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LIVE WIRELESS FIRE FIGHTING ROBOT

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ABSTRACT

The **Real-time Wireless Fire Fighting Robot** is an innovative autonomous robotic system designed for effective fire response in hazardous environments. This robot integrates advanced technologies such as wireless communication, sensors, and real-time data processing to enhance firefighting capabilities. Equipped with a high-resolution camera, the robot can navigate through smoke-filled areas and transmit live video feeds to the control center. The wireless communication system enables seamless remote operation, allowing firefighters to assess the situation and make informed decisions. The robot's robust design and fire-resistant materials ensure its durability in high-temperature environments. Overall, the Live Wireless Firefighting Robot presents a cutting-edge solution for improving firefighting efficiency and reducing risks to human responders. This robot is equipped with advanced sensors for real-time fire detection and localization. Its wireless connectivity enables remote control and monitoring, allowing firefighters to operate it from a safe distance. The robot's mobility and agility enable it to navigate challenging environments, reaching areas that may be hazardous for humans. With a built-in water or foam spraying system, the robot can effectively suppress fires. Additionally, it incorporates live video streaming to provide a comprehensive view of the situation. The use of wireless technology not only facilitates seamless communication but also ensures quick response times, making this robot a valuable asset in firefighting scenarios, minimizing risks to human lives.

Keywords: Fire Fighting Robot, Mobility, Live Video Feeds.

I. INTRODUCTION

Robots can be defined as machines resembling human beings but capable of performing complex assignments. In hazardous jobs like firefighting, robots can be of significant service. Fire Fighting is an imaginary gameplay of firefighters rescuing the victims and stopping the fire as soon as possible. Many times, wide reaching fire mishaps commence due to small fire flames leading to much more vandalization. The stated firefighting robot is competent in detecting the smoke raised in the air due to flame, with the help of smoke sensor MQ2. Likewise, the presence of the fire can be detected by the robot with flame sensors intact on the anterior of the prototype robot. Fire detected gets doused with water from the water tank mounted on the robot.

What is Robot?

A re-programmable multifunctional manipulator designed to move material, parts, tools, or specialized devices through various programmed motions for performing a variety of tasks. Robotics is the branch of technology that deals with the design, construction, operation, structural disposition, manufacture, and application of robotics. Robotics is related to the science of electronics, engineering, mechanics, mechatronics, and software. Robots are classified into two types: Autonomous robots like Line sensing or edge sensing robots, and Remote-controlled robots like Gesture controlled Robots. Since this paper deals with firefighting robots, the primary focus will be on remotely controlled robots only. Undoubtedly, the output and the functioning of machines will be more intuitive if they are communicated using human gestures.

Types of Robots

We gathered all the equipment and parts which are required for making a prototype The methodology we followed as follows.

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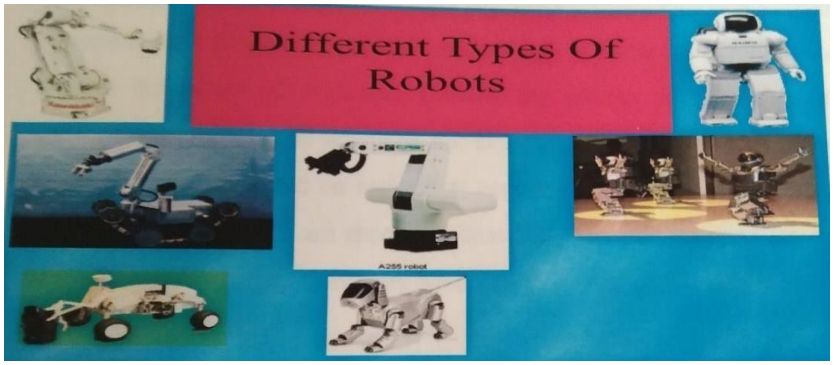
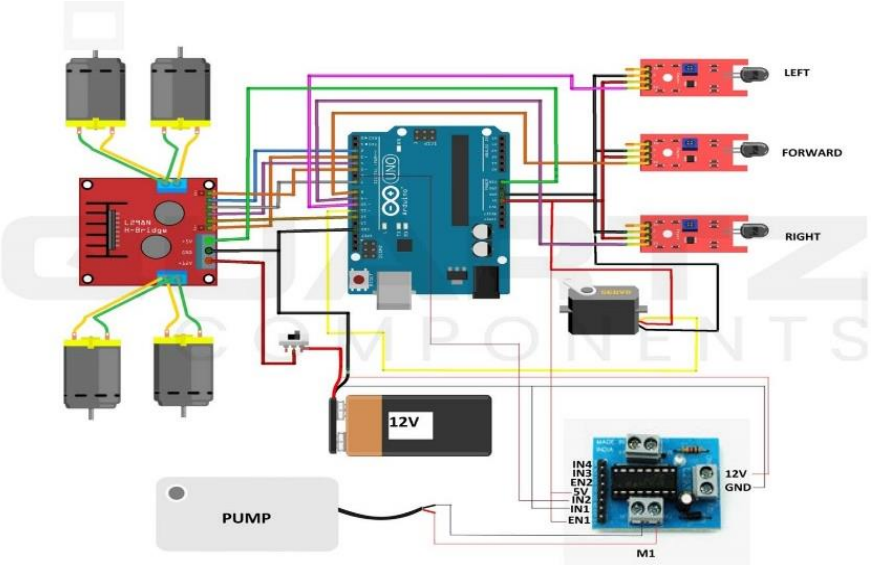


