IOT Based Fire Detection System

1st SWETA PAL , 2nd MUNESH NU, 3rd SPOORTHI K , 4th M THIRUMURUGAN, 5th DIVYASHREE NAYAK

[1]Dept. of Information Science and Engineering,[2] Dept. of Information Science and Engineering, [3]Dept. of Information Science and Engineering,[4]Dept. of Information Science and Engineering, [5]Dept. OF Information Science and Engineering

[1]AMC ENGINEERING COLLEGE, BENGALURU, KARNATAKA, INDIA
[2]AMC ENGINEERING COLLEGE, BENGALURU, KARNATAKA, INDIA
[3]AMC ENGINEERING COLLEGE, BENGALURU, KARNATAKA, INDIA
[4]AMC ENGINEERING COLLEGE, BENGALURU, KARNATAKA, INDIA
[5]AMC ENGINEERING COLLEGE, BENGALURU, KARNATAKA, INDIA

ABSTRACT

Fire is a devastating situation, if action is not taken on time it can cause huge losses of property and lives, therefore it is very important to take a preventive measure against it. According to NCRB on an average in India over 25,000 people die every year. So as a result fire alarms are constructed and to make things more easier we have connected IoT with that. It will help to control even if we are in remote location. The only thing required is uninterrupted internet connection. Traditional fire detector had many limitations and to overcome those we have designed thus project.[2] It requires no man power and can be easily maintained. This system can be used in schools, colleges and various organizations for safety purposes.[1]

Index Terms: IoT Fire alarm, NodeMCU, Blynk, Arduino, Fire, Smoke Detector, Buzzer, Heat Sensor, Fire Detection, GSM module and Technology, Text Message, Android application.

1. INTRODUCTION

Fire detection system based on IoT provides an immediate response without any lag so that individuals can be evacuated on time and the extinguishing team can be called to handle the situation immediately so that properties and lives can be protected. as human technology is evolving day by day, so prevention needs to be taken against fire to safeguard emerging trends. We have designed this project using IoT which usually comprise of sensors, various software and other technologies to do the allotted task by using GSM i.e. global system of mobile, we can monitor a system from far away location. [5]

The major application used here is Blynk application which is an IoT based platform for IOS and android Smartphone used to monitor devices like Arduino, Raspberry pi and NodeMCU via internet connectivity. It is an open-source platform which can be programmed using languages like python, C++, C, Java, JavaScript or any other language to control the system.

Here we are using sensing devices like Smoke detector and heat sensors. An smoke detector works on the principle of light scatter. smoke sensors doesn't work properly in the regions where temperature falls very often like hilly areas as smoke particles sticks on the sensing part. Heat sensors are designed to detect changes in temperature and convert them into electrical signals, that can be processed and used to trigger an alarm or control a system.[6] These sensors detects smoke or heat produced by the fire and sends a text message to the user along with an onsite alarm(buzzer). This system has varied applications, it can be installed in homes, schools, colleges and industries for safety purposes.

2. ARCHITECTURE

A large number of sensor nodes are used in wireless networks. These sensor nodes are used for typical purposes such as event monitoring, fault detection, humidity measurement and so on. The sensor device consists of four main components:

Detection unit: It usually consists of the two sub modules: sensors and Analog-to-Digital converter (ADC):

1.ADC converts the analogue signal produced by the sensor based on the observed phenomenon into a digital signal, which is then fed to the processing unit.

2. Processing Unit: It usually manages the program executed by the sensor. Nodes communicate with each other to perform assigned tasks.

3. Usually associated with small storage Transceiver: Connect the node to the network.

4. Power supply: Since wireless sensor networks pay more attention to energy efficiency rather than quality of service (QoS), this is one of the most important components of detecting nodes. The power source can be compatible with energy recovery equipment (eg. Solar panels). Sensor nodes can only be equipped with limited power supplies.

5.There are other sectors depending in the application: location finder: usually required, because most of the technical tasks involved in routing and discovering sensor networks require knowledge High positioning accuracy.

6. Mobilizer: Sometimes it may be necessary to move the sensor to complete the assigned task.[3]

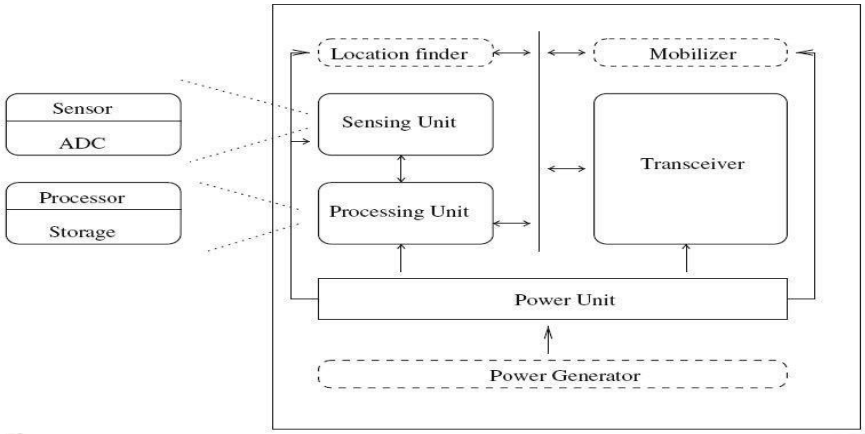


Fig.1 Mobilizer

3. SENSORS USED

An optical smoke alarm works using light scatter principle. Smoke alarm usually detects particles in air to produce electric signal. They mainly use two technologies for detection, that is, Ionization and Photoelectric.

