WIFI CONTROLLED CAR USING NODEMCU

MINI PROJECT REPORT

Submitted by

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AUTONOMOUS

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

BONAFIDE CERTIFICATE

This is to certify that it is the bonafide work of **"VISHNU SANKAR J (202009046), RAGAVAN M (202009034), SIDDARTH S (202009038)"** for the mini project titled **"WIFI CONTROLLED CAR USING NODEMCU"** in 19AD752 –Intelligent Systems for IoT Laboratory during the seventh semester June 2023 – November 2023 under my supervision.

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ABSTRACT

In this modern era of technology, the integration of the Internet of Things (IoT) has transformed the way we interact with everyday objects. One such application is the development of a WiFi-controlled car using NodeMCU, a versatile open-source platform for IoT projects. This project demonstrates a novel approach to remotely control a car via a web or mobile application using WiFi connectivity.

The system comprises a NodeMCU microcontroller, a motor driver, and a set of motors installed in the car. NodeMCU, which is built on the ESP8266 WiFi module, provides the necessary computational power and connectivity for the project. It connects to a local WiFi network, allowing users to access and control the car from any device with internet access.

The control interface is developed using web technologies such as HTML, CSS, and JavaScript. Users can connect to the NodeMCU's web server through a web browser or a dedicated mobile app. The interface provides intuitive controls to navigate the car, including forward, backward, left, and right movements. It also offers the possibility of integrating additional features, such as video streaming from a camera mounted on the car or sensor data feedback.

This project exemplifies the potential of NodeMCU and IoT technologies for enhancing the capabilities of conventional objects, providing an efficient and versatile platform for remote control applications. The WiFi-controlled car serves as a practical demonstration of how IoT can be leveraged to create responsive and remotely accessible systems for various purposes, from surveillance to entertainment.

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1.INTRODUCTON

1.1 Project Description

The "WiFi Controlled Car using NodeMCU" project is an exciting and educational endeavor that combines the power of IoT technology with remote control to create a versatile and entertaining vehicle. In this project, we will build a small car that can be controlled wirelessly via a web interface or mobile application. The core component enabling this functionality is the NodeMCU, an ESP8266-based microcontroller known for its WiFi capabilities.

1.2 Project Objectives

1. Remote Control: Develop a WiFi-controlled car that can be operated from any location with internet access.
2. NodeMCU Integration: Utilize the NodeMCU platform to establish a WiFi connection and control the car's movement.
3. Web Interface: Create a user-friendly web-based control interface for easy interaction with the car.
4. Mobile App Compatibility: Explore the possibility of developing a dedicated mobile application for more convenient control.
4.Expandable Features: Consider adding features like live video streaming from the car or integrating sensors for enhanced functionality.

