with other applications. This opens up possibilities for incorporating additional functionalities, such as GPS navigation, voice control, or live video streaming from the robot car.

8.2 DISADVANTAGES:

1. Device Compatibility: Android-controlled robot cars may face compatibility issues with certain Android devices due to variations in hardware specifications, operating system versions, or device capabilities. Ensuring compatibility across a wide range of devices can be challenging.
2. Reliance on Battery Life: Both the Android device and the robot car require power sources to operate. Depending on the battery life of the Android device and the robot car's power supply, the runtime may be limited, requiring frequent recharging or replacement of batteries.
3. Connectivity Limitations: The wireless control of the robot car relies on a stable and reliable connection between the Android device and the car. Connectivity issues, such as signal interference or limited range, can affect the control experience and responsiveness.
4. Programming Complexity: Developing the Android application and the necessary firmware for the robot car requires a certain level of programming knowledge and expertise. This can be a barrier for beginners or individuals without programming skills who want to engage with the project.
5. Security Risks: As with any connected device, there is a potential risk of unauthorized access or hacking when using an Android-controlled robot car. Implementing appropriate security measures and keeping software up to date is essential to mitigate these risks.

8.3 APPLICATIONS:

1. Education and Learning: The project can be used as a practical learning tool for students, allowing them to understand the fundamentals of robotics, electronics, and programming. It provides a hands-on experience in designing, building, and controlling a robotic system.
2. Home Automation: The robot car can be employed as a part of a home automation system. It can be used to remotely monitor and control various devices and appliances, such as lights, security systems, and entertainment systems. Users can use their Android devices to navigate the robot car through the house and perform desired tasks.
3. Surveillance and Security: The robot car can serve as a mobile surveillance system for monitoring and securing a specific area. Equipped with a camera, it can capture real-time video footage and transmit it to the user's Android device, enabling remote surveillance and monitoring capabilities.
4. Exploration and Mapping: The robot car can be utilized for exploration purposes, especially in environments that are difficult or unsafe for humans. It can navigate through unknown terrains, capture images or videos, and create a map of the surroundings. This application can be valuable in search and rescue operations or in hazardous environments.
5. Entertainment and Gaming: The Android controlled robot car can be incorporated into interactive gaming systems. Users can control the car to participate in races, obstacle courses, or other gaming scenarios. This application adds an element of fun and excitement to the project.
6. Research and Development: The project can be utilized in research and development activities related to robotics, artificial intelligence, and human-robot interaction. It provides a platform for testing and experimenting with new algorithms, sensors, and control systems.
7. STEM Outreach: The Android controlled robot car project can be used in educational outreach programs to inspire and engage students in science, technology, engineering, and mathematics (STEM). It can be demonstrated at schools, science fairs, and community events to showcase the potential of robotics and encourage young minds to pursue STEM fields.

CHAPTER 9

COST SHEET

9.1 COMPONENTS, SPECIFICATIONS AND THEIR COSTS

COMPONENTS	SPECIFICATION	QUANTITY	COST	TOTAL COST
Microcontroller	ESP 8266	1	450	450
	Ardiuno Uno v3	1	750	750
IC	Motor Driver IC	1	250	250
Sensors	Ultrasonic Sensor	1	150	150
	Gas Sensor	1	250	250
Other	DC Gear Motor	4	90	360
	Jumper wire	30	2	60
	Wheels	4	40	160
	chasis	1	160	160
	Battery	10	30	300

CHAPTER 10

SYSTEM OVERVIEW

10.1 Hardware Overview:

1. ESP8266 Microcontroller: The main control unit for the robotic car, providing Wi-Fi connectivity and processing capabilities.

2. Motor Driver IC: Interfaces between the microcontroller and the motors, supplying power and control signals for movement.

3. Motors: Drive the wheels of the robotic car and determine its speed and direction.

4. Power Supply: Provides the necessary voltage and current to power the ESP8266, motor driver IC, motors, and sensors.

5. Gas Sensor: Detects the presence and concentration of specific gases in the surrounding environment. It can be used for gas leakage detection or air quality monitoring. The gas sensor is typically connected to the ESP8266 through digital or analog pins, depending on the sensor's interface requirements.

6. Ultrasonic Sensor: Measures the distance between the robotic car and obstacles in its path using sound waves. It emits ultrasonic pulses and calculates the time it takes for the pulses to bounce back after hitting an object. The ultrasonic sensor is typically connected to the ESP8266 through digital pins, using separate trigger and echo pins for distance measurement.

10.2 Software Overview:

1. Arduino IDE: The programming environment used for coding and uploading firmware to the ESP8266 microcontroller.

2. ESP8266Wifi Robot CAR Library: A specialized library for controlling the robotic car using the ESP8266 and Arduino. It simplifies Wi-Fi connectivity, command reception, motor control, and sensor interfacing.

3. Firmware: The software code uploaded to the ESP8266 microcontroller, written in Arduino programming language. The firmware code handles Wi-Fi communication, interprets incoming commands, controls the motor driver IC, and interfaces with the sensors.

4. Wi-Fi Communication: The ESP8266 connects to a Wi-Fi network, either as a client or an access point, enabling wireless communication with a remote device. This allows the user to control the car remotely and receive sensor data.

5. Motor Control: The firmware code interprets the received commands and sends appropriate signals to the motor driver IC to control the motors' speed, direction, and rotation based on the user's input.

6. Gas Sensor Integration: The firmware code includes logic to read data from the gas sensor. This involves configuring the sensor's interface, reading sensor values, and performing any necessary data processing or calibration.

7. Ultrasonic Sensor Integration: The firmware code includes logic to trigger the ultrasonic sensor and measure the time it takes for the sound waves to return. This information is used to calculate the distance to obstacles, which can be used for collision avoidance or navigation purposes.

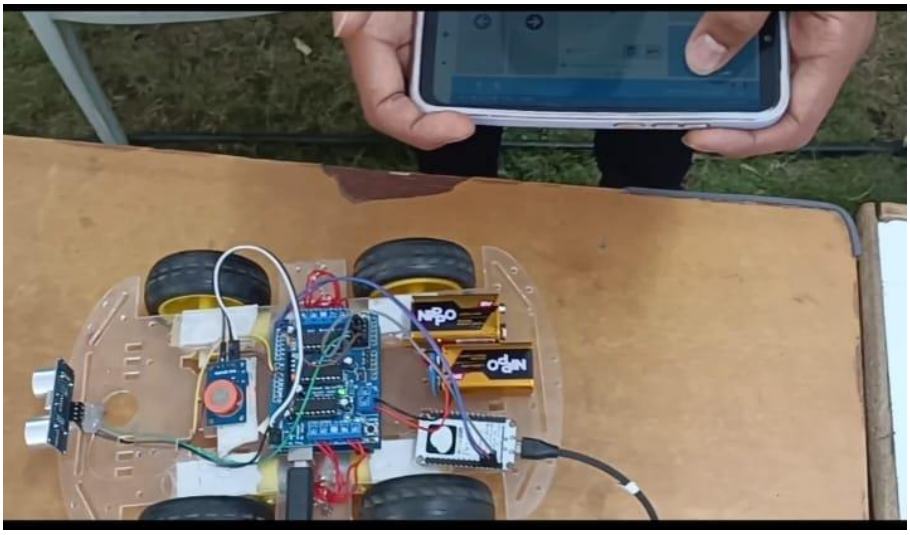
By incorporating the gas sensor and ultrasonic sensor into the robotic car system, you can enhance its functionality by adding gas detection and obstacle avoidance capabilities. The firmware code and sensor integration ensure that the sensors' data is properly collected, processed, and utilized in controlling the car's behaviour.

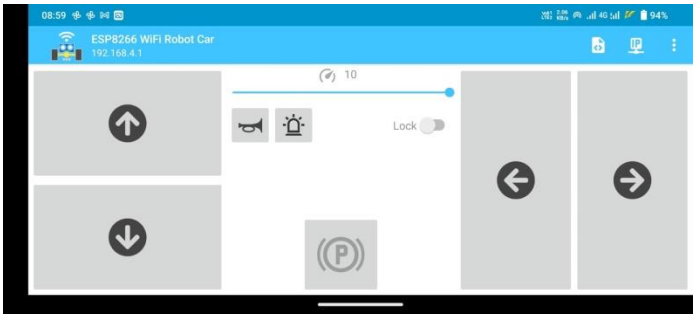
CHAPTER 11

11.1 RESULTS :

The Android Controlled Robot Car project has achieved the following results:

1. Successful integration of Android technology: The project successfully integrated Android smartphones or tablets as the control interface for the robot car, leveraging the power of mobile computing and touch-based interaction.
2. Remote control capabilities: Users can control the robot car wirelessly using the Android application, providing them with the ability to navigate the car in different directions, such as forward, backward, left, and right.
3. Autonomous navigation: By incorporating obstacle detection and avoidance systems, the robot car can navigate autonomously, detecting and avoiding obstacles in its path.
4. Seamless control experience: The control interface provided by the Android application offers intuitive and user-friendly controls, enabling users to operate the robot car effortlessly.
5. Potential for future development: The Android Controlled Robot Car project lays the foundation for further enhancements and advancements in the field of remote-controlled vehicles and robotic systems. It showcases the possibilities of merging Android technology with robotics, fostering innovation and exploration in this domain.





CHAPTER 12

CONCLUSION

12.1 CONCLUSION:

- The Android Controlled Robot Car project successfully combines the power of Android technology with robotics to create a versatile and interactive vehicle. Through the integration of an Android device and a custom-built application, users can remotely control the robot car, providing a seamless and intuitive control experience.
- Throughout the development process, the project team focused on optimizing wireless communication, control algorithms, and hardware components. Extensive testing and iterations were performed to ensure reliable and responsive control, allowing users to maneuver the car effortlessly. The addition of sensors, such as obstacle detection and avoidance systems, further enhanced the functionality of the robot car, enabling autonomous navigation and collision avoidance.
- The project's results demonstrate the potential of merging Android technology with robotics. The Android Controlled Robot Car opens up possibilities for various applications, ranging from entertainment and hobbyist projects to practical applications in areas like surveillance, exploration, and automation.
- By leveraging the capabilities of Android smartphones or tablets, users can control the robot car from a distance, enabling them to explore and interact with their surroundings in new and exciting ways. The integration of a live video stream from the onboard camera provides a first-person perspective, enhancing the user's immersion and control experience.
- The Android Controlled Robot Car project represents a successful convergence of mobile computing, wireless communication, and robotics, showcasing the advancements made in these fields. It serves as a stepping stone for further innovation and development in remote-controlled vehicles and robotic systems.
- Overall, this project demonstrates the potential of combining Android technology with robotics to create engaging and interactive experiences, fostering curiosity, exploration, and learning in the field of robotics.

CHAPTER 13

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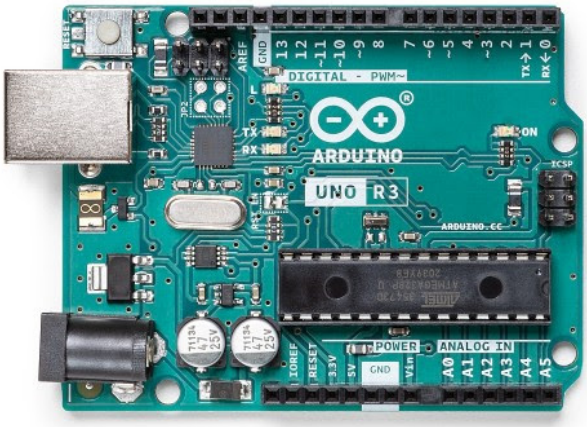
Product Reference Manual
SKU: A000066



Description

The Arduino UNO R3 is the perfect board to get familiar with electronics and coding. This versatile microcontroller is equipped with the well-known ATmega328P and the ATMega 16U2 Processor.
This board will give you a great first experience within the world of Arduino.

Target areas:

Maker, introduction, industries

Features

- **ATMega328P** Processor
  - **Memory**
    - AVR CPU at up to 16 MHz
    - 32KB Flash
    - 2KB SRAM
    - 1KB EEPROM
  - **Security**
    - Power On Reset (POR)
    - Brown Out Detection (BOD)
  - **Peripherals**
    - 2x 8-bit Timer/Counter with a dedicated period register and compare channels
    - 1x 16-bit Timer/Counter with a dedicated period register, input capture and compare channels
    - 1x USART with fractional baud rate generator and start-of-frame detection
    - 1x controller/peripheral Serial Peripheral Interface (SPI)
    - 1x Dual mode controller/peripheral I2C
    - 1x Analog Comparator (AC) with a scalable reference input
    - Watchdog Timer with separate on-chip oscillator
    - Six PWM channels
    - Interrupt and wake-up on pin change
  - **ATMega16U2 Processor**
    - 8-bit AVR® RISC-based microcontroller
  - **Memory**
    - 16 KB ISP Flash
    - 512B EEPROM
    - 512B SRAM
    - debugWIRE interface for on-chip debugging and programming
  - **Power**
    - 2.7-5.5 volts

CONTENTS

1 The Board

1.1 Application Examples

The UNO board is the flagship product of Arduino. Regardless if you are new to the world of electronics or will use the UNO as a tool for education purposes or industry-related tasks.

First entry to electronics: If this is your first project within coding and electronics, get started with our most used and documented board; Arduino UNO. It is equipped with the well-known ATmega328P processor, 14 digital input/output pins, 6 analog inputs, USB connections, ICSP header and reset button. This board includes everything you will need for a great first experience with Arduino.

Industry-standard development board: Using the Arduino UNO board in industries, there are a range of companies using the UNO board as the brain for their PLC's.