In ionization detection system, a small radioactive material is used, which electrically ionizes the air molecules among two metal plates, this results in flow of electrons from one metal plate to another.

Photoelectric smoke alarms are usually more responses towards fire which begin with the long

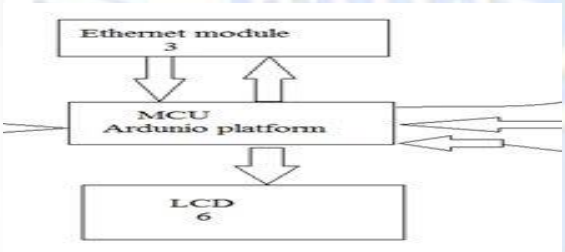


Fig. 2 Schematic flow of Message

period of Smoldering, therefore also called “Smolder fires”.The Heat sensors are designed to detect the changes in temperature and convert them into electrical signals, that can be processed and use to trigger an alarm or control a system.

4. WORKING

The fire detectors senses smoke/heat. In the situation of fire, the sensing part of these sensors reacts to the particles of smoke or the temperature which is more than room temperature. after fire is detected, the device will send a electrical signal to the system which is programmed to send a message to the user whose phone/device is linked with the system by using Blynk application via internet.

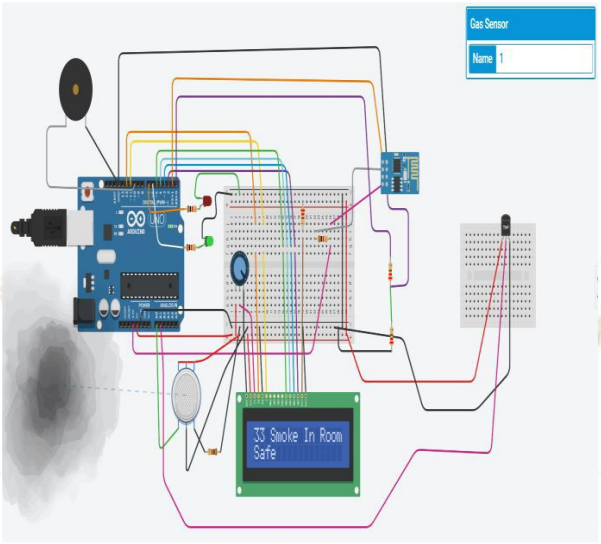


Fig. 3 Simulation of smoke value < threshold value

Since fire alarms are generally more likely to detect smoke/heat than actual fires, these sensing components are usually not known as "fire alarms." These devices can be referred to as "smoke detectors" and "heat detectors," respectively. Few of these components are limited for a particular task like smoke sensors can detect smoke in the coverage of 7.5m radians and heat sensors can react in coverage of 5.3m radians. While the other technically advanced components can perform multiple tasks.

After the smoke and/or heat detector is activated, a signal is sent to the alarm system to achieve a predefined response.

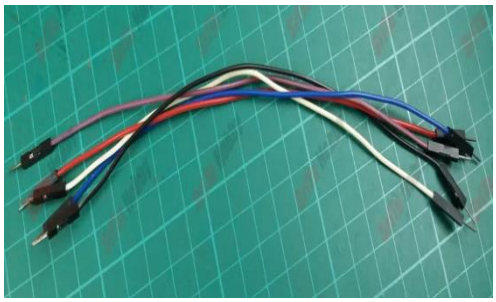
However, it is also common for the detector to receive the fire confirmation before sending the message. Notify the main railway station. This usually means that the sensor will be activated twice in a short period of time. By programming the sensor in this way, the user can avoid false alarms.