2.DESIGN PROCESS

2.1 Block Diagram

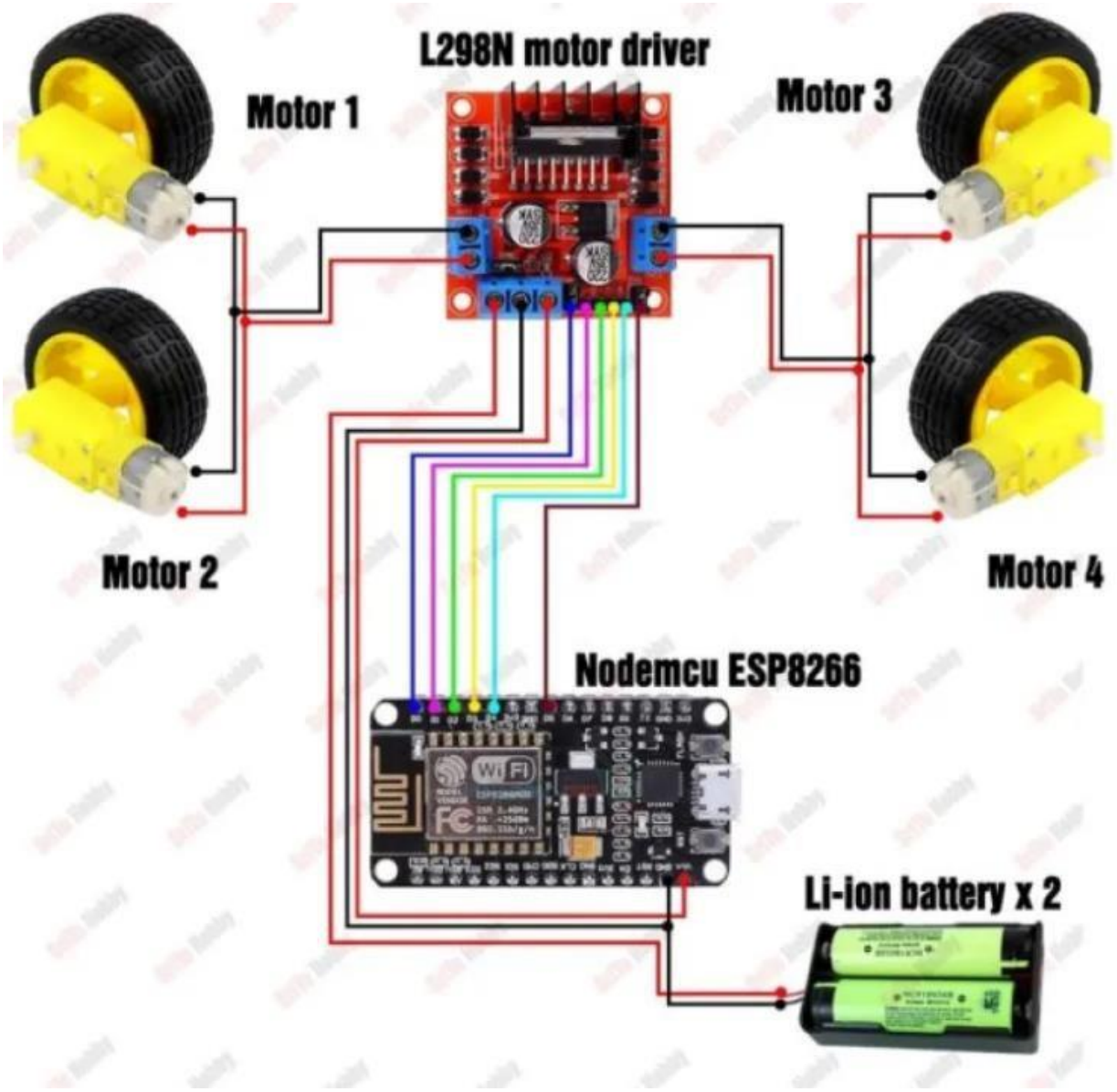

Fig 2.1.1:System Design

The user's device sends control commands through the web or mobile app interface to the NodeMCU-based control system, which interprets these commands and controls the motors via the motor driver, causing the car to move accordingly.

The power supply ensures that all components receive the necessary electrical power for their operation.

This system diagram illustrates how the components are interconnected to create a WiFi-controlled car, enabling remote operation over a local WiFi network.

2.2 Implementaton Steps

1.User Device (Web Browser/Mobile App): This component represents the device used by the user to interact with the WiFi-controlled car. Users can connect to the car through a web interface (browser) or a dedicated mobile application.

2.WiFi Network (Router/Access Point): The WiFi network provides the communication infrastructure, allowing the user's device to connect to the NodeMCU-based control system wirelessly.

3.NodeMCU-based Control System (WiFi Server): The NodeMCU microcontroller acts as a server that hosts a web interface accessible over the WiFi network. It receives commands from the user's device and controls the motors accordingly.

4.Web or App Interface for Control: This interface, developed using HTML, CSS, and JavaScript, enables users to send commands for car movements (forward, backward, left, right) over the WiFi network.

5.Motor Driver & Motors: The motor driver module controls the DC motors that drive the car's wheels. The NodeMCU communicates with the motor driver to control the direction and speed of the motors.

6.Power Supply (Battery Pack): The power supply provides energy to the entire system. In most cases, a battery pack is used to power both the NodeMCU and the motors.

7.Chassis/Wheels and Motors: These physical components represent the car's structure, including the wheels and the motors attached to them. The motors are controlled to move the car in the desired direction.