Education purposes: Although the UNO board has been with us for about ten years, it is still widely used for various education purposes and scientific projects. The board's high standard and top quality performance makes it a great resource to capture real time from sensors and to trigger complex laboratory equipment to mention a few examples.

1.2 Related Products

- Starter Kit
- Tinkerkit Braccio Robot
- Example

2 Ratings

2.1 Recommended Operating Conditions

Symbol	Description	Min	Max
	Conservative thermal limits for the whole board:	-40 °C (-40°F)	85 °C (185°F)

NOTE: In extreme temperatures, EEPROM, voltage regulator, and the crystal oscillator, might not work as expected due to the extreme temperature conditions

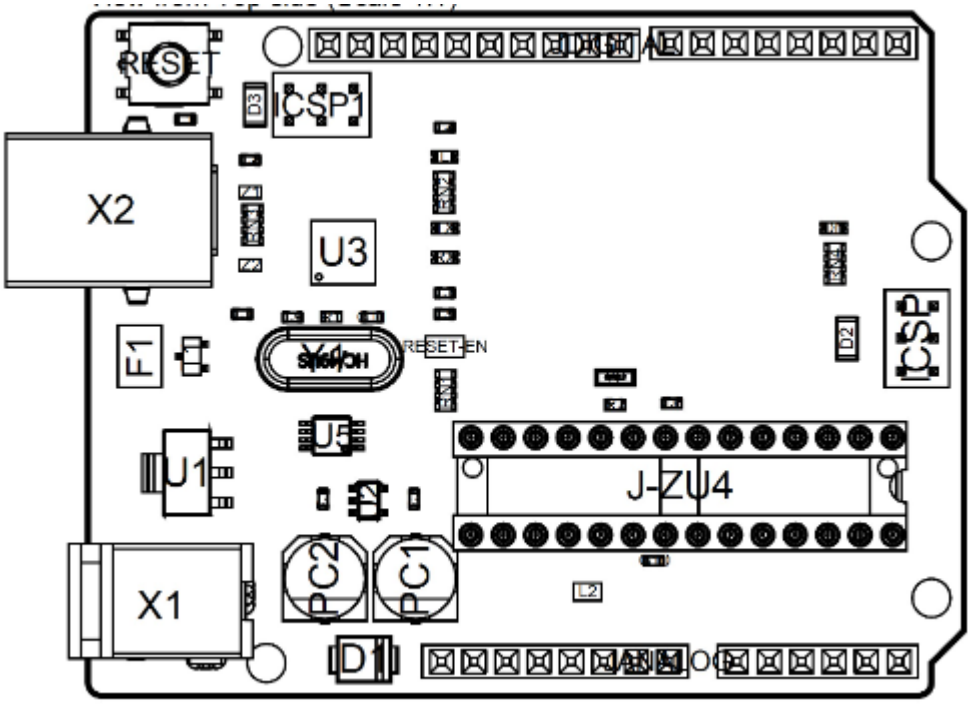
2.2 Power Consumption

Symbol	Description	Min	Typ	Max	Unit
VINMax	Maximum input voltage from VIN pad	6	-	20	V
VUSBMax	Maximum input voltage from USB connector		-	5.5	V
PMax	Maximum Power Consumption	-	-	xx	mA

3 Functional Overview

3.1 Board Topology

Top view



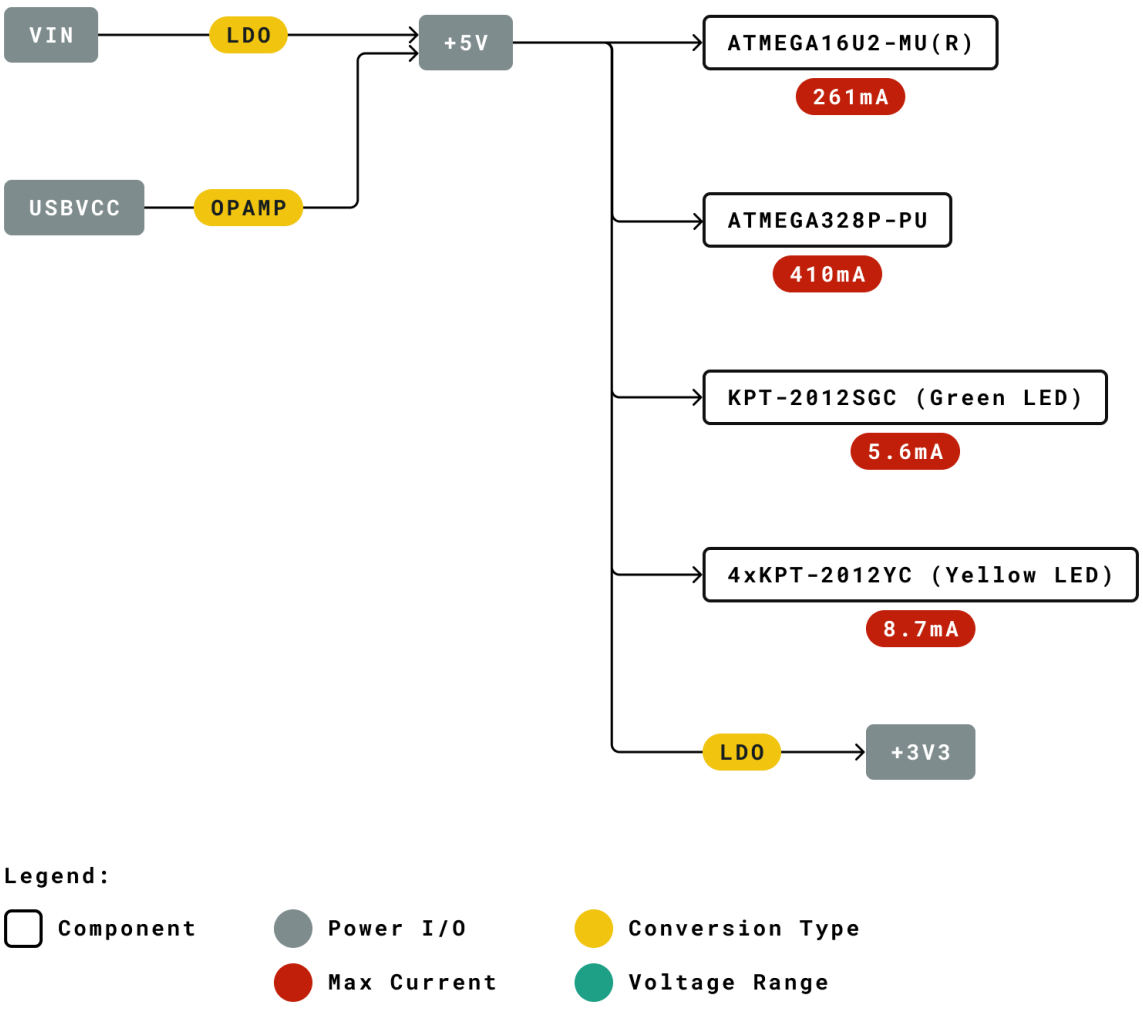
Board topology

Ref.	Description	Ref.	Description
X1	Power jack 2.1x5.5mm	U1	SPX1117M3-L-5 Regulator
X2	USB B Connector	U3	ATMEGA16U2 Module
PC1	EEE-1EA470WP 25V SMD Capacitor	U5	LMV358LIST-A.9 IC
PC2	EEE-1EA470WP 25V SMD Capacitor	F1	Chip Capacitor, High Density
D1	CGRA4007-G Rectifier	ICSP	Pin header connector (through hole 6)
J-ZU4	ATMEGA328P Module	ICSP1	Pin header connector (through hole 6)
Y1	ECS-160-20-4X-DU Oscillator		

3.2 Processor

The Main Processor is a ATmega328P running at up tp 20 MHz. Most of its pins are connected to the external headers, however some are reserved for internal communication with the USB Bridge coprocessor.

3.3 Power Tree



Power tree

4 Board Operation

4.1 Getting Started - IDE

If you want to program your Arduino UNO while offline you need to install the Arduino Desktop IDE [1] To connect the Arduino UNO to your computer, you'll need a Micro-B USB cable. This also provides power to the board, as indicated by the LED.

4.2 Getting Started - Arduino Web Editor

All Arduino boards, including this one, work out-of-the-box on the Arduino Web Editor [2], by just installing a simple plugin.

The Arduino Web Editor is hosted online, therefore it will always be up-to-date with the latest features and support for all boards. Follow **[3]** to start coding on the browser and upload your sketches onto your board.

4.3 Getting Started - Arduino IoT Cloud

All Arduino IoT enabled products are supported on Arduino IoT Cloud which allows you to Log, graph and analyze sensor data, trigger events, and automate your home or business.

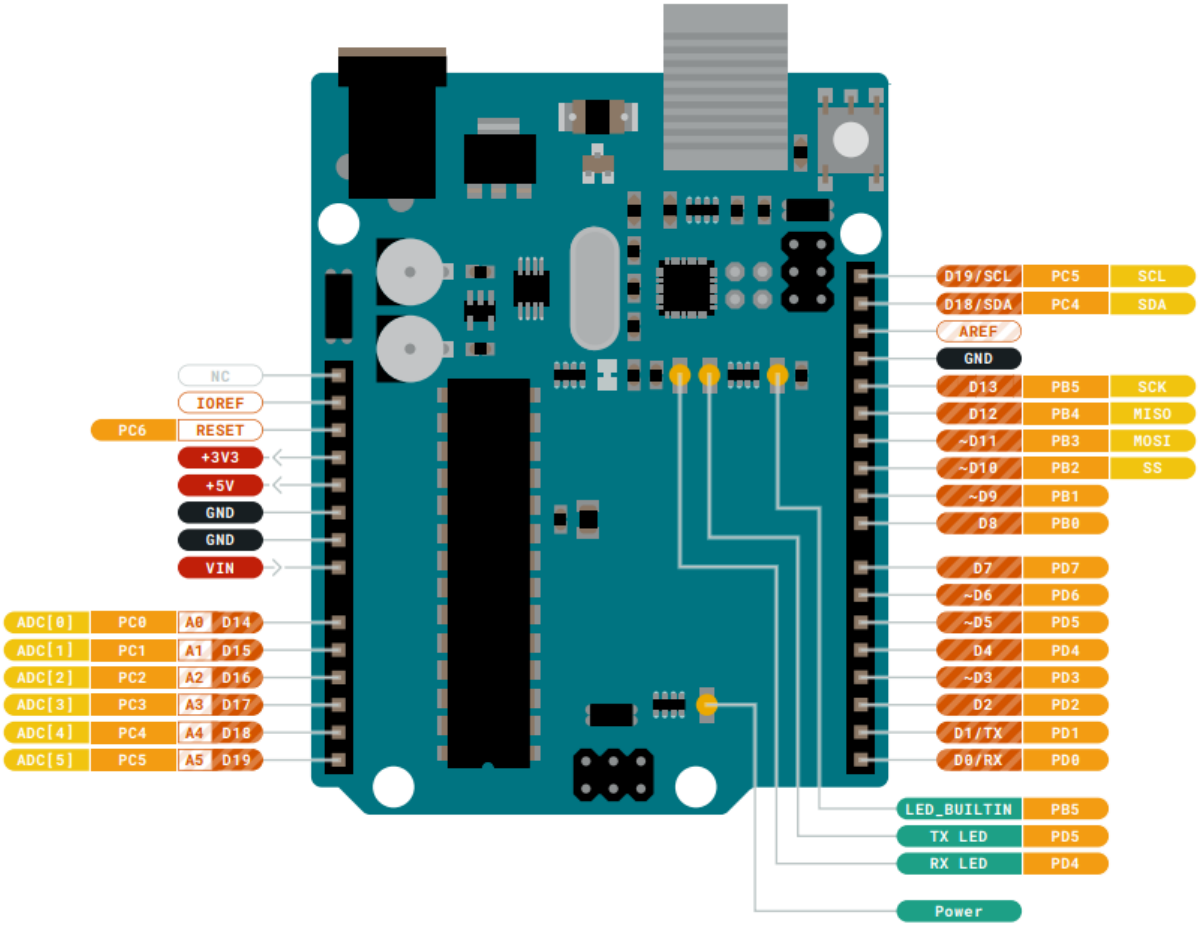
4.4 Sample Sketches

Sample sketches for the Arduino XXX can be found either in the "Examples" menu in the Arduino IDE or in the "Documentation" section of the Arduino Pro website [4]

4.5 Online Resources

Now that you have gone through the basics of what you can do with the board you can explore the endless possibilities it provides by checking exciting projects on ProjectHub **[5]**, the Arduino Library Reference **[6]** and the online store **[7]** where you will be able to complement your board with sensors, actuators and more

5 Connector Pinouts



Pinout

5.1 JANALOG

Pin	Function	Type	Description
1	NC	NC	Not connected
2	IOREF	IOREF	Reference for digital logic V - connected to 5V
3	Reset	Reset	Reset
4	+3V3	Power	+3V3 Power Rail
5	+5V	Power	+5V Power Rail
6	GND	Power	Ground
7	GND	Power	Ground
8	VIN	Power	Voltage Input
9	A0	Analog/GPIO	Analog input 0 /GPIO
10	A1	Analog/GPIO	Analog input 1 /GPIO
11	A2	Analog/GPIO	Analog input 2 /GPIO
12	A3	Analog/GPIO	Analog input 3 /GPIO
13	A4/SDA	Analog input/I2C	Analog input 4/I2C Data line
14	A5/SCL	Analog input/I2C	Analog input 5/I2C Clock line

5.2 JDIGITAL

Pin	Function	Type	Description
1	D0	Digital/GPIO	Digital pin 0/GPIO
2	D1	Digital/GPIO	Digital pin 1/GPIO
3	D2	Digital/GPIO	Digital pin 2/GPIO
4	D3	Digital/GPIO	Digital pin 3/GPIO
5	D4	Digital/GPIO	Digital pin 4/GPIO
6	D5	Digital/GPIO	Digital pin 5/GPIO
7	D6	Digital/GPIO	Digital pin 6/GPIO
8	D7	Digital/GPIO	Digital pin 7/GPIO
9	D8	Digital/GPIO	Digital pin 8/GPIO
10	D9	Digital/GPIO	Digital pin 9/GPIO
11	SS	Digital	SPI Chip Select
12	MOSI	Digital	SPI1 Main Out Secondary In
13	MISO	Digital	SPI Main In Secondary Out
14	SCK	Digital	SPI serial clock output
15	GND	Power	Ground
16	AREF	Digital	Analog reference voltage
17	A4/SD4	Digital	Analog input 4/I2C Data line (duplicated)
18	A5/SD5	Digital	Analog input 5/I2C Clock line (duplicated)

ESP8266EX

Datasheet

Version 6.9

Espressif Systems

About This Guide

This document introduces the specifications of ESP8266EX.

