

# SMOKE AND FIRE ACCIDENT DETECTION USING GSM

<sup>1</sup>**VELAGAPURI. DEEPA, ASSISTANT PROFESSOR**, Dept of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India.

<sup>2</sup>**V. HARSHITH, UG SCHOLAR**, Dept of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India, Email: [venkat14.ventrapragada@gmail.com](mailto:venkat14.ventrapragada@gmail.com).

<sup>3</sup>**G. PRAVEEN KUMAR, UG SCHOLAR**, Dept of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India, Email: [praveengargapati2822@gmail.com](mailto:praveengargapati2822@gmail.com).

<sup>4</sup>**A. AJAY KUMAR, UG SCHOLAR**, Dept of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India, Email: [ajayadla8@gmail.com](mailto:ajayadla8@gmail.com).

<sup>5</sup>**B. AJAY KUMAR, UG SCHOLAR**, Dept of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India, Email: [ajaykumarbural1@gmail.com](mailto:ajaykumarbural1@gmail.com).

<sup>6</sup>**B. MANI KARTHIK, UG SCHOLAR**, Dept of ECE, Teegala Krishna Reddy Engineering College, Hyderabad, India, Email: [balshettymani99@gmail.com](mailto:balshettymani99@gmail.com).

## ABSTRACT

Bedroom fires account for almost 7% of all home fires. It kills people and destroys all stuffed animals. For situations like these, an Arduino-based wireless fire detector is the way to go. With the help of an Arduino, a smoke detector, and a flame detector, we were able to include a fire alarm into this model. The smoke detector can identify the presence of smoke from inhaled gases, whereas the flame detector can identify the presence of fire. It is equipped with an automated water sprinkler system and a buzzer that sounds a warning.

## 1. INTRODUCTION

"Global System for Mobile Communication" is what GSM stands for. The transmission of mobile voice and data services is facilitated by this digital

cellular technology. Below, you can find important facts concerning the GSM. In 1982, a standardization committee called GSM was formed with the goal of developing a uniform mobile telephone standard across Europe. Global System for Mobile Communications (GSM) is the de facto standard for mobile phone networks across the world. Every 200 kHz channel in a GSM network is partitioned into eight 25 kHz time slots. 900 MHz and 1800 MHz are the mobile communication bands on which GSM works in the majority of the world. Within the United States, GSM is operational in the 850 MHz and 1900 MHz bands. Over 70% of the world's digital cellular customers are GSM owners. Time Division Multiple Access (TDMA) is a narrowband technology that GSM uses to transmit signals. Digital technology was utilized in the development of GSM. Data speeds ranging

from 64 kbps to 120 Mbps are within its capabilities. Over one billion mobile customers in over 210 countries are currently supported by GSM. Advanced voice and data services, including roaming, are provided by GSM. Accessing another GSM network with your GSM phone number is known as roaming. Reviews have shown that smoke detectors are an essential part of active fire detection strategies in today's homes and businesses. Industries saw a spike in smoke detector use in the 1970s, and a number of major research projects confirmed the life-saving benefits of these devices, lending credence to the idea that their use should continue to rise. Several studies were also initiated to comprehend the environmental response and operational concept of these detectors. Because smoke detector reaction may be relied upon by both inhabitants and the fire department, an accurate forecast of the smoke detector's performance is a crucial method for evaluating the detector system's efficiency. To foretell how smoke detectors would react, one might utilize the Fire Dynamic Simulator program. A whopping 96% of fires in buildings equipped with automatic sprinklers were put out by these systems, according to the reference. The automated sprinkler system is set off when the fire detection system initiates the alarm, which occurs in the event of a fire. Every single business structure must have a fire suppression system. Problems with automated smoke detectors originate from their use of ineffective methods for rapid alerting, their tolerance of false noise, and the variety of sensor combinations they employ. Scientists have been keeping tabs on fires that break out in many types of structures, including homes and businesses. A smoke alarm is a piece of equipment that can

detect smoke, which is usually a sign of a fire. As part of a fire alarm system, it can send a signal to a control panel, which is common in commercial security systems, or it can activate a visible or auditory alert in the home. Optical (photoelectric) or physical smoke detectors are available.

