

ESP32-CAM Remote Controlled Car Robot Web Server

Build a Wi-Fi remote controlled car robot with the ESP32-CAM. You'll be able to control the robot using a web server that displays a video streaming of what the robot "sees". You can control your robot remotely even if it's out of your sight. The ESP32-CAM will be programmed using Arduino IDE.

Project Overview:

Wi-Fi

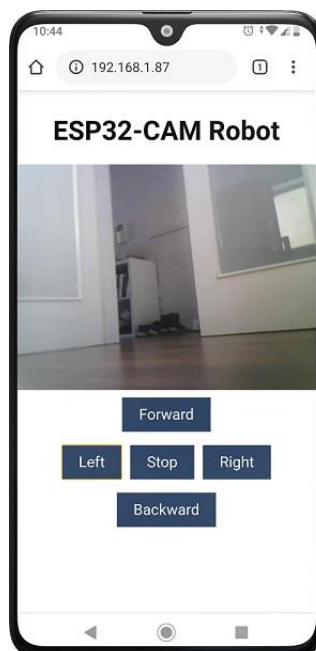
The robot will be controlled via Wi-Fi using your ESP32-CAM. We'll create a web-based interface to control the robot, that can be accessed in any device inside your local network.

The web page also shows a video streaming of what the robot "sees". For good results with video streaming, we recommend using an [ESP32-CAM with external antenna](#).



Robot Controls:

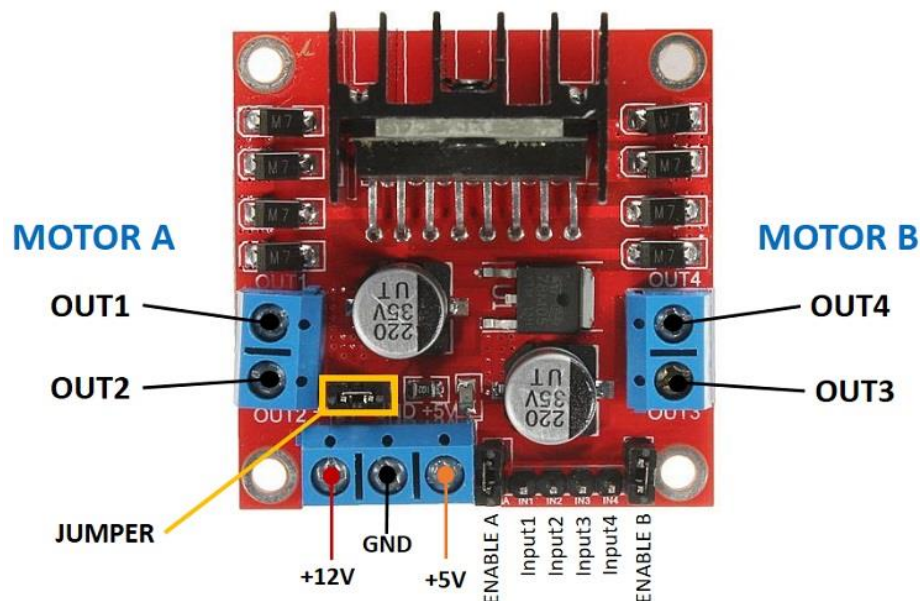
The web server has 5 controls: **Forward**, **Backward**, **Left**, **Right**, and **Stop**.



The robot moves as long as you're pressing the buttons. When you release any button, the robot stops. However, we've included the **Stop** button that can be useful in case the ESP32 doesn't receive the stop command when you release a button.

L298N Motor Driver

There are many ways to control DC motors. We'll use the L298N motor driver that provides an easy way to control the speed and direction of 2 DC motors.



- **+12V**: The +12V terminal is where you should connect your power supply
- **GND**: power supply GND
- **+5V**: provide 5V if jumper is removed. Acts as a 5V output if jumper is in place
- **Jumper**: jumper in place – uses the motors power supply to power up the chip. Jumper removed: you need to provide 5V to the +5V terminal. If you supply more than 12V, you should remove the jumper

At the bottom right you have four input pins and two enable terminals. The input pins are used to control the direction of your DC motors, and the enable pins are used to control the speed of each motor.