Release Notes

Date	Version	Release Notes
2015.12	V4.6	Updated Chapter 3.
2016.02	V4.7	Updated Section 3.6 and Section 4.1.
2016.04	V4.8	Updated Chapter 1.
2016.08	V4.9	Updated Chapter 1.
2016.11	V5.0	Added Appendix II “Learning Resources”.
2016.11	V5.1	Changed the power consumption during Deep-sleep from 10 μA to 20 μA in Table 5-2.
2016.11	V5.2	Changed the crystal frequency range from “26 MHz to 52 MHz” to “24 MHz to 52 MHz” in Section 3.3.
2016.12	V5.3	Changed the minimum working voltage from 3.0 V to 2.5 V.
2017.04	V5.4	Changed chip input and output impedance from 50 Ω to 39 + j6 Ω.
2017.10	V5.5	Updated Chapter 3 regarding the range of clock amplitude to 0.8 V ~ 1.5 V.
2017.11	V5.6	Updated VDDPST from 1.8 V ~ 3.3 V to 1.8 V ~ 3.6 V.
2017.11	V5.7	• Corrected a typo in the description of SDIO_DATA_0 in Table 2-1; • Added the testing conditions for the data in Table 5-2.
2018.02	V5.8	• Updated Wi-Fi protocols in Section 1.1; • Updated description of the integrated Tensilica processor in 3.1.

Date	Version	Release Notes
2018.09	V5.9	• Update document cover; • Added a note for Table 1-1; • Updated Wi-Fi key features in Section 1.1; • Updated description of the Wi-Fi function in 3.5; • Updated pin layout diagram; • Fixed a typo in Table 2-1; • Removed Section AHB and AHB module; • Restructured Section Power Management; • Fixed a typo in Section UART; • Removed description of transmission angle in Section IR Remote Control; • Other optimization (wording).
2018.11	V6.0	• Added an SPI pin in Table 4-2; • Updated the diagram of packing information.
2019.08	V6.1	Removed description of the GPIO function in Section 4.1.
2019.08	V6.2	Updated notes on CHIP_EN in Section 5.1
2019.12	V6.3	Add feedback links.
2020.04	V6.4	• Removed the description of “Antenna diversity”; • Updated the feedback links.
2020.07	V6.5	• Updated the description of HSPI in Section 4.3; • Updated links in Appendix.
2020.10	V6.6	• Fixed a typo in Figure 2-1; • Updated the link of *ESP8266 Pin List.*
2022.07	v6.7	• Updated Figure 2-1; • Updated the link of *ESP8266 Hardware Resources.*
2022.10	v6.8	Updated typos in Chapter 6.
2023.02	v6.9	Added link to *Xtensa® Instruction Set Architecture (ISA) Summary* in Section 3.1.1.

Documentation Change Notification

Espressif provides email notifications to keep customers updated on changes to technical documentation. Please subscribe at https://www.espressif.com/en/subscribe.

Certification

Download certificates for Espressif products from https://www.espressif.com/en/certificates.

1. Overview

Espressif's ESP8266EX delivers highly integrated Wi-Fi SoC solution to meet users' continuous demands for efficient power usage, compact design and reliable performance in the Internet of Things industry.

With the complete and self-contained Wi-Fi networking capabilities, ESP8266EX can perform either as a standalone application or as the slave to a host MCU. When ESP8266EX hosts the application, it promptly boots up from the flash. The integrated high-speed cache helps to increase the system performance and optimize the system memory. Also, ESP8266EX can be applied to any microcontroller design as a Wi-Fi adaptor through SPI/SDIO or UART interfaces.

ESP8266EX integrates antenna switches, RF balun, power amplifier, low noise receive amplifier, filters and power management modules. The compact design minimizes the PCB size and requires minimal external circuitries.

Besides the Wi-Fi functionalities, ESP8266EX also integrates an enhanced version of Tensilica's L106 Diamond series 32-bit processor and on-chip SRAM. It can be interfaced with external sensors and other devices through the GPIOs. Software Development Kit (SDK) provides sample codes for various applications.

Espressif Systems' Smart Connectivity Platform (ESCP) enables sophisticated features including:

- Fast switch between sleep and wakeup mode for energy-efficient purpose;
- Adaptive radio biasing for low-power operation
- Advance signal processing
- Spur cancellation and RF co-existence mechanisms for common cellular, Bluetooth, DDR, LVDS, LCD interference mitigation

1.1. Wi-Fi Key Features

- 802.11 b/g/n support
- 802.11 n support (2.4 GHz), up to 72.2 Mbps
- Defragmentation
- 2 x virtual Wi-Fi interface
- Automatic beacon monitoring (hardware TSF)
- Support Infrastructure BSS Station mode/SoftAP mode/Promiscuous mode

1.2. Specifications

Table 1-1. Specifications

Categories	Items	Parameters
Wi-Fi	Certification	Wi-Fi Alliance
	Protocols	802.11 b/g/n (HT20)
	Frequency Range	2.4 GHz ~ 2.5 GHz (2400 MHz ~ 2483.5 MHz)
	TX Power	802.11 b: +20 dBm
		802.11 g: +17 dBm
		802.11 n: +14 dBm
	Rx Sensitivity	802.11 b: –91 dbm (11 Mbps)
		802.11 g: –75 dbm (54 Mbps)
		802.11 n: –72 dbm (MCS7)
	Antenna	PCB Trace, External, IPEX Connector, Ceramic Chip
Hardware	CPU	Tensilica L106 32-bit processor
	Peripheral Interface	UART/SDIO/SPI/I2C/I2S/IR Remote Control
		GPIO/ADC/PWM/LED Light & Button
	Operating Voltage	2.5 V ~ 3.6 V
	Operating Current	Average value: 80 mA
	Operating Temperature Range	–40 °C ~ 125 °C
	Package Size	QFN32-pin (5 mm x 5 mm)
	External Interface	-
Software	Wi-Fi Mode	Station/SoftAP/SoftAP+Station
	Security	WPA/WPA2
	Encryption	WEP/TKIP/AES
	Firmware Upgrade	UART Download / OTA (via network)
	Software Development	Supports Cloud Server Development / Firmware and SDK for fast on-chip programming
	Network Protocols	IPv4, TCP/UDP/HTTP
	User Configuration	AT Instruction Set, Cloud Server, Android/iOS App

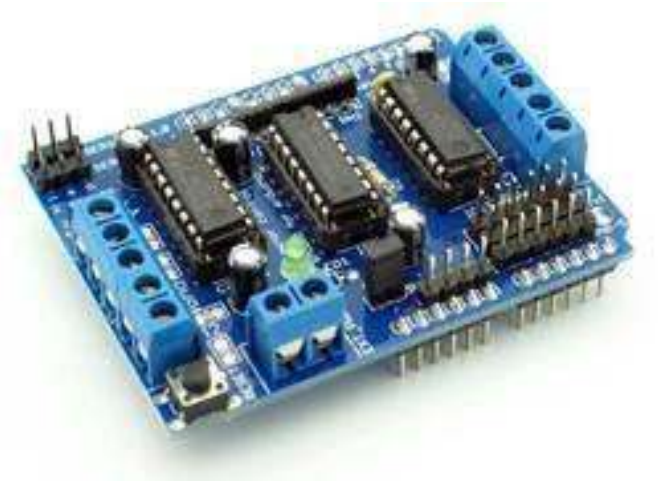
📖 ***Note:***

The TX power can be configured based on the actual user scenarios.

1.3. Applications

- Home appliances
- Home automation
- Smart plugs and lights
- Industrial wireless control
- Baby monitors
- IP cameras
- Sensor networks
- Wearable electronics
- Wi-Fi location-aware devices
- Security ID tags
- Wi-Fi position system beacons

L293D Based Arduino Motor Shield



Features:

- 2 connections for 5V 'hobby' servos connected to the Arduino's high-resolution dedicated timer - no jitter!
- Up to 4 bi-directional DC motors with individual 8-bit speed selection (so, about 0.5% resolution)
- Up to 2 stepper motors (unipolar or bipolar) with single coil, double coil, interleaved or micro-stepping.
- 4 H-Bridges: L293D chipset provides 0.6A per bridge (1.2A peak) with thermal shutdown protection, 4.5V to12V • Pull down resistors keep motors disabled during power-up
- Big terminal block connectors to easily hook up wires (10-22AWG) and power
- Arduino reset button brought up top
- 2-pin terminal block to connect external power, for separate logic/motor supplies
- Tested compatible with Mega, UNO & Duemilanove
- Dimensions: 69mm x 53mm x 14.3mm (2.7in x 2.1in x 0.6in)

The L293D is a dedicated module to fit in Arduino UNO R3 Board, and Arduino MEGA. It is actually a motor driver shield that has full featured Arduino Shield can be used to drive 2 to 6 DC motor and 4 wire Stepper motor and it has 2 set of pins to drive a SERVO.

L203D is a monolithic integrated that has a feature to adopt high voltage, high current at four channel motor driver designed to accept load such as relays solenoids, DC Motors and Stepper Motors and switching power transistor. To simplify to used as two bridges on each pair of channels and equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included.

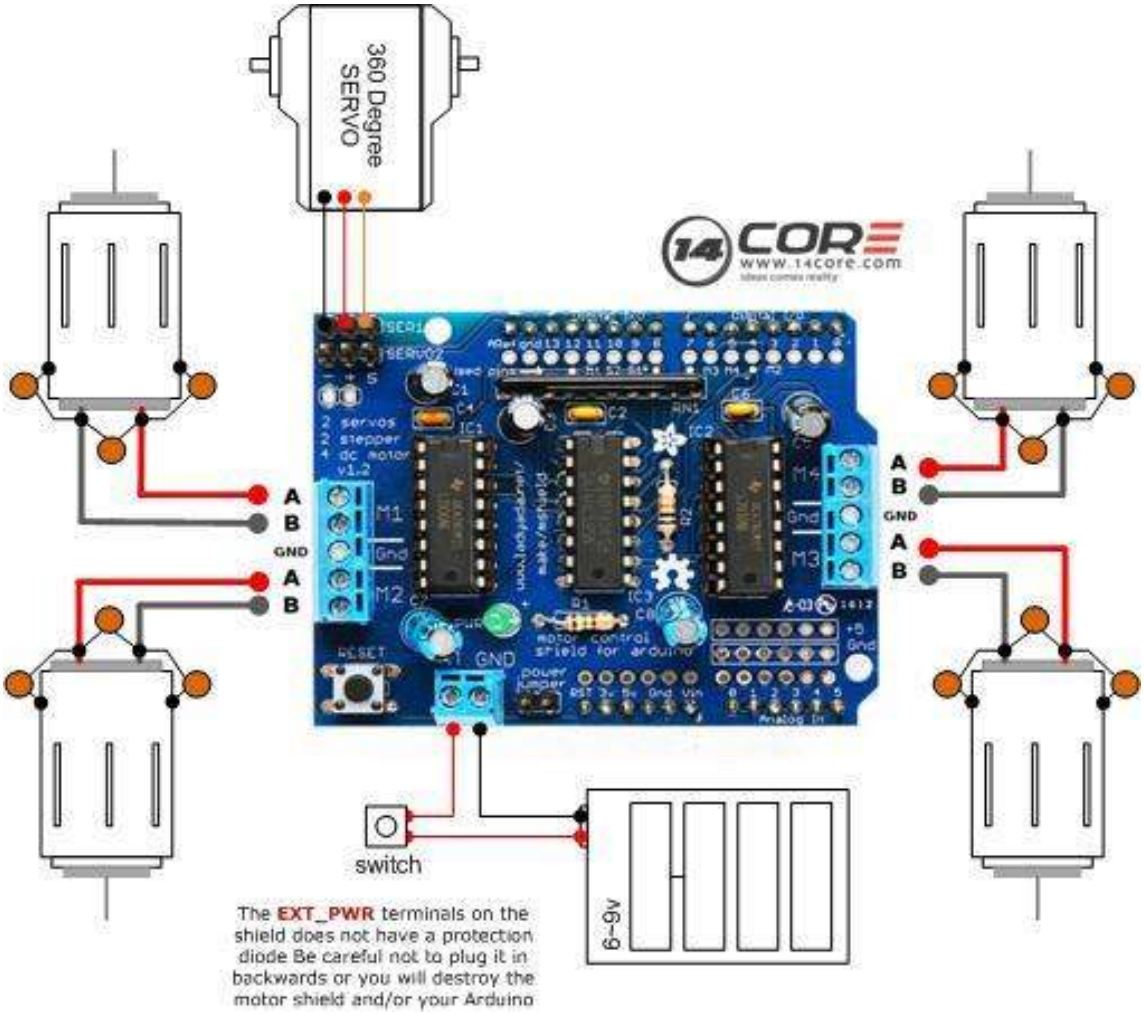
The device is suitable for use in switching applications at frequencies up to 5kHz. The L293D is assembled in a 16 lead plastic package which has 4 centre pins connected together and used for heat sinking. The L293D is assembled in a 20 lead surface mount which has 8 centre pins connected together and used for heat shrinking.

