

DESIGN AND FABRICATION OF IOT BASED FIRE FIGHTING ROBOT

Dr. Amit Kumar Mehar¹, S. Hemasundar², S. Bhanoji Rao³, K. Vaishnavi Devi⁴,

P. Nikhil Kumar⁵, S. Rajeev⁶

¹Associate Professor, Department of Mechanical Engineering, Raghu Engineering College (Autonomous), Dakamarri, Visakhapatnam, Andhra Pradesh, India.

^{2,3,4,5,6} B.Tech. Students, Department of Mechanical Engineering, Raghu Engineering College (Autonomous), Dakamarri, Visakhapatnam, Andhra Pradesh, India.

ABSTRACT - In this paper, design and fabrication of I.O.T. Based Fire Fighting Robot is discussed. The main objective of the robot is to extinguish the fire in the area where the fire men cannot enter inside. Now a days, fire accidents are very common and sometimes it becomes very difficult for a fireman to save someone's life. It is not possible to appoint a person to continuously observe for accidental fire where robot can do that. Therefore in such cases firefighting robot comes in picture. Robot will detect fire remotely. These robots are mostly useful in industries where probability of accidental fire is more. The proposed vehicle is able to detect presence of fire and extinguishing it automatically by using smoke sensor and temperature sensor. It contains gear motors and motor driver to control the movement of robot. Relay circuit is used to control the pump and when it will detect fire then it will communicate with microcontroller (Arduino IDE) through Hotspot module. The proposed robot has a water jet spray which is capable of sprinkling water. The sprinkler can be move towards the required direction. At the time of moving towards the source of fire it may happen that it will come across some obstacles, then it has obstacle avoiding capability because of it has a night vision camera. With the help of camera we can see all obstacles which will come in the way of robot. Communication between the mobile phone and robot will take place with the help of camera because camera is two way operatable which is operate with the help of Hotspot and I.O.T.

1.INTRODUCTION

In this we have one flame sensor and a temperature sensor which are connected to the node MCU in ground looking position. The robot's path is decided based on the direction of the fire which is sensed using temperature sensor. The robot is operated using a remote control. When the power is given to the circuit the Microcontroller will on the DC motors, which are connected to the robots wheel. So the robot will move in forward direction on the floor. When the fire sensor detects fire then robot is stopped and pump relay will turn on for some seconds which helps to pour the water on fire detected area. This project is used in large industries for carrying the things. And in atomic power

stations, to work in atomic explosions. This used where firemen cannot make contact with the environment directly.

2. SYSTEM DESCRIPTION:

L298N Module:

This module is connected to the node MCU. The motors to which the wheels are attached is connected to the L298N Module. The power to this moterdrive is passed through the node MCU.

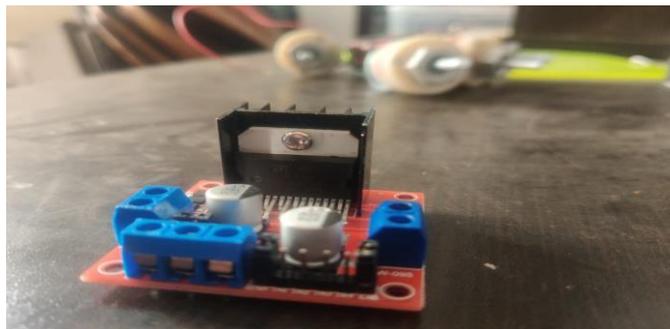


Fig.1 L298N Module

Node MCU:

Node MCU is a electronic panel with a integrated USB interface through which we install the code into this integrated device which helps in controlling the operations of the robot like movement of robot, water spraying etc.



Fig.2 Node MCU

Pump:

Pump is used in pumping the water which helps in controlling the fire and to stop it completely. The pump we used is a DC 3-6V Micro Submersible Pump Mini water pump. This is a low cost, small size Submersible Pump Motor which can be operated from a 3 ~ 6V power supply. A pipe is connected to the outlet of the pump through which the water exits.