## 2. LITERATURE SURVEY

N N Mahzan, N I M Enzai, N M Zin A house fire alarm system that uses an Arduino and a GSM module is detailed in this article. House fire safety is the primary goal of this initiative, which aims to reduce the likelihood of fires and protect both people and their possessions from harm. A combination of an Arduino Uno board and an ATmega328 chip is used. The ATmega328, a temperature-sensitive home fire alarm system controller, is unquestionably the most important component. The heat from the fire is detected using an LM35 temperature sensor. Quick messaging service (SMS) alerts will be given to the user using the GSM module. An alarm signal will be shown on the LCD display and consumers will also receive an SMS warning when the system detects a temperature of 40 °C or higher in the residence.

Kaushalya Thopte, Shravani Bahirat, Vaishnavi Dalvi, A novel approach that can identify and notify individuals of possible fire dangers is a GSM-based fire alarm system. This system makes use of the worldwide system for mobile communication (GSM) technology. An interconnected system of smoke and heat detectors communicates with a command center via a GSM modem to sound an alarm. In response, the control unit notifies a pre-established list of emergency contacts by voice call or SMS of the

possible fire danger. Because of how simple it is to set up and run, the system is perfect for a variety of settings, including private residences, commercial buildings, and public areas. A GSM-based fire alarm system is dependable, affordable, and adaptable to each user's unique requirements. An all-inclusive fire and security system may be created by integrating it with other security systems, including CCTV cameras. To sum up, the GSM-based fire alarm system shows great promise as a means to enhance fire safety and decrease the likelihood of fire-related events.

Patel Maitri A1 Patel Hardili D2 Patel Ankita M3 Building a smart fire detection and control system for doordarshan HPT Vadodara using a variety of sensors is our primary objective. We use a sensor-based approach to construct the fire detection and controlling technique, and we use four separate sensors to build the fire detection system. When used in an outdoor setting, such as a high power transformer, the sensor can detect flames using image processing and keeps a constant eye on temperature, smoke, and flames. The device is equipped with a GSM module that allows it to send warning messages to both the relevant personnel in the industry and the nearby fire station in the event that the temperature rises above a certain threshold, smoke is detected, or flame is detected. A buzzer will sound to indicate the occurrence of a fire accident. All four of these sensors keep a constant eye on Doodarshan, and if they detect a fire, a relay is triggered to release water into the chamber.

N.Bharath,1 G.Harika, A.Sai Susmitha, L.N.Adithya teja K.V.V.Kumar One

mode of transportation is the train. There is a potential for fires because most of our trains are induction trains. Because winds may feed the flames and spread them to adjacent coaches, a rushing train fire is even more disastrous than a stationary one. There is a real risk to people's lives as a result of these fire catastrophes. Now more than ever, the lack of advanced protective measures in the current system is a major cause for worry when it comes to the safety of individuals in the event of fire catastrophes. The automated fire detecting system can measure the current and load continuously; if there is an abnormal rise, it will alert the train's guards and passengers, allowing them to stop the train in the event of an accident. A power source, an LCD screen, sensors, buzzers, and GSM and GPS modems make up the components shown in the block diagram. A GSM modem is utilized for both receiving and interpreting messages sent by a mobile device. The basic components of this system are a microprocessor, power supply, LCD, and GSM module. This Arduino will be responsible for all controlling functions.

### 3. Block diagram

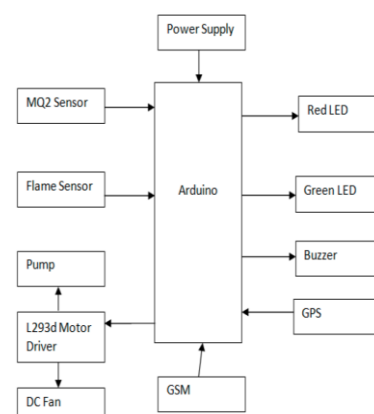


Fig .1. Block diagram.