2.3 Flow Diagram

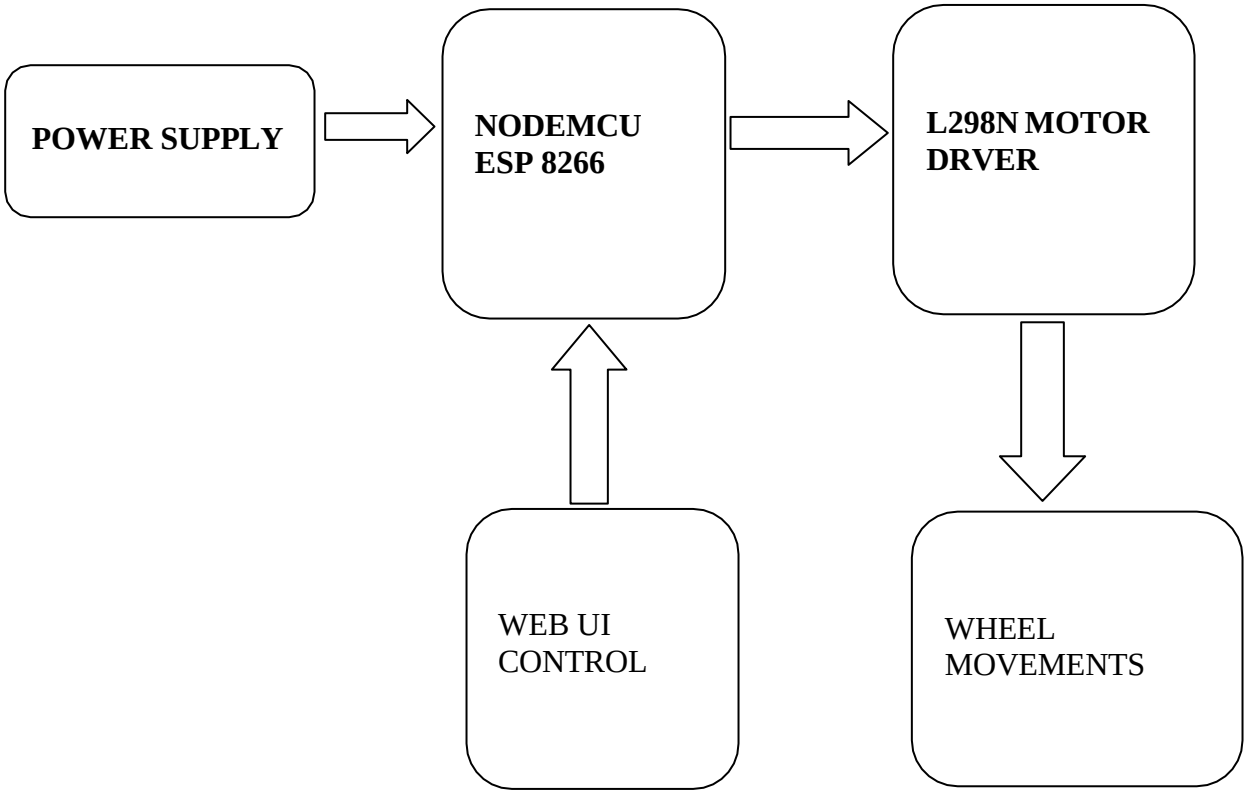

Fig 2.3.1 Flow Diagram

3.COMPONENTS

3.1 NodeMCU:

NodeMCU is built around the ESP8266, which is a low-cost and power-efficient WiFi module. The ESP8266 supports WiFi connectivity, making it suitable for IoT projects that require wireless communication.

Nodemcu ESP8266

Fig 3.1.1: NodeMCU ESP 8266

3.2 Motor driver:

Motor drivers are designed to work with different types of motors, including DC motors, stepper motors, and brushless DC motors. Different motor types require specific driver circuits.