Fig.3 Low Submersible Pump

LM35 Temperature Sensor:

LM35 is a temperature sensor that outputs an analog signal which is proportional to the instantaneous temperature. The output voltage can easily be interpreted to obtain a temperature reading in Celsius. The advantage of lm35 over thermistor is it does not require any external calibration. The coating also protects it from self-heating. Low cost (approximately \$0.95) and greater accuracy make it popular among hobbyists, DIY circuit makers, and students. Many low-end products take advantage of low cost, greater accuracy and used LM35 in their products.



Fig.4 LM35 Temperature Sensor

3. SOFTWARE USED:

We used three softwares in this process.

Blynk App:

Blynk is a Platform with IOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. This App is used in controlling the operations of the vehicle. We connect the vehicle and this app using the code we developed in Arduino IDE.

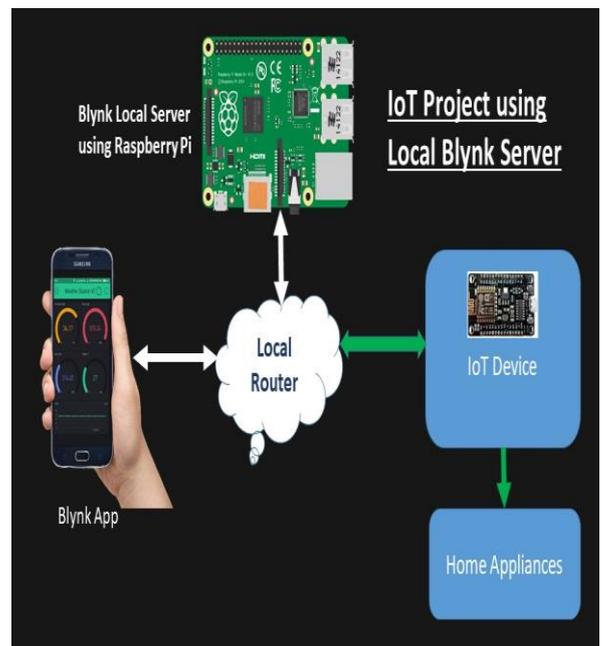


Fig.5 Blynk Application

Arduino IDE:

Arduino Integrated Development Environment is a cross-platform used in different operating systems for coding a program. This program explains in detail about the functions or operations that has to be performed by the robot,

Fusion 360:

Fusion 360 is a designing platform that is introduced by the Autodesk. This helps in designing the parts of the robot like frame, wheel, pump, motor, container, sensors and electronic devices. And the we lastly assemble them in the same software.



Fig.6 Design of Robot

4. CONSTRUCTION:

In this process we assembled all the parts of the vehicle and establish connections between them. The parts which are explained above are used in the assembly of our project. The wheels are connected to the motors which are connected to the L298N motordrive. The motor drive is connected to the node MCU.

We used two sensors in this which are connected to the node MCU. The first sensor is temperature sensor which helps us in finding the change in temperature and this temperature is displayed on the screen. The other was the flame sensor which is used to detect where the fire actually is and it automatically activates pump and pump the water until the fire turnoff.

The pump is inter connected with the node MCU and the flame sensor which helps in activating the pump to start the pumping of water on to the fire.

