King Saud University
College of Computer & Information Sciences
Department of Computer Engineering

Project CEN318
Wi-Fi Car

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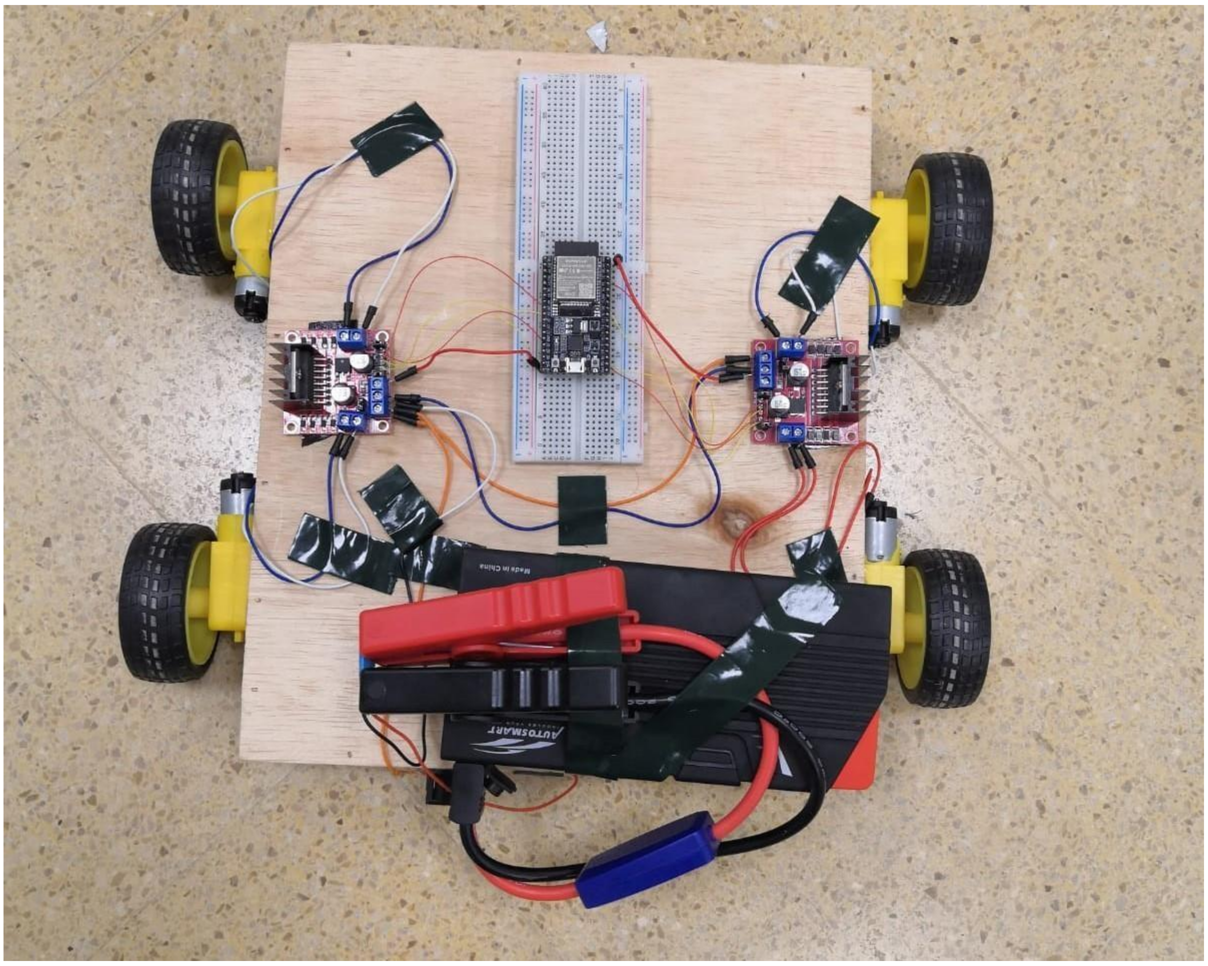


Introduction

Our project is Wi-Fi Car. It is a car controlled by esp32 microcontroller and programmed using Arduino IDE.it can move eight directions.

Article

In this project we have hardware and software.