Schematic diagram



The schematic diagram consists of an ESP8266 microcontroller, Motor DriverL298D, Wi-Fi Module, three flame sensors, a pump, and two DC motors, which are interconnected.

- Pin 0 and Pin 1 are connected to RX and TX of B.
- Pin 3 of Arduino is connected to the ENA of the L298D motor driver.
- Similarly, Pin 4, Pin 5, and Pin 6 are connected to IN 2, IN 1, and ENA B respectively.
- Pin 7, and Pin 8 are connected to IN3 and IN 4 respectively.
- SENSA, SENSB, and GND are inter-connected
- The output pins OUT 1 and OUT 2(PIN 3 and PIN 4) are connected to one motor.
- OUT 3 and OUT 4(PIN 13 and PIN 14) are connected to the other motor.
- +5V is given to VCC and +12V is given to GND.
- After the connections are made dump the code from Arduino IDE into the ESP Module.

II. HARDWARE COMPONENTS

ESP MICROCONTROLLER

The ESP8266 is a low-cost Wi-Fi microchip, with built-in TCP/IP networking software, and microcontroller capability, produced by Espressif Systems in Shanghai, China.

The chip was popularized in the English-speaking maker community in August 2014 via the ESP-01 module, made by a third-party manufacturer Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at first, there was almost no English-language documentation on the chip and the commands it accepted. The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, the chip, and the software on it, as well as to translate the Chinese documentation.

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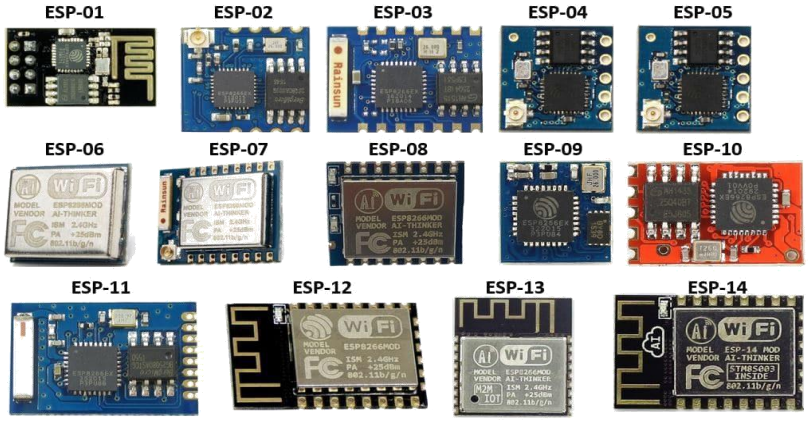
Types of ESP Wi-Fi Modules



III. SOFTWARE USED AND PROGRAMMING

ARDUINO IDE

Arduino IDE (Integrated Development Environment) is the software for Arduino. It is a text editor like a notepad with different features. It is used for writing code, compiling the code to check if any errors are there, and uploading the code to Arduino. It is a cross-platform software that is available for every Operating System like Windows, Linux, and macOS. It supports C/C++ language, and it is open-source software, where the user can use the software as they want it to. They can also make their own modules/functions and add them to the software. It supports every available Arduino board including Arduino Mega, Arduino Leonardo, Arduino Ethernet, and more. The format of Arduino is saved asino

Steps to installing and updating the Arduino software/IDE:

Step-1: Installing Arduino Software

Step-2: Where to find the Boards Manager Dialog

Step-3: Telling Arduino Where to Find the ESP8266-E12 Library

Step-4: Installing the ESP8266 Board Via the Board Manager

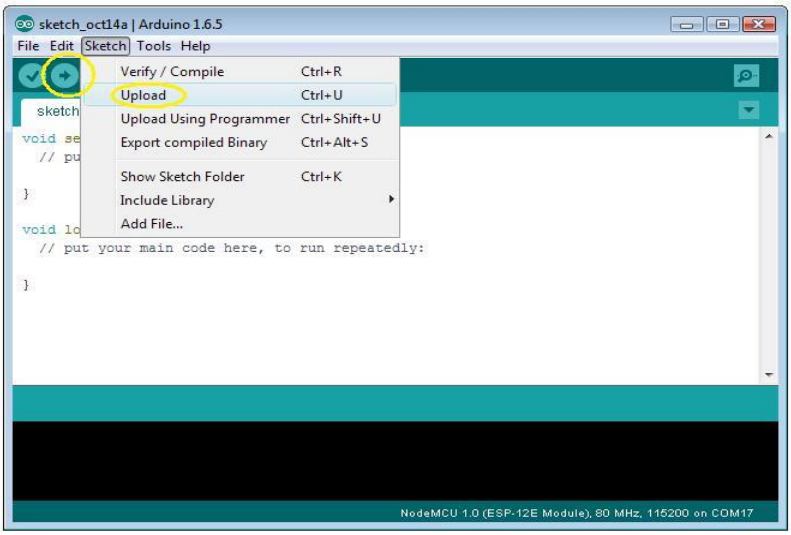
Step 5: Installing the ESP8266 Board Via the Board Manager

Step-6: Selecting the ESP8266-E12 Board

Step-7: Configuring COM Port

Step-8: Configuring COM Port Speed

Step-9: Test Drive the Setup



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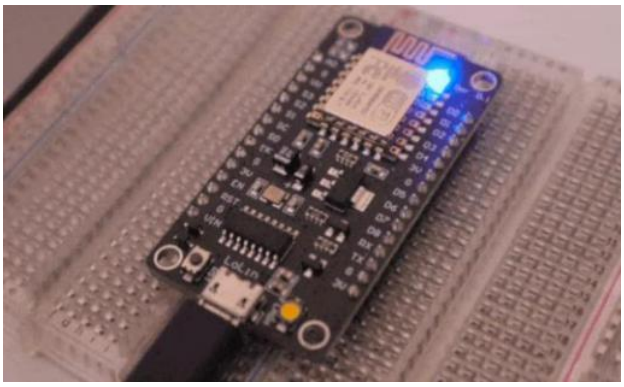
IV. TESTING THE SETUP

Double Blink Program



Double Blink Test

TheESP8266-12E WIFI Development Board has two LEDs connected to the digital I/O pins. One LED is on GPIO 2 and the other is on GPIO 16. The sketch Double Blink.Ino will alternate the blinking of these LEDs. Save your sketch and upload it to your ESP8266-12E. The two blue onboard LEDs will blink alternately.

ConstshortintBUILTIN_LED1=2;//GPIO2 const short int BUILTIN_LED2 = 16 //GPIO16

V. FUTURE SCOPE

The future scope of firefighting robots is promising. They can be designed to autonomously navigate through hazardous environments, detect and extinguish fires, and even assist in search and rescue operations. With advancements in AI, robotics, and materials science, these robots can become more efficient, versatile, and capable of handling various firefighting scenarios, ultimately reducing risks to human firefighters and saving lives. Additionally, integrating technologies like machine learning can improve their ability to adapt to different situations and optimize firefighting strategies. The future scope of firefighting robots is promising. They can operate in hazardous environments, reducing risks to human firefighters. Advanced AI and sensors can enhance their capabilities, allowing them to navigate complex spaces, detect fires early, and extinguish flames autonomously. Furthermore, these robots can be equipped with thermal imaging, gas sensors, and even drones for aerial surveillance, providing comprehensive firefighting support. As technology advances, we can expect even greater efficiency, adaptability, and safety features in firefighting robots, revolutionizing how we combat fires in the future. The future of firefighting robots is very promising. In the coming years, it is expected that robots will become increasingly autonomous and will be able to navigate dangerous environments, detect and analyze fires, and take action to extinguish them. Additionally, robots could be used to search and rescue victims, detect hazardous materials, and monitor situations remotely. There is also potential for robots to be equipped with thermal cameras, allowing them to detect hot spots and better direct firefighters on the ground. Furthermore, the development of artificial intelligence and machine learning could allow robots make decisions and coordinate with each other in more sophisticated ways. Finally, it is likely that robots will be used in more applications to assist firefighters, such as providing medical aid and helping to contain fires.

VI. CONCLUSION

In conclusion, developing a fire-fighting robot project requires careful consideration of various components, including water spraying systems and servo movements. By integrating servo motors, the robot can achieve precise control over its water spraying mechanism, mobility, and surveillance capabilities. Enhance the accuracy and reliability of servo movements, ensuring the robot's effectiveness in extinguishing fires autonomously. Overall, servo technology plays a crucial role in the successful implementation of a fire-fighting robot project, enabling it to respond efficiently to fire emergencies and contribute to enhancing firefighting capabilities. In conclusion, firefighting robots equipped with cameras provide a range of advantages and applications for firefighting and emergency response situations. These robots can enter hazardous environments and provide real-time information to firefighters, enhancing their safety and ability to make informed decisions. Firefighting robots with cameras can be used in a variety of applications, including building

and wildfire firefighting, search and rescue, hazardous material handling, and industrial firefighting. Overall, the use of firefighting robots with cameras has the potential to revolutionize the way we approach firefighting and emergency response situations, ultimately saving lives and reducing property damage.

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