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Android Controlled Robot Car
CHAPTER 1
INTRODUCTION
1.1 ABSTRACT

Now day's an android phone is play the important role in every one's life.And the now day's every one can travels one place to another place as per the need.For that we required some resources like car, bus, etc.

A car is usually an electro-mechanical machine that is guided by computer and electronic programming. The car which can be controlling using an APP of android mobile. We are developing the remote buttons in the android app by which we can control the car motion with them. Here we use Wi-fi communication to interface controller and android. Controller can be interfaced to the Wi-fi module though UART. According to commands received from android by wifi module the robotic car motion can be controlled. The consistent output of a robotic system along with quality and repeatability are unmatched.

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1.2 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[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].

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1.3 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 coherent and that combined with the electricity cost means that charging an electric vehicle is affordable 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.

1.4 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.

1.5OBJECTIVES OF THE PROJECT

• To control the car with help of Android phone.

• Drive the car/vehicle safely and with the security.

• Avoid the Accidental cases.

• Maintain the Environmental balance(with ECO-friendly).

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1.6 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.

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 8051 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.

• 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.

• 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.

• 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.

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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 i n h u m a n environments I n d u s t r i a l R o b o t : A n International Journal s

2007 B a s e d o n design and 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 Zi-Yi, Lam, Sew- Kin, Wong, Wai- Leong, Pang, 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 AVCOE, Sangamner

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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. & [SEP] Adv. Tech. & Sci 2015 B a s e d o n 8051Microco n t r o l l e r technology P a r m a r D , Tripathi D, Sahni A, Singh P Bluetooth operated robot vehicle [SEP] 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 Ashima, Kumar R, Nikhil T, Singh P O b s t a c l e avoidance and Anderoid mobile phone controlled Bluetooth robot using arduino IJEEE 2015 B a s e d o n Arduino and Ultra-sonic 4. E s h i t a R Z , Barua T, Barua A and Dip A

Bluetooth based android controlled robot A m e r i c a n Journal of Engineering R e s e a r c h (AJER) 2016 Based on Bluetooth 6 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[SEP] 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 Interdisciplina ry Research (IJIR) 2016 Based on

A r d u i n o control AVCOE, Sangamner

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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 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 AVCOE, Sangamner

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6. 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. 3 August 2022 • Given the presentation on the above three project topics

• Final topic was selected :

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• Gave presentation on final topic.

• Suggestions are given by the teachers. 5 September 2022 • Literature survey

• Block diagram implementation

• Finalisation of components, downloading of datasheet of each component used for the project. 6 October 2022 • Circuit diagram design.

• Designed the Flowchart. AVCOE, Sangamner

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[SEP] 7 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 8 December 2022 • Preparation of Synopsis report. AVCOE, Sangamner

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CHAPTER 2

HARDWARE DESIGN

2.1 BLOCK DIAGRAM

Fig.:2.1 A) Block Diagram

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Fig.:2.1 B) Block Diagram

2.1.1 BLOCK DIAGRAM DESCRIPTION:

Above block diagram show the actual working of the Android controlled Robot car. As shown in fig. 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.

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2.2 COMPONENTS REQUIRED:

2.2.1 NodeMCU:

NodeMCU is a low-cost and easily available

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IoT platform[9][10].It initially involved firmware which runs on the ESP8266 Wi-Fi SoC in Espressif Systems, and hardware which was based on the ESP-12 module[11][12]. Later

on , it get updated and support for the ESP32 32-bit MCU was added.

Fig.2.2.1:A) NodeMCU

NodeMCU was created after the ESP8266 came out. On December 30, 2013, Espressif Systems[11]started production of the ESP8266[13].NodeMCU started on 13 Oct 2014, when Hong decided the first file of nodemcu-firmware in GitHub[14]. Two months later, the project expanded to include an open-hardware platform when hardware developer Huang R committed the gerber file of an ESP8266 board, named devkit v0.9[15].Later that month, Tuan PM ported MQTT client library from Contiki to the ESP8266 SoC platform,[16]and committed to NodeMCU project, then NodeMCU was able to support the MQTT IoT protocol, using Lua to access the MQTT broker. Another important update was made on 30 AVCOE, Sangamner

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Jan 2015, when Devsaurus ported the u8glib[17] to the NodeMCU project,[18]enabling NodeMCU to easily drive LCD, Screen, OLED, even VGA displays.