The Hardware Component:

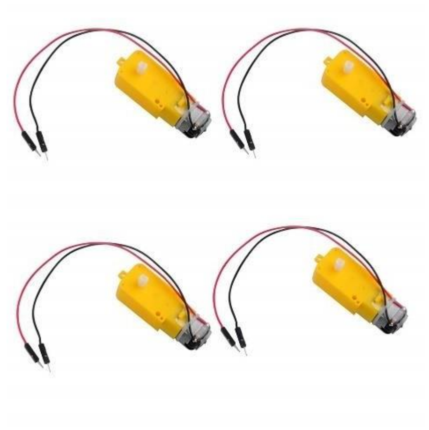


Figure 1: TT Motor DC Gearbox Motor 200RPM DC 3-6V.

Figure 2: four wheels.

Figure 3: Wooden plate for car chassis.

Figure 4: esp32

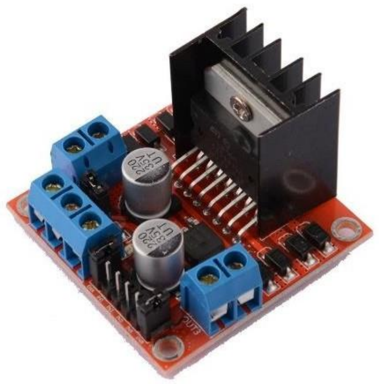


Figure 5: L298N Motor Drive Controller Board DC (2 pieces).

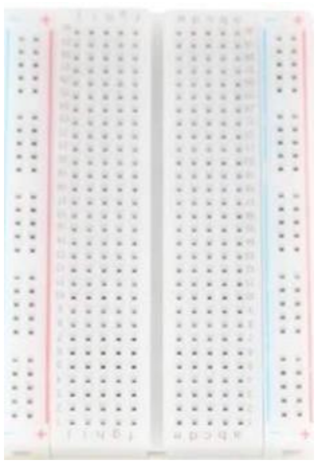


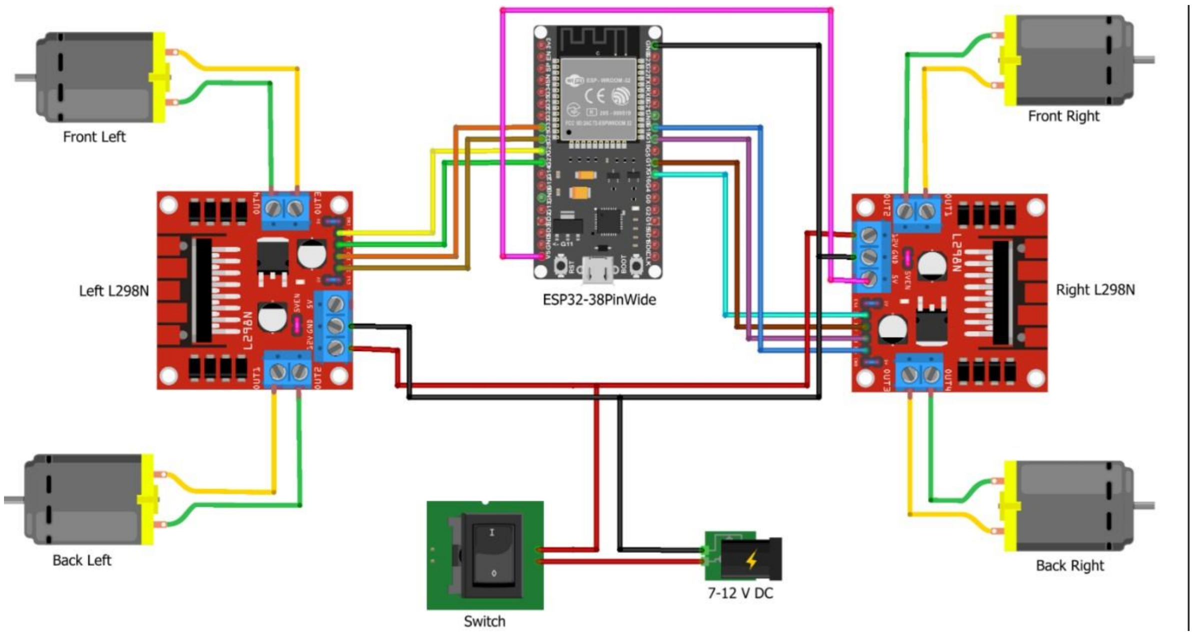
Figure 6: Breadboard

Figure 7: 12V Smart Battery Charge

Figure 8: switch.

