International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 11 Issue: 05 | May 2024 www.irjet.net p-ISSN: 2395-0072

"Autonomous Fire Fighting Robot Using IOT"

Miss. Patil Vidya Hindurao[1], Mr. Nadaf Nihal Muner[2], Miss. Patil Rutuja Dilip[3], Mr. KumarSagar M. Dange[4]

*[*1,2,3] B. Tech Student, Dept of Electronics and Telecommunication Engineering , Nanasaheb Mahadik College of Engineering, Peth, Maharashtra, India*

*[*4] Professor, Mr. KumarSagar M. Dange Dept of Electronics and Telecommunication Engineering , Nanasaheb Mahadik College of Engineering, Peth, Maharashtra, India*

Abstract - *Fire detection and its blow out is a dangerous job. It can put the life of a fire fighter at risk. In many fire accidents fire fighters are losing their lives every year throughout the world. To avoid these conflicts research and development in Artificial Intelligence gives rise to robotics. These robots are designed to be used in extreme conditions where human interruption become less, and robots are using for various work. We will using this implemented robot to assist fire fighters and to reduce the risk of their lives.*

Key Words: **IOT (Internet Of Things) , Node MCU (ESP8266), IORT (Internet Of Robotic Things), Flame -+Sensor ,Motor Driver IC, Servo Motor**

1.INTRODUCTION

The IoT based fire extinguishing robot that detects fire. Now a days, safety from fire is also important aspect that we have to concern about. Because fire fighters have to face some problems while fire extinguishing like it may be dangerous to their lives and they have to work in some unfriendly environments like high temperature, explosions and collapsed buildings also. Thus, it is necessary to replace human with machines like robots that detect fire automatically by avoiding obstacles. So, it would save human lives and heavy losses also. An Autonomous fire extinguishing robot has been developed to extinguish the fire by navigating the arena and avoiding obstacles. The robot also provides external communications by sending SMS. Internet of Robotic Things is a recently developed field which mainly focuses on machine intelligence framework based on IoT and Robotics. In IoT, the intelligent agents monitor the activities and integrate the data from the sensors to determine the finest course of action. Fusion of advanced Internet of Things and Robotic technologies gives rise to Internet of Robotic Things. The overall system architecture of IoT is divided into 5 layers namely the hardware/robotic things layer, the hardware layer, the internet layer, infrastructure layer and application layer. The aim of the proposed system is to control the robot through an android application. The robot will be patrolling through prescribed area. Such robot will be easier and effective replacement for the firemen. The robot will work faster than the firemen, so it will be timesaving. Android operating systems are portable, and they have many features. So, we will be developing an android application through which we will control the robot. The objective of the system is to perform fire extinguishing task. The robot will be consisting of different sensors, node MCU and water pump and CO2 pump.

2. PROPOSED METHOD

The design consists of array of sensors and Node MCU. The firefighting robot is connected with Node MCU through wireless medium. If a node detects fire, it will notify that to the central Node MCU. Central Node MCU will sends information to fire safety officers and initiate robot to perform Firefighting actions and start the pump to extinguish the fire. At the receiving end, two motors are interface to the L293D Motor driver. These two motors are used for the movement of the robot in various directions. Battery is used to supply the power. The storage system is used to store the values of the graph analyzed by the sensors. The Node MCU will get all the values from the various sensors and will give commands to the robot to start the pump.

they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

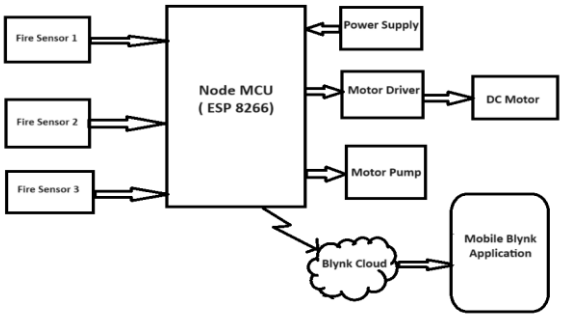

Fig -1: Block Diagram of Autonomous Fire Fighting Robot

3. COMPONENT INFORMATION

3.1 Component list

- Node MCU
- Flame sensor

- Motor driver
- DC motor
- 12v li ion battery
- Water pump
- Servo motor
- DC female jack connector

3.2 Component Description

3.2.1 Node MCU (ESP8266):

The NodeMCU (Node Microcontroller Unit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Expressive Systems, contains the crucial elements of a computer: CPU, RAM, networking (WiFi), and even a modern operating system and SDK. That makes it an excellent choice for Internet of Things (IoT) projects of all kinds.