### 3.1 Power Supply Block diagram:

Transformers, rectifiers, filters, and voltage regulators are all parts of a power supply that work together to convert alternating current (AC) into direct current (DC) and vice versa.

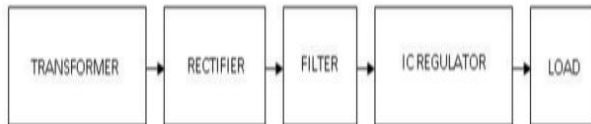


Fig.2. power supply.

### 3.2 ATMEGA 328 MICROCONTROLLER

AVR microcontrollers include the ATmega328. Data processing using 8 bits is supported. There is 32 KB of internal flash memory on the ATmega-328. Electro-Erasable Programmable Read-Only Memory (EEPROM) with 1 KB is available on the ATmega328. This feature demonstrates that the microcontroller can still store data and provide results after being powered on, even in the absence of an electrical source. There is 2 KB of static random access memory (SRAM) on the ATmega-328. We will elucidate other features at a later time. The most common device on the market now is the ATmega328, which offers various different characteristics. Features like as a programmable Serial USART, a programming lock for software security, a real-time counter with a separate oscillator, low power consumption, and a programming lock are all part of this modern RISC design. The throughput can reach up to 20 MIPS, and there are 6 PWM pins. Microchip's ATmega328 is an 8-bit, 28-pin AVR microcontroller with 32 KB of flash-type program memory and RISC architecture. Basic Arduino boards,

such as the Arduino UNO, Pro Mini, and Nano, all employ the Atmega328 microprocessor.

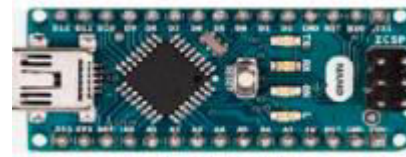


Fig.3. Atmega Microcontroller

### 3.3 MQ2 GAS SENSOR

Modular Gas Sensor MQ2 The versatile and inexpensive MQ2 gas sensor can identify a variety of gases, including hydrogen, propane, methane, and other flammable steam, among others. The smoke and combustible gas detector is quite sensitive. The smoke detector is powered by 5 volts. A smoke detector's output voltage serves as an indicator of the presence of smoke. Smoldering increases production. To fine-tune the sensitivity, a potentiometer is included. The SnO<sub>2</sub> sensor is utilized because, in clean air, it has a low conductivity. The sensor, however, gives an analog resistive output proportional to the smoke concentration whenever smoke is present. A heater is part of the circuit. The heater receives electricity from the power source via VCC and GND. There is a variable resistor in the circuit. The amount of smoke in the air that the sensor picks up determines the resistance across the pin. Increasing the content will decrease the resistance. Additionally, the sensor and load resistor are connected to an elevated voltage.



Fig .4.MQ2 gas sensor.

### 3.4 FLAME SENSOR

The three main properties of fire—heat, smoke (particulate matter), and flame (light)—are the primary targets of most fire detection technologies. Heat from steam pipes, particulate matter from aerosols, and sunlight are all non-flammable sources that can cause these traits. Factors like air temperature and air movement further muddle fire detection by hiding the relevant feature. Also, fire smoke and heat might either build up too slowly or disappear too quickly for detection to be useful. Optical flame detectors, on the other hand, may react to flames in a fraction of a second. Since not every fire has a flame, this optical property further restricts the flame detector's usefulness. The application of any detection method is contingent upon its compatibility with the surrounding environment and the nature of the danger therein. At this time, you may choose between three different kinds of flame detectors. There are three of them: infrared, ultraviolet, and hybrids of the two.

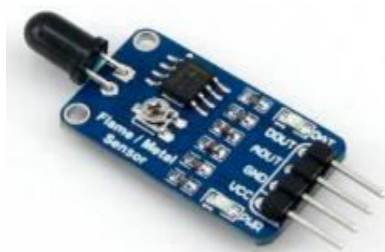


Fig. 5. Flame sensor.

### 3.5 LED

A semiconductor light source known as a light-emitting diode (LED) has two leads.