L298N motor driver

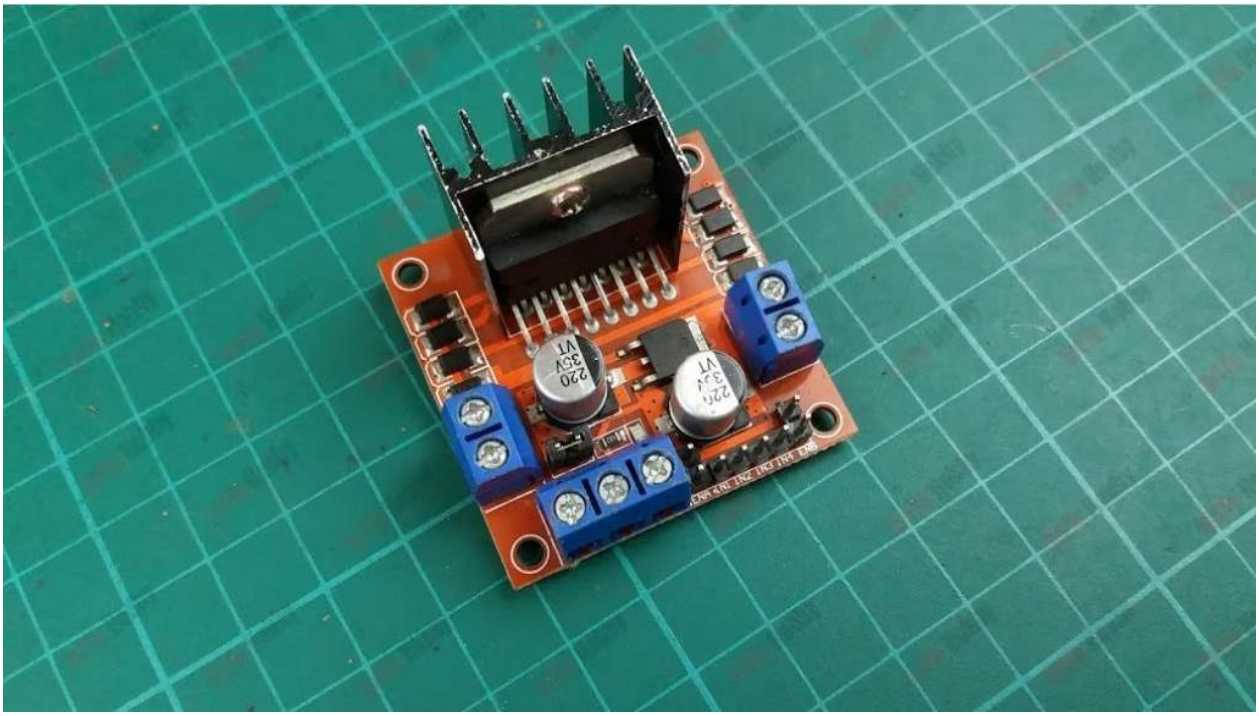

Fig 3.2.1: L298N Motor driver

3.3 Gear Motor:

A gear motor, also known as a geared motor, is an integrated combination of an electric motor and a gearbox (gear reduction unit). The purpose of combining these two components is to control the speed, torque, and direction of the motor's output shaft. Gear motors are commonly used in a wide range of applications where precise control of mechanical motion is required.

Gear motor

Fig 3.3.1 : Gear Motor

3.4 Wheel:

Wheels are cylindrical or disc-shaped devices that rotate on an axle and are often used in various forms of transportation and machinery for the purpose of movement. They are a fundamental mechanical component and have been in use for thousands of years.

Fig 3.4.1 : Wheel

3.5 Battery holder:

A battery holder, also known as a battery enclosure or battery case, is a device designed to hold and secure batteries in place. It is commonly used in various electronic devices and projects to provide a secure and easily accessible housing for batteries.

Battery holder

Fig 3.5.1 : Battery holder

3.6 Li-ion battery:

A lithium-ion (Li-ion) battery is a type of rechargeable battery that has become one of the most popular choices for a wide range of applications due to its high energy density, long cycle life, and relatively lightweight design.

Li-ion battery

Fig 3.6.1 : Li-ion battery

3.7 Connecting Wires:

Connecting Wires are a type of electrical wire used in electronics and electrical projects to make temporary connections between components on a breadboard, circuit board, or other electronic platforms. They are typically made of insulated wire with connectors at both ends, which can be easily inserted into or attached to various components and connectors. Connecting Wires play a vital role in prototyping, experimenting, and troubleshooting electronic circuits.

