Fire Detection, Monitoring and Alerting System based on IoT

Shreya Gosrani[1], Abhishek Jadhav[2], Krutika Lekhak[3], Devesh Chheda[4]

[1,2,3,4]B.E. Student, Dept. of Information Technology, Shah & Anchor Kutchhi Engg. College, Mumbai, India

Abstract: **The Internet of Things refers to connecting things and people through internet, it has imposed itself as the New business practices in different sectors. To make quick and efficient response in real time, IoT enhances the way and provides emergency managers with the necessary information and communication to make use of those assets. In this paper it is proposed that a quick response for fire hazards is evaluated and examined by using IoT based model. Fire is one of the major reasons of accidental deaths in the world. To implement this proposed system a low-cost Wi-Fi module, gas detection sensor, Flame detection sensor, buzzer to alert and temperature sensors are used. The sensors detects and alerts the local emergency with the data collected by the system, and alerts organizations like fire departments, police stations and hospitals by sending the exact location to both user and operator through module which all are well connected with. Thus, an integrated intelligent system is designed through IoT to manage such hazards where innocent lives and property**

Keywords: **Ardino board, Fire detection, IoT based monitor, Wi-Fi module.**

1. Introduction

This project has proposed an internet of things based fire alarm and monitoring system which is best suited for industrial and home applications. Fire is the major cause of accidental death claiming valuable lives and expensive property. The major property of fire is it spreads exponentially with time spreading in no period of time and destroys everything it catches. Hence, detection of fire in time is important so that many lives and property can be saved. It can detect smoke, the rise in temperature, rise in flame etc. and send it to a far-away controlling unit through GSM to generate needful precautions accordingly inform the nearest domestic help. The proposed system is capable of detecting smoke, different gases and fire.

This system will be providing hazard coordinates to the nearby local help including fire department, police stations, and hospitals. This fire and gas sensing system with systematic IoT framework concentrates on public safety and livelihood service sector [2], [3]. The fire detecting system with IoT standardized design methods is shown in Fig. 1. The spark Detection sensor PT333B is used to sense the spark, the Flammable gas sensor MQ-6 is used to detect the gases like LPG/LNG and the GPS module is to obtain device location. These sensors along with Wi-Fi micro-controller are connected via Internet through which it communicates hazard status to the nearest service centers for all kind of help [4].
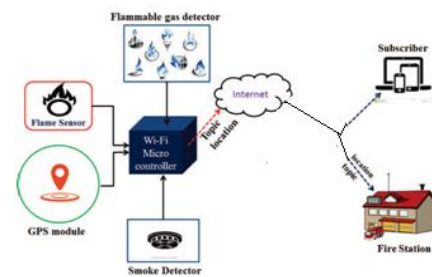

Fig. 1. Block diagram

A. Internet of Things

The Internet of things (IoT) is the extension of online availability into equipment gadgets and ordinary items. Implanted with a wide range of equipment, (for example, sensors), these gadgets share data with one another over the remote system, and these gadgets can be methodically overseen and changes can be produced using time to time. The meaning of the Internet of things has advanced because of up gradation of different advances, run time investigation, framework learning (machine learning), sensors and conventional fields of inserted load up engraved frameworks, unwired sensor systems, control frameworks, robotization (counting home and building computerization), and others all add to setting up the IOT. In the shopper showcase, IoT innovation is most acquainted with items having to the idea of the "keen home", covering home gadgets and machines that help at least one normal ways of life, and can be controlled telephones or remotes related with that framework, for example, cell phones and speakers. IOT helps in making a few simplicities to the client we in this undertaking are utilizing this for a speedy check and a thought regarding the dangers that can occur and can be maintained a strategic distance from. With option to that it gives us freedom to add new things to the framework at whatever point required to make it progressively proficient and dependable.