When turned on, this p-n junction diode produces light. The gadget releases energy in the form of photons when an appropriate current is given to the leads, allowing electrons to recombine with electron holes within. This phenomenon is known as electroluminescence, and the semiconductor's energy band gap dictates the light's hue, which is proportional to the photon's energy. Integrated optical components can be utilized to modify the radiation pattern, and LEDs are usually tiny (less than 1 mm<sup>2</sup>), further contributing to their diminutive size. When first introduced in 1962, the first light-emitting diodes (LEDs) produced faint infrared light. The transmission components of many remote control circuits, including those used in a broad range of consumer gadgets, continue to be infrared LEDs. Early light-emitting diodes (LEDs) could only emit red light and had a low intensity. These days, you can get incredibly bright LEDs that work in the visible, UV, and infrared spectrums.

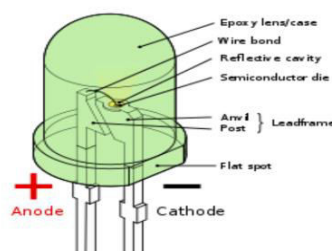


Fig. 6. LED.

### 3.6 GSM

Specialized modems known as Global System for Mobile Communications (GSM) use subscription-based wireless networks, much like a cell phone. By connecting to a computer using a Subscriber Identity Module (SIM) card, a GSM modem may function similarly to a mobile phone. An actual mobile phone that

the computer can connect to a GSM network can also serve as a modem. In order to establish dial-up connections to other computer systems, conventional modems are connected to personal computers. The main difference between this and a GSM modem is that the former uses radio waves for data transmission and reception instead of a telephone connection. These modems can be external devices that are linked to your computer using a serial cable or a Universal Serial Bus (USB) connection. But most of the time, it's only a little gadget that your computer or laptop's USB port or card slot may accept. There is no mobile communication system that is more popular than this one. Mobile voice and data services run in the 850MHz, 900MHz, 1800MHz, and 1900MHz frequency bands using GSM, an open and digital cellular technology.



Fig.7. GSM.

### 3.7 GPS (GLOBAL POSITIONING SYSTEM)

One such American space-based navigational system is the Global Positioning System (GPS). At all times, day or night, and in any location on or near Earth, it reliably offers locating, navigation, and timing services to users all over the globe. There are three components that make up GPS: a constellation of 24–32 satellites in Earth's

orbit, four ground-based control and monitoring stations, and individual GPS receivers used by consumers. In order to give users with three-dimensional position data (latitude, longitude, and altitude) and the current time, GPS receivers rely on signals transmitted from space by GPS satellites.



Fig.8. GPS.

### 3.9 DC FAN

This is a cooling fan for exhaust that is small in size. Imagine holding this little fan in your hand. It operates on 12V DC. A standard 12V battery will power it up with no problem at all. The speed range for this little fan is 6800 to 13,000 revolutions per minute. The fan's body is constructed from a mix of plastic and resin. The fan is made stronger and more insulated by the combination. It is sturdy enough to withstand several drops from a height while being rather lightweight thanks to its construction.



Fig.9. dc fan.

### 3.10 L293D MOTOR DRIVER

Embedded applications may take use of the L293D motor driver, which offers simple and intuitive user interfaces. The L293D motor driver is attached to a high-

quality, one-sided, non-PTH printed circuit board. To facilitate access to the pin functionalities of the L293D motor driver IC, the IC's pins are attached to connectors. With a supply voltage of up to 24V, the L293D, a dual full bridge driver, can drive up to 1Amp per bridge. One or more DC motors, relays, solenoids, etc., can be driven by it. You may use it with any TTL sensor. If you want to make its current capacity 2 Amp, you may connect two L293D H bridges in parallel.



Fig. 10. L293D Motor driver.