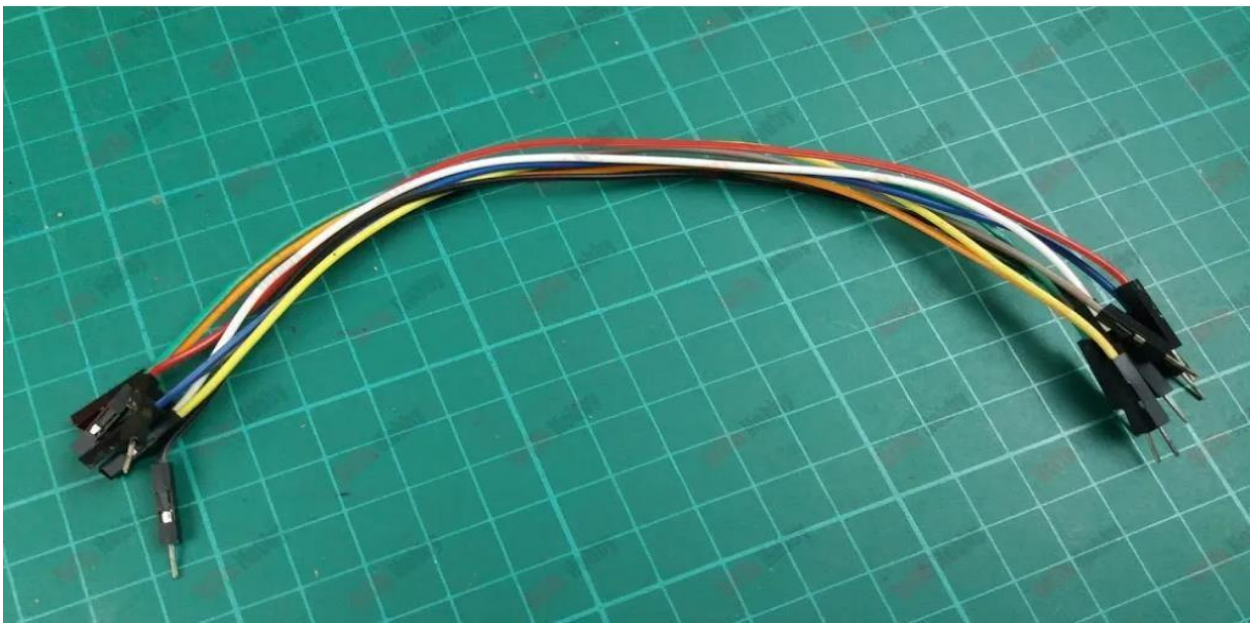

Fig 3.7.1 : Connecting Wires

3.8 BreadBoard:

A breadboard, often referred to as a protoboard, is a fundamental tool used in electronics and electrical engineering for building and testing electronic circuits without the need for soldering. It consists of a plastic board with a grid of holes into which electronic components, Connecting Wires, and Connecting Wires can be inserted to create temporary connections. Breadboards are essential for prototyping, experimenting, and quickly iterating on circuit designs.

