WIFI ROBOT WITH NODE MCU

Introduction

A **WiFi Robot** is an advanced robotic system that can be controlled wirelessly via a WiFi network. These robots are widely used in surveillance, industrial automation, home automation, and educational projects. WiFi robots can be operated remotely using a smartphone, computer, or a dedicated controller, making them highly versatile and efficient.

Key Components

1. Microcontroller/Microprocessor

The brain of the WiFi robot is a microcontroller or microprocessor that processes commands and controls movement. Popular choices include:

- **ESP8266/ESP32**: Affordable microcontrollers with built-in WiFi capabilities.
- **Raspberry Pi**: A powerful single-board computer suitable for AI and image processing applications.
- **Arduino with WiFi Module**: Arduino Uno/Nano with ESP8266 for wireless communication.

2. Motor Driver

Motor drivers act as an interface between the microcontroller and motors. Commonly used motor drivers include:

- **L298N**: Dual H-Bridge motor driver for controlling two DC motors.
- **L293D**: Suitable for small robotic applications.
- **TB6612FNG**: More efficient and compact than L298N.

3. Motors

Motors determine the movement and functionality of the robot. Options include:

- **DC Motors**: Provide smooth and continuous motion.
- **Stepper Motors**: Ideal for precise movements and rotations.
- **Servo Motors**: Useful for robotic arms or directional adjustments.

4. WiFi Module

For wireless communication, the robot needs a WiFi module. Choices include:

- **ESP8266/ESP32**: Built-in WiFi capability.
- **Raspberry Pi WiFi**: Onboard WiFi for advanced processing.
- **NRF24L01**: For wireless communication in specific applications.

5. Power Supply

A reliable power source is crucial for uninterrupted operation. Common power options:

- **Li-ion or LiPo Batteries**: High-capacity rechargeable batteries.
- **12V Battery Pack**: Suitable for high-power motors.
- **18650 Cells**: Popular in DIY robotic projects.

6. Sensors (Optional)

Sensors enhance the robot's capabilities, such as:

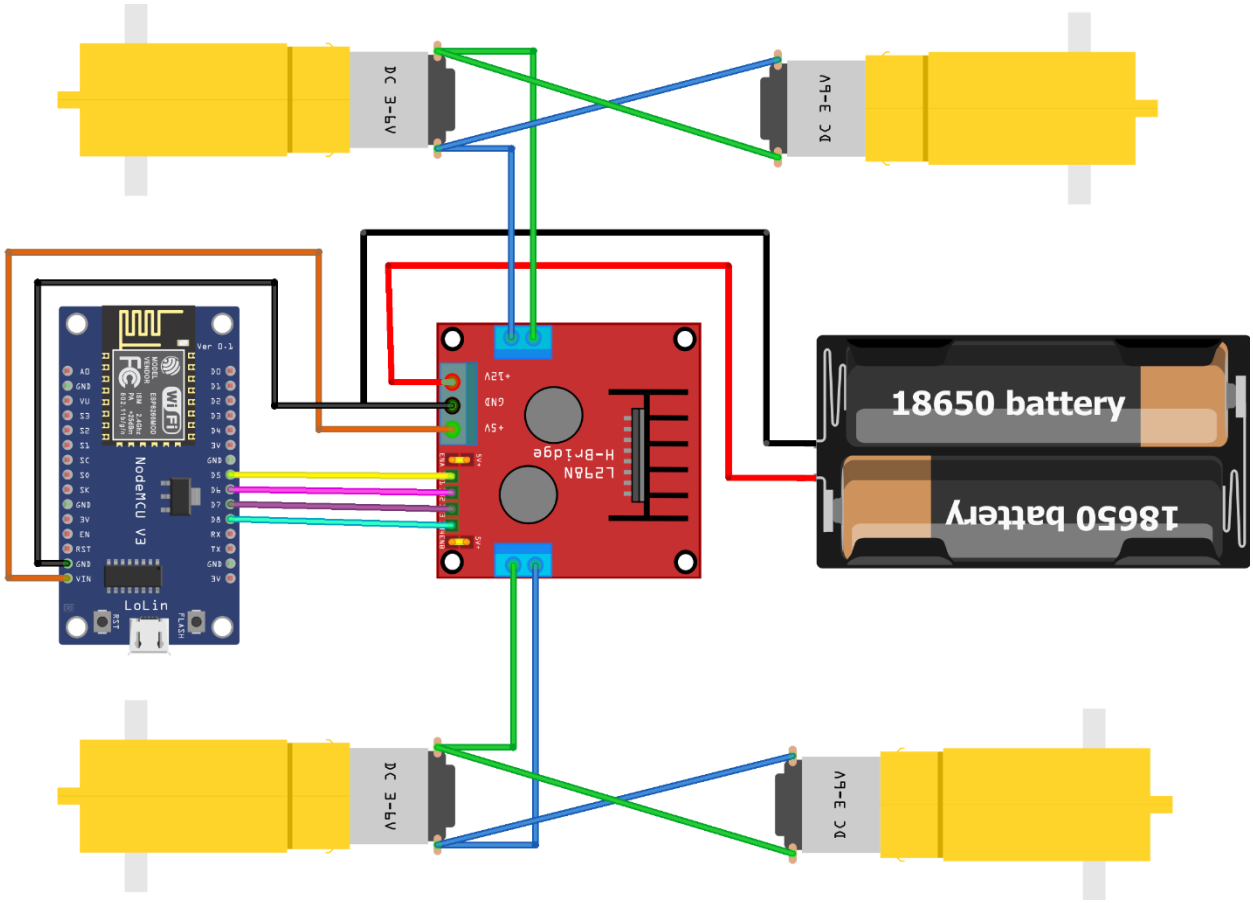
- **Ultrasonic Sensors**: Obstacle detection.
- **IR Sensors**: Line following and proximity sensing.
- **Camera Module**: Live streaming and AI vision.

