VOICE-CONTROLLED BLUETOOTH CAR

A Project Report

Submitted in the partial fulfillment of the requirements for the award of the degree of

Bachelor of Technology

in

Department of Electronics and Communication Engineering/Internet of Things/Electrical and Electronics Engineering/Electronics and Communication Engineering

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KONERU LAKSHMAIAH EDUCATION FOUNDATION

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DECLARATION

The Project Report entitled **"VOICE-CONTROLLED BLUETOOTH CAR"** is a record of bonafide work of **P GOVARDHAN (2200049155), P PATTABI RAM (2200049156)** submitted in partial fulfilment for the award of **B.Tech in Electronics and Communication Engineering to the K L University.** The report is submitted as the outcome of the skilling project for the course 22SDEC01 R (Electronic System Design). The results embodied in this report have not been copied from any other departments/University/Institute.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

This is to certify that the Project Report entitled "**VOICE-CONTROLLED BLUETOOTH CAR"** is being submitted by P GOVARDHAN (2200049155), P PATTABI RAM (2200049156**)** submitted in partial fulfilment for the award of B-Tech in Electronics and Communication Engineering to the K L University is a record of bonafide work carried out under our guidance and supervision. The report is submitted as the outcome of the skilling project for the course 22SDEC01 R (Electronic System Design).

The results embodied in this report have not been copied from any other departments/University/ Institute.

Signature of the Supervisor **Signature of the HOD**

Signature of the external Examiner

ACKNOWLEDGMENT

Apart from the efforts by us, the success of any work depends largely on the encouragement and guidelines of many others. We take this opportunity to express our gratitude to the people who have been instrumental in the successful completion of this project.

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ABSTRACT

The Bluetooth controlled car using Arduino is an innovative and versatile project that leverages the power of Arduino microcontrollers and Bluetooth technology to create a remote-controlled car. This project provides an engaging platform for learning, experimentation, and practical application of embedded systems and wireless communication.

The system consists of two main components: a mobile application and an Arduino-based car. The mobile application is installed on a smartphone and serves as the user interface, allowing users to send control commands to the Arduino car. The Arduino car is equipped with a Bluetooth module, motor drivers, sensors, and wheels, enabling it to receive and interpret commands from the mobile application and execute various movements.

The proposed system employs a sensor fusion approach, integrating data from multiple sensors, such as LIDAR, radar, and cameras, to create a comprehensive perception of the environment. Machine learning algorithms, specifically deep neural networks, are utilized to process and analyze sensor data, enabling the system to recognize and classify obstacles in real-time.

CONTENT

CHAPTER - I

INTRODUCTION

Remote-controlled cars are a popular hobby, but adding Bluetooth control brings a new dimension to these toys. Arduino provides an excellent platform for such projects. This project focuses on building a Bluetooth-controlled car using Arduino, a smartphone, and a Bluetooth module.

Key features of this Bluetooth controlled car include forward, backward, left, and right motion, as well as the ability to stop and change speed. The car can also be enhanced with additional sensors like ultrasonic sensors or cameras for obstacle detection and video streaming, providing potential for further development and customization.

The project offers valuable hands-on experience in programming Arduino microcontrollers, designing motor control circuits, and implementing Bluetooth communication protocols. It is suitable for educational purposes, makers, and hobbyists, providing a fun and interactive way to explore the realms of embedded systems, robotics, and wireless control.

In the era of rapid technological advancements, the integration of artificial intelligence (AI) and robotics has paved the way for innovative solutions to everyday challenges. One such breakthrough is the development of voice-controlled robo cars, marking a significant leap in human-machine interaction. This report delves into the intricacies of voice-controlled robo cars, exploring the underlying technologies, applications, benefits, and challenges associated with this cutting-edge development.

The idea of a voice-controlled robo car builds upon the convergence of AI, machine learning, and robotics. Traditional modes of human-robot interaction have often relied on manual input methods, limiting the potential for seamless integration into daily activities. Voice control emerges as a natural and intuitive interface, allowing users to communicate with their robotic counterparts effortlessly.

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LITERATURE SURVEY

A literature survey involves reviewing existing research and publications related to the topic of interest, in this case, voice-controlled cars. Below is a concise literature survey highlighting key studies, advancements, and trends in the field of voice-controlled cars:

1) **Voice Command Recognition for Automotive Applications" (2015) by M. Alauthaman et al.:**

This paper explores the challenges and solutions in implementing voice command recognition systems specifically tailored for automotive applications. It discusses the importance of robust algorithms for real-time processing in dynamic environments.