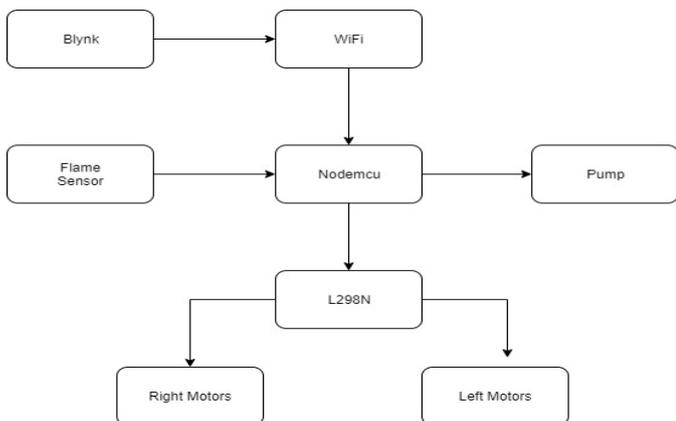


Fig.7 Block Diagram

5. WORKING:

We control our model with a remote control i.e., using an app called Blynk. The Blynk and the robot vehicle is connected with the code we coded in Arduino IED. This code is copied into the node MCU. In this code we clearly coded about the movement of the vehicle, activating the pump, recording the temperature and of showing an alert on the screen when the flame sensor detects fire. The Vehicle is controlled using Blynk app. The movement of joystick replicates the movement of the vehicle. When the vehicle moves close to the fire there will be a change in the temperature and this change in temperature is detected by the temperature sensor and the temperature is displayed on the screen. At the same time the Flame sensor detects the fire it automatically switch on the pump helps in pumping of water and it sends an alert message to the operate. The message is displayed on the screen. The pump stops automatically if the flame sensor stops detecting the fire. This how our model works.

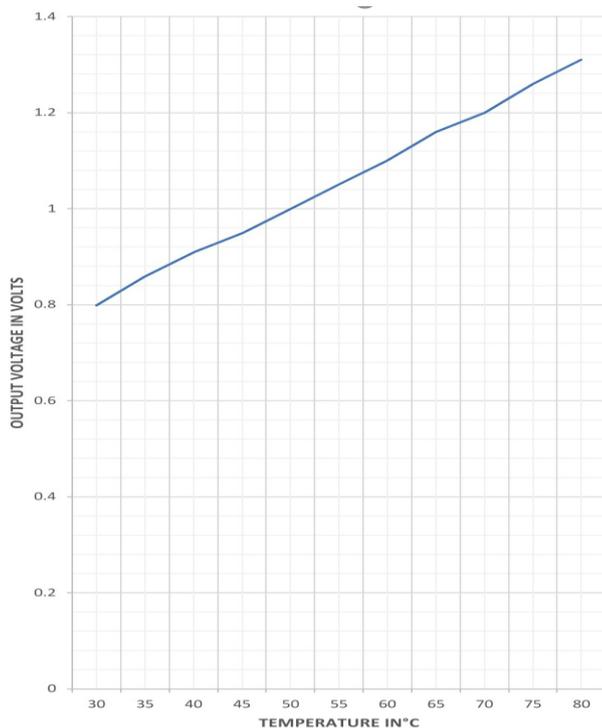
6. RESULT:

In this design, we used two different sensors namely temperature sensor and flame temperature. The temperature sensor is used to find change in temperature and the flame sensor is used to detect the fire this helps in navigating the robot in the direction of the fire.

Table-1 Temperature and voltage Readings.

TEMPERATURE	VOLTAGE
30 °c	799 mv
35°c	859 mv
40 °c	909 mv
45°c	949 mv
50°c	999 mv

55°c	1.05 v
60°c	1.10 v
65°c	1.16 v
70°c	1.20 v
75°c	1.26 v
80°c	1.31 v



Graph-1 Temperature vs output voltage

REFERENCES

1. Ratnesh Malik, “Fire Fighting Robot: An Approach”, Indian Streams Research Journal Vol.2, Issue.II/March; 12pp.1-4
2. Megha Kanwar, Agilandeewari L. “IOT Based Fire Fighting Robot”, 2018 7th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO).
3. H. P. Singh, Akanshu Mahajan, N. Sukavanam, VeenaBudhraj,” Control of An Autonomous Industrial Fire Fighting Mobile Robot”, DU Journal of Undergraduate Research and Innovation.
4. Vijayalakshmi Badre, Pankaj Agarwal, Sameer Chavan, Pranav Kabra, "Smart firefighting robot", (IJSRCSEIT) International Journal of Scientific Research in Computer Science, Engineering and Information Technology, Volume 2, Issue 3, MayJune -201.
5. Sandip Gupta Farogh Ahmad S. Sundar and Shanmugasundaram M., "Manually controlled enhanced Wireless Intelligent Firefighting Robot", Asian Research Publishing Network (ARPN), Volume 12, no. 21, November 2017.

7. CONCLUSIONS:

As the technology is developing in this world day by day we have to upgrade the techniques in different fields which helps in the decreasing the damage and danger. The fire fighting robot is one among those developed technologies helps in detecting fire and helps in controlling the fire. This robot is used in the places where there is no possibility to the firemen to enter and the places where the danger is high for the firemen.