Fire Alarm System Using IOT

R. Angeline, Adithya S, Abishek Narayanan

Abstract: ***Detection of fire in homes is necessary to avoid destruction of property due to fire accidents both natural and induced. Detection of fire can prove to be very important as it could mean the difference between life and death. Fires can occur from anywhere and at any point of time, hence the presence of Fire Alarm System helps in keeping your family safe.***

Some people don't see the need to have a fire alarm system. They just assume that they could smell the fire and run out in time. The average time for a house to burn down nowadays is just 60 seconds. So, by the time you smell the fire and try to run away, the fire has probably engulfed the house. The Internet of Things (IoT) is a system of devices connected and accessible through the internet. The 'Thing' in IOT could refer to any physical device, varying from a toaster to an automobile. These devices can be connected through the internet and help us manipulate or collect data from them. In this paper, we will be using a wide variety of sensors to detect the presence of fire and alert its presence to the watchman and fire officials. It discusses in detail about the functions of each module and its implementation in an elaborate manner. It also discusses the application of Iot Technology in relation to fire detection technologies.

Keywords: Fire alarm system, raspberry PI, Internet of things

I. INTRODUCTION:

Fire is very deadly and it leads to loss of human life and property. Fire detection systems are necessary to reduce the destruction of personal belongings and caused by fire both man made and induced. The National Crime Records Bureau indicates that there have been a total of 113961 fatalities due to fire accidents during the years 2010 to 2014. Fire accidents claim roughly 65 victims every day. A total of 1.21 lakh fire accidents occurred between the years 2010 and 2014. Thankfully by the usage of more smart fire detecting systems the number of fire accidents have been reducing steadily. One of the most destructive properties of fire is that it spreads exponentially and with the right medium can spread uncontrollably. This is why timely detection of fire is necessary for avoiding a fire hazard. The Internet of Things is a collection of sensor, actuators, software, electronics embedded with home appliances, physical devices and vehicles which connect with each other to connect and exchange date which helps in increasing the efficiency of everyday appliances using computer based systems. Not only does it help in improving the efficiency of a device\ but also has economic benefits. Iot is just another way to make everyday life easier for humans by developing smart devices. IoT devices have increased 31% per and was at 8.4 billion in the year 2017. The total count is set to reach 30 billion devices by the year 2020.

The market value for IoT devices is also set to increase to $7.1 million by the year 2020. Iot involves connecting objects beyond the range of standard devices which are used for everyday purposes. In this paper we have developed an IoT based fire alarm with additional safety and verification methods. The devices uses a wide variety of sensors- PIR sensor, to detect the exact location of the origin of fire. Gas sensor, it detects the presence of any flammable gas like CO2. Temperature sensor, detects of there is any unusual change in the room temperature. The connectivity and compilation of data is done by using a Raspberry Pi 3. As soon as the sensors detect some unusual activity, the web camera attached to the device takes a picture of the surrounding and sends it to the watchman and the nearby fire stations. The watchman has a grace period of 120 seconds to confirm the fire and its validity. Upon his verification the fire marshalls arrive at the scene to put out the fire. If the message is unanswered by the watchman for 120 seconds the device sends out a red alert to the fire station requesting their immediate arrival.

II. RELATED WORK:

In this section we will discuss about various existing fire detection methods.

- A.V.Duraivel proposed a system using raspberry Pi 3. They designed the system by using a wide variety of sensors, a video camera and a sprinkler. It is highly compact and provides an authenticated detection process. The disadvantage of this system is that it will need to be connected to a Wi-Fi network.
- S.Naveen proposed a system using Raspberry Pi , gas sensor , flame sensor and a temperature sensor. In this system, the gas and flame sensor are first triggered and then checked by the Raspberry Pi. The temperature signal is then activated for confirmation.
- R.Dhanujalakshmi designed a system which detected the presence of fire using image processing techniques. They used a Raspberry pi for the computation. The disadvantage was that the algorithm is very complex and needed perfect conditions to work efficiently.
- Sailaja Vungarala designed a system using sensors and an Arduino which identified the flames based on its shapes and colours. The disadvantage in this method is that it does not have a long range and needs monitoring for efficient usage.

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- E.Saraswathi designed a system using sensors and an Arduino Uno board. In this system, The sensor networks are programmed with various user interfaces suitable for user of varying ability and for expert users such that the system can be maintained easily and interacted with very simply. The disadvantage is that the energy consumption is high and since there is no good authentication system, it may lead to many false alarms.