2) **Human-Vehicle Interaction: A Survey of Models, Sensors, and Interfaces" (2018) by A. Sharma et al.:**

This comprehensive survey provides an overview of various interaction models, sensors, and interfaces used in human-vehicle interaction. It covers voice recognition as a critical aspect of improving user experience and safety.

3) **Voice-Controlled Intelligent Wheelchair: A Review" (2019) by S. Kumar et al.:**

Although focused on wheelchairs, this review discusses voice-controlled systems and their implementation challenges. Insights from this study can be extrapolated to voice-controlled car systems, particularly in terms of user acceptance and system responsiveness.

4) **Speech Recognition in Noisy Environments: A Review" (2017) by N. Jha et al.:**

Recognizing that the in-car environment can be noisy, this paper reviews techniques and technologies for speech recognition in challenging acoustic conditions. Understanding these challenges is crucial for developing robust voice-controlled car systems.

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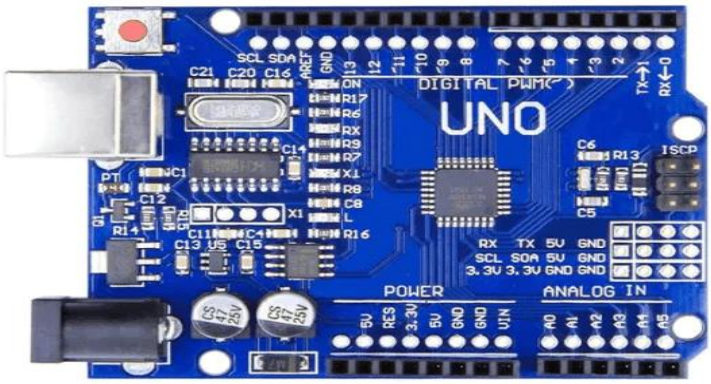
THEORETICAL ANALYSIS

3.1. ARDUINO UNO

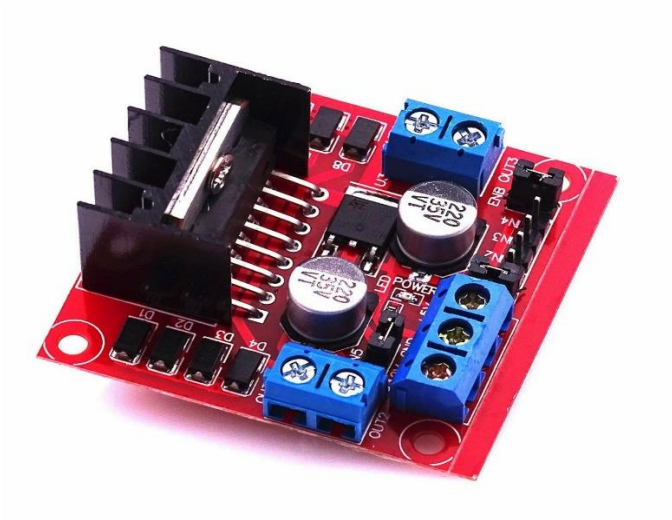


Arduino UNO is a microcontroller board based on the **ATmega328P**. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

Each of the 14 digital pins and 6 analog pins on the Uno can be used as an input or output, under software control (using pinMode(), digitalWrite(), and digitalRead() functions). They operate at 5 volts. Each pin can provide or receive 20 mA as the recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50K ohm. A maximum of 40mA must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller. The Uno has 6 analog inputs, labeled A0 through A5; each provides 10 bits of resolution (i.e. 1024 different values). By default, they measure from ground to 5 volts, though it is possible to change the upper end of the range using the AREF pin and the analog Reference.