- **IN1**: Input 1 for Motor A
- **IN2**: Input 2 for Motor A
- **IN3**: Input 1 for Motor B
- **IN4**: Input 2 for Motor B
- **EN1**: Enable pin for Motor A
- **EN2**: Enable pin for Motor B

There are jumper caps on the enable pins by default. You need to remove those jumper caps to control the speed of your motors.

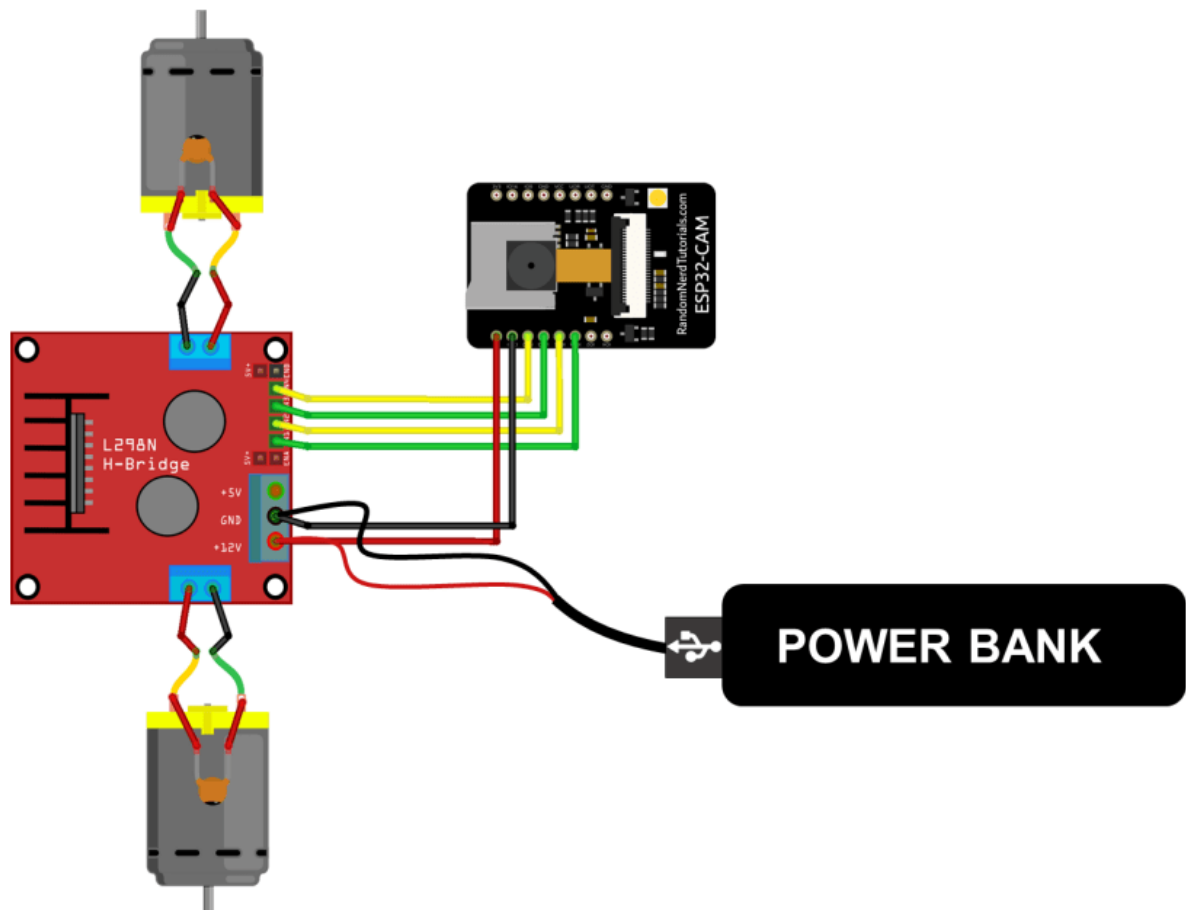
Parts Required

For this project, we'll use the following parts:

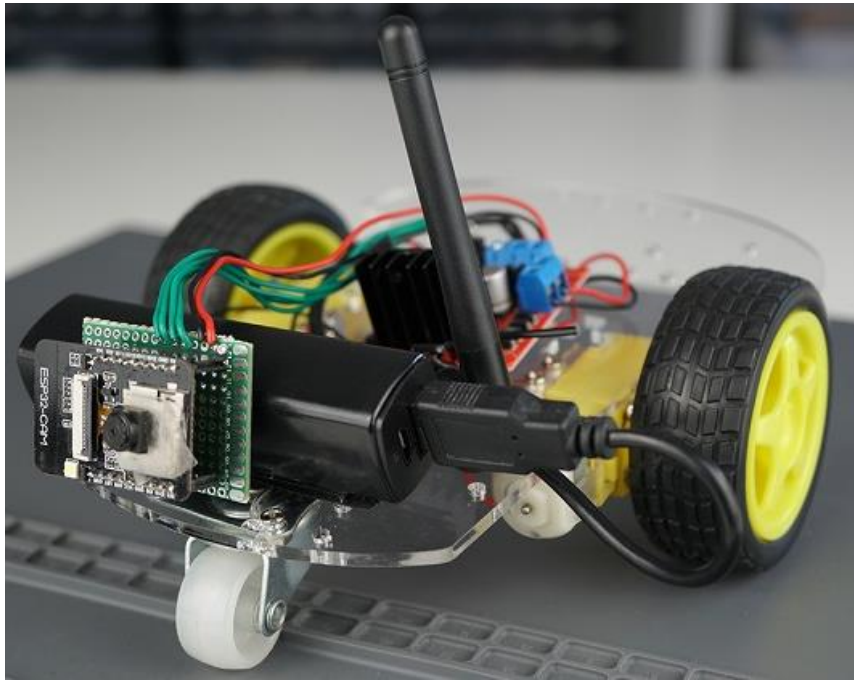
- [ESP32-CAM AI-Thinker with external antenna](#)
- [L298N Motor Driver](#)
- [Robot Car Chassis Kit](#)
- Power bank or other 5V power supply
- [Prototyping circuit board](#) (optional)

Circuit

After assembling the robot chassis, we can wire the circuit by following the next schematic diagram.



Hardware Implementation:



Results: Testing the Code

After inserting our network credentials, we can upload the code to your ESP32-CAM board.