Figure 9: Jumper Wire.

Schematic


Front Left
Front Right
Left L298N
Right L298N
ESP32-38PinWide
Back Left
Back Right
Switch
7-12 V DC

Software:

We use Arduino IDE.

Code:

```
#include <Arduino.h>
#ifdef ESP32
#include <WiFi.h>
#include <AsyncTCP.h>
#include <ESPAsyncWebServer.h>

#define UP 1
#define DOWN 2
#define LEFT 3
#define RIGHT 4
#define UP_LEFT 5
#define UP_RIGHT 6
#define DOWN_LEFT 7
#define DOWN_RIGHT 8
#define TURN_LEFT 9
#define TURN_RIGHT 10
#define STOP 0

#define FRONT_RIGHT_MOTOR 0
#define BACK_RIGHT_MOTOR 1
#define FRONT_LEFT_MOTOR 2
#define BACK_LEFT_MOTOR 3

#define FORWARD 1
#define BACKWARD -1

struct MOTOR_PINS
{
  int pinIN1;
  int pinIN2;
};

std::vector<MOTOR_PINS> motorPins =
{
  {16, 17},  //FRONT_RIGHT_MOTOR
  {18, 19},  //BACK_RIGHT_MOTOR
  {27, 26},  //FRONT_LEFT_MOTOR
  {25, 33},  //BACK_LEFT_MOTOR
};

const char* ssid     = "MyWiFiCar";
const char* password = "12345678";
```

```
AsyncWebServer server(80);
AsyncWebSocket ws("/ws");


const char* htmlHomePage PROGMEM = R"HTMLHOMEPAGE(
<!DOCTYPE html>
<html>
  <head>
  <meta name="viewport" content="width=device-width, initial-scale=1, maximum-
scale=1, user-scalable=no">
    <style>
    .arrows {
      font-size:70px;
      color:red;
    }
    .circularArrows {
      font-size:80px;
      color:blue;
    }
    td {
      background-color:black;
      border-radius:25%;
      box-shadow: 5px 5px #888888;
    }
    td:active {
      transform: translate(5px,5px);
      box-shadow: none;
    }

    .noselect {
      -webkit-touch-callout: none; /* iOS Safari */
        -webkit-user-select: none; /* Safari */
         -khtml-user-select: none; /* Konqueror HTML */
           -moz-user-select: none; /* Firefox */
            -ms-user-select: none; /* Internet Explorer/Edge */
                user-select: none; /* Non-prefixed version, currently
                                      supported by Chrome and Opera */
    }
    </style>
  </head>
  <body class="noselect" align="center" style="background-color:white">

    <h1 style="color: teal;text-align:center;">Hash Include Electronics</h1>
    <h2 style="color: teal;text-align:center;">Wi-Fi &#128663; Control</h2>

    <table id="mainTable" style="width:400px;margin:auto;table-
layout:fixed" CELLSPACING=10>
      <tr>
        <td ontouchstart='onTouchStartAndEnd("5")' ontouchend='onTouchStartAndEnd("0")'><sp
an class="arrows" >&#11017;</span></td>
        <td ontouchstart='onTouchStartAndEnd("1")' ontouchend='onTouchStartAndEnd("0")'><sp
an class="arrows" >&#8679;</span></td>
        <td ontouchstart='onTouchStartAndEnd("6")' ontouchend='onTouchStartAndEnd("0")'><sp
an class="arrows" >&#11016;</span></td>
      </tr>
```

```
   <tr>
        <td ontouchstart='onTouchStartAndEnd("3")' ontouchend='onTouchStartAndEnd("0")'><sp
an class="arrows" >&#8678;</span></td>
        <td></td>
        <td ontouchstart='onTouchStartAndEnd("4")' ontouchend='onTouchStartAndEnd("0")'><sp
an class="arrows" >&#8680;</span></td>
      </tr>

      <tr>
        <td ontouchstart='onTouchStartAndEnd("7")' ontouchend='onTouchStartAndEnd("0")'><sp
an class="arrows" >&#11019;</span></td>
        <td ontouchstart='onTouchStartAndEnd("2")' ontouchend='onTouchStartAndEnd("0")'><sp
an class="arrows" >&#8681;</span></td>
        <td ontouchstart='onTouchStartAndEnd("8")' ontouchend='onTouchStartAndEnd("0")'><sp