However, as a chip, the ESP8266 is also hard to access and use. You must solder wires, with the appropriate analog voltage, to its pins for the simplest tasks such as powering it on or sending a keystroke to the "computer" on the chip. You also have to program it in low-level machine instructions that can be interpreted by the chip hardware. This level of integration is not a problem using the ESP8266 as an embedded controller chip in mass-produced electronics. It is a huge burden for hobbyists, hackers, or students who want to experiment with it in their own IoT projects.

But, what about Arduino? The Arduino project created an open-source hardware design and software SDK for their versatile IoT controller. Similar to NodeMCU, the Arduino hardware is a microcontroller board with a USB connector, LED lights, and standard data pins. It also defines standard interfaces to interact with sensors or other boards. But unlike NodeMCU, the Arduino board can have different types of CPU chips (typically an ARM or Intel x86 chip) with memory chips, and a variety of programming environments. There is an Arduino reference design for the ESP8266 chip as well. However, the flexibility of Arduino also means significant variations across different vendors. For example, most Arduino boards do not have WiFi capabilities, and some even have a serial data port instead of a USB port.

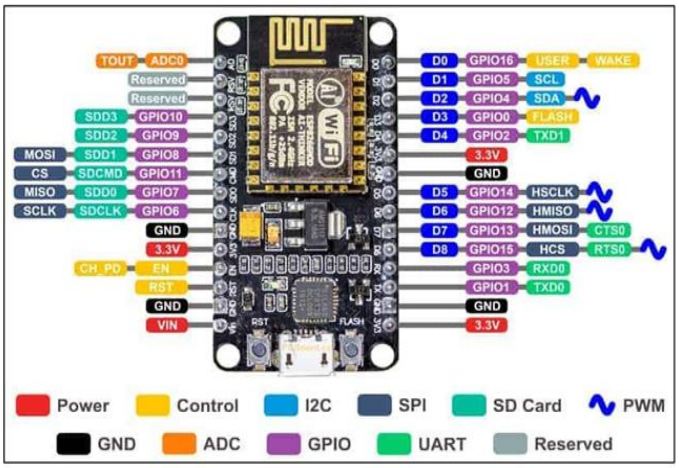

Fig 2 : Pin Diagram of NodeMCU

3.2.2 Flame Sensor:

A sensor which is most sensitive to a normal light is known as a flame sensor. That's why this sensor module is used in flame alarms. This sensor detects flame otherwise wavelength within the range of 760 nm – 1100 nm from the light source. This sensor can be easily damaged to high temperature. So, this sensor can be placed at a certain distance from the flame. The flame detection can be done from a 100cm distance, and the detection 7 angle will be 600. The output of this sensor is an analog signal or digital signal. These sensors are used in firefighting robots as a flame alarm.

What is a Flame Sensor?

A flame-sensor is one kind of detector which is mainly designed for detecting as well as responding to the occurrence of a fire or flame. The flame detection response can depend on its fitting. It includes an alarm system, a natural gas line, propane & a fire suppression system. This sensor is used in industrial boilers. The main function of this is to give authentication whether the boiler is properly working or not. The response of these sensors is faster as well as more accurate compare with a heat/smoke detector because of its mechanism while detecting the flame.

Working Principle

This sensor/detector can be built with an electronic circuit using a receiver like electromagnetic radiation. This sensor uses the infrared flame flash method, which allows the sensor to work through a coating of oil, dust, water vapor, otherwise ice.

Flame Sensor Module

The pin configuration of this sensor is shown below. It includes four pins which include the following. When this module works with a microcontroller unit then the pins are

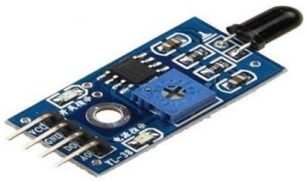

Fig 3 : Flame Sensor

3.2.3 Motor DriverL239D):

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors. L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively. Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating. 9 When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state. They are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as their high-current/high-voltage loads in positive-supply applications.