The Arduino/Genuino Uno has a number of facilities for communicating with a computer, another Arduino/Genuino board, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The 16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. Arduino Software (IDE) includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A SoftwareSerial library allows serial communication on any of the Uno's digital pins

3.2. L293D MOTOR DRIVER



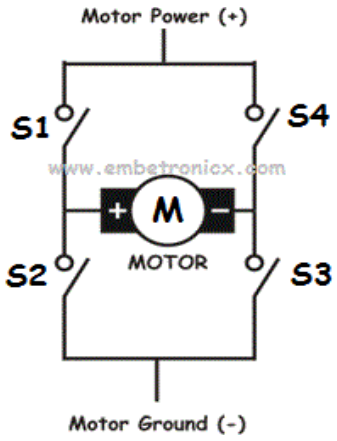
Even the simplest robot requires a motor to rotate a wheel or performs particular action. Since motors require more current than the microcontroller pin can typically generate, you need some type of a switch that can accept a small current, amplify it and generate a larger current, which further drives a motor. This entire process is done by what is known as a Motor driver. With L293D Motor Driver IC, that task is made simple and has helped in a number of applications with relative ease.

L293D H-bridge driver is the most commonly used driver for Bidirectional motor driving applications. This L293D IC allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Because it has two H-Bridge Circuit inside. The L293D can drive small and quiet big motors as well. There are various ways of making an H-bridge motor control circuit such as using transistors, relays, and using L293D/L298. Before going into detail, first we will see what is H-Bridge circuit.

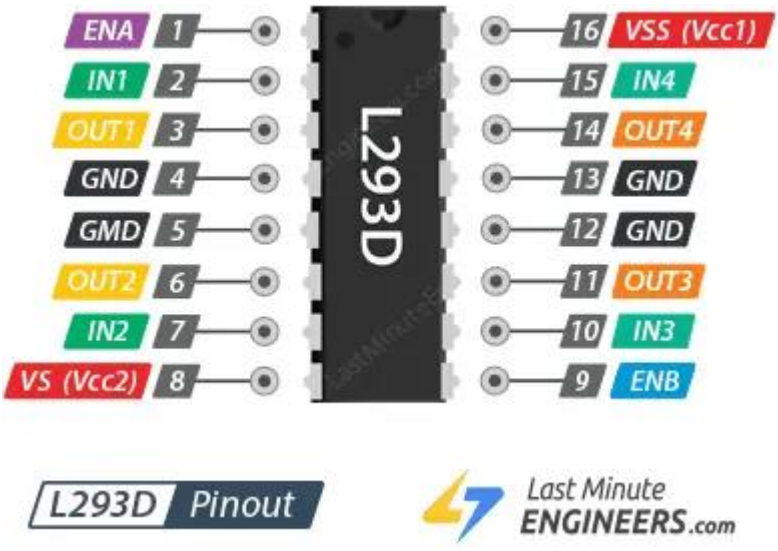
A H bridge is an electronic circuit that allows a voltage to be applied across a load in any direction. H-bridge circuits are frequently used in robotics and many other applications to allow DC

motors to run forward & backward. These motor control circuits are mostly used in different converters like DC-DC, DC-AC, AC-AC converters, and many other types of power electronic converters. In specific, a bipolar stepper motor is always driven by a motor controller having two H-bridges.

A H-bridge is fabricated with four switches like S1, S2, S3 and S4. When the S1 and S4 switches are closed, then a +ve voltage will be applied across the motor. By opening the switches S1 and S4 and closing the switches S2 and S3, this voltage is inverted, allowing invert operation of the motor.



Generally, the H-bridge motor driver circuit is used to reverse the direction of the motor and also to brake the motor. When the motor comes to a sudden stop, as the terminals of the motor's are shorted. Or let the motor run free to a stop when the motor is detached from the circuit. The table below gives the different operations with the four switches corresponding to the above circuit. By using the direction control pins, you can control whether the motor rotates forward or backward. These pins actually control the switches of the H-Bridge circuit inside the L293D IC.



VS (Vcc2) pin gives power to the internal H-Bridge of the IC to drive the motors. You can connect an input voltage anywhere between 4.5 to 36V to this pin.

VSS (Vcc1) is used to drive the internal logic circuitry which should be 5V.

GND pins are common ground pins. All 4 GND pins are internally connected and used to dissipate the heat generated under high load conditions.

The L293D motor driver's output channels for the motor A and B are brought out to pins OUT1,OUT2 and OUT3,OUT4 respectively. You can connect two 5-36V DC motors to these pins.

Each channel on the IC can deliver up to 600mA to the DC motor. However, the amount of current supplied to the motor depends on system's power supply.