#### 4. Schematic Diagram

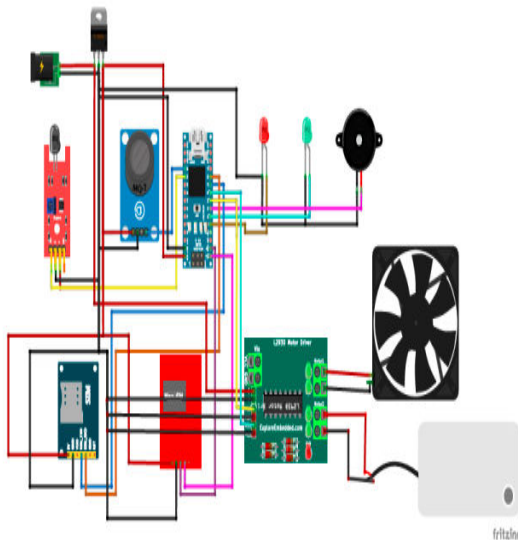


Fig.11. Schematic Diagram.

#### 5. WORKING PRINCIPLE

The purpose of this project is to create an arduino controller-based smoke and fire detection system. The mq2 smoke detector

is connected to the system's main controller, the arduino. A buzzer serves as an alert, while lights show the visual cues. In contrast, turning off is indicated by the green led. If there is no smoke, the green light will be on and the red light and buzzer will be off. An SMS will be sent to the appropriate authorities.

#### 6. FLOW CHART

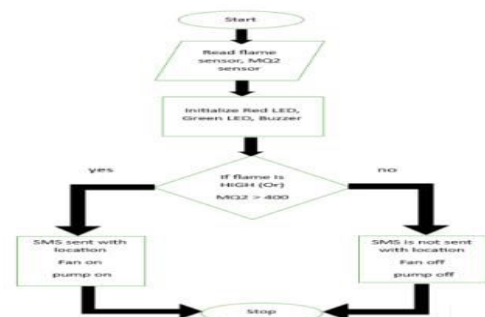


Fig .12 . Flow chart. Diagram.

#### 7. PROJECT OUTPUT RESULTS

##### 7.1 Safe Case

When the smoke detector and flame detector are activated, the intended outcomes will be the detection of smoke and fire. When there is no sign of smoke or fire, it is considered safe to enter the house or drive the car. Thus, we shall employ the green LED to denote the secure state. The green led signifies a secure status when it is turned on.

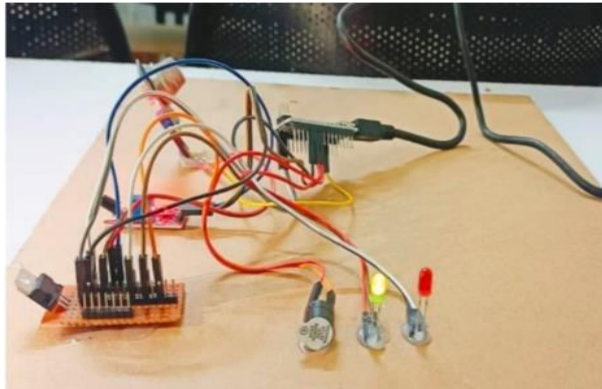


Fig 13 Safe case condition output.

## 7.2 DANGER CASE

Smoke and fire are therefore considered dangerous conditions whenever they are detected. We utilize the buzzer and red LED to indicate a dangerous state. It is necessary to have a buzzer in order to notify anyone who may be in that area.

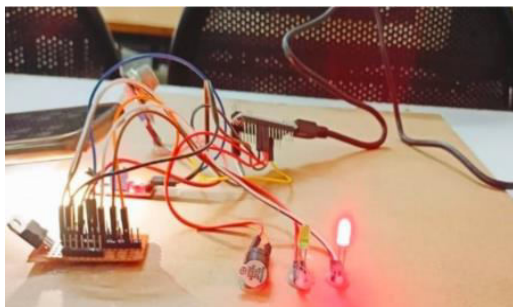


Fig 14; Danger case condition output.

## 8. CONCLUSION

Because of this, fire alarms based on electronic circuits may be constructed to offer very high efficiency and serve as a security measure. Installing and regularly servicing smoke detectors in every room and section of a structure is the surest way to catch fires early.

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