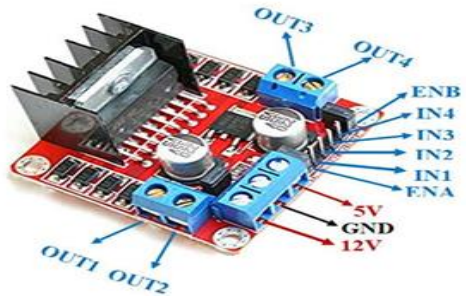

Fig 4 : Motor Driver LN293

3.2.4 DC Motor:

It is a Special type of DC Motor that runs on a 12-volt DC Supply. It is a general-purpose DC motor. Most of the household electronics machine consists of a 12-volt dc motor. The current rating of this motor depends on the load of the motor. The speed of DC motors is specified in Revolution Per Meter (RPM).

Fig 5 : 12V DC Motor

3.2.5 Servo Motor (SG90):

The Servo Motor SG-90 (SG90) is a small and affordable servo motor widely used in various applications that require precise control over angular motion. Despite its compact size, it offers impressive performance and Fig 6: Servo Motor(SG90) 11 versatility. With an operating voltage range typically between 4.8V to 6V, it can be easily powered by common power sources. The SG90 servo motor is designed to rotate within a range of approximately 180 degrees, providing a wide range of motion for controlling mechanisms. Its built-in gear mechanism ensures smooth and precise motion, allowing for accurate positioning of objects or components. This makes it ideal for applications that require precise control, such as robotics, RC vehicles, and pan-tilt camera systems.

Fig 6: Servo Motor(SG90)

4. RESULTS

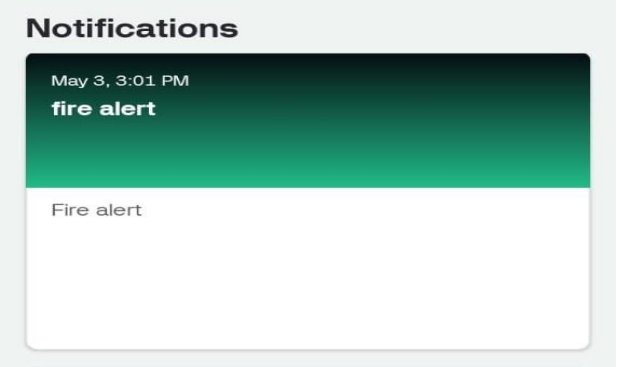

Fig 7: Notification

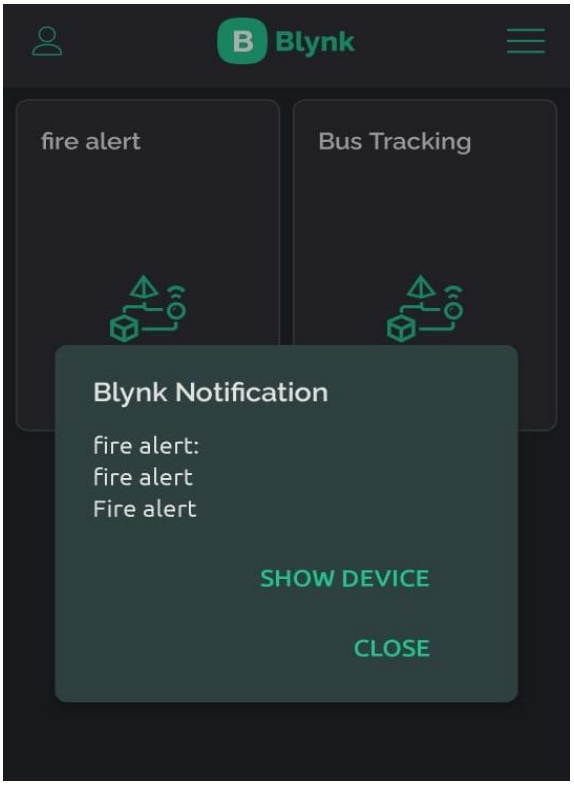

Fig 8: Notification

Fig 8: Fire Fighting Robot

5. CONCLUSION

This fire extinguishing robot using IoT is Introduced to help fire men to avoid the Risk situations. This proposed work Presents an outline about the fire Extinguishing robot using IoT and also Gives objectives and advantages of the Proposed system. It provides better Features that make it a more practically Usable robot in real time. By introducing This system in industries and other Factories, fire accident rates can be decreased.

