

## FIRE DETECTION AND CONTROL SYSTEM USING ARDUINO

Pratiksha Jedhe

Marathwada Mitra Mandal's College of Engineering,  
Karvenagar, Pune, Department of Electrical Engineering  
[pratikshajedhe2018.elect@mmcoe.edu.in](mailto:pratikshajedhe2018.elect@mmcoe.edu.in)

Harsh Khatri

Marathwada Mitra Mandal's College of Engineering,  
Karvenagar, Pune, Department of Electrical Engineering  
[harshkhatri2019.elect@mmcoe.edu.in](mailto:harshkhatri2019.elect@mmcoe.edu.in)

Mahek Khot

Marathwada Mitra Mandal's College of Engineering,  
Karvenagar, Pune, Department of Electrical Engineering  
[Mahekhhot208.elect@mmcoe.edu.in](mailto:Mahekhhot208.elect@mmcoe.edu.in)

Avinash Pathak

Marathwada Mitra Mandal's College of Engineering,  
Karvenagar, Pune, Department of Electrical Engineering  
[avinashpathak2019.elect@mmcoe.edu.in](mailto:avinashpathak2019.elect@mmcoe.edu.in)

Prof. Samarpita Bakshi

Marathwada Mitra Mandal's College of Engineering,  
Karvenagar, Pune, Department of Electrical Engineering  
[samarpitabakshi@mmcoe.edu.in](mailto:samarpitabakshi@mmcoe.edu.in)

### ABSTRACT

The fire alarm and controlling method present in this paper includes the use of various electrical and electronics instruments and water sprinkling system. Fire is considered as the most dangerous hazard at Residential Area, Commercial Area, industries etc. It is very dangerous and can affect human life and cause a mass destruction of properties that's why we require high security and control to avoid this mass destruction. That's why to protect from the danger caused by fire, preventive measures are to install an automatic fire alarm detector at endangered locations, hence the Arduino fire alarm detection and control system was proposed. It is capable of automatically detecting smoke or fire in a given environment, sound an alarm, switch off MCB switch of the building and also spray water to reduce the intensity of fire. The system uses a LM35 sensor, MQ2 sensor, a 5V buzzer, 230V DC (Direct Current) motor, a GSM (Global System Mobile) Module sim800l to send SMS (Short Message Service), GPS (Global Positioning System) Module Neo 6, an LCD screen 16X2, Relay and Arduino UNO Atmega328p Fire Alarm and controlling system is a system that sense the fire from respective sensors and activates Buzzer. Fire Alarm System and controlling is the important to sense fire in the proper time and take safety measures to avoid many hazards to humans or property. Fire Alarm System, smoke and temperature Sensors are a part of the entire systems which help in detecting the fire and take necessary actions to avoid damage. In the market there are many fire alarms available, but they are expensive and having complicated design and system, but in our system we have designed in simple form and it includes the water sprinkling also. The primary purpose of this fire alarm and controlling system is to give

an immediate warning of fire so that respective person of that building can be informed and immediate action can be taken so that prevent fire effect and hazards caused by it as soon as possible.

## **I. INTRODUCTION**

Ever since human being started building structures by using of wood rather than stone, fire has become the part of the total process.

In actual case, there are many examples of fire outbreaks which causes a huge destruction latest example in indias capital New delhi where 27 peoples have to lose their life and more than 12 peoples got heavily injured as well as in lucknow city more than 12 fire incidents happen not as large a fire as the one in Chicago the year before or the fire that was ravage San Francisco just over three decades later Firefighting calls for capabilities in combating, extinguishing, and stopping hearthplace, working and retaining hearthplace branch device and quarters, and vast education in acting firefighting activities. Nowadays, many industries and residential have installed related fire safety and control arrangements such as fire alarm, fire extinguisher, water sprinkling supply system. But in actual practice these all-fire alarm and controlling systems they are not that much capable enough to take necessary action when fire is started that's why to protect life.

The new way to avoid all the losses is to respond to emergency situations as quickly as possible. So, at that point comes the need of a upgraded fire detection systems. This project therefore look for to design an Arduino Fire Alarm and Controlling systems that will monitor the presence of significant quantity of tempreature and smoke and activate alarms and along with that switch off the mains of the building, send an SMS to respective send an SMS alert and location and extinguish the fire as a safety measure to contain the situation.