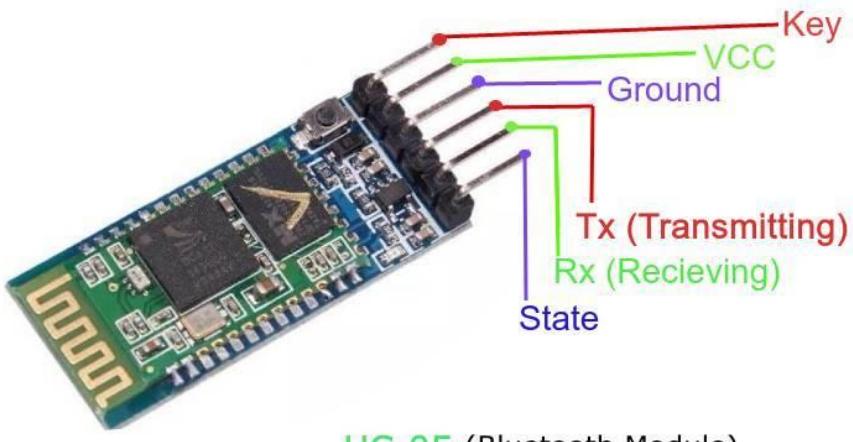
The IC has two direction control pins for each channel. The IN1 and IN2 pins control the spinning direction of motor A; While IN3 and IN4 control the spinning direction of motor B.

3.3. HC05 BLUETOOTH MODULE

Wireless communication is swiftly replacing the wired connection when it comes to electronics and communication. Designed to replace cable connections HC-05 uses serial communication to communicate with the electronics. Usually, it is used to connect small devices like mobile phones using a short-range wireless connection to exchange files. It uses the 2.45GHz frequency band. The transfer rate of the data can vary up to 1Mbps and is in range of 10 meters.

The HC-05 module can be operated within 4-6V of power supply. It supports baud rate of 9600, 19200, 38400, 57600, etc. Most importantly it can be operated in Master-Slave mode which means it will neither send or receive data from external sources.

The HC-05 Bluetooth module has emerged as a versatile and widely-used component for enabling wireless communication in electronic projects. This report provides a comprehensive overview of the HC-05 module, detailing its features, specifications, applications, and key considerations for integration into various electronic systems. The HC-05 Bluetooth module facilitates seamless wireless communication between electronic devices. Operating on Bluetooth 2.0/2.1 specifications, it serves as a bridge for serial communication, enabling data transmission without the need for physical connections.



HC-05 (Bluetooth Module)

The HC-05 module features pins for power supply, ground, and serial communication (TX and RX). AT commands can be sent through the serial interface to configure parameters such as the device name and baud rate.

- Enable - This pin is used to set the Data Mode or and AT command mode (set high).
- VCC - This is connected to +5V power supply.
- Ground - Connected to ground of powering system.
- Tx (Transmitter) - This pin transmits the received data Serially.
- Rx (Receiver) - Used for broadcasting data serially over bluetooth.
- State -Used to check if the bluetooth is working properly.

In Command Mode, you can communicate with the Bluetooth module through AT Commands for configuring various settings and parameters of the Module like get the firmware information, changing Baud Rate, changing module name, it can be used to set it as master or slave.

A point about HC-05 Module is that it can be configured as Master or Slave in a communication pair. In order to select either of the modes, you need to activate the Command Mode and sent appropriate AT Commands.

As we know that Vcc and Gnd of the module goes to Vcc and Gnd of Arduino.The TXD pin goes to RXD pin of Arduino and RXD pin goes to TXD pin of Arduino i.e(digital pin 0 and 1).The user can use the on board Led.But here,Led is connected to digital pin 12 externally for betterment of the process.