Breadboard

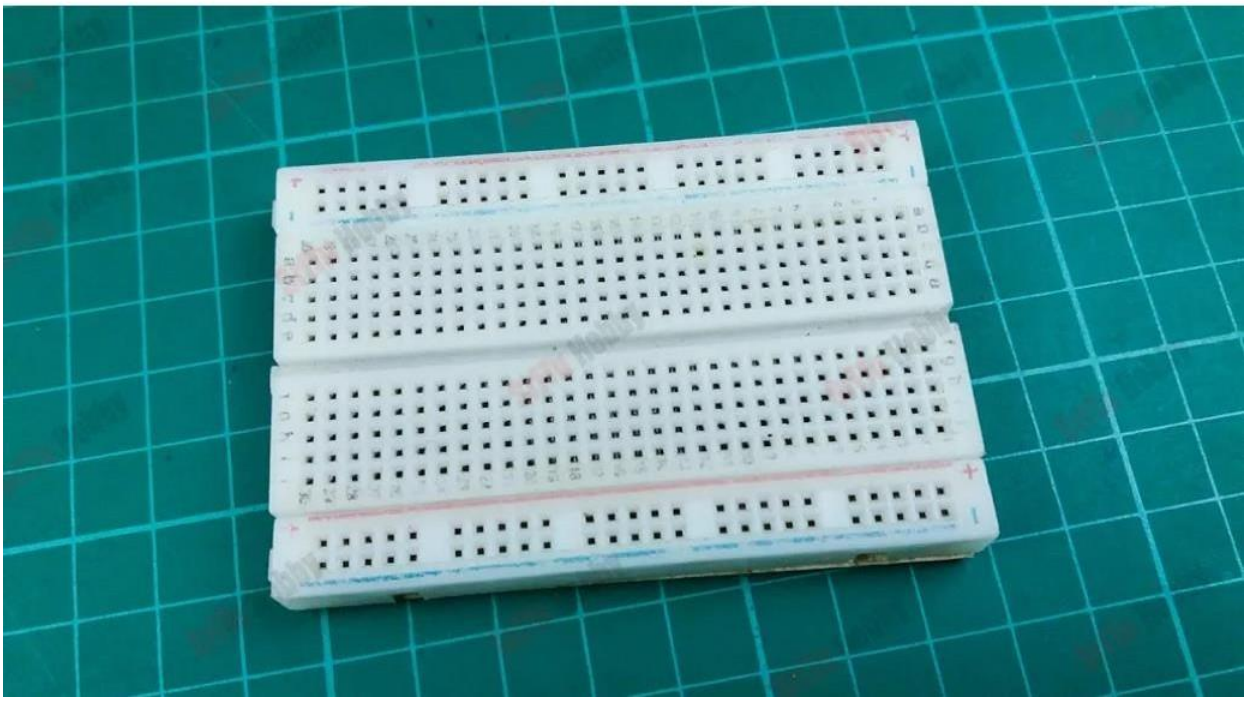

Fig 3.8.1:BreadBoard

3.9 Foamboard piece:

A foam board piece, or foamboard, is a lightweight and rigid material made from a foam core sandwiched between two layers of paper or plastic. It is commonly used in various craft and construction projects due to its versatility and ease of use.