5.1 Future Scope

❖ Revolutionizing Fire Safety: A Futuristic Outlook on IoT-Enabled Autonomous Fire Extinguishing Robots with Android Control Interface.

❖ Innovative Solutions for Tomorrow: Harnessing the Power of Internet of Robotic Things (IoRT) in Fire Safety through Intelligent, Autonomous Fire Extinguishing Robots.

❖ Smart Fire Defense: Unveiling the Potential of Android-Controlled IoT Fire Extinguishing Robots for Rapid and Risk-Free Emergency Response.

❖ Beyond Boundaries: A Glimpse into the Future of Fire Safety with Cutting-Edge Internet of Robotic Things (IoRT) Technology and Android Interface Integration.

6. REFERENCES

[1]Vipul Agrawal, Anoop Kini. "Design & Development of an IoT based Firefighting Robot using Arduino" International Journal for Research in Applied Science & Engineering Technology (IJRASET).2019. paper ID : IJRASET21196 ISSN No.: 2321-9653

[2]E.V.Sivakumar, P.Manoj, S.Punithadevi, S.Sherlin Sylvia, M.Thangaraj(2016). "Voice Controlled Intelligent Fire Extinguisher Robot" IJSART – 2016.

[3]Megha Kanwar1, Agilandeeswari L. "IOT Based Fire Fighting Robot", 978-1-5386-4692-2/18/$31.00 ©2018 IEEE.2018.

[4]Anjitha Krishnan, Athira Paul, Fathima Shermin, Merlin Jose, Merin Skariah. "Implementation of GSM Based Fire Fighting Robot" ,International Journal of Innovative Research in Computer and Communication Engineering. 2017.

[5]Lakshay Arora, Prof.Amol Joglekar "Cell Phone Controlled Robot with Fire Detection Sensors' ,Lakshay Arora et al, / (IJCSIT) International Journal of Computer Science and Information Technologies. 2015.6(3):2954-2958p.

[6]R.Karthik, M.Karthikeyan, D.Manoj Kumar, T.Divagar "Voice Operated Intelligent Fire Extinguishing Vehicle" ,5th International Conference on Advanced Computing & communication Systems (ICACCS).2019.

[7]Saini, R., & Gupta, A. (2020). "A Review on IoT Based Firefighting Robot: Challenges and Opportunities". International Journal of Advanced Research in Computer Science and Software Engineering, 10(3), 233-237. ISSN: 2277-128X.

[8]Mishra, A., & Tiwari, P. (2018). "IoT based Firefighting Robot: A Review". International Journal of Advanced Research in Computer Science, 9(3), 411-415. ISSN: 0976-5697.

[9]Singh, G., & Sharma, R. (2019). "Design and Development of IoT Based Firefighting Robot for Industrial Applications". International Journal of Computer Science and Mobile Computing, 8(7), 60-65. ISSN: 2320-088X.

[10]Patel, N., & Patel, S. (2017). "A Review: IoT Based Fire Fighting Robot". International Journal of Computer Science Trends and Technology, 5(4), 162-166. ISSN: 2347-8578.

BIOGRAPHIES

Miss. Vidya H. Patil Final Year B-tech student in the Electronics and Telecommunication Engineering at Nanasaheb Mahadik College of Engineering, Peth, Maharashtra, India

Mr. Nihal M. Nadaf Final Year B-tech student in the Electronics and Telecommunication Engineering at Nanasaheb Mahadik College of Engineering, Peth, Maharashtra, India

Miss. Rutuja D. Patil Final Year B-tech student in the Electronics and Telecommunication Engineering at Nanasaheb Mahadik College of Engineering, Peth, Maharashtra, India

Prof. Mr. Kumarsagar M. Dange Currently working as an HOD in the Electronics and Telecommunication Engineering at Nanasaheb Mahadik College of Engineering, Peth, Maharashtra, India