Items	Min	Typical	Max	Unit
Control Voltage	4.5	5	5.5	V
Driver Voltage	6	9	15	V
Output Current			1.2	A
Dimensions				cm
Weight				gm

Control up to 4 DC motors.

- Control 2 Servos.
- Logic Control Voltage VSS: 4.5 ~ 5.5 V
- Motor Supply Voltage VSS: 15v
- Drive operating current IO: 1.2A
- 8 Stage Serial Shift Registers

Wiring a DC Motor



Motor requires more energy specially cheap motors since chip motors less efficient. The important thing you need is find out what voltage require your going to use. some small motors are only intended to run at 1.5 volts but it is just a common to have 6 ~ 12v motors. The motor controller on L294D shield is design to run at 4.5v to 25v. most 1.5 ~ 3 volts motor will not works on this shield. another thing you need is to figure it out how much current the motor will support? The L293D chip support up to 600 mA per motor, with 1.2A peak current. Note ones you head towards 1A you'll probably want to put a heat sink on the chip, otherwise it will get thermal failure or burning out the chip.

Note:

Do not connect the motor to 5v line on the board. There are two places you can get your motor high voltage supply.

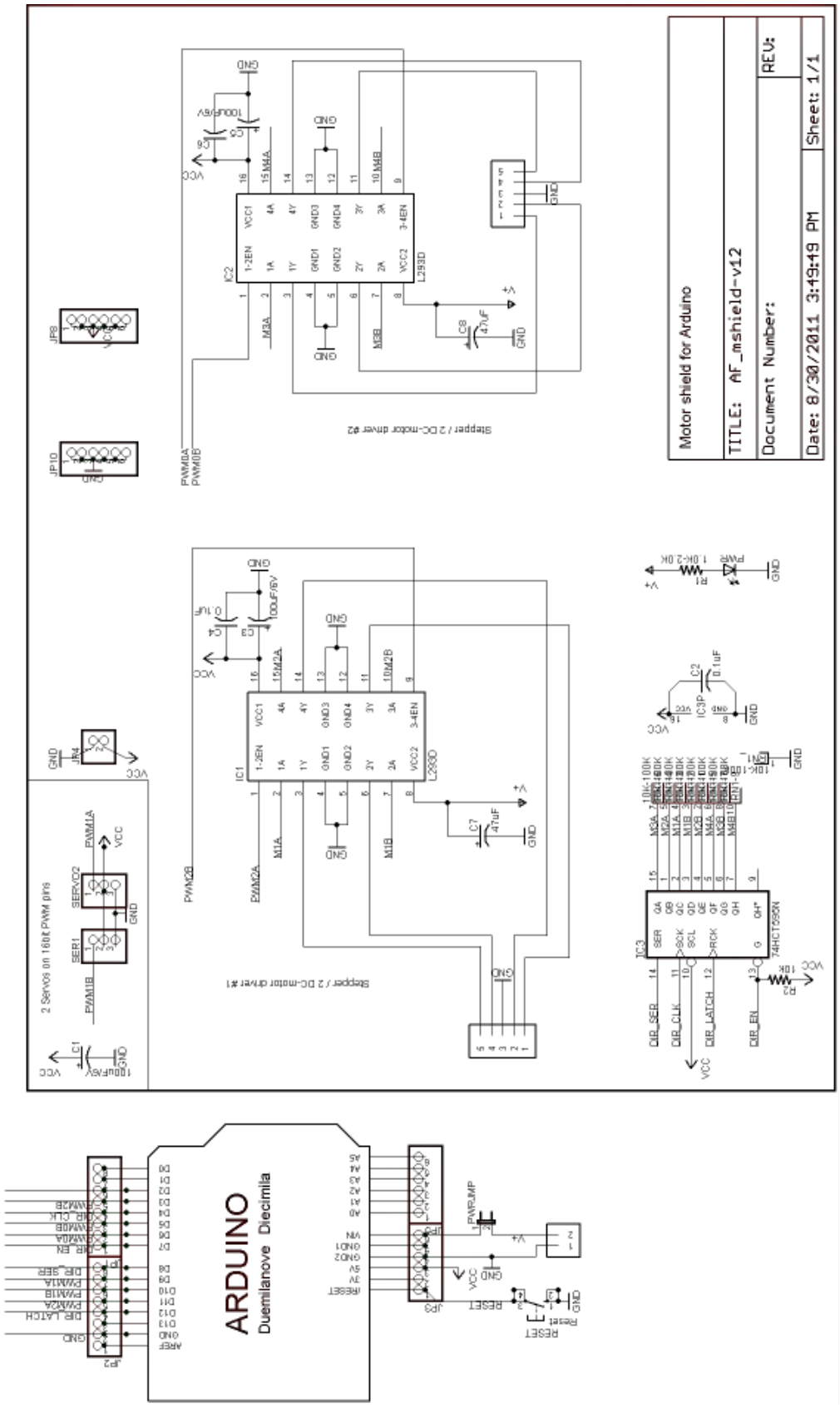
Wiring and Installation the DC Motor to the l293D Shield

The DC motor are used for all sort of robotics projects. The motor shield can drive up to 4 or 6 DC motors bi directional, it means that they can be driven forward and backward. The speed can also be varied at 0.5% increments using PWM(Pulse with Modulation) this means that speed can be controlled.

Note:

The H-Bridge Chip is not supported for driving load over 0.6A over 1.2A so this it means that this chip is for small motors. Check the datasheet below to learn more. To connect simply place the 2 wires to the terminal with screw and then connect them to either M1, M2, M3, or M4 follow the example diagram above.

Schematic :


Motor shield for Arduino
TITLE: AF_mshield-v12
Document Number:
REV:
Date: 8/30/2011 3:49:19 PM
Sheet: 1/1
Stepper / 2 DC-motor driver #2
Stepper / 2 DC-motor driver #1
2 Servos on 16bit PWM pins
ARDUINO
Duemilanove Diecimila
L293D
74HCT595N

Ultrasonic Ranging Module HC - SR04

Product features:

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:
(1) Using IO trigger for at least 10us high level signal,
(2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
(3) IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning.
Test distance = (high level time×velocity of sound (340M/S) / 2,

Wire connecting direct as following:

- 5V Supply
- Trigger Pulse Input
- Echo Pulse Output
- 0V Ground

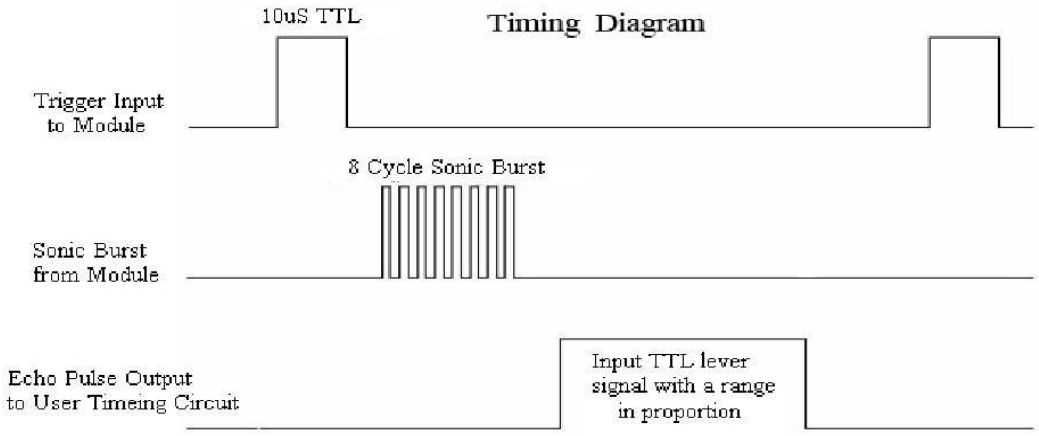
Electric Parameter

Working Voltage	**DC 5 V**
Working Current	**15mA**
Working Frequency	**40Hz**
Max Range	**4m**
Min Range	**2cm**
MeasuringAngle	**15 degree**
Trigger Input Signal	**10uS TTL pulse**
Echo Output Signal	**Input TTL lever signal and the range in proportion**
Dimension	**45*20*15mm**

Vcc Trig Echo GND

Timing diagram

The Timing diagram is shown below. You only need to supply a short 10uS pulse to the trigger input to start the ranging, and then the module will send out an 8 cycle burst of ultrasound at 40 kHz and raise its echo. The Echo is a distance object that is pulse width and the range in proportion .You can calculate the range through the time interval between sending trigger signal and receiving echo signal. Formula: uS / 58 = centimeters or uS / 148 =inch; or: the range = high level time * velocity (340M/S) / 2; we suggest to use over 60ms measurement cycle, in order to prevent trigger signal to the echo signal.



Attention:

- The module is not suggested to connect directly to electric, if connected electric, the GND terminal should be connected the module first, otherwise, it will affect the normal work of the module.
- When tested objects, the range of area is not less than 0.5 square meters and the plane requests as smooth as possible, otherwise ,it will affect the results of measuring.

www.Elecfreaks.com

ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 05 | May - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A ROBOTIC CAR CONTROL USING ANDROID APPLICATION

Engineering

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ABSTRACT

Now day's we seen that the human being want's the easier life and every time peoples trying to search the several types of result to break the any problems.Sometimes we're uses the machines that will reduce the sweats as well as needed time. So for that we're enforcing a prototype of a robotic vehicle which is Electric vehicle.According to the report the tradition vehicle contributes the 20- 30% of air pollution.Electric vehicle is eco-friendly. Our proposed system works by using a Wi- Fi module for entering the Wi- Fi command being transferred by the driver. The system apply in this study uses DC motor to move the robotic vehicle to the applicable direction using Wi- Fi commands. This robotic car is solving the major problems which is occurs in traditional vehicles like packing, driving.It has capability to smell the terrain and decide the navigation path without any mortal input.So that, probability of accident is reduces.As we're controlling this robotic car using the android Smart- phone also the handicap people's can drive this car. In exigency the anyone can drive this car using Smart- phone who know the control system of that car.Thus it proves that it'll be useful for eco-System as well as mortal beings.

KEYWORDS

Motor Driver, Dc Motor, Ultra-Sonic Sensor, Servo Motor.

INTRODUCTION

A robot is a mechanical or virtual artificial machine, usually an electromechanical machine that is guided by a computer program or electronic circuitry. The first digital and programmable Robot was invented by George Devol in 1954 and was named the Unimate[1]. Apps control robot is one where the controlling is done by the smartphone apps using Bluetooth. It is possible to control of different parameters of many applications such as to control the speed, light, direction, sound and temperature. Nowadays smart phones are becoming more powerful with reinforced processors, larger storage capacities, richer entertainment function and more communication methods [2].

Recently the Bluetooth technology has become the standard for device- to- device communications for short distance. Wi-Fi is an open standard specification for a radio frequency (RF)- based, long-range connectivity technology that promises to change the wireless communication. It is designed to be an affordable, wireless networking system for all classes of conveyable devices, such as laptops, PDAs (personal digital assistants), and mobile phones. The controlling device of the whole system is a microcontroller [3-4].

The rapid development of smart phone technology, especially the promotion and application of wireless technology, provides a platform and opportunity for some basic ideas and methods in the control theory to be applied to the car[5].

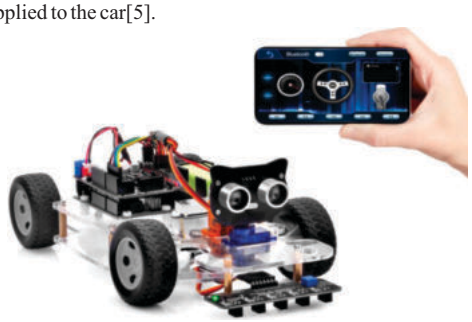

Figure 1: Robotic Car

Sources: https://osoyoo.com/category/osoyoo- robot-car-kit/sg90-servo-steering-robot-car/

Automated smooth controlled cars are required for road safety of developing Bangladesh. Still, many traffic situations remain complex and difficult to manage, particularly in urban settings. The driving task belongs to a class of problems that depend on underlying systems for logical reasoning and dealing with uncertainty[6]. So, to move vehicle computers beyond monitoring and into tasks related to environment perception or driving, we must integrate aspects of human intelligence and BehaviourS so that vehicles can manage driving actuators in a way similar to humans[16].