Foamboard piece

Fig 3.9.1 : Foamboard piece

4. CODE

```
#include <ESP8266WiFi.h>
#include <ESP8266WebServer.h>

// Motor PINs
#define ENA D0
#define IN1 D1
#define IN2 D2
#define IN3 D3
#define IN4 D4
#define ENB D5

bool forward = 0;
bool backward = 0;
bool left = 0;
bool right = 0;
int Speed;

const char* ssid = "Vishnu";
const char* password = "ccqi5339";

ESP8266WebServer server(80);

void setup() {
  Serial.begin(9600);
  pinMode(ENA, OUTPUT);
  pinMode(IN1, OUTPUT);
  pinMode(IN2, OUTPUT);
  pinMode(IN3, OUTPUT);
  pinMode(IN4, OUTPUT);
  pinMode(ENB, OUTPUT);

  // Connect to Wi-Fi
  WiFi.begin(ssid, password);
  while (WiFi.status() != WL_CONNECTED) {
    delay(1000);
    Serial.println("Connecting to WiFi...");
  }
  Serial.println("Connected to WiFi");
```

```
  // Define endpoints
  server.on("/", HTTP_GET, handleRoot);
  server.on("/forward", HTTP_GET, handleForward);
  server.on("/backward", HTTP_GET, handleBackward);
  server.on("/left", HTTP_GET, handleLeft);
  server.on("/right", HTTP_GET, handleRight);
  server.on("/stop", HTTP_GET, handleStop);

  server.begin();
}

void loop() {
  server.handleClient();
  smartcar();
}

void handleRoot() {
  String html = "<html><body>";
  html += "<h1>Smart Car Control</h1>";
  html += "<a href='/forward'><button>Forward</button></a><br>";
  html += "<a href='/backward'><button>Backward</button></a><br>";
  html += "<a href='/left'><button>Left</button></a><br>";
  html += "<a href='/right'><button>Right</button></a><br>";
  html += "<a href='/stop'><button>Stop</button></a><br>";
  html += "</body></html>";
  server.send(200, "text/html", html);
}

void handleForward() {
  forward = 1;
  backward = left = right = 0;
  server.send(200, "text/plain", "Forward");
}

void handleBackward() {
  backward = 1;
  forward = left = right = 0;
  server.send(200, "text/plain", "Backward");
}
```

```
void handleLeft() {
  left = 1;
  forward = backward = right = 0;
  server.send(200, "text/plain", "Left");
}

void handleRight() {
  right = 1;
  forward = backward = left = 0;
  server.send(200, "text/plain", "Right");
}

void handleStop() {
  forward = backward = left = right = 0;
  server.send(200, "text/plain", "Stop");
}

void smartcar() {
  if (forward == 1) {
    carforward();
    Serial.println("carforward");
  } else if (backward == 1) {
    carbackward();
    Serial.println("carbackward");
  } else if (left == 1) {
    carturnleft();
    Serial.println("carleft");
  } else if (right == 1) {
    carturnright();
    Serial.println("carright");
  } else if (forward == 0 && backward == 0 && left == 0 && right == 0) {
    carStop();
    Serial.println("carstop");
  }
}

void carforward() {
  analogWrite(ENA, Speed);
  analogWrite(ENB, Speed);
```

```
  digitalWrite(IN1,  LOW);
  digitalWrite(IN2, HIGH);
  digitalWrite(IN3, HIGH);
  digitalWrite(IN4, LOW);
}

void carbackward() {
  analogWrite(ENA, Speed);
  analogWrite(ENB, Speed);
  digitalWrite(IN1, HIGH);
  digitalWrite(IN2, LOW);
  digitalWrite(IN3, LOW);
  digitalWrite(IN4, HIGH);
}

void carturnleft() {
  analogWrite(ENA, Speed);
  analogWrite(ENB, Speed);
  digitalWrite(IN1, HIGH);
  digitalWrite(IN2, LOW);
  digitalWrite(IN3, HIGH);
  digitalWrite(IN4, LOW);
}

void carturnright() {
  analogWrite(ENA, Speed);
  analogWrite(ENB, Speed);
  digitalWrite(IN1, LOW);
  digitalWrite(IN2, HIGH);
  digitalWrite(IN3, LOW);
  digitalWrite(IN4, HIGH);
}

void carStop() {
  digitalWrite(IN1, LOW);
  digitalWrite(IN2, LOW);
  digitalWrite(IN3, LOW);
  digitalWrite(IN4, LOW);
}
```