## **II. PROPOSED SYSTEM**

Our project, "fire detection and control system using Arduino" is divided in three parts i.e., Problem, Alert and Solution.

### **Problem**

Mainly 10 components are used in this project like Arduino UNO, MQ2 (Smoke)Sensor, LM35 (Temperature)sensor, GPS (Global positioning system), GSM (Global System Mobile Communications), DC Motor, LCD Display (16\*2), Buzzer, Two types of Adapters(5V,12V), Buzzer. Firstly, we used Arduino IDE software for programming. We can use compilation, debugging of program in this Arduino IDE software. Arduino UNO is microprocessor-based device which is used for interfacing analog or digital input and output devices and depending upon the program stored in Arduino by Arduino IDE software it will give output. We used integrated C programming in this project. In this program we mentioned about LCD, longitude and latitude value of GPS, Desired value of temperature, buzzer on off situation, GSM Messages, on off instruction for Dc motor etc. when the fire will catch it will produce smoke and surrounding temperature will get increase.

### **Alert**

This smoke will sense by MQ2 sensor audit would detect LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and Carbon Monoxide and at that time it will sense the temperature by LM35 Sensor. this sensor will give commands to Arduino UNO. Depending upon the program stored in Arduino it will give output.at the same time Arduino will give command to LCD, GPS, GSM, Dc motor, Buzzer etc.

### **Solution**

When the temperature will increase beyond the 40 degrees Celsius and smoke will detect then LCD will show fire has been caught. Same time buzzer will be ringing so user will understand about the fire. also, by using

GSM user and fire officer will get message about location and also about the smoke and temperature. By using GPS Depend upon longitude and latitude value location will get identified  
And DC motor will sprinkle the water at fire caught area and it will extinguish the fire.

### III. BLOCK DIAGRAM

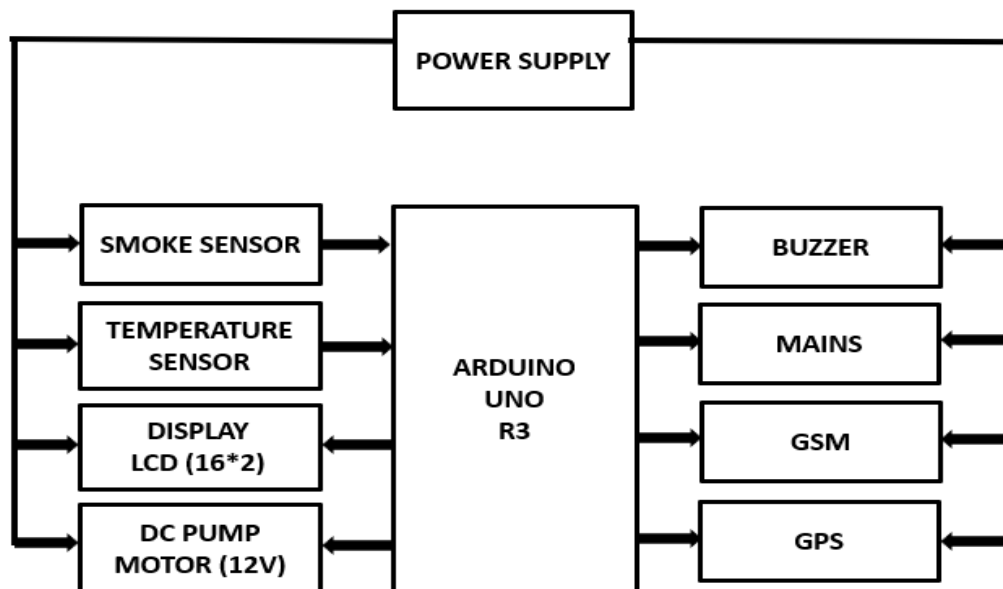


Fig no. 3.1

The system includes two main parts: hardware and software. A stand-alone embedded system based on an Arduino, a GSM mobile with GSM Modem (SIM800L), a relay module, and current sensors make up the hardware architecture. The software comprises of Arduino IDE programming. The GSM modem provides the communication media between the home owner(consumer) and the system by means of SMS. The SMS consists of AT commands to be performed. The format of this message is predetermined. The SMS message is delivered to the residential customer in format of a text message with a predetermined structure. The Arduino will decode and execute the commands supplied by the GSM module. The system will starts the commands and switch the appliances/equipment (ON/OFF) as per instructions. The detailed information related the hardware and software are as follows: -