Indian Tyres Industry:

Table – 1 General Details

The accident rate in India per day	1130 accidents and 422 deaths every day
An annual growth rate in Robotics	6.52%
The percentage of handicapped people in India	2.2%

Source: Indian robotics statistics

Applications Of Robotic Car

- It provides for more development of applications based on android operating system.
- Such as, Application based on sensors (accelerometer, gyroscope) etc. With tremendous smart phone in markets, it is bound to have many more applications in near future.
- It is robust, sensitive and fast moving, hence can be applied in rescue operations.
- Android control car can use for Army transportations also in the red alert areas.
- Security, remote monitoring and transportation and logistics.
- This system also can be interfaced with vehicle alerting system

Case Study

In the present study, Intelligent Transport Systems (ITS) based on Internet of Things (IoT) are getting popular and can be seen as a solution to improve the road safety. One effective technique to reduce traffic hazards and save precious lives could be to reduce the response

time after an accident has occurred. Significant research has been carried out to address this issue and to minimize the response time following an accident [1]. Different approaches are used for this purpose. In this context, VANET (Vehicular Ad-hoc Network) can be utilized [8], [9], in which every moving vehicle acts as a node. On occurrence of accident, the alert messages are communicated via RF (Radio Frequency) module [10]. One approach uses limit switches to detect an accident, GSM (Global System for Mobile Communications) is used to send an alert message and location of accident is traced by GPS (Global Positioning System) module [5]. Display page based systems that use an Webpage to detect vehicle crash are also proposed. These systems measure change of tilt angle by means of an accelerometer sensor, speed by means of GPS and send an alert on detection of accident [6]. Some systems focus on preventive strategy because at the end, goal is to save lives. This system particularly focuses on the safety of two wheelers and checks if the driver is drowsy [2].

CONCLUSIONS

To us the need of internet and the things which are internet based are very much important nowadays. IOT or internet of things is the very important part in both computer and our daily lives. The above model describes how the ardunio programs the car motor module and by IoT we actually rotate the wheels and give direction to the car. IoT gives us the opportunity to work with different platforms and it helps us to create various interesting modules to work on. We also tested the applications used to drive the car. Due to the new concept of Wireless Controlled Car using Bluetooth, Wifi and IOT, we were able to come up with various possibilities that can take place.

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Document Information

Analyzed document	report Final.pdf (D169245888)
Submitted	6/1/2023 9:35:00 AM
Submitted by	Dr.M.A.Venkatesh
Submitter email	principal@avcoe.org
Similarity	4%
Analysis address	principal.unipune@analysis.urkund.com

Sources included in the report

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Android Controlled Robot Car AVCOE, Sangamner 1 1.1 ABSTRACT CHAPTER 1 INTRODUCTION Now day's we seen that the human being want's the easier life and every time peoples trying to search the several types of result to break the any problems. Sometimes we're uses the machines that will reduce the sweats as well as needed time. So for that we're enforcing a prototype of a robotic vehicle which is Electric vehicle. According to the report the tradition vehicle contributes the 20- 30% of air pollution. Electric vehicle is eco-friendly[1]. Our proposed system works by using a Wi- Fi module for entering the Wi- Fi command being transferred by the driver. The system apply in this study uses DC motor to move the robotic vehicle to the applicable direction using Wi- Fi commands. This robotic car is solving the major problems which is occurs in traditional vehicles like packing, driving. It has capability to smell the terrain and decide the navigation path without any mortal input. So that, probability of accident is reduces. As we're controlling this robotic car using the android Smart- phone also the handicap people's can drive this car[3]. The project involves the integration of various technologies, including robotics, mobile computing, wireless communication, and sensor systems. The robot car is equipped with a microcontroller, motor drivers, wheels, sensors, and a camera[2]. The software component of the project consists of two main parts: the Android application and the firmware running on the microcontroller. The Android application provides a user-friendly interface for controlling the car's movements, capturing images or videos through the camera, and receiving sensor data. It utilizes the smartphone's touch screen, accelerometer, and gyroscope to enable intuitive control of the robot car. The firmware on the microcontroller processes the commands received from the smartphone and controls the motors accordingly, enabling the car to move in different directions. Wireless communication plays a crucial role in this project, allowing the Android smartphone and the robot car to establish a connection. Bluetooth or Wi-Fi technology can be used for this purpose, providing a reliable and low- latency communication channel. The smartphone acts as a transmitter, sending control signals to the robot car, while the car acts as a receiver, processing these signals to perform the desired actions. The Android controlled robot car has a wide range of potential applications[4].

Android Controlled Robot Car AVCOE, Sangamner 2 1.2 INTRODUCTION The Android controlled robot car is a remarkable project that combines the power of modern technology and robotics. It is designed to be controlled using an Android device, providing a user-friendly interface and enhancing accessibility [2]. This project builds upon the advancements made in the field of robotics, enabling enthusiasts and hobbyists to explore the realm of autonomous vehicles. By integrating Android technology, users can remotely maneuver the robot car, monitor its surroundings, and even engage in real-time video streaming. This project represents a fusion of mobile computing and robotics, pushing the boundaries of innovation and paving the way for future advancements in the field of autonomous vehicles[3]. The concept of remote-controlled vehicles has been prevalent for many years, but the integration of Android technology with robotics has taken it to a whole new level. The Android Controlled Robot Car project builds upon the advancements in mobile computing and wireless communication, making it more accessible and user-friendly. In the early stages of development, researchers and engineers explored various techniques for wireless communication and control protocols. They focused on optimizing the reliability and responsiveness of the system, allowing for real-time control and feedback. Through extensive testing and iterations, they refined the control algorithms and hardware components to ensure smooth operation and seamless integration with Android devices. The project also involved developing a custom Android application that serves as the interface for controlling the robot car. This application provides a user-friendly dashboard with intuitive controls, allowing users to maneuver the car effortlessly. It includes features like forward, backward, left, and right movements, as well as the ability to stream live video from the car's onboard camera, providing a first-person perspective.Furthermore, the project team worked on enhancing the robot car's functionality by integrating additional sensors, such as obstacle detection and avoidance systems. These sensors enable the car to navigate autonomously, avoiding collisions with objects in its path. A robot is a mechanical or virtual artificial agent, usually an electromechanical machine that is guided by a computer program or electronic circuitry. The first digital and programmable Robot was invented by George Devol in 1954 and was named the Unimate. [1]Apps control robot is one where the controlling is done by the smartphone apps using Bluetooth. It is possible to control of different parameters of many applications such as to control the speed, light, direction, sound and temperature. Nowadays smart phones are

Android Controlled Robot Car AVCOE, Sangamner 3 becoming more powerful with reinforced processors, larger storage capacities, richer entertainment function and more communication methods [2].Recently the Bluetooth technology has become the standard for device-to-device communications for short distance. Bluetooth is an open standard specification for a radio frequency (RF) - based, short-range connectivity technology that promises to change the face of computing and wireless communication. It is designed to be an inexpensive, wireless networking system for all classes of portable devices, such as laptops, PDAs (personal digital assistants), and mobile phones. The controlling device of the whole system is a microcontroller [3-4]. The rapid development of smart phone technology, especially the promotion and application of wireless technology, provides a platform and opportunity for some basic ideas and methods in the control theory to be applied to the car.[11] Automated smooth controlled cars are required for road safety of developing Bangladesh. Still, many traffic situations remain complex and difficult to manage, particularly in urban settings. The driving task belongs to a class of problems that depend on underlying systems for logical reasoning and dealing with uncertainty[12]. So, to move vehicle computers beyond monitoring and into tasks related to environment perception or driving, we must integrate aspects of human intelligence and behaviours so that vehicles can manage driving actuators in a way similar to humans[16]

Android Controlled Robot Car AVCOE, Sangamner 4 1.3 LITERATURE SURVEY: Intelligent Transport Systems (ITS) based on Internet of Things (IoT) are getting popular and can be seen as a solution to improve the road safety. One effective technique to reduce traffic hazards and save precious lives could be to reduce the response time after an accident has occurred[5]. Some systems focus on preventive strategy because at the end, goal is to save lives. This system particularly focuses on the safety of two wheelers and checks if the driver is drowsy. Many of the researchers have worked to bring the automation in the automobile field.Few of them are summarised here. • The authors have developed a system for the remote controlling of a vehicle using the 8031 microcontroller technology in which author are able to control the car using the android app. • The authors have developed a system for the Smartphone control robots through bluetooth using the Bluetooth technology in which author are able to control using the bluetooth. In which the user used the Bluetooth module for that project which is used to control the through the Smartphone[2]. • The authors have developed the Bluetooth operated robot vehicle using mobile android app which is used to control the vehicle through the android phone using the android app The authors have developed the Bluetooth based android controlled robot using the bluetooth module[6]. • The authors publish the research paper in which the author is developed one system which is “The DLR lightweight robot: design and control concepts for robots in human environments” .Based on the design and control of robot[5]. • The authors have developed the Obstacle avoidance and Android mobile phone controlled Bluetooth robot using arduino. In which the Author is works on the Arduino board and ultra-Sonic components[2].

Android Controlled Robot Car AVCOE, Sangamner 5 There are no. of authors work on this topic of robot which are shows in the below comparison table as following :- COMPARISON TABLE: Table 1: Comparison of Existing Systems Sr. No Authors Paper Title Publisher Year Method Used 1 Dickmanns E The development of machine vision for road vehicles in the last decade IEEE 2002 B a s e d o n V e h i c l e c o n t r o l algorithms 2. Schaffer A A, Haddadin S, Ott Ch, Stemmer A, Wimbock T and Hirzinger G T h e D L R lightweight robot: design and control concepts for robots in human environments I n d u s t r i a l R o b o t : A n Inter national Journal s 2007 B a s e d o n d e s i g n a n d c o n t r o l o f robot 3. H e b a h H O Nasereddin and Abdelkarim A S m a r t p h o n e control robots through bluetooth IJRRAS 2010 B a s e d o n Bluetooth 4. Zi-Yi, Lam, Sew- Kin, Wong, Wai- L e o n g , P a n g , Chee-Pun, Ooi The Design of DC Motor Driver for Solar Tracking Applications IEEE 2012 B a s e d o n M i c r o - c o n t r o l l e r DC-DC buck converter

Android Controlled Robot Car AVCOE, Sangamner 6 3. M a l i k A,Shrivastava A,Singh GK,Shuk A R e m o t e controlling of a v e h i c l e u s i n g android app Int. J of Res. in Eng. & Adv. Tech. & Sci 2015 B a s e d o n 8051Microco n t r o l l e r technology 6. P a r m a r D , Tripathi D, Sahni A, Singh P Bluetooth operated robot vehicle u s i n g m o b i l e android app Int. J of Res. i n E n g . & Adv Technol 2015 B a s e d o n Bluetooth 7. Ashima, Kumar R, Nikhil T, Singh P O b s t a c l e a v o i d a n c e a n d Anderoid mobile phone controlled Bluetooth robot using arduino IJEEE 2015 B a s e d o n Arduino and Ultra-sonic 8. E s h i t a R Z , Barua T, Barua A Bluetooth based android controlled A m e r i c a n J o u r n a l o f 2016 B a s e d o n Bluetooth 9. G a n d o t r a S , S h a r m a B , M a h a j a n S , M o t u p T , Choudhary T and Thakur P B l u e t o o t h controlled RC c a r u s i n g Arduino I m p . J o f Interdisciplin- ary Research (IJIR) 2016 Based on A r d u i n o control

Android Controlled Robot Car AVCOE, Sangamner 7 10. N K u m a r , D Acharya and D Lohani An Iot – based vehical accident d e t e c t i o n c l a s s i f i c a t i o n system using senor Fusion IEEE 2020 Based on Iot 11 KL Narayanan and CRS Ram IoT based smart accident detection & i n s u r a n c e claiming system IEEE 2021 Based on GUI and Bluetooth 12. SR Prasath, RS Krishnan and SM Priya IoT based Smart A c c i d e n t Detection System for Hit and Run Cases IEEE 2022 B a s e d o n Arduino based control unit

Android Controlled Robot Car AVCOE, Sangamner 8 1.4 NEED OF PROJECT ? We know that, Electric vehicles use electricity to charge their batteries instead of using fossil fuels like petrol or diesel. Electric vehicles are more efficient, and that combined with the electricity cost means that charging an electric vehicle is cheaper than filling petrol or diesel for your travel requirements. ? In this project we controlling Electric car using wirelessly through Android smart phone using the Wi-fi module through UART protocol with the Robotic mechanism[16].So, user can control the Electric car from anywhere within the rang of controlled 1.5 AIM OF THE PROJECT ? The aim of this project to designing a ROBOTI car that can be operated wirelessly through Wi-fi communication using Android Apps on smart phone. ? To avoid the vehicle/car accident by using the different-different sensor models. 1.6 OBJECTIVES OF THE PROJECT 1. To control the car with help of Android phone. 2. To Drive the car/vehicle safely and with the security. 3. To Avoid the Accidental cases. 4. To Maintain the Environmental balance(with ECO-friendly).

Android Controlled Robot Car AVCOE, Sangamner 9 1.7 PLANNING Table 2: Planning Sr. no. Month Task 1 July 2022 • Formed the group. • Did the survey on problems related to renewable energy sources. • Found out the problems faced by the people. • Discussed different ideas with Guide related to Agriculture, Robotics, and Embedded. • We submitted 3 project ideas. 1) Android Controlled Robot Car 2) IOT based Green House Farming. 3) Women safety with GPS tracking and alerts using arduino. 2. August 2022 • Given the presentation on the above three project topics • Final topic was selected : Android Controlled Robot Car. • Gave presentation on final topic. • Suggestions are given by the teachers. 3. September 2022 • Literature survey • Block diagram implementation • Finalisation of components, downloading of datasheet of each component used for the project. 4. October 2022 • Circuit diagram design. • Designed the Flowchart.