5. RESULT

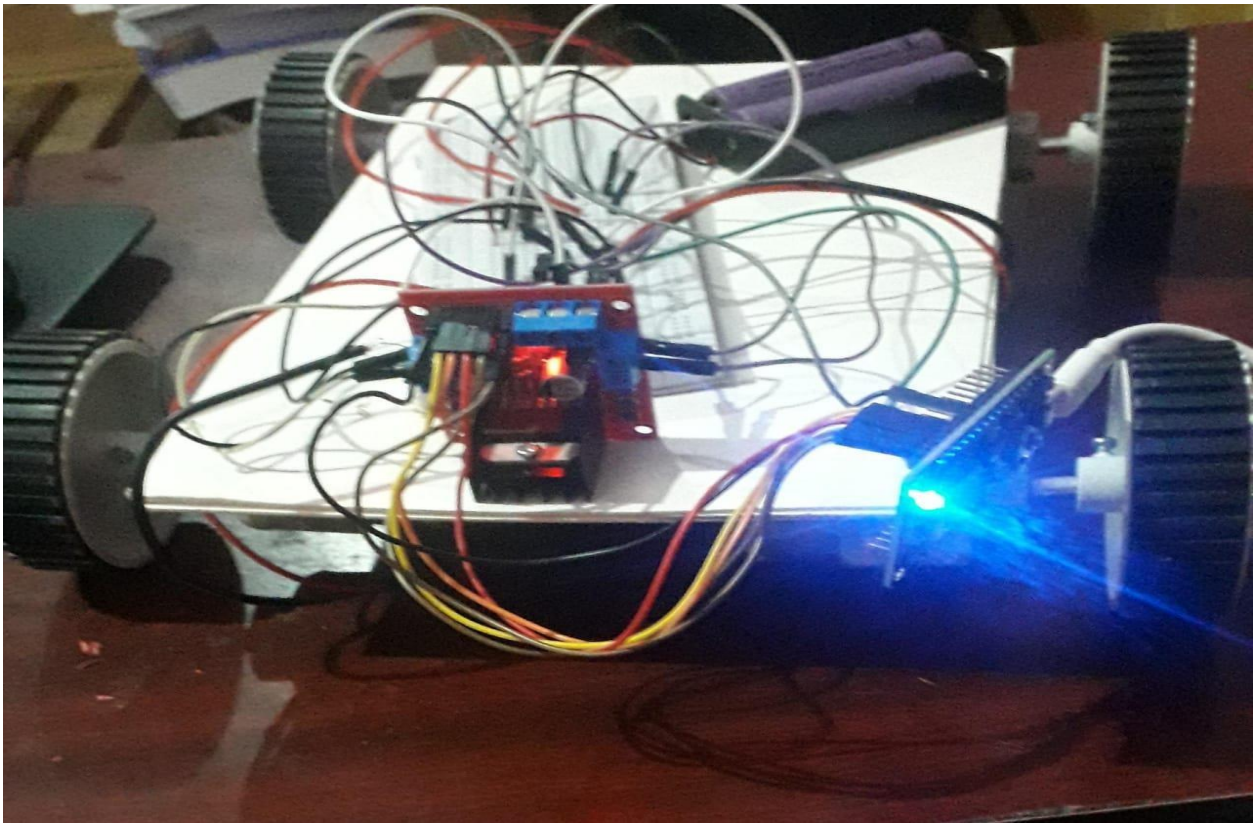

Fig 5.1 SMART CAR

Fig 5.2 SMART CAR UI

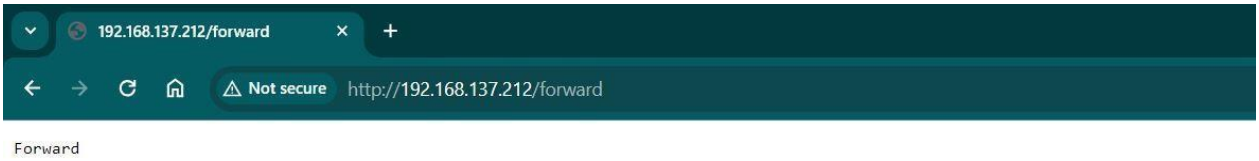

Fig 5.3 SMART CAR CONTROL 1

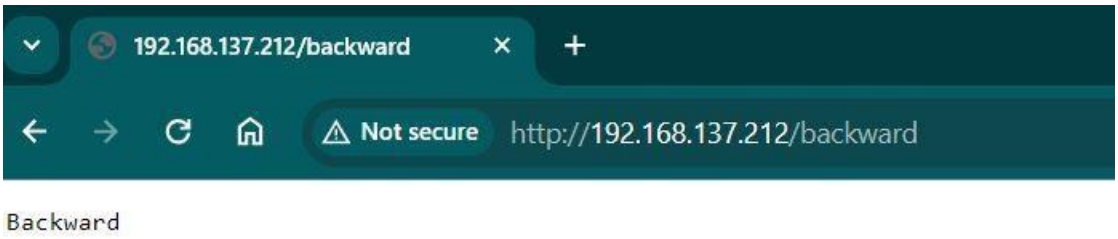

Fig 5.4 SMART CAR CONTROL 2

6. CONCLUSION

The WiFi-controlled car project offers a practical and enjoyable way to gain insights into the world of IoT, embedded systems, and wireless control. It exemplifies how technology can be harnessed to create interactive and innovative solutions while providing opportunities for learning and skill development. It can be a stepping stone for more advanced IoT and robotics projects in the future, making it a valuable educational and hobbyist endeavor.

7. REFRENCES

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- www.srihub.com
- www.ieeexplore/wificar/