6. COMPONENTS USED

- Arduino Uno Board
- Embedded system: NodeMCU ESP8266
- Smoke and Heat Sensors

1. Smoke sensor- detects smoke particles in air

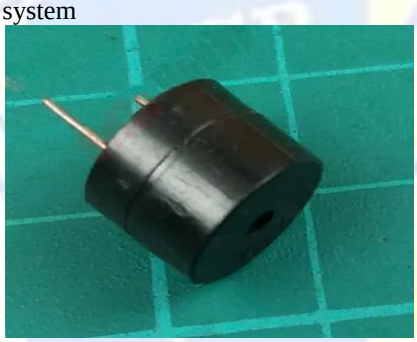
2. Heat sensor- detects change of temperature in environment



3. Jumper wires- Wires or collection of wires in a cable used to make connections on breadboard.

4. Red and green LEDs- Red glows when fire is detected and Green indicated normal state.

5. Power Supply- supplies electrical energy to system



5. Buzzer-converts electrical energy into sound energy and acts as a alarm.

6. CIRCUIT DIAGRAM

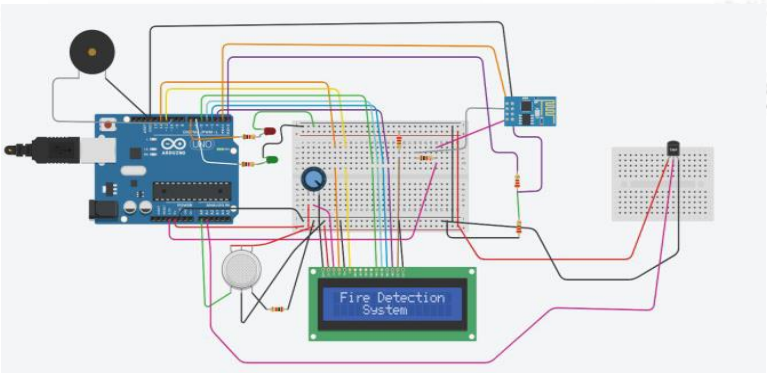


Fig. 6 Circuit Diagram

Two boards are used, namely Arduino uno and NodeMcu ESP8266. On Arduino Uno, the piezoelectric buzzer is connected to digital pin D10 and ground. The smoke detector is connected to analog pin A0. The red and green LEDs are connected to digital pins D7 and D6 on the Arduino card. The result is displayed on the LCD.

7. RESULT

After all connections are made:

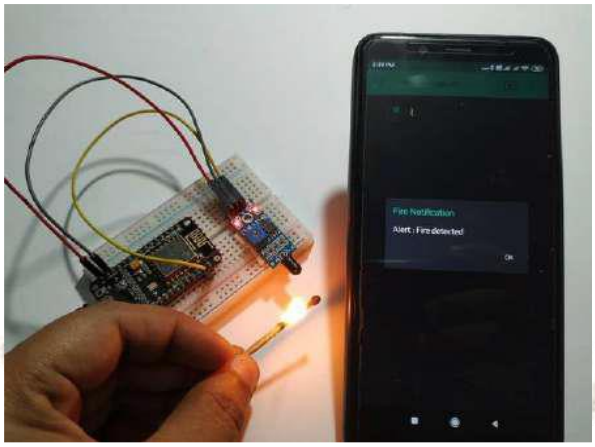


Fig. 4 Blynk Interface[2]

When the system is supplied to power, the NodeMCU gets connected with Blynk application via Internet. They can turn the system ON and OFF using Blynk interface without manually removing any connections.[3] When system gets activated Red LED glows up and buzzer is activated simultaneously and Smartphone receives an ALERT notification when fire takes place. After this system moves back to its normal state and green LED turns on indicating cool environment.[6]

8. CONCLUSION AND FUTURE ENHANCEMENT

Therefore, the IoT based non-contact fire alarm security system using Blynk application (GSM Technology) was successfully developed and implemented. Although we have smart IoT based technologies but this too has its own pros and cons. These sensing devices do not show any error for a long period of time but it should be invigilated timely as accumulation of dust is natural. The components should be replaced after a time span of 10 years as it will get too old and outdated and in case it shows wrong results the components should be replaced immediately.

9. REFERENCES

[1] Authors-Barge Yash Uday, Chawade Prem Shailesh, Gaikwad AyodhyaSurgriv, Ms Khote Sheetal. Title:' Smart fire alert system using iot' published in the year 2022.
[2] Authors- Hari Varshini S, Bhoomika S, Sherene Amalia G, Leena R. Title:'IoT Based Fire Alarm security system' published in the year 2022.
[3] Authors- Devanshi Pandey, Rutuja Pawar, Jyoti Sharma, Santosh Rathod, Chetan Maharajan. Title: 'IoT based fire detection system' published in the year 2021.
[4] Authors- Nitin Galugade, Mahesh Jakkar, Devika air, Prof. Deepti Patne, Madhur Gawas. Title: 'Fire monitoring and controlling system based on IoT' published in the year 2021.
[5] Authors- Rahmi Vinod Patil, SayaliFakira Jadhav, Kaveri Sitaraman Kapse, Prf. M.B Thombare, Prof. S.A. Talekar. Title: 'IoT based fire detection system'. Published in the year 2021.
[6] Authors- Bahman A. Sassanil, Noreen Jamil, M G Abbas Malik, S S Tirumala. Title: 'FireNot-An IoT based fire alerting system: Design and implementation'. Published in the year 2020.