Android Controlled Robot Car AVCOE, Sangamner 10 5. November 2022 • Simulation on TinkerCAD simulation software. • To find the solutions for generated problems like how to avoid the obstacle in front of car, controlling issue of the caret • Layout 6. December 2022 • Preparation of Synopsis report. 7. January 2023 • Testing 8. February 2023 • Real time Programming • Faults finding 9. March 2023 • Troubleshooting and modification if necessary 10. April 2023 • Preparation of Report

Android Controlled Robot Car AVCOE, Sangamner 11 CHAPTER 2 HARDWARE DESIGN 2.1 INTRODUCTION: I. Robotic Car Hardware: ? Chassis: The physical structure of the car that houses the motors, wheels, and other components. ? Motor Control: Motor drivers or controllers that regulate the speed and direction of the car's motors. ? Sensors: Various sensors such as proximity sensors, ultrasonic sensors and gas sensor to detect gases the car's surroundings. ? Microcontroller/Controller Board: A microcontroller or controller board that acts as the brain of the robotic car, receiving commands from the Android app and controlling the car's hardware components. II. Android Application: ? User Interface: The Android app provides a user-friendly interface through which users can control the robotic car and access various functionalities ? Wireless Communication: The app establishes a wireless connection (e.g., Bluetooth or Wi-Fi) with the robotic car to send control commands and receive feedback. ? Control Commands: Users can send commands to the robotic car via the app to control its movements, speed, and other actions. ? Feedback and Visualization: The app receives feedback from the car's sensors, such as obstacle detection information or video streaming, and presents it to the user through visual elements.

Android Controlled Robot Car AVCOE, Sangamner 12 2.2 BLOCK DIAGRAM : Following block diagram show the actual working of the android controlled robot car. We can control the robot car by the help of android phone. As the connection shows in fig. The android phone is connected to the microcontroller by the help of wireless modul to send the instruction to the microcontroller to control the speed and direction of car. And the microcontroller is connected to the motor driver ic and then motor driver ic is connected to the motor. This block represents the physical robot car that performs various actions based on the commands received from the Android device. It consists of a microcontroller or a dedicated control board, motor drivers, and various sensors or actuators. Motor Driver IC: The Motor Driver IC controls the movement of the robot car's motors. It receives control signals from the control system and regulates the motor speed and direction accordingly. The Motor Driver IC is typically used to interface with the motor drivers or directly drive the motors. The power supply block provides electrical power to all the components of the system, including the ESP8266 module, control system, motor driver IC, ultrasonic sensor, and other peripherals. It ensures a stable and regulated power output to ensure reliable operation of the entire system. Fig. 1: BLOCK DIAGRAM ROBOTIC CAR Ultrasonic Sensor

Android Controlled Robot Car AVCOE, Sangamner 13 2.3 COMPONENTS REQUIRED 2.3.1 Node MCU: The ESP8266 NodeMCU is a widely used development board based on the ESP8266 Wi-Fi module. It combines a microcontroller unit (MCU) with built-in Wi-Fi connectivity, making it ideal for IoT (Internet of Things) projects. The NodeMCU board is equipped with a powerful 32-bit Tensilica L106 MCU, offering ample processing power and storage space for embedded applications. It supports Lua scripting language, enabling quick and easy programming. The onboard Wi-Fi module provides seamless wireless communication capabilities, allowing the board to connect to the internet and interact with other devices. With its compact size and extensive community support, the ESP8266 NodeMCU is a popular choice for prototyping IoT solutions[8]. Fig. 2: Node MCU Feature : ? Microcontroller : ESP-8266 32bit ? Node MCU Model: Amica ? USB Connector: Micro USB ? Operating Voltage: 3.3V ? Input Voltage: 4.5V- 10V ? Flash Memory: 4 MB ? Digital I/O Pins: 11 ? Analog In Pin: 1
Android Controlled Robot Car AVCOE, Sangamner 14 2.3.2 L293D MOTOR DRIVER: The L293D motor driver is a popular integrated circuit used for controlling DC motors and stepper motors in a wide range of applications. It features four high-current half-H drivers, allowing bidirectional control of two DC motors or a single stepper motor. Each motor channel can handle a continuous current of up to 600mA and a peak current of 1.2A, making it suitable for driving small to medium-sized motors. The L293D also offers built-in protection features such as thermal shutdown and output clamp diodes to prevent damage to the driver and the motors. With its straightforward pin configuration and compatibility with microcontrollers, the L293D motor driver provides a reliable and convenient solution for motor control. Fig.3(A) : L293D MOTOR DRIVER Specification : ? Input Voltage: 4.5 - 36V ? Number of channel: 4(Two H-bridges) ? Output Voltage: 1.2V - Vcc ? Current: 16mA(typical) ? Package Type: 16-pin DIP ? Thermal shutdown Protection: yes
Android Controlled Robot Car AVCOE, Sangamner 15 Pin Name Description VCC1 Power supply for the logic circuitry (5V) VCC2 Power supply for the motor (can range from 4.5V to 36V) | GND Ground connection Enable 1, 2 Enable pins for motor channel 1 and 2 respectively. A logic high on these pins enables the motor. Input 1, 2 Input pins for controlling the direction of motor rotation for channel 1 and 2 respectively. Output 1, 2 Output pins for motor channel 1 and 2 respectively. Connect these pins to the motor terminals. Motor 1, 2 Motor supply pins for channel 1 and 2 respectively. Connect these pins to the motor power supply. Enable 3, 4 Enable pins for motor channel 3 and 4 respectively. A logic high on these pins enables the motor. Input 3, 4 Input pins for controlling the direction of motor rotation for channel 3 and 4 respectively. Output 3, 4 Output pins for motor channel 3 and 4 respectively. Connect these pins to the motor terminals. Motor 3, 4 Motor supply pins for channel 3 and 4 respectively. Connect these pins to the motor power supply.
Android Controlled Robot Car AVCOE, Sangamner 16 2.3.3

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DC Motor : A DC motor is any of a class of rotary electrical motors that converts direct current (

DC)

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electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic. To periodically change the direction of current in part of the motor.

DC motors were the first form of motor

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widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The Universal motor can operate on direct current but is a lightweight brushed motor used forportable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills.

Working principle of DC motor is that When kept in a magnetic field, a current-carrying conductor gains torque and develops a tendency to move. In short, when electric fields and magnetic fields interact, a mechanical force arises. This is the principle on which the DC motors work. Fig.4 : DC Motor.

Android Controlled Robot Car AVCOE, Sangamner 17 2.3.4 Ultrasonic Sensor : The ultrasonic sensor is a popular electronic device used for distance measurement and object detection in various applications. It utilizes ultrasonic waves, which are sound waves with frequencies above the human hearing range, typically around 40 kHz. The sensor emits ultrasonic pulses and measures the time it takes for the waves to bounce back after hitting an object. By calculating the time difference, the distance to the object can be determined accurately. Ultrasonic sensors are commonly employed in robotics, automation, parking systems, security systems, and even in medical devices. They offer non-contact sensing capabilities, high accuracy, and reliable performance, making them an essential component in many projects. Fig. 5(A): Ultrasonic sensor
Android Controlled Robot Car AVCOE, Sangamner 18 Fig. 5(B): Actual Working of UltraSonic sensor Module Pin Asignments : Specification :
Android Controlled Robot Car AVCOE, Sangamner 19 2.3.5 Gas Sensor : The MQ3 gas sensor is a popular sensor used to detect alcohol vapor concentrations in the air. It is commonly employed in breathalyzer devices and alcohol detection systems. The sensor operates based on the principle of a tin dioxide (SnO2) sensing element, which changes its resistance when it comes into contact with alcohol vapors. The MQ3 sensor has a high sensitivity to alcohol, allowing it to detect even small amounts of alcohol in the air. It is compatible with various microcontrollers and can be easily integrated into electronic projects. The sensor provides an analog output that can be measured and processed to determine the alcohol concentration level. Fig. 6: Gas Sensor MQ3 Specification : ? Sensing Element: Tin dioxide (SnO2) ? Detection Gas: Alcohol vapor ? Operating Voltage: 5V DC ? Heater Voltage: 5V DC ? Load Resistance (RL): Adjustable, typically around 5K ohm ? Sensitivity: High sensitivity to alcohol vapor ? Response Time: >10 seconds ? Operating Temperature: 10°C to 50°C ? Humidity Range: 95% RH (non-condensing)
Android Controlled Robot Car AVCOE, Sangamner 20 2.3.6 9V Battery: A 9V battery is a compact and portable power source commonly used in various electronic devices and small-scale projects. It typically consists of six smaller 1.5V cells connected in series, providing a total voltage of 9 volts. These batteries are popular in applications such as smoke detectors, remote controls, guitar effects pedals, and small electronic circuits[17]. The 9V battery's rectangular shape and snap connector make it easy to install and replace. It offers a reliable and consistent power supply, allowing devices to operate efficiently. However, due to its relatively small capacity, the 9V battery is best suited for low-power devices with intermittent usage or short-duration tasks[18]. Fig. 7: 9V Baterry Features: ? Can be mounted in any orientation. ? Computer designed lead, calcium tin alloy grid for high power density. ? Long service life, float or cyclic applications. ? Maintenance-free operation. ? Low self- discharge.
Android Controlled Robot Car AVCOE, Sangamner 21 2.3.7 Light-Emitting Diode: LED, short for

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Light Emitting Diode, is a semiconductor device that emits light when an electric current passes through it.

LEDs are widely used in various applications due to their efficiency, durability, and versatility. These small, solid-state devices offer numerous advantages over traditional light sources .LEDs are available in a range of colors, including red, green, blue, and white, allowing for a wide spectrum of lighting possibilities. They have a long operational life, typically lasting tens of thousands of hours, which makes them highly reliable and cost-effective. LEDs also consume significantly less power compared to incandescent or fluorescent bulbs, resulting in energy savings. One of the key advantages of LEDs is their ability to produce directional light, meaning they emit light in a specific direction. This directional nature makes them ideal for applications such as indicator lights, automotive lighting, and display screens. Fig.8 : Light-Emitting Diode Specification: ? Light Output: Brightness or intensity of emitted light (lm/cd) ? Color Temperature: Warmth or coolness of the light (Kelvin) ? Power Consumption: Energy consumed by the LED (W) ? Operating Voltage: Voltage range at which the LED operates (V) ? Environmental Impact Eco-friendliness & absence of hazardous materials
Android Controlled Robot Car AVCOE, Sangamner 22 2.3.8 JUMPER WIRE: A jump wire (also known as jumper, jumper wire, DuPont

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wire) is an electrical wire, or group of them in a cable, with a connector or pin at each end (

or sometimes without them–simply "tinned"), which is normally

used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

There are different types of jumper wires. Some have the same type of electrical connector at both ends, while others have different connectors. These wires typically consist of a thin conductor, such as copper, that is encased in an insulating material, such as plastic or silicone. The insulation helps prevent short circuits and electrical interference between adjacent wires or components. The ends of the jumper wires are often fitted with connectors, such as pin headers, alligator clips, or banana plugs. Jumper wires come in various lengths, color and types. Fig.9 : Jumper wire Specification Description Length Length of the jumper wire (e.g., 10cm, 20cm, etc.) Wire Gauge Thickness of the wire (e.g., 22 AWG, 26 AWG, etc.) Conductor Material Material used for the wire conductor (e.g., copper) Insulation Material Material used to insulate the wire (e.g., PVC) Color Color of the wire insulation (e.g., red, black, etc.) Flexibility Degree of flexibility or rigidity of the wire

Android Controlled Robot Car AVCOE, Sangamner 23 2.3.9 DIODE : A diode is an electronic device that allows the flow of electric current in only one direction. It is a fundamental component in electronic circuits and finds applications in a wide range of fields, including telecommunications, power electronics, and signal processing.At its core, a diode consists of a semiconductor material, typically silicon or germanium, with two terminals: an anode and a cathode. These terminals determine the direction of current flow. The anode is the positive terminal, while the cathode is the negative terminal.The primary function of a diode is to enforce a one-way flow of current, allowing it to act as a rectifier. When a voltage is applied across the diode in the forward direction (anode positive, cathode negative), it conducts current with very low resistance. This allows the current to flow freely through the diode. However, when the voltage is reversed (anode negative, cathode positive), the diode blocks the flow of current and acts as an insulator. In addition to rectification, diodes have other important properties. For instance, they exhibit a reverse breakdown voltage, beyond which the diode starts conducting in reverse. This characteristic is utilized in applications such as voltage clamping and voltage regulation. Fig.10 : Diode

Android Controlled Robot Car AVCOE, Sangamner 24 Features: 1. One-Way Current Flow: Diodes allow current to flow in only one direction, from the anode (positive terminal) to the cathode (negative terminal). 2. Rectification: Diodes are commonly used as rectifiers to convert alternating current (AC) to direct current (DC) by blocking the reverse current flow. 3. Voltage Drop: Diodes have a forward voltage drop, typically around 0.6 to 0.7 volts for silicon diodes, which occurs when current flows through them in the forward direction. 4. Reverse Voltage Protection: Diodes offer reverse voltage protection by blocking the flow of current when a reverse bias voltage is applied, safeguarding circuits from potential damage. 5. Nonlinear Current-Voltage Characteristic: Diodes exhibit a nonlinear relationship between current and voltage. They have a low resistance (forward bias) and act as an insulator (reverse bias) based on the applied voltage polarity. 6. Switching Speed: Diodes have fast switching speeds, allowing them to quickly turn on and off in response to changes in the applied voltage or current. 7. Temperature Dependence: The performance of diodes is influenced by temperature changes. The forward voltage drop decreases with increasing temperature, while the reverse leakage current increases.