an class="arrows" >&#11018;</span></td>
      </tr>

      <tr>
        <td ontouchstart='onTouchStartAndEnd("9")' ontouchend='onTouchStartAndEnd("0")'><sp
an class="circularArrows" >&#8634;</span></td>
        <td style="background-color:white;box-shadow:none"></td>
        <td ontouchstart='onTouchStartAndEnd("10")' ontouchend='onTouchStartAndEnd("0")'><s
pan class="circularArrows" >&#8635;</span></td>
      </tr>
    </table>

    <script>
      var webSocketUrl = "ws:\/\/" + window.location.hostname + "/ws";
      var websocket;

      function initWebSocket()
      {
        websocket = new WebSocket(webSocketUrl);
        websocket.onopen    = function(event){};
        websocket.onclose   = function(event){setTimeout(initWebSocket, 2000);};
        websocket.onmessage = function(event){};
      }

      function onTouchStartAndEnd(value)
      {
        websocket.send(value);
      }

      window.onload = initWebSocket;
      document.getElementById("mainTable").addEventListener("touchend", function(event){
        event.preventDefault()
      });
    </script>

  </body>
</html>

)HTMLHOMEPAGE";
```

```
void rotateMotor(int motorNumber, int motorDirection)


{
  if (motorDirection == FORWARD)
  {
    digitalWrite(motorPins[motorNumber].pinIN1, HIGH);
    digitalWrite(motorPins[motorNumber].pinIN2, LOW);
  }
  else if (motorDirection == BACKWARD)
  {
    digitalWrite(motorPins[motorNumber].pinIN1, LOW);
    digitalWrite(motorPins[motorNumber].pinIN2, HIGH);
  }
  else
  {
    digitalWrite(motorPins[motorNumber].pinIN1, LOW);
    digitalWrite(motorPins[motorNumber].pinIN2, LOW);
  }
}

void processCarMovement(String inputValue)
{
  Serial.printf("Got value as %s %d\n", inputValue.c_str(), inputValue.toInt());
  switch(inputValue.toInt())
  {

    case UP:
      rotateMotor(FRONT_RIGHT_MOTOR, FORWARD);
      rotateMotor(BACK_RIGHT_MOTOR, FORWARD);
      rotateMotor(FRONT_LEFT_MOTOR, FORWARD);
      rotateMotor(BACK_LEFT_MOTOR, FORWARD);
      break;

    case DOWN:
      rotateMotor(FRONT_RIGHT_MOTOR, BACKWARD);
      rotateMotor(BACK_RIGHT_MOTOR, BACKWARD);
      rotateMotor(FRONT_LEFT_MOTOR, BACKWARD);
      rotateMotor(BACK_LEFT_MOTOR, BACKWARD);
      break;

    case LEFT:
      rotateMotor(FRONT_RIGHT_MOTOR, FORWARD);
      rotateMotor(BACK_RIGHT_MOTOR, BACKWARD);
      rotateMotor(FRONT_LEFT_MOTOR, BACKWARD);
      rotateMotor(BACK_LEFT_MOTOR, FORWARD);
      break;

    case RIGHT:
      rotateMotor(FRONT_RIGHT_MOTOR, BACKWARD);
      rotateMotor(BACK_RIGHT_MOTOR, FORWARD);
      rotateMotor(FRONT_LEFT_MOTOR, FORWARD);
      rotateMotor(BACK_LEFT_MOTOR, BACKWARD);
      break;
```

```
case UP_LEFT:
      rotateMotor(FRONT_RIGHT_MOTOR, FORWARD);
      rotateMotor(BACK_RIGHT_MOTOR, STOP);
      rotateMotor(FRONT_LEFT_MOTOR, STOP);
      rotateMotor(BACK_LEFT_MOTOR, FORWARD);
      break;

    case UP_RIGHT:
      rotateMotor(FRONT_RIGHT_MOTOR, STOP);
      rotateMotor(BACK_RIGHT_MOTOR, FORWARD);
      rotateMotor(FRONT_LEFT_MOTOR, FORWARD);
      rotateMotor(BACK_LEFT_MOTOR, STOP);
      break;

    case DOWN_LEFT:
      rotateMotor(FRONT_RIGHT_MOTOR, STOP);
      rotateMotor(BACK_RIGHT_MOTOR, BACKWARD);
      rotateMotor(FRONT_LEFT_MOTOR, BACKWARD);
      rotateMotor(BACK_LEFT_MOTOR, STOP);
      break;

    case DOWN_RIGHT:
      rotateMotor(FRONT_RIGHT_MOTOR, BACKWARD);
      rotateMotor(BACK_RIGHT_MOTOR, STOP);
      rotateMotor(FRONT_LEFT_MOTOR, STOP);
      rotateMotor(BACK_LEFT_MOTOR, BACKWARD);
      break;

    case TURN_LEFT:
      rotateMotor(FRONT_RIGHT_MOTOR, FORWARD);
      rotateMotor(BACK_RIGHT_MOTOR, FORWARD);
      rotateMotor(FRONT_LEFT_MOTOR, BACKWARD);
      rotateMotor(BACK_LEFT_MOTOR, BACKWARD);
      break;

    case TURN_RIGHT:
      rotateMotor(FRONT_RIGHT_MOTOR, BACKWARD);
      rotateMotor(BACK_RIGHT_MOTOR, BACKWARD);
      rotateMotor(FRONT_LEFT_MOTOR, FORWARD);
      rotateMotor(BACK_LEFT_MOTOR, FORWARD);
      break;

    case STOP:
      rotateMotor(FRONT_RIGHT_MOTOR, STOP);
      rotateMotor(BACK_RIGHT_MOTOR, STOP);
      rotateMotor(FRONT_LEFT_MOTOR, STOP);
      rotateMotor(BACK_LEFT_MOTOR, STOP);
      break;

    default:
      rotateMotor(FRONT_RIGHT_MOTOR, STOP);
      rotateMotor(BACK_RIGHT_MOTOR, STOP);
      rotateMotor(FRONT_LEFT_MOTOR, STOP);
      rotateMotor(BACK_LEFT_MOTOR, STOP);
      break;
```

```
 }
}

void handleRoot(AsyncWebServerRequest *request)
{
  request->send_P(200, "text/html", htmlHomePage);
}

void handleNotFound(AsyncWebServerRequest *request)
{
    request->send(404, "text/plain", "File Not Found");
}


void onWebSocketEvent(AsyncWebSocket *server,
                      AsyncWebSocketClient *client,
                      AwsEventType type,
                      void *arg,
                      uint8_t *data,
                      size_t len)
{
  switch (type)
  {
    case WS_EVT_CONNECT:
      Serial.printf("WebSocket client #%u connected from %s\n", client->id(), client-
>remoteIP().toString().c_str());
      //client->text(getRelayPinsStatusJson(ALL_RELAY_PINS_INDEX));
      break;
    case WS_EVT_DISCONNECT:
      Serial.printf("WebSocket client #%u disconnected\n", client->id());
      processCarMovement("0");
      break;
    case WS_EVT_DATA:
      AwsFrameInfo *info;
      info = (AwsFrameInfo*)arg;
      if (info->final && info->index == 0 && info->len == len && info->opcode == WS_TEXT)
      {
        std::string myData = "";
        myData.assign((char *)data, len);
        processCarMovement(myData.c_str());
      }
      break;
    case WS_EVT_PONG:
    case WS_EVT_ERROR:
      break;
    default:
      break;
  }
}

void setUpPinModes()
{
  for (int i = 0; i < motorPins.size(); i++)
  {
    pinMode(motorPins[i].pinIN1, OUTPUT);
pinMode(motorPins[i].pinIN2, OUTPUT);
    rotateMotor(i, STOP);
  }
}


void setup(void)
{
  setUpPinModes();
  Serial.begin(115200);

  WiFi.softAP(ssid, password);
  IPAddress IP = WiFi.softAPIP();
  Serial.print("AP IP address: ");
  Serial.println(IP);

  server.on("/", HTTP_GET, handleRoot);
  server.onNotFound(handleNotFound);

  ws.onEvent(onWebSocketEvent);
  server.addHandler(&ws);

  server.begin();
  Serial.println("HTTP server started");
}

void loop()
{
  ws.cleanupClients();
}
```

Step for control Car by using WiFi

First, connect the esp32 to laptop and upload the cod.

Second, connect your mobile phone with car_wiFi.

Finally, write in google :192.168.4.1.

Result:

This video explains the result:

https://youtu.be/SKjIMHoV9CQ

Conclusion

We learned a lot of things from this project. we earned experience about how connect esp32 and how create small car. finally, this was very exciting and we enjoyed it.