In the summer of 2015 the original creators abandoned the firmware project and a group of independent contributors took over. By the summer of 2016 the NodeMCU included more than 40 different modules.

Fig.2.2.1:B) NodeMCU

Features:

Node-MCU Specifications:

The Node MCU is available in various modes Common to all the designs is the based on ESP8266 core. Designs based on the structure have maintained the standard 30- pin layout. Some designs use the more usual narrow (0.9″) footprint, while others use a broad AVCOE, Sangamner

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(1.1″) footprint – an important thought to be aware of the most common models of the NodeMCU are the Amica (basis on the standard narrow pin-spacing) and the LoLin which has the longer pin spacing and larger board. The open-source design of the base ESP8266 ables the market to design new variants of the Node-MCU continually.

Node-MCU Technical Specifications:

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2.2.2 L298N Motor Driver Module:

A motor driver module is a simple and easy circuit used for controlling a DC motor. It is most of times used in autonomous robots and RC cars (L2938N and L293D are the most regularly utilized motor driver chips). A motor driver module takes the voltage input from a controller like Arduino and ESP-8266. This input logic controls the direction of DC motors which connected to the driver. To put it in easy words, you can control the direction of DC motors by giving appropriate logic to the motor driver module.

The motor driver module consists of a motor driver IC, which is the main part of the module. The IC alone can control the DC motor but using the module makes the interfacing with Arduino in simple manner.

All microcontrollers operate on low voltage or current signals, unlike motors. For instance, the Arduino or Node-MCU microcontroller can output a maximum voltage of 5V or 3.3V. But a decent DC motor needs minimum 5V or 12V. Also, the output current limit of Arduino is corresponding very low.

Hence the output of Arduino is not sufficient to power up the motors. To solve this problem the use of a motor driver is needed. We bridge the gap between the Arduino and motor by introducing a motor driver. And to supply the voltage or current required to operate the motor, an external supply is connected to the motor driver module.

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Fig.2.2.2: A) L298N Motor Driver Module.

The L298N motor driver is basis on the H-bridge configuration (an H-bridge is easy circuit that lets us control a DC motor to go backward or forward.) which is useful in controlling the direction of a DC motor rotation .

It is a high current dual full H-bridge driver that is construct to receive standard TTL logic levels. It can also be used to control inductive loads like relays, solenoids, motors (DC and stepping

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motor), etc. The L298N Motor Driver Module is a high power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator voltage. L298N Module can control up to 4 DC motors, or 2 DC motors

of direction and speed control.

The

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L298N Motor Driver module consists of an L298 Motor Driver IC, 78M05 Voltage Regulator, resistors, capacitor, LED, 5V jumpers in an integrated circuit. 78M05 Voltage regulator will be abled only when the jumper is placed. When the power supply is maximum upto 12V, then the internal circuitry will be powered by the voltage regulator and the 5V pin can be used as an output pin to power the Node-MCU. The jumper should not be placed when the power supply is more than 12V and separate 5V should be given through 5V terminal to power the internal circuit. ENA & ENB pins are speed control pins for Motor A and Motor B while IN1& IN2 and IN3 & IN4 are direction controlling pins for Motor A and Motor

B.

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Fig.2.2.2
B): Internal circuit diagram of

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Features:
• Operating Supply Voltage maximum Up to 46V.
• Total DC Current maximum Up to 4A.
• Low Saturation Voltage.
• High Temperature Protection.
• Logical "0" Input Voltage Up to 1.5V
• (High Noise Immunity)

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2.2.3 DC Motor:
A DC motor is any of a class of rotary electric motors that converts direct current (DC) electrical energy after mechanical energy. The common types rely on the forces produce by magnetic fields. Almost all types of DC motors have some internal mechanism, either electromechanical or electronic.To regularly change the direction of current in part of the motor. DC motors were the first form of motor mostly used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a long range, using either a variable supply voltage or by changing the power of current in its field windings. Small DC motors are used in tools, toys, cars and appliances.
The Universal motor can operate on direct current but is a lightweight brushed motor used for portable power appliances. Larger DC motors are currently used in impulse of electric vehicles, elevator and hoists, and in drives for steel rolling mills. Working principle of DC motor is the When kept in a magnetic field, a current-carrying conductor gain torque and develops a tendency to move. It means, when electric fields and magnetic fields interact, a mechanical force arises. This is the way on which the DC motors work.
Fig2.2.3:A) DC Motor.
Fig.2.2.3:B)Electromagnetic Motor.
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2.2.4 Ultrasonic Sensor:

Ultrasonic sensors use sound to determine the distance between the sensor and the closest object in its path. How the ultrasonic sensors works? Ultrasonic sensors are essentially sound sensors, but they operate at a high frequency above human hearing.

Fig.2.2.4:A) UltraSonic sensor

Fig.2.2.4:B) Actual Working of UltraSonic sensor

The sensor sends out a sound wave at a specific frequency. It then listens for that specific sound wave to bounce off of an object and come back (Fig. 2.2.4:B). The sensor keeps track of the time between sending the sound wave and the sound wave returning. If you know how AVCOE, Sangamner

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fast something is going and how long it is traveling you can find the distance traveled of waves with equation 1.

Equation 1. $d = v \times t$

HCSR04 Specifications :

• Power Supply: +5V DC

• Quiescent Current: >2mA

• Working current: 15mA

• Effectual Angle: >15o

• Ranging Distance: 2400 cm

• Resolution: 0.3 cm ⌷SEP Measuring Angle: 30o

• Trigger Input Pulse width: 10uS

• Dimension: 45mm x 20mm x 15mm

• Weight: approx. 10 g

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2.2.5. 9_Volt Battery:

The 12-volt battery, or 9-volt battery, is an electric battery that supplies a minimum voltage of 9 volts. Practical voltage measures 7.2 to 9.6 volts, depending on battery capacity. Batteries of different sizes and capacities are manufactured; a very common size is known as PP3, introduce for early transistor radios. The PP3 has a rectangular prism shape with rounded edge and two polarized snap connectors on the top. This type is commonly used for many applications including household uses such as smoke and gas detectors, clocks, toys and cars etc[17].

Fig.2.2.5:9_Volt Battery

A rechargeable battery is a type of electrical battery which can be charged, discharged into a load, and recharged many times, as opposed to a biodegradable or primary battery, which is supplied fully charged and discarded after use.

General Features

• Can be mounted in any direction.

• Computer designed lead, calcium tin alloy grid for more power density.

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• Long service life, float and cyclic applications.

• No Maintenance.

• Low self discharge rate.

2.2.6. Light-Emitting Diode:

LED, is full light-emitting diode, in electronics, a semiconductor device that emits infrared or visible light when charged with an electric current. Visible LEDs are used in all electronic devices as indicator lamps, in automobiles as rear-window and brake lights, and on billboards and signs as alphanumeric displays and even full-colour posters. Infrared LEDs are employed in autofocus cameras and television remote controls or also as light sources in fibre optic telecommunication systems.

The familiar light bulb gives off light through glow, a phenomenon in which the heating of a wire filament by an electric current causes the wire to emit photons, is the basic energy packets of light. LEDs operate by electroluminescence, a phenomenon in which the discharge of photons is caused by electronic excitation of a material. The material commonly used in LEDs is gallium arsenide, though there are many variations on this basic compounds, such as aluminum , gallium ,arsenide or aluminum gallium indium phosphide. The brightness of the light observed from an LED depending on the power emitted by the LED and on the relative sensitivity of the eye at the emitted wavelength. Maximum sensitivity occurs at 0.555 micro metre, which is in the yellow-orange or green region. The applied voltage in most LEDs is low, in the region of 2.0 volts; the current depends on the application which is ranges from a few milli amperes to several hundred milli ampere

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Fig.2.2.6: Light-Emitting Diode.

2.2.7

Jumper

Wires:

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A jump wire (also known as jumper, jumper wire, DuPont wire) is an electrical conductor wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them — simply "conserved"), which is normally used to connection the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering. original jumper wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board and a piece of test equipment.

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Jumper wires are simply wires that have connector pins at each end

which

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allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards or other prototyping tools

in order to make it simple to change a circuit as needed.