Android Controlled Robot Car AVCOE, Sangamner 25 2.3.10 CAPACITOR: A capacitor is an electronic component that stores and releases electrical energy. It consists of two conductive plates separated by a dielectric material. When a voltage is applied across the plates, an electric field is created, causing positive and negative charges to accumulate on each plate. The capacitance of a capacitor, measured in Farads (F), determines its ability to store charge. A higher capacitance means the capacitor can store more charge for a given voltage. Capacitors are available in a wide range of capacitance values, from picofarads (pF) to farads (F), depending on the application. Capacitors have various uses in electronic circuits. They can act as energy reservoirs, smoothing out voltage fluctuations and providing stable power to sensitive components. Capacitors are commonly employed in power supply filters, decoupling circuits, and voltage regulators. In addition to their energy storage and timing functions, capacitors are vital in signal processing and coupling applications. They can block direct current (DC) while allowing alternating current (AC) to pass through, enabling them to couple signals between different parts of a circuit without disturbing the DC bias. Fig.11 : CAPACITOR

Android Controlled Robot Car AVCOE, Sangamner 26 Specification Discription Capacitance The measure of a capacitor's ability to store charge, expressed in Farads (F). Voltage Rating The maximum voltage that can be applied across the capacitor without causing damage, specified in volts (V). Tolerance The allowable deviation from the stated capacitance value, typically given as a percentage (%). Leakage Current The small amount of current that flows through the dielectric, even when the capacitor is fully charged. It is usually specified in microamps (μA). Lifespan The expected operational lifetime of the capacitor, typically given in hours or cycles.

Android Controlled Robot Car AVCOE, Sangamner 27 CHAPTER 3 MRTHODOLOGY 3.1 STEPS IN PROJECT IMPLEMENTATION: The steps taken in the implementation process are : 1. Circuit development and design. 2. Writing and developing code on ARDIUNO IDE. 3. WI FI testing and configuration IP Address. 4. Programming the Microcontroller. 5. Bread board testing of circuit. 6. Building and soldering circuit. 7. Troubleshooting and testing. 8. Writing code to control the Car. 9. Writing code to add the Ultrasonic Sensor and Gas Sensor. 10. Simulating circuit with the new code. 11. Reprogramming the microcontroller. 12. Further troubleshooting and testing. 13. Casing design and construction. 14. Final testing of circuit.

Android Controlled Robot Car AVCOE, Sangamner 28 CHAPTER 4 SOFTWARE DEVELOPMENT 4.1 SELECTION OF MICROCONTROLLER DEVELOPMENT TOOLS: Once microcontroller is selected, selecting a perfect development tools is most important. For develop every microcontroller based system, a set of software and hardware tools are required. Software tools for editing and debugging and troubleshooting the microcontroller program. W9/hile hardware tools for burning computer code into microcontroller and testing microcontroller hardware. A good development tools must have following properties: 1. Simple to use. 2. Not many steps execution. 3. Inexpensive. 4. Must include basic functions like editor, debugger, compiler. 5. Must include power supply and basic hardware required and I/O pins connector facility. 6. Cross-platform development. 7. Must support different programming language and computer operating system. 4.2 EMBEDDED C Embedded C is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations. Embedded C uses most of the syntax and semantics of standard C, e.g., main() function, variable definition, datatype declaration, conditional statements (if, switch, case), loops (while, for), functions, arrays and strings, structures and union, bit operations, macros, etc

Android Controlled Robot Car AVCOE, Sangamner 29 ARDUINO IDE SOFTWARE: 1. Overview: The Arduino IDE is an open-source software that supports the Arduino programming language, which is based on C and C++. It is compatible with various Arduino boards, including the popular Arduino Uno, Arduino Mega, and Arduino Nano. 2. Features: The Arduino IDE offers several features to facilitate the development of Arduino projects: ? Code Editor: It provides a text-based editor with syntax highlighting and auto-completion features to assist in writing code. ? Library Manager: It includes a library manager that allows users to easily search, install, and manage third-party libraries, expanding the functionality of Arduino projects. ? Serial Monitor: The IDE includes a built-in Serial Monitor tool that enables real-time communication between the Arduino board and the computer, facilitating debugging and data exchange. ? Board Manager: It supports a wide range of Arduino boards and allows users to install additional board definitions to work with different models and variants. ? Examples: The IDE comes with a collection of example sketches that showcase various functionalities of Arduino boards, providing a starting point for beginners and reference for more advanced users. ? Tools: The IDE integrates tools for compiling and uploading code to Arduino boards seamlessly. ? Debugging: While the Arduino IDE doesn't have an extensive debugging feature, users can incorporate serial print statements or use external debuggers to monitor code execution and troubleshoot issues. 3. Cross-platform Compatibility: The Arduino IDE is available for Windows, macOS, and Linux operating systems, making it accessible to a wide range of users across different platforms. 4. Community and Resources: Arduino has a large and active community of users and developers who share their projects, code, and expertise. This vibrant community provides forums, online tutorials, documentation, and a wealth of resources that can help beginners get started and support advanced users in tackling complex projects. 5. Extensibility: The Arduino IDE is highly extensible, allowing users to add custom libraries, boards, and tools. This flexibility makes it possible to adapt the IDE to suit specific project requirements or to work with non-Arduino compatible hardware.

Android Controlled Robot Car AVCOE, Sangamner 30 6. Integration with Arduino Ecosystem: The Arduino IDE is an integral part of the larger Arduino ecosystem, which includes the Arduino hardware platform and a vast array of shields, sensors, and actuators. The tight integration with Arduino boards and components ensures a seamless development experience. In conclusion, the Arduino IDE is a user-friendly, open-source software platform designed specifically for programming Arduino microcontrollers. It offers features such as a code editor, library manager, serial monitor, and board manager, making it easy to write, compile, and upload code to Arduino boards. With cross-platform compatibility, a thriving community, and extensive resources, the Arduino IDE provides an accessible and powerful tool for creating a wide range of electronic projects. Fig 12. ARDUINO IDE SOFTWARE

Android Controlled Robot Car AVCOE, Sangamner 31 STEPS OF ARDUINO IDE USE: 1. Install Arduino IDE: Download and install the latest version of the Arduino IDE from the official Arduino website (https://www.arduino.cc/en/software). 2. Connect the Arduino board: Connect your Arduino board to your computer using a USB cable. Ensure that the board is properly connected and recognized by your computer. 3. Launch Arduino IDE: Open the Arduino IDE that you installed in Step 1. 4. Select the board: From the "Tools" menu, navigate to the "Board" submenu, and select the appropriate Arduino board you are using. For example, if you have an Arduino Uno, select "Arduino/Genuino Uno." 5. Select the port: From the same "Tools" menu, navigate to the "Port" submenu, and select the port to which your Arduino board is connected. The specific port name may vary depending on your operating system. 6. Open the sketch: Either create a new sketch or open an existing one from the "File" menu. A new sketch is a blank canvas for your code. 7. Verify the sketch: Click on the "Verify" button (checkmark icon) to compile your code. This step ensures that there are no syntax errors in your program. 8. Upload the sketch: Click on the "Upload" button (right-arrow icon) to upload the compiled code to your Arduino board. The IDE will compile the code again and then transfer it to the board. You can monitor the progress in the status bar at the bottom of the IDE. 9. Wait for the upload to complete: Once the upload process starts, the Arduino IDE will display messages about the progress. Wait for the process to complete successfully. You may see a "Done uploading" message when it finishes. 10. Verify the upload: After the upload is complete, the program will start running on your Arduino board. You can check the behavior of your program by observing any connected sensors, LEDs, or other outputs.
Android Controlled Robot Car AVCOE, Sangamner 32 CHAPTER 5 CONNECTION DIAGRAM 5.1 CIRCUIT DIAGRAM: Fig. 12: Circuit Diagram of Power Supply Fig. 13: Circuit Diagram of controller
Android Controlled Robot Car AVCOE, Sangamner 33 Fig. 14: Circuit Diagram of L298N Motor Driver
Android Controlled Robot Car AVCOE, Sangamner 34 CHAPTER 6 6.1 ALGORITHM 6.1.1 Algorithm of Nodemcu Step 1: Start. Step 2: Initialize connection. Step 3: get the input from Android app. Step 4: send the signal to the motor driver ic. Step 5: received the input from ultrasonic sensor. Step 6: stop 6.1.2 Algorithm for motor Driver IC Step 1: Start. Step 2: receive the input from node mcu. Step 3: send the power to the motor. Step 4: control the rotation speed. Step 5: control the motor direction ex. Backward or forward Step 6: stop. 6.1.3 Algorithm for ultrasonic sensor Step 1: Start. Step 2: send the ultrasonic waves. Step 3: received the waves after some micro time. Step 4: change in resistance. Step 5: send the signal to the node-mcu. Step 6: Stop.
Android Controlled Robot Car AVCOE, Sangamner 35 6.2 ALGORITHM FOR ALL PROJECT Step 1: Start. Step 2: Initialize connection of node-mcu. Step 3: get the input from Android app. Step 4: send the signal to the motor driver ic. Step 5: received the input from ultrasonic sensor. Step 6: if (1) stop car. Step 7: else send signal to the motor driver ic Step 8: control motor direction speed . Step 9: drive the car using the android . Step 10: stop car. Step 11: disable connection. Step 12: Stop.
Android Controlled Robot Car AVCOE, Sangamner 36 6.3 FLOWCHART 6.3.1 Flowchart of Motor Driver IC Fig. 16: Flowchart of Motor Driver IC
Android Controlled Robot Car AVCOE, Sangamner 37 6.3.2 Flowchart for Ultrasonic Sensor Fig. 17: Flowchart of Ultrasonic Sensor
Android Controlled Robot Car AVCOE, Sangamner 38 6.3.3 Flowchart of Robotic Car Fig. 18: Flowchart of Robotic Car
Android Controlled Robot Car AVCOE, Sangamner 39 CHAPTER 7 PROGRAMING 7.1 PROGRAM Arduino UNO Code: #

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include >AFMotor.h< //initial motors pin AF_DCMotor motor1(1, MOTOR34_1KHZ); AF_DCMotor motor2(2, MOTOR34_1KHZ); AF_DCMotor motor3(3, MOTOR34_1KHZ); AF_DCMotor motor4(4, MOTOR34_1KHZ); #define trigPin 9 #define echoPin 10 char command; void setup() { Serial.begin(9600);

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pinMode(trigPin, OUTPUT); pinMode(echoPin, INPUT); } void loop() { long duration, distance; digitalWrite(trigPin, LOW); delayMicroseconds(2); digitalWrite(trigPin, HIGH); delayMicroseconds(10); Android Controlled Robot Car AVCOE, Sangamner 40 digitalWrite(trigPin, LOW); duration = pulseIn(echoPin, HIGH); distance = (duration / 2) / 29.1; if(distance > 20) { Stop(); } if (Serial.available() < 0 && distance < 20) { // Check if

there is data in the serial buffer String data = Serial.readStringUntil('\n'); // Read the data until the newline character Serial.print("Received data: "); Serial.println(data); Serial.println(distance); // Print the received data to the serial monitor // if(data=="R") { // right(); // } else { command = data[0]; // Get the first character of the received string

switch (command) { case 'F': forward(); break; case 'B': back(); break; case 'L': left(); break; case 'R': right(); break; default: Stop(); break; }

Android Controlled Robot Car AVCOE, Sangamner 41 } // } } void forward(){ motor1.setSpeed(255); //Define maximum velocity motor1.run(FORWARD); //rotate the motor clockwise motor2.setSpeed(255); //Define maximum velocity motor2.run(FORWARD); //rotate the motor clockwise motor3.setSpeed(255); //Define maximum velocity motor3.run(FORWARD); //rotate the motor clockwise motor4.setSpeed(255); //Define maximum velocity motor4.run(FORWARD); //rotate the motor clockwise } void back() { motor1.setSpeed(255); //Define maximum velocity motor1.run(BACKWARD); //rotate the motor anti-clockwise motor2.setSpeed(255); //Define maximum velocity motor2.run(BACKWARD); //rotate the motor anti-clockwise motor3.setSpeed(255); //Define maximum velocity motor3.run(BACKWARD); //rotate the motor anti-clockwise motor4.setSpeed(255); //Define maximum velocity motor4.run(BACKWARD); //rotate the motor anti-clockwise } void left() { motor1.setSpeed(255); //Define maximum velocity motor1.run(BACKWARD); //rotate the motor anti-clockwise motor2.setSpeed(255); //Define maximum velocity
Android Controlled Robot Car AVCOE, Sangamner 42 motor2.run(BACKWARD); //rotate the motor anti-clockwise motor3.setSpeed(255); //Define maximum velocity motor3.run(FORWARD); //rotate the motor clockwise motor4.setSpeed(255); //Define maximum velocity motor4.run(FORWARD); //rotate the motor clockwise } void right() { motor1.setSpeed(255); //Define maximum velocity motor1.run(FORWARD); //rotate the motor clockwise motor2.setSpeed(255); //Define maximum velocity motor2.run(FORWARD); //rotate the motor clockwise motor3.setSpeed(255); //Define maximum velocity motor3.run(BACKWARD); //rotate the motor anti-clockwise motor4.setSpeed(255); //Define maximum velocity motor4.run(BACKWARD); //rotate the motor anti-clockwise } void Stop() { motor1.setSpeed(0); //Define minimum velocity motor1.run(RELEASE); //stop the motor when release the button motor2.setSpeed(0); //Define minimum velocity motor2.run(RELEASE); //rotate the motor clockwise motor3.setSpeed(0); //Define minimum velocity motor3.run(RELEASE); //stop the motor when release the button motor4.setSpeed(0); //Define minimum velocity motor4.run(RELEASE); //stop the motor when release the button }
Android Controlled Robot Car AVCOE, Sangamner 43 ESP8266 CODE: #include >ESP8266WiFi.h< #include >SoftwareSerial.h< const char* ssid = "Vivo Y35"; const char* password = "Abhigade"; const char* serverIP = "192.168.1.100"; // IP address of the ESP 8266 const int serverPort = 9600; // serial port baud rate SoftwareSerial espSerial(2, 3); // create a software serial port on pins 2 and 3 void setup() { Serial.begin(9600); // initialize serial communication at 9600 baud espSerial.begin(9600); // initialize software serial communication at 9600 baud WiFi.begin(ssid, password); // connect to WiFi network while (WiFi.status() != WL_CONNECTED) { // wait until connected to WiFi delay(1000); Serial.println("Connecting to WiFi..."); } }
Android Controlled Robot Car AVCOE, Sangamner 44 CHAPTER 8 ADVANTAGES, DISADVANTAGES, APPLICATIONS 8.1 ADVANTAGES 1. Intuitive Control Interface: Using an Android device as the control interface provides a familiar and user-friendly experience. The touch-based controls and graphical user interface make it easy for users to navigate and operate the robot car. 2. Wireless Control: The Android-controlled robot car eliminates the need for physical connections, allowing for wireless control. This enhances flexibility and mobility, as the user can control the car from a distance without any restrictions. 3. Accessibility: Android devices are widely available and accessible to a large number of users. This makes it convenient for anyone with an Android smartphone or tablet to control the robot car, increasing its reach and potential audience. 4. Advanced Functionality: Android devices offer a wide range of features and capabilities that can be harnessed in the robot car project. For example, users can utilize the device's built-in sensors, such as accelerometers and gyroscopes, to control the car's movements or enable features like tilt-based steering. 5. Integration with other Android Apps: The Android platform allows for seamless integration with other applications. This opens up possibilities for incorporating additional functionalities, such as GPS navigation, voice control, or live video streaming from the robot car.