### IV. PROJECT IMPLEMENTATION

#### A] Hardware Implementation

Arduino is Associate in Nursing ASCII text file hardware and code company, project, and user community that styles and manufactures single-board microcontrollers or microcontroller kits for creating these digital devices. Arduino Its hardware product square measure accredited underneath a CC BY-SA license, whereas code is accredited underneath the wildebeest Lesser General Public License (LGPL) or the wildebeest General Public License (GPL), [permitting the manufacture of Arduino boards and code distribution by anyone. Arduino boards square measure out there commercially from the official web site or through approved distributors. LM35 could be a temperature device that outputs Associate in Nursing analog signal that is proportional to the fast temperature. The output voltage will simply be taken to get a temperature read in uranologist. MQ2gas device is Associate in Nursing electronic device that senses the concentration of gases within the air like LPG, propane, methane,

hydrogen, alcohol, smoke and carbon monoxide gas. GPS receiver measures the distances to satellites using radio signals to trilateration. And trilateration is similar to triangulation, which measures angles, depicted in this illustration (Tim Gunther, 2020). GPS modules contain tiny processors and antennas that directly receive data sent by satellites through dedicated RF frequencies. Submersible pumps push water to the surface as against jet pumps, that got to pull water. The circuit detects the absence water and monitors the water level to stop dry running from occurring. the pump guard physical science contains 2 level electrodes, a water level detector, associate degree magnetism relay, and therefore the relay driver electronic equipment. The pump motor is employed to get water from a tank and sprinkle it to the affected space caught aflame. this is often done therefore once a high signal is shipped to the pin the motor is connected.

Merchandise library, which provides some traditional info and yield system. this is often associate degree open supply board which allows easy secret writing and transfer. B. computer code Implementation Coddling or Programming, Program utilized within the project, developed in C language with the Arduino linguistic structure within the Arduino IDE. The programming is likewise utilized for stacking the program code in to Arduino board. during this task, the Arduino IDE was utilized to program, create, debug, and transfer the secret writing into the microcontroller MQ2 gas device is additionally referred to as chemoreceptor. It contains a sensing material whose resistance changes once it comes up-to-date with the gas.

A GSM electronic equipment or GSM module could be a hardware device that uses GSM mobile phone technology to supply a knowledge link to a far-off network. From the rear of the transportable network, they're primarily a twin of a normal transportable, as well as the necessity for a SIM to spot themselves to the network. One of the global positioning systems (GPS) devices utilizes data from satellites to locate a specific point on the Earth in a process named trilateration.

## B) Software Requirement

It underpins both C and C++ programming dialects. Arduino supplies the product library, which gives some normal information and yield system. This is an open-source board which permits simple coding and transfer. Software Implementation Coddling or Programming, Program utilized in the project, developed in C language with the Arduino linguistic