B. About this project

Fire is a very dreadful situation and an outbreak of fire causes a lot of damage to life &property. Every year thousands of properties and lives are claimed due to a fire casualty. Preventing an outbreak of fire and taking required precautions beforehand can save a lot of destruction. In developed countries, properties come equipped with precautionary systems. However, in counties underdeveloped or developing,

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no such facility prevails. The system that we aim to develop will act as a precautionary measure to alert and thus prevent any further casualties. Since this system is highly cost efficient, deploying it will be economical and affordable. With this system, we aim to create a safe environment at homes, workplaces, universities and public places. The main constraint was to keep the system cost efficient so that maximum advantage can be made of it. Since it is economical, installation of the device can be done to assure safety of live and property.

C. Billing if the overall system

Table 1
Overall budget

Component	Quantity	Cost(In Rs)
LM35	1	80
Infrarred Sensor PT333b	1	55
MQ6	1	150
Adapter	1	200
Buzzer	1	60
Aurdino	1	350
16*2 LCD Display	1	230

2. Experimental Setup and Working

In this framework, we have sensors LM35 and MQ6 inserted in the Arduino board. The LM35 is a temperature sensor. The LM35 sensor gives exact readings at room temperature. The smoke sensor utilized is MQ6 which recognizes smoke. It is a nonexclusive gas sensor. It is effectively ready to recognize LPG, iso-butane, propane, Hydrogen, smoke methane. One of the significant points of interest of this sensor is its high affectability and quick reaction time. The yield of the sensor depends on the power of gas. A small scale controller goes about as the focal handling unit, which takes the qualities evaluated by these sensors as the contribution for further preparing. Each framework is fused with a bell. The whole framework is associated with a Wi-Fi module so as to have the capacity to exchange information from the sensors onto diverse frameworks. Every framework has an exceptional Identification number. Alongside the ID, clients are additionally required to give fundamental subtleties as for the area of framework establishment, contact subtleties and Login certifications.
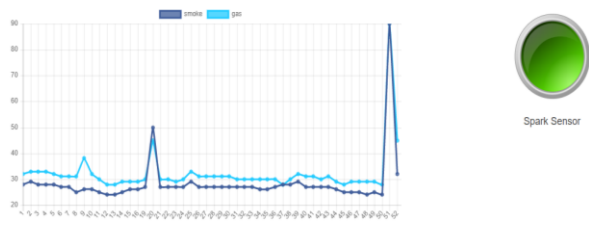

Fig. 2. Readings of Setup

Contact subtleties are utilized in case of a crisis. We have likewise built up a site for cutting edge wellbeing reason and to guarantee sharpness. The site is for the nearby specialists of local group of fire-fighters to screen the frameworks and their movement. It goes about as a warning stage.

The sensors in the framework will gain information and continually continue sending it crosswise over to this site with the assistance of the Wi-Fi module. The dependable specialists will almost certainly keep themselves refreshed with the status at every area. Each time there is a noteworthy change in the esteem caught by the sensors, an alarm will be sent crosswise over to the local group of fire-fighters just as to the number enrolled alongside the framework. Ready will be sent when the limit esteem is crossed. If there should be an occurrence of an outrageous ascent in temperature or gas levels, the sensors get initiated and quickly an alarm as warning on the site gotten to by local group of fire-fighters is sent. The local group of fire-fighters is then foreseen to send help at the most punctual since area will be enrolled with them. The focal local group of fire-fighters will at that point send a prompt alarm to the closest flame station to the spot of mishap. Close by an alarm is likewise sent to the closest medical clinic to send crisis help in the event of any setbacks.
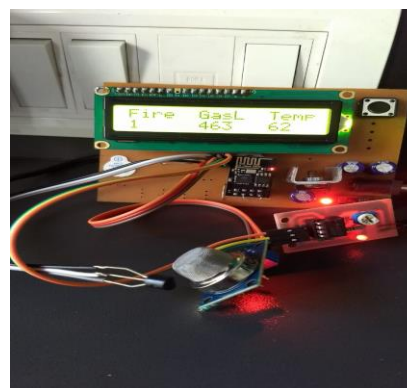

Fig. 3. Experimental setup

3. Hardware aspects

A. Gas sensor (MQ6)

MQ-06 is used to detect inflammable gases in the system. All the gases that emit carbon dioxide in the air after inflating gets detected by the sensor. These sensor has threshold value when crossed they give a notification. For gas where Au and Pt are used as an electrode, Ni-Cr alloy is used for heater coil.