III. PROPOSED SYSTEM & RESULTS

Fires cause serious damage and disrupts daily life in a devastating manner. Hence preventing them or reducing their effects is a top priority.

Though there are many systems that have been created to tackle this problem, false alarms is a challenge that is yet to be avoided.

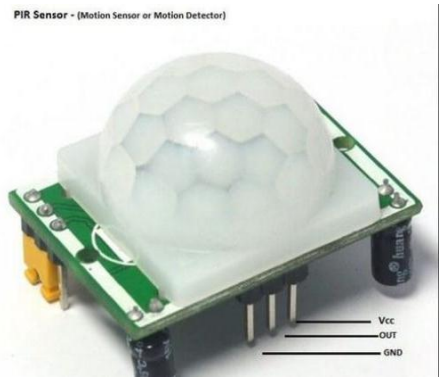
In our model, the place to be monitored is under constant surveillance by a closed circuit television. At tactical points, a number of sensors are placed. The sensor include pir sensor, temperature sensor, heat sensor and gas sensor. Each sensor plays a vital role in detecting a fire if it occurs. On top of these sensors, the footage from the camera is also used to detect the fire through image processing. The main advantage of this system is that it has a very high accuracy. If the fire has been detected a mail is sent to the security and the nearest fire department with an attachment of the photo.

IV. RASPBERRY PI

Raspberry PI is a single board computer. It is a small computer which can be used by connecting it to any computer or monitor and is also compatible with a keyboard and mouse. It is capable of connecting to hardware equipments and can be put to real time use in many placed due to its compact size and efficiency. The main parts of raspberry PI are the main processing chip, HDMI out, Ethernet port, USB ports and much more.

V. PIR SENSOR

PIR sensor or Passive InfraRed sensor is an electronic device that can measure the infrared light from a particular object to which it is focused. In this particular project it is used to detect the origin of the fire. Every object that has a temperature above absolute zero emit a small amount of heat, (a large amount in the case of fire), this heat is detected using the infrared light. This property can be used to find the place which emits the maximum amount which can be inferred as the place of origin of the fire.

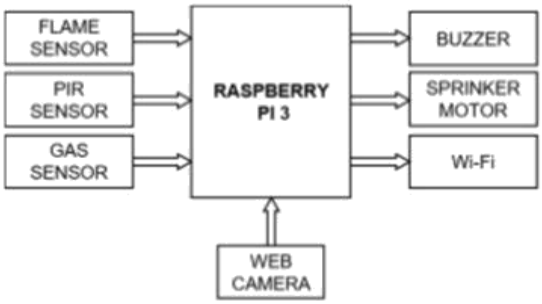


VI. GAS SENSOR

Gas sensor as the name suggests, detects gas leaks or other emissions which can be used to deduct what is happening or going to happen and is very useful particularly in fire safety

VII. ARCHITECTURE DIAGRAM

The following system architecture of this project depicts the flow of control. The hardware devices required are the sensors , the camera and the raspberry pi 3.



The architecture diagram is almost self explanatory. The sensors and the camera act as input devices that gives input data to the raspberry pi which then processes the information and deduces through the unique algorithm whether there is a fire or not. The buzzer and spikler are close vicinity warning and countermeasure system while the wifi is used to send a message to the security guard and the nearest fire department.

VIII. MODULE IDENTIFICATION

• *Detection*

The flame sensor senses the presence of the flame and stores the value in a database The smoke sensors sense the particles present in the air to determine the presence of smoke.The output value is again stored in the database.The gas sensor senses if there is any presence of inflammable gases/liquids that may have caused the fire. PIR

Sensor(Passive Infrared Sensor) helps in locating where the fire originated from. Web Camera monitors the area and in case of fire,it can detect it using image processing.

• *Deduction*

All the data collected from the sensors and the web camera is stored in a database.This data is then segregated to deduce the accuracy of the detection.

• *Intimation*

When the accuracy is above the accepted threshold,the email is sent to the base security and the fire department. After confirmation from the security,the fire department begins the rescue operation.

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IX. CONCLUSION

The paper depicts the necessity and an efficient solution for fire safety. Internet of Things was the main concept used and the project mainly builds on the techniques which are already presents and also it has overcome many obstacles present in the previous systems. But still there are few tweaks and remodelling required to get a more efficient and working model. The time taken for process is to be reduced for practical use.

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