## V. FLOW CHART

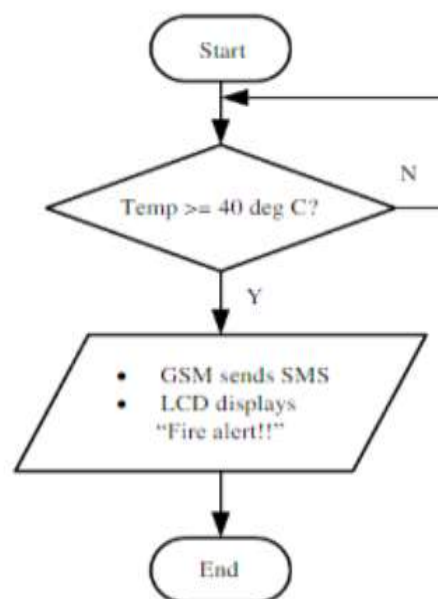


Fig no 5.1

## VI. RESULT



Fig no. 6.1

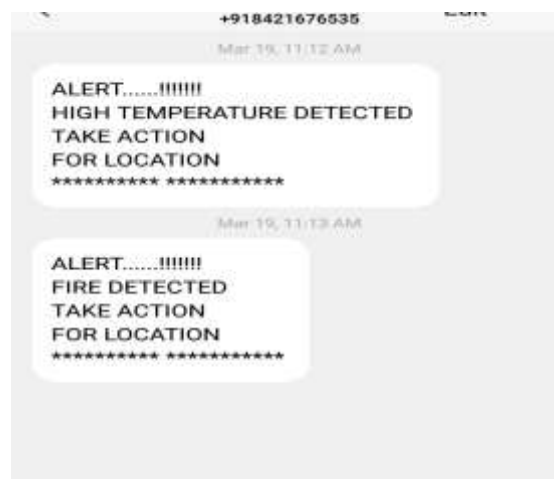


Fig no. 6.2

## VII. FUTURE SCOPE

The developed prototype in this work is made for a user to control the fire alarm system remotely. This helps the user if he/she is not in the building or even unaware of emergency condition. The use of this prototype will avoid the unpredictable situation or any critical situation from occurring in the residential areas without awareness of the resident. The use of coupled sensor of temperature sensor and smoke detector was found to be more appropriate than the use of only one of them. Though the prototype was able to extinguish the fire but the portability can be significantly improved by an efficient assimilation of the different modules. This system should also take care that each module of it can be easily replaced by a better sensor and equipment with updated technology. The microcontroller can be programmed with the contact number of local authorities of fire brigade. The Electronic copy available at: <https://ssrn.com/abstract=3724291> proposed prototype can be applied in smart cities (e.g., houses, hostels, hotel industries, factories) due to its flexibility

## VIII. CONCLUSION

In this work, an attempt has been done to design a fire alarm system using Temperature sensor and Micro controller for efficient use of electricity. This project will help to reduce huge hazards and also save human lives easily. It will also help to reduce the wastage of electricity, save lives, reduce percentage of accident and reduce waste of electric appliance. The results obtained from the measurement have shown that the system perform well under all the conditions. The main objective of this project has been to design a circuit that detects high temperature and consequently triggers an alarm, switch off the mains of the building, send SMS message to user and also security guard and extinguish the fire. These objectives were met since the systems works effectively

## REFERENCES

- 1) Adekunle A., Umanah I.I., Ibe K.E. and Imonikosaye M.R. (2018) Statistical analysis of fire outbreaks in homes and public buildings in Nigeria. A Case Study of Lagos State, (pp. 21 - 30).
- 2) Amy, T., et al. (2019) Boston fire of 1872.encyclopedia of world history. Retrieved from <https://www.britannica.com/event/Boston-fire-of1872>
- 3) Sarah, B. ( 2017) The great fire of nero and the ancient history of firefighting. Retrieved from <https://www.forbes.com/emperor-nero,>
- 4) Erik, A.. Influential innovator. Ctesibius, (2016).
- 5) Huang, Y., Zhang, W., Dai, X., Zhao Y. (2012). Study on water-based fire extinguishing agent formulations and properties. International Symposium on Safety Science and Technology, (pp. 650 - 654)
- 6) Shehab, J. N. (2018) Design and Implementation of Factory Security System. (PP. 162 - 171)
- 7) Qin, W. Jiashuo, C. and Chuang, Z. (2018) Intelligent Smoke Alarm System with Wireless SensorNetwork Using ZigBee, (pp. 1 - 10)
- 8) Aydin, B., Selvi, E., Tao, J. and Starek, M. J. (2019) Use of Fire-Extinguishing Balls for a Conceptual System of Drone-Assisted Wildfire Fighting, (PP.1 - 15)
- 9) Bahrepour, M., Meratnia, N. and Havinga, P. (n, d).A Survey from Wireless Sensor Network Perspective, Automatic Fire Detection
- 10) Shin-Juh, C., Chris, H., Kristen A. P. and André, M. (2007) Fire detection using smoke and gas.