Fig. 4. Image of Gas sensor

B. Spark Sensor

Detects the ignition of the light when there is some spark in through wires or some inflammable system. Pt333B is the sensing component. The Module is LM358.

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Fig. 5. Spark sensor

C. Arduino Uno Board

The Arduino Uno is a microcontroller board on which we have connected the used sensors at the end Wi-Fi module is mounted on it. Then it is connected to the website for further process.
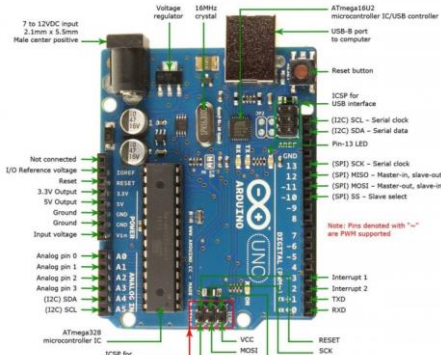

Fig. 6. Micro controller board

D. Temperature sensor (LM-35)

The lm35 temperature sensor is used to detect the rise in the room temperature and give a notification.
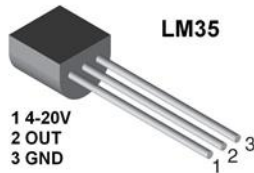

Fig. 7. Image of temperature sensor

E. Wi-Fi module (ESP8266)

Fig. 8. Wi-Fi module ESP8266

Wi-Fi module is used to send data through wireless network to the system and web application and then it gets all the data from the sensors and gives a notification to the web application. The ESP8266 is a minimal effort Wi-Fi microchip with full TCP/IP stack and microcontroller capability. This little module enables microcontrollers to interface with a Wi-Fi system and make basic TCP/IP associations utilizing Hayes-style

commands. The ESP8285 is an ESP8266 with 1 MiB of inherent glimmer, taking into account single-chip gadgets equipped for associating with Wi-Fi.

4. Software aspects

In this task we utilized distinctive programming methods to construct a code for the Arduino board. Here Arduino board reads the data given by the system and sends the information to site and to client through Wi-Fi module. For the Chart and spark sensor indicator we utilized Php language (Personal home page). Other language utilized were html and CSS to make the page and site additionally appealing.

Arduino board: software is used to write programs that can be embedded onto the board. It is available for many operating systems like Windows, Linux, Mac OS X, Portable IDE. It is an open source platform for electronics design, and very easy tool to use for both hardware and software. Arduino IDE comes with few advantages like fast prototyping and also helps the students who don't have any prior knowledge in electronics and software programming. It provides flexible, simple and clear programming environment for beginners.

5. Conclusion

Fire breakouts create serious health and Infrastructure hazard, associated with it is unavoidable injuries or loss of lives in one hand, partial or complete damage to properties. This loss is inestimably enormous; hence this paper proposes the development of IOT based fire department alerting system. This model constantly monitoring the fire signal and will send warning to alert the user and nearest fire station. This application targets people who don't have someone to be at home, office or any other workplace so when they away from their place they are notified about the fire problems if any. Using this application will help these people as they will be informed quickly about the incident and also the nearest fire department will be notified in an effective way. The application has a notification feature which notifies the user and the nearest fire station plus the domestic help so that a quick action can be taken. It is also very efficient and hence very easy to use. This system has tried to solve almost every problem related to the safety of homes and its assets.

6. Future scope

The framework which we have assembled is only one single unit for testing reason; the equivalent should be possible on a substantial scale. The framework can be actualized by including different new highlights, for example, camera. Including a Camera will give a reasonable image of the site of mishap in this manner enabling policeman to get the outcomes quick and as that issue even suspects. It can likewise be utilized for review purposes in future and to keep comparative mishaps from occurring. What's more, the framework can naturally gauge the power of flame so local group of fire-fighters station can realize

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how much work power will be required to beat this issue this as well as the measure of quencher required can likewise be created by further research, this will spare the errand of workforce at the stations. Model can likewise be outfitted with water sprinklers which will be valuable for controlling little events of flame, contingent upon spending we can introduce it the entire territory on greatest safeguard.

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