7. Chassis

The robot's frame or chassis holds all components together. It can be made of:

- **Metal**: Strong and durable for industrial robots.
- **Acrylic or Plastic**: Lightweight and cost-effective for educational projects.

Circuit diagram



Program:

```
#define ENA   14          // Enable/speed motors Right        GPIO14(D5)
#define ENB   12          // Enable/speed motors Left         GPIO12(D6)
#define IN_1  15          // L298N in1 motors Right           GPIO15(D8)
#define IN_2  13          // L298N in2 motors Right           GPIO13(D7)
```

```
#define IN_3  2          // L298N in3 motors Left          GPIO2(D4)
#define IN_4  0          // L298N in4 motors Left          GPIO0(D3)

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

String command;             //String to store app command state.
int speedCar = 1000;         // 400 - 1023.
int speed_Coeff = 3;

const char* ssid = "nodeMCU Car";
ESP8266WebServer server(80);

void setup() {

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

  Serial.begin(115200);
```

```
// Connecting WiFi

  WiFi.mode(WIFI_AP);
  WiFi.softAP(ssid);

  IPAddress myIP = WiFi.softAPIP();
  Serial.print("192.168.4.1 ");
  Serial.println(myIP);

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

void goAhead(){

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

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

```
void goBack(){

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

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

void goRight(){

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

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

void goLeft(){
```

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

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

void goAheadRight(){

    digitalWrite(IN_1, LOW);
    digitalWrite(IN_2, HIGH);
    analogWrite(ENA, speedCar/speed_Coeff);

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

void goAheadLeft(){

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

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

void goBackRight(){

    digitalWrite(IN_1, HIGH);
    digitalWrite(IN_2, LOW);
    analogWrite(ENA, speedCar/speed_Coeff);

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

void goBackLeft(){

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

    digitalWrite(IN_3, HIGH);
    digitalWrite(IN_4, LOW);
```

```
    analogWrite(ENB, speedCar/speed_Coeff);
  }

void stopRobot(){

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

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

void loop() {
   server.handleClient();

    command = server.arg("State");
    if (command == "F") goAhead();
    else if (command == "B") goBack();
    else if (command == "L") goLeft();
    else if (command == "R") goRight();
    else if (command == "I") goAheadRight();
    else if (command == "G") goAheadLeft();
    else if (command == "J") goBackRight();
```

```
    else if (command == "H") goBackLeft();
    else if (command == "0") speedCar = 400;
    else if (command == "1") speedCar = 470;
    else if (command == "2") speedCar = 540;
    else if (command == "3") speedCar = 610;
    else if (command == "4") speedCar = 680;
    else if (command == "5") speedCar = 750;
    else if (command == "6") speedCar = 820;
    else if (command == "7") speedCar = 890;
    else if (command == "8") speedCar = 960;
    else if (command == "9") speedCar = 1023;
    else if (command == "S") stopRobot();
}

void HTTP_handleRoot(void) {

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

APP Link: https://play.google.com/store/apps/details?id=com.bluino.esp8266wifirobotcar

Working Principle

A WiFi robot operates by receiving commands over a WiFi network and executing them accordingly. The steps include:

1. **User sends a command** from a mobile app, web browser, or computer.
2. **Microcontroller processes the command** and sends control signals to the motor driver.
3. **Motor driver actuates the motors**, enabling movement.
4. **Sensors provide feedback** to ensure accurate navigation and obstacle avoidance.
5. **If equipped with a camera**, real-time video feed is transmitted over WiFi.

Features

- **Remote Control via WiFi**: Operated from anywhere within network range.
- **Real-time Video Streaming (Optional)**: Surveillance applications using a camera.
- **Autonomous Navigation (Optional)**: AI-based movement and path planning.
- **IoT Integration**: Cloud connectivity for remote monitoring and automation.
- **Battery-powered**: Ensures portability and independent operation.

Applications

WiFi robots have a wide range of applications, including:

- **Surveillance and Security**: Monitoring homes, offices, and industrial areas.
- **Industrial Automation**: Transporting materials in factories.
- **Home Automation**: Smart robots for household tasks.
- **Educational Purposes**: Learning robotics, AI, and IoT development.

Conclusion

A WiFi robot is a powerful, flexible, and efficient solution for remote-controlled and autonomous robotic applications. With the integration of AI, IoT, and advanced sensors, WiFi robots are becoming an essential tool in modern automation and robotics development. Whether for

hobbyists, students, or professionals, building a WiFi robot is an exciting and educational experience.