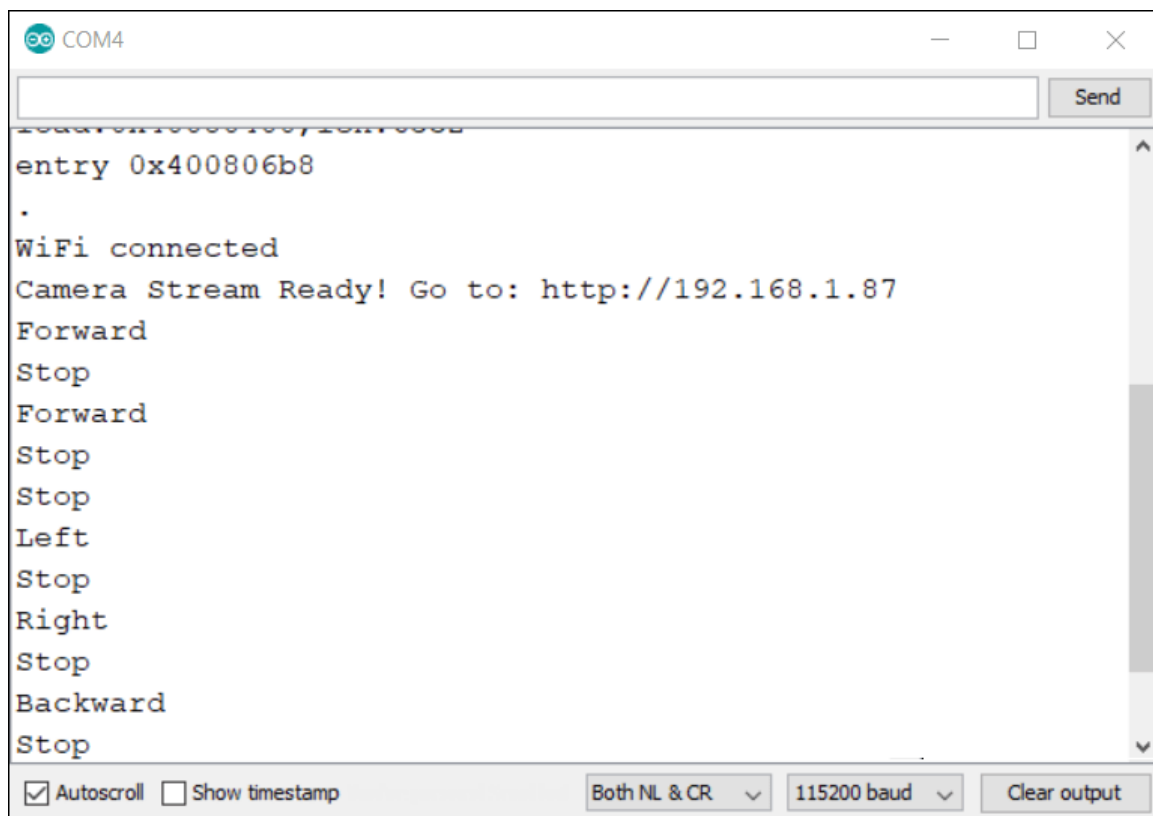
After uploading, open the Serial Monitor to get its IP address.

```
COM4
rst:0x1 (POWERON_RESET),boot:0x13 (SPI_FAST_FLASH_BOOT)
config: 0, SPIWP:0xee
clk_drv:0x00,q_drv:0x00,d_drv:0x00,cs0_drv:0x00,hd_drv:0x00,wp_drv:0x00
mode:DIO, clock div:1
load:0x3fff0018,len:4
load:0x3fff001c,len:1216
ho 0 tail 12 room 4
load:0x40078000,len:9720
ho 0 tail 12 room 4
load:0x40080400,len:6352
entry 0x400806b8
.
WiFi connected
Camera Stream Ready! Go to: http://192.168.1.87
```

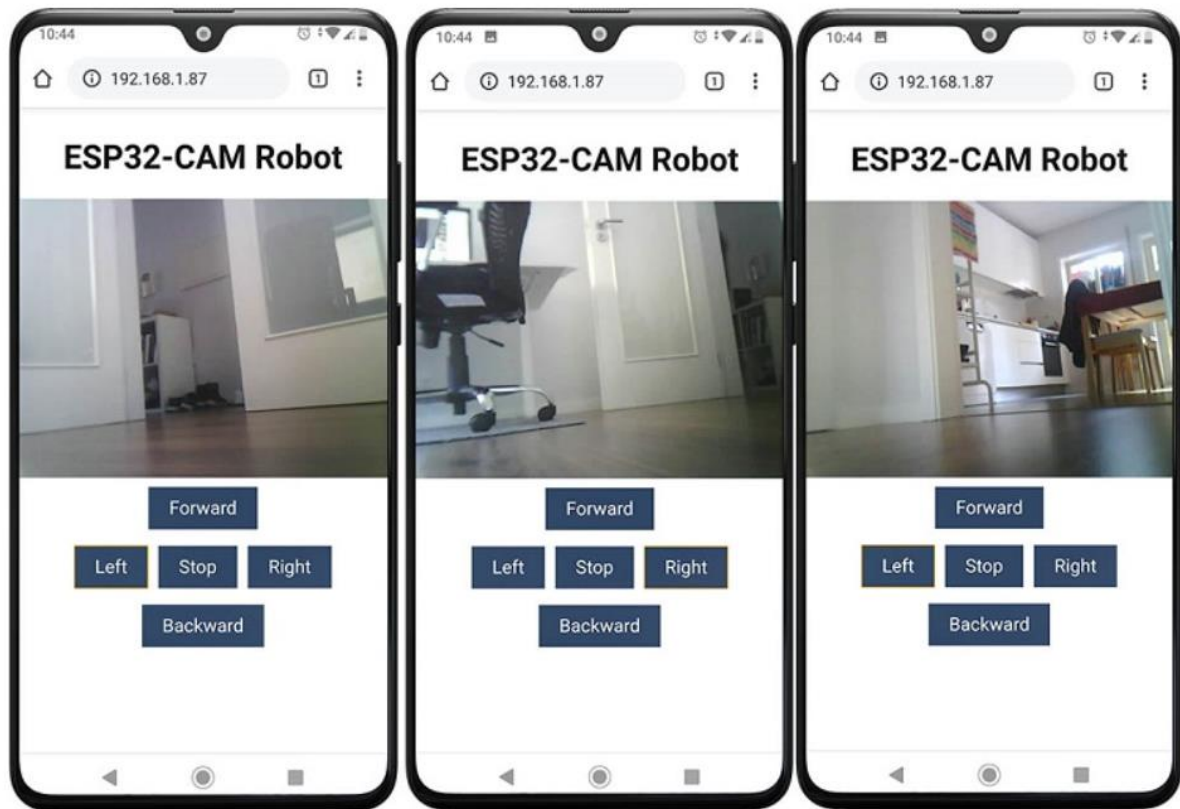
Open a browser and type the ESP IP address. A similar web page should load:



Press the buttons and take a look at the Serial Monitor to see if it is streaming without lag and if it is receiving the commands without crashing.



Android veiw: s



Applications

- i. As a medical assistance (Medicine delivery, Patient Condition Surveillance) Bot in Quarantine Stations.
- ii. Low range Mobile Surveillance Devices
- iii. Military Applications (no human intervention.
- iv. Assistive devices (like wheelchairs)
- v. home automation
- vi. The robot is small in size so can be used for spying.
- vii. With few additions and modifications, this robot can be used in the borders for detecting and disposing hidden land mines.
- viii. The robot can be used for reconnaissance or surveillance.
- ix. Can be used by construction engineers for exploring tunnels.
- x. Cave explorers
- xi. Can also be used in Mining activities.
- xii. For food and luggage delivery assistance in hotels and lodges.

Advantages

- Wireless control is one of the most important basic needs for all the people all over the world in all the fields. Here the Bluetooth controlled BOT is used to provide a solution to the health care workers to avoid the problem of being infected by Corona virus by coming in contact with the patients.
- This is indeed a cost-effective and efficient project. The novelty lies in the fact that it is a cost-effective project with a simple and easy to use interface.
- The BOT can deliver medicines, food and water to the patient within a limited range successfully.
- The IR Receiver and Remote is another effective way of traversing the robot which is bot user friendly and cost effective.
- The ESP32 Camera module is cheap (Compared to Raspberry Pi camera module) and is commonly available in the market.

Conclusion:

The operating system of smart phone is android which can develop effective remote-control program. At the same time, this program uses blue-tooth connection to communicate with robot. It has proven to allow for meaningful two-way communication between the Android phone and the robot which would allow a non-expert to interact with and adjust the functionality of a system which uses Arduino Uno controller, a single board micro-controller intended to make the application of interactive objects or environments more accessible. The medical assistance and surveillance of quarantine stations is always has been a quite sensitive and dangerous task. And it includes so many risks. So, it's better to use robot for this job instead of people. And if you are able to control the robots with efficiency and accuracy then you can guarantee yourself with good results and success. This system is a good step for medical surveillance using robots. Wireless control is one of the most important basic needs for all the people all over the world. But unfortunately, the technology is not fully utilized due to a huge amount of data and communication overheads. Generally, many of the wireless-controlled robots use RF modules. But our project for robotic control makes use of Android mobile phone which is very cheap and easily available. The available control commands are more than RF modules. For this purpose, the android mobile user has to install a designed application (MIT AI2 Companion) on her/his mobile.