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There are various types of jumper wires. Some have the same type of electrical connector at both side ends, while others have different connectors some common connectors are: • Solid tips — are used to connect on a breadboard or female header connector. The position of the elements and ease of insertion on a breadboard

ables

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to increasing the mounting density of both components and jumper wires without fear of short-circuits.

The jumper wires having in different size and colour to distinguish the different working signals.

•

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Crocodile clips – are used, among other applications like to temporarily bridge sensors, buttons and other elements of prototypes with components

and

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equipment that have arbitrary connectors, wires, screw terminals, etc. • Banana connectors – are mostly used on test equipment for DC and low-frequency AC signals. • Registered jack (RJnn) – are mostly used in telephone (RJ11) and computer networking (RJ45). • RCA connectors – are mainly used for audio, low-resolution composite video signals, or other low-frequency applications requiring a shielded cable. • RF connectors – are

mainly

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used to carry radio frequency signals between circuits, test equipment, and antennas.RF jumper cables - Jumper cables is a smaller and wide bendable corrugated cable which is used to connect antennas and other components to network cabling. Jumpers are also used in base stations to connect antennas to radio units. commonly the most bendable jumper cable diameter is 1/2".

Fig.2.2.7:Jumper Wires

2.2.8 RELAY:

Basically Relay is electromechanical switch. They have very high current rating and both AC and DC motors can be controlled by them because motor will be completely isolated from the remaining circuit. Relays are mostly used as driving circuit for motor, they are used to rotate the motor in both (forward or reverse) direction. Every motor uses two relays hence there are total 6 relays connected to pins of microcontroller which are 20-24

Fig.2.2.8:A) Relay

• Normally Open (NO): It connect the circuit when the relay is activated, the circuit is disconnected when the relay is inactive.

• Normally Closed (NC): It disconnect the circuit when the relay is activated, the circuit is connected when the relay is inactive.

• ChangeOver (CO): It's the common connection.

• Coil: It's the electromagnetic coil inside relay.

• Relay ratings:

• Coil rating: It's the minimum Voltage at which the coil gets fully activated. Some also have coil resistance which is mentioned on them. Relay coil voltage rated 6V and 12V are the mostly available.

2.2.9 DIODE:

A diode is a two terminal electronic component that conducts primarily in one direction. It has low resistance to the current in one direction and high resistance in other. The most important function of a diode is to allow an electric current to pass in one direction while blocking current in the opposite direction. This unidirectional behaviour is called rectification and it is used to convert ac to dc. Here we use 1N4007 diodes.

Fig.2.2.9: 1N4007 Diode

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2.2.10 CAPACITOR:

Capacitor is a passive two terminal electrical component that stores electrical charge when they are connected to battery or some other charging circuit. The effect of capacitor is called as capacitance. The capacitor contains two metallic plates that are separated by insulation. Capacitance is mainly measured in the farad unit. They are mostly placed in electronic components and are used to maintain a power supply while the device is unregulated and without a battery for a short time.

Here, in our project we are using various capacitor.

Fig.2.2.10: Capacitors

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2.2.11 RESISTORS:

A resistor is the passive

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two-terminal electrical component that implements electrical resistance as a circuit element. Resistors act to reduce current

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flow and at the that time, act to smaller voltage levels within circuits. In our project we are using various types of 10Ω, 1kΩ, 2.2KΩ and 10KΩ resistors.

Fig.2.2.11: (a) resistor (b) rheostat (variable resistor) and (c) potentiometer

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2.3 CIRCUIT DIAGRAM:

Fig.2.3.1: Circuit Diagram of Power Supply

Fig.2.3.2: Circuit Diagram of controller

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Fig.2.3.3: Circuit Diagram of L298N Motor Driver

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Fig.2.2.4: Circuit Diagram of Relay

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CHAPTER 3

3.1ALGORITHM

3.1.1 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

3.1.2 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.

3.1.3 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.

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3.1.4 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.

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3.2 FLOWCHART

3.2.1 Flowchart of Motor Driver IC

Fig.3.2.1: Flowchart of Motor Driver IC

AVCOE, Sangamner

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Android Controlled Robot Car

3.2.2 Flowchart for Ultrasonic Sensor

Fig.3.2.2: Flowchart of Ultrasonic Sensor

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3.2.3 Flowchart of Robotic Car

Fig.3.2.3: Flowchart of Robotic Car

Android Controlled Robot Car

CHAPTER 4

SYSTEM OVERVIEW

4.1 ADVANTAGES

• The use of automated shipping trucks will impact on the world's economy.