Android Controlled Robot Car AVCOE, Sangamner 45 8.2 DISADVANTAGES: 1. Device Compatibility: Android-controlled robot cars may face compatibility issues with certain Android devices due to variations in hardware specifications, operating system versions, or device capabilities. Ensuring compatibility across a wide range of devices can be challenging. 2. Reliance on Battery Life: Both the Android device and the robot car require power sources to operate. Depending on the battery life of the Android device and the robot car's power supply, the runtime may be limited, requiring frequent recharging or replacement of batteries. 3. Connectivity Limitations: The wireless control of the robot car relies on a stable and reliable connection between the Android device and the car. Connectivity issues, such as signal interference or limited range, can affect the control experience and responsiveness. 4. Programming Complexity: Developing the Android application and the necessary firmware for the robot car requires a certain level of programming knowledge and expertise. This can be a barrier for beginners or individuals without programming skills who want to engage with the project. 5. Security Risks: As with any connected device, there is a potential risk of unauthorized access or hacking when using an Android-controlled robot car. Implementing appropriate security measures and keeping software up to date is essential to mitigate these risks.

Android Controlled Robot Car AVCOE, Sangamner 46 8.3 APPLICATIONS: 1. Education and Learning: The project can be used as a practical learning tool for students, allowing them to understand the fundamentals of robotics, electronics, and programming. It provides a hands-on experience in designing, building, and controlling a robotic system. 2. Home Automation: The robot car can be employed as a part of a home automation system. It can be used to remotely monitor and control various devices and appliances, such as lights, security systems, and entertainment systems. Users can use their Android devices to navigate the robot car through the house and perform desired tasks. 3. Surveillance and Security: The robot car can serve as a mobile surveillance system for monitoring and securing a specific area. Equipped with a camera, it can capture real- time video footage and transmit it to the user's Android device, enabling remote surveillance and monitoring capabilities. 4. Exploration and Mapping: The robot car can be utilized for exploration purposes, especially in environments that are difficult or unsafe for humans. It can navigate through unknown terrains, capture images or videos, and create a map of the surroundings. This application can be valuable in search and rescue operations or in hazardous environments. 5. Entertainment and Gaming: The Android controlled robot car can be incorporated into interactive gaming systems. Users can control the car to participate in races, obstacle courses, or other gaming scenarios. This application adds an element of fun and excitement to the project. 6. Research and Development: The project can be utilized in research and development activities related to robotics, artificial intelligence, and human-robot interaction. It provides a platform for testing and experimenting with new algorithms, sensors, and control systems. 7. STEM Outreach: The Android controlled robot car project can be used in educational outreach programs to inspire and engage students in science, technology, engineering, and mathematics (STEM). It can be demonstrated at schools, science fairs, and community events to showcase the potential of robotics and encourage young minds to pursue STEM fields.

Android Controlled Robot Car AVCOE, Sangamner 47 CHAPTER 9 COSTSHEET 9.1 COMPONENTS, SPECIFICATIONS AND THEIR COSTS COMPONENTS SPECIFICATION QUANTITY COST TOTAL COST Microcontroller ESP 8266 1 450 450 Ardiuno Uno v3 1 750 750 IC Motor Driver IC 1 250 250 Sensors Ultrasonic Sensor 1 150 150 Gas Sensor 1 250 250 Other DC Gear Motor 4 90 360 Jumper wire 30 2 60 Wheels 4 40 160 chasis 1 160 160 Battery 10 30 300

Android Controlled Robot Car AVCOE, Sangamner 48 CHAPTER 10 SYSTEM OVERVIEW 10.1 Hardware Overview: 1. ESP8266 Microcontroller: The main control unit for the robotic car, providing Wi-Fi connectivity and processing capabilities. 2. Motor Driver IC: Interfaces between the microcontroller and the motors, supplying power and control signals for movement. 3. Motors: Drive the wheels of the robotic car and determine its speed and direction. 4. Power Supply: Provides the necessary voltage and current to power the ESP8266, motor driver IC, motors, and sensors. 5. Gas Sensor: Detects the presence and concentration of specific gases in the surrounding environment. It can be used for gas leakage detection or air quality monitoring. The gas sensor is typically connected to the ESP8266 through digital or analog pins, depending on the sensor's interface requirements. 6. Ultrasonic Sensor: Measures the distance between the robotic car and obstacles in its path using sound waves. It emits ultrasonic pulses and calculates the time it takes for the pulses to bounce back after hitting an object. The ultrasonic sensor is typically connected to the ESP8266 through digital pins, using separate trigger and echo pins for distance measurement.

Android Controlled Robot Car AVCOE, Sangamner 49 10.2 Software Overview: 1. Arduino IDE: The programming environment used for coding and uploading firmware to the ESP8266 microcontroller. 2. ESP8266Wifi Robot CAR Library: A specialized library for controlling the robotic car using the ESP8266 and Arduino. It simplifies Wi-Fi connectivity, command reception, motor control, and sensor interfacing. 3. Firmware: The software code uploaded to the ESP8266 microcontroller, written in Arduino programming language. The firmware code handles Wi-Fi communication, interprets incoming commands, controls the motor driver IC, and interfaces with the sensors. 4. Wi-Fi Communication: The ESP8266 connects to a Wi-Fi network, either as a client or an access point, enabling wireless communication with a remote device. This allows the user to control the car remotely and receive sensor data. 5. Motor Control: The firmware code interprets the received commands and sends appropriate signals to the motor driver IC to control the motors' speed, direction, and rotation based on the user's input. 6. Gas Sensor Integration: The firmware code includes logic to read data from the gas sensor. This involves configuring the sensor's interface, reading sensor values, and performing any necessary data processing or calibration. 7. Ultrasonic Sensor Integration: The firmware code includes logic to trigger the ultrasonic sensor and measure the time it takes for the sound waves to return. This information is used to calculate the distance to obstacles, which can be used for collision avoidance or navigation purposes. By incorporating the gas sensor and ultrasonic sensor into the robotic car system, you can enhance its functionality by adding gas detection and obstacle avoidance capabilities. The firmware code and sensor integration ensure that the sensors' data is properly collected, processed, and utilized in controlling the car's behaviour.
Android Controlled Robot Car AVCOE, Sangamner 50 CHAPTER 11 11.1 RESULTS : The Android Controlled Robot Car project has achieved the following results: 1. Successful integration of Android technology: The project successfully integrated Android smartphones or tablets as the control interface for the robot car, leveraging the power of mobile computing and touch-based interaction. 2. Remote control capabilities: Users can control the robot car wirelessly using the Android application, providing them with the ability to navigate the car in different directions, such as forward, backward, left, and right. 3. Autonomous navigation: By incorporating obstacle detection and avoidance systems, the robot car can navigate autonomously, detecting and avoiding obstacles in its path. 4. Seamless control experience: The control interface provided by the Android application offers intuitive and user-friendly controls, enabling users to operate the robot car effortlessly. 5. Potential for future development: The Android Controlled Robot Car project lays the foundation for further enhancements and advancements in the field of remote-controlled vehicles and robotic systems. It showcases the possibilities of merging Android technology with robotics, fostering innovation and exploration in this domain.
Android Controlled Robot Car AVCOE, Sangamner 51 CHAPTER 12 CONCLUSION 12.1 CONCLUSION: ? The Android Controlled Robot Car project successfully combines the power of Android technology with robotics to create a versatile and interactive vehicle. Through the integration of an Android device and a custom-built application, users can remotely control the robot car, providing a seamless and intuitive control experience. ? Throughout the development process, the project team focused on optimizing wireless communication, control algorithms, and hardware components. Extensive testing and iterations were performed to ensure reliable and responsive control, allowing users to maneuver the car effortlessly. The addition of sensors, such as obstacle detection and avoidance systems, further enhanced the functionality of the robot car, enabling autonomous navigation and collision avoidance. ? The project's results demonstrate the potential of merging Android technology with robotics. The Android Controlled Robot Car opens up possibilities for various applications, ranging from entertainment and hobbyist projects to practical applications in areas like surveillance, exploration, and automation. ? By leveraging the capabilities of Android smartphones or tablets, users can control the robot car from a distance, enabling them to explore and interact with their surroundings in new and exciting ways. The integration of a live video stream from the onboard camera provides a first- person perspective, enhancing the user's immersion and control experience. ? The Android Controlled Robot Car project represents a successful convergence of mobile computing, wireless communication, and robotics, showcasing the advancements made in these fields. It serves as a stepping stone for further innovation and development in remote-controlled vehicles and robotic systems. ? Overall, this project demonstrates the potential of combining Android technology with robotics to create engaging and interactive experiences, fostering curiosity, exploration, and learning in the field of robotics.

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Submitted text	As student entered the text in the submitted document.
Matching text	As the text appears in the source.

1/9	SUBMITTED TEXT	21 WORDS	77%	MATCHING TEXT	21 WORDS

DC Motor : A DC motor is any of a class of rotary electrical motors that converts direct current (

DC geared motor A DC gear motor is any of a class of electrical machines that converts direct current

W http://suspace.su.edu.bd/bitstream/handle/123456789/108/3project%20Book.pdf?sequence=1&isAllowed=y

2/9	SUBMITTED TEXT	44 WORDS	91%	MATCHING TEXT	44 WORDS

electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic. To periodically change the direction of current in part of the motor.

electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor.

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3/9	SUBMITTED TEXT	94 WORDS	83%	MATCHING TEXT	94 WORDS

widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The Universal motor can operate on direct current but is a lightweight brushed motor used forportable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills.

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4/9	SUBMITTED TEXT	18 WORDS	58%	MATCHING TEXT	18 WORDS

Light Emitting Diode, is a semiconductor device that emits light when an electric current passes through it.

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5/9	SUBMITTED TEXT	21 WORDS	90%	MATCHING TEXT	21 WORDS

wire) is an electrical wire, or group of them in a cable, with a connector or pin at each end (

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6/9	SUBMITTED TEXT	42 WORDS	70%	MATCHING TEXT	42 WORDS

include >AFMotor.h< //initial motors pin AF_DCMotor motor1(1, MOTOR34_1KHZ); AF_DCMotor motor2(2, MOTOR34_1KHZ); AF_DCMotor motor3(3, MOTOR34_1KHZ); AF_DCMotor motor4(4, MOTOR34_1KHZ); #define trigPin 9 #define echoPin 10 char command; void setup() { Serial.begin(9600);

include >AFMotor.h< #include >Servo.h< //initial motors pin AF_DCMotor motor1(1, MOTOR12_1KHZ); AF_DCMotor motor2(2, MOTOR12_1KHZ); AF_DCMotor motor3(3, MOTOR34_1KHZ); AF_DCMotor motor4(4, MOTOR34_1KHZ); Servo myServo; int val; int void setup() { Serial.begin(9600); //

W https://roboticthamizhayt.blogspot.com/

7/9	SUBMITTED TEXT	25 WORDS	91%	MATCHING TEXT	25 WORDS

used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

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8/9	SUBMITTED TEXT	95 WORDS	44%	MATCHING TEXT	95 WORDS

pinMode(trigPin, OUTPUT); pinMode(echoPin, INPUT); } void loop() { long duration, distance; digitalWrite(trigPin, LOW); delayMicroseconds(2); digitalWrite(trigPin, HIGH); delayMicroseconds(10); Android Controlled Robot Car AVCOE, Sangamner 40 digitalWrite(trigPin, LOW); duration = pulseIn(echoPin, HIGH); distance = (duration / 2) / 29.1; if(distance > 20) { Stop(); } if (Serial.available() < 0 && distance < 20) { // Check if

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9/9	SUBMITTED TEXT	171 WORDS	64%	MATCHING TEXT	171 WORDS

switch (command) { case 'F': forward(); break; case 'B': back(); break; case 'L': left(); break; case 'R': right(); break; default: Stop(); break; }

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