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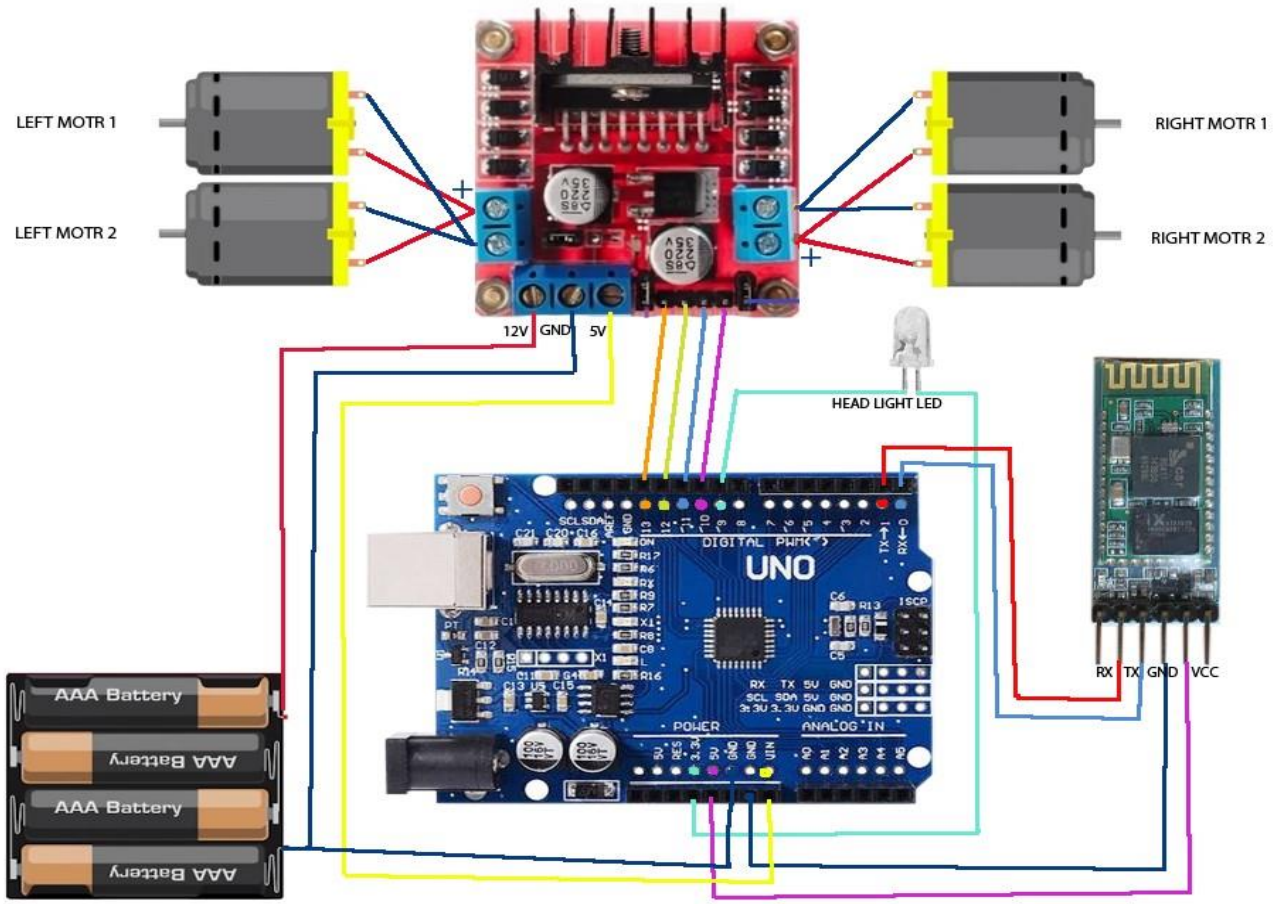
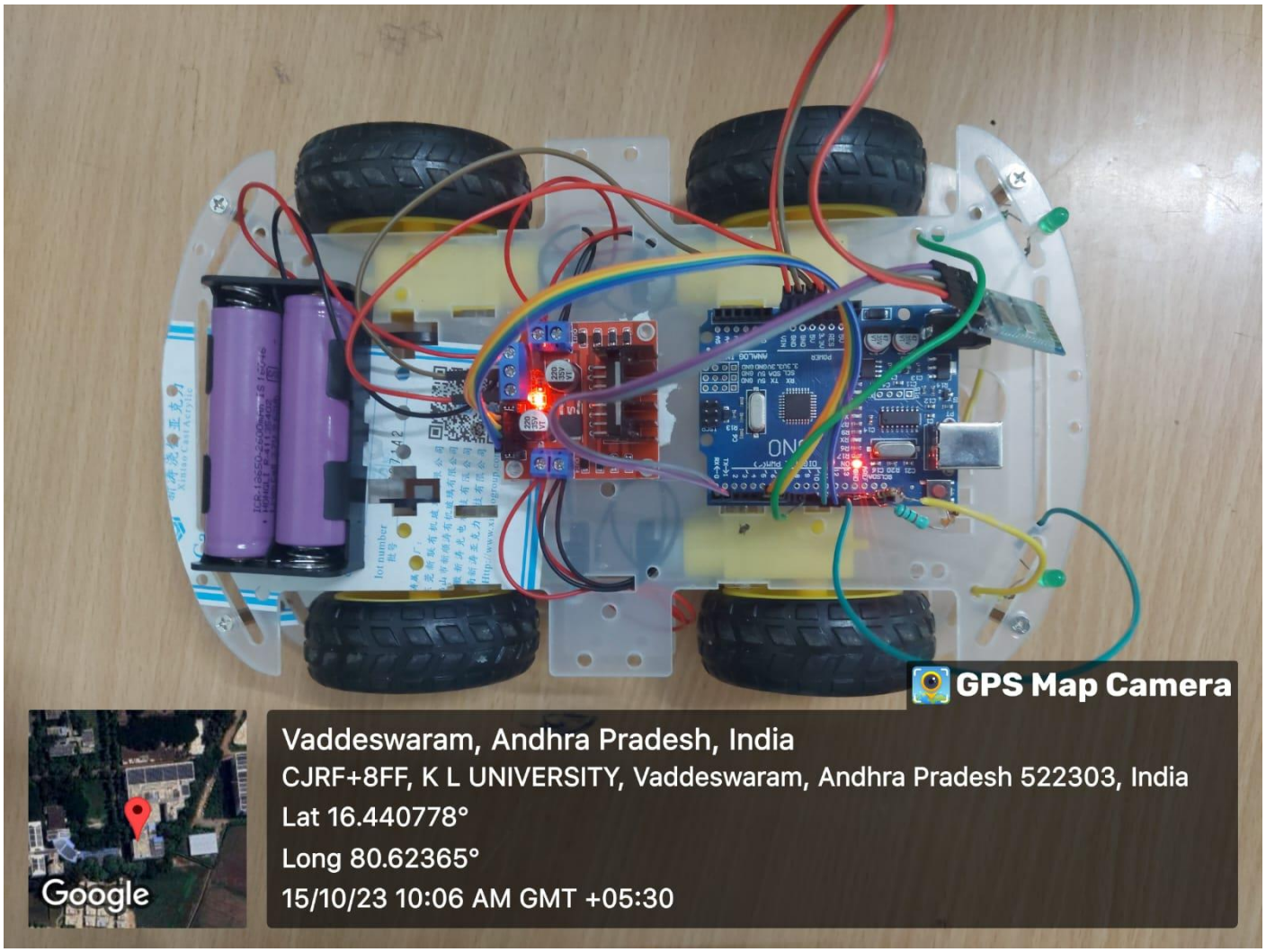
METHODOLOGY