• Robotic car increases the car efficiency & speed.

• Self-driving cars will improve the traffic conditions and congestion.

• Inter vehicle communication.

• Traffic signal notification.

• Driver assistance.

• Quick accident notifications .

• Increased security (Live tracking)

4.2 DISADVANTAGES:

• High Cost.

• Every time need of Internet.

• It works in the range of Wi-Fi only.

4.3 APPLICATIONS:

• For transportation.

• 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.

Android Controlled Robot Car

CHAPTER 5

CONCLUSION:

After completing this project we will conclude the following conclusion:

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 arduino 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.

Hit and source - focused comparison, Side by Side

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

5/14	SUBMITTED TEXT	33 WORDS	100%	MATCHING TEXT	33 WORDS

OUT1 & OUT2 Output pins of Motor A OUT3 & OUT4 Output pins of Motor B 12V 12V input from DC power Source 5V Supplies power for the switching logic circuitry inside L298N IC GND Ground pin

SA ANDROID PHONE CONTROLLED ROBOT.docx (D91483742)

6/14	SUBMITTED TEXT	95 WORDS	88%	MATCHING TEXT	95 WORDS

A jump wire (also known as jumper, jumper wire, DuPont wire) is an electrical conductor wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "conserved"), which is normally used to connection the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering. original jumper wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board and a piece of test equipment.

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7/14	SUBMITTED TEXT	13 WORDS	100%	MATCHING TEXT	13 WORDS

Jumper wires are simply wires that have connector pins at each end

Jumper wires are simply wires that have connector pins at each end,

SA Aarushi.docx (D76059128)

8/14	SUBMITTED TEXT	26 WORDS	74%	MATCHING TEXT	26 WORDS

allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards or other prototyping tools

allowing them to be used to connect two points to each other without soldering. Jumper wires square measure generally used with breadboards and alternative prototyping tools

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| 9/14 | SUBMITTED TEXT | 55 WORDS | 90% | MATCHING TEXT | 55 WORDS |

There are various types of jumper wires. Some have the same type of electrical connector at both side ends, while others have different connectors some common connectors are: • Solid tips – are used to connect on a breadboard or female header connector. The position of the elements and ease of insertion on a breadboard

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| 10/14 | SUBMITTED TEXT | 16 WORDS | 68% | MATCHING TEXT | 16 WORDS |

to increasing the mounting density of both components and jumper wires without fear of short-circuits.

SA Report.pdf (D133951753)

| 11/14 | SUBMITTED TEXT | 22 WORDS | 92% | MATCHING TEXT | 22 WORDS |

Crocodile clips – are used, among other applications like to temporarily bridge sensors, buttons and other elements of prototypes with components

SA SUMA.T.R..pdf (D141736715)

SUBMITTED TEXT 63 WORDS **92%** **MATCHING TEXT** 63 WORDS

equipment that have arbitrary connectors, wires, screw terminals, etc. • Banana connectors – are mostly used on test equipment for DC and low-frequency AC signals. • Registered jack (RJnn) – are mostly used in telephone (RJ11) and computer networking (RJ45). • RCA connectors – are mainly used for audio, low-resolution composite video signals, or other low-frequency applications requiring a shielded cable. • RF connectors – are

SA SUMA.T.R..pdf (D141736715)

SUBMITTED TEXT 59 WORDS **94%** **MATCHING TEXT** 59 WORDS

used to carry radio frequency signals between circuits, test equipment, and antennas.RF jumper cables - Jumper cables is a smaller and wide bendable corrugated cable which is used to connect antennas and other components to network cabling. Jumpers are also used in base stations to connect antennas to radio units. commonly the most bendable jumper cable diameter is 1/2".

SA SUMA.T.R..pdf (D141736715)

SUBMITTED TEXT 17 WORDS **70%** **MATCHING TEXT** 17 WORDS

two-terminal electrical component that implements electrical resistance as a circuit element. Resistors act to reduce current

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