1) CIRCUIT DIAGRAM



The Voice-Controlled Bluetooth Car project showcases the successful integration of voice recognition technology with a Bluetooth-enabled robotic platform. The system provides an innovative and user-friendly approach to controlling robotic vehicles, opening avenues for further advancements in voice-controlled robotics and automation.

2)ASSEMBLING



COMPONENTS REQUIRED:

- Robot Chassis Kit
- Arduino UNO
- L293D Motor Driver
- Battery Holder
- HC05 Bluetooth Module

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CONCLUSION

Creating a Bluetooth-controlled car using Arduino is an exciting and educational project. It combines hardware, software, and mobile app development, making it an excellent learning experience. This project can be expanded by adding features like obstacle detection, camera modules, or remote video streaming.

This project can be expanded by adding more sensors, improving the motor control algorithm, or integrating additional features such as obstacle detection. It serves as a great starting point for those interested in robotics and embedded systems.

This report provides an overview of the construction and operation of a Bluetooth-controlled car using an Arduino. It can be further customized and expanded based on your specific project requirements and goals.

The Voice-Controlled Bluetooth Car represents a convergence of advanced technologies, promising a safer and more enjoyable driving experience. As the automotive industry embraces the era of smart mobility, this innovation sets the stage for future developments in human-machine interaction, making driving more accessible and efficient for a broad spectrum of users. The Voice-Controlled Bluetooth Car project showcases the successful integration of voice recognition technology with a Bluetooth-enabled robotic platform. The system provides an innovative and user-friendly approach to controlling robotic vehicles, opening avenues for further advancements in voice-controlled robotics and automation.

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