A SMART FIRE DETECTION SYSTEM USING GSM TECHNOLOGY WITH AUTOMATIC WATER SPRINKLER

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Abstract - Fire is one of mankind's greatest discoveries but can also be a great source of danger in accidents. Fire in any occupancy has the potential to cause harm to its occupants and severe damage to the property. As a solution a smart fire detection system is designed using GSM technology, smoke/Flame sensors, and Arduino technology, water sprinkler system, LCD display, buzzer,. A smoke sensor is used to detect the smoke from the fire and Flame sensor. In a event of a The microcontroller is used to process the sensor circuitry input, and also used to turn on the LCD, exhaust fan, water pump motor and the main supply switch will be switched off (switch open). It turns on the GSM modem after that, it continues to send SMS to mobile number for alerting danger to the people. This system helps users to respond immediately to the situation and so improve their safety by protecting their lives and the properties from fire hazards.

Key Words: : Fire Safety, water Sprinklers system, Exhaust fan, GSM, Arduino uno, low cost.

1.INTRODUCTION

Fire is a serious danger to life and property in worldwide. Fire is a serious danger to life and property in worldwide. In order to prevent fires from occurring or minimize their impact, accurate and early detection is essential and automatic fire detection is becoming very essential to reduce the fire in the building and industry. Automatic fire detection system provides real-time surveillance and monitoring. A key aspect of fire protection is to identify a developing fire emergency in a timely manner, and to alert the building's occupants.

As we all know that the fire safety in a building is designed as such like whenever the building has caught fire the sensors will be activated and the sprinklers will be turned on. By this method we can control the fire in the building which is efficient but in major case the people dying in the fire accident is due to breathing problems created by the smoke. But now we can overcome this limitation by simply adding an extra ventilation shaft or the exhaust chamber in the building, so that whenever there is excess amount of smoke in the building the exhaust fan will be turned on so that the smoke in the building is sucked out to the open environment and leaving the people inside the building to breath easily and can be rescued from the fire by the officials of the fire department.

The most crucial aspect of a building's safety in the face of fire is the possibility of safe escape. An important precondition is that fire safety facilities enable independent and adequate fire response performances by the building's occupant. In practice, it appears that the measures currently required by law do not always provide the support people need in burning buildings, consequently, understanding how individuals behave in an event of fire.

2. OBJECTIVE

The main objective of this project is to design and simulate the automatic fire detection and water sprinkler system that can be produced at low cost with effective and competitive usage. This system is designed to be more user friendly and easy to operate at any level.

This project aims to achieve the following specific objectives.

1.To design low cost fire detection and protection system.

2.To develop the monitoring system to safeguard the user and their belongings.

3.To develop the controlling system of the fire accident area by connecting water sprinkler.

3. PROPOSED SYSTEM

A smart fire detection system with automatic water sprinkler has been developed to solve the issues of the fire accidents. an Arduino and Global System for Mobile (GSM) based system for efficient detection of fire hazards. This project's purpose is industrial and domestic safety, and the

primary concern is to avoid the fire hazards that occur to the employees and the properties inside the buildings.

A smart fire and Smoke detection system is designed using GSM technology, smoke/flame sensors, and Arduino technology. A smoke sensor is used to detect the smoke from the fire inside the building. In event of a fire, an alert message will be sent to the user via short message service (SMS) via the GSM module. And the LCD displays the message of Fire alert when fire or smoke is detected. Furthermore, when a fire is detected, a signal will be sent to the microcontroller and then the power supply of the particular building will shut down and at the same time water sprinkler releases water from the tank. The water pump is connected to a relay module. If a flame is detected the relay activates the water pump. Once the fire is detected, the relay is switched on. The water pump is activated and suck water from the tank and release it into the water sprinkler.

4. COMPONENTS USED

4.1 Flame sensor

Fig -1: Flame sensor

A Flame Sensor module or Fire Sensor module is a small size electronic device that can detect a fire source or any other bright light sources. This sensor basically detects IR (Infrared) light wavelength between 760 nm – 1100 nm that is emitted from the fire flame or light source. The flame sensor comes with a YG1006 Phototransistor sensor which is a high speed and high sensitivity. Flame Sensor is having four pins (A0, D0, GND, VCC) .

4.2 Smoke sensor

Fig -2: **Smoke sensor**

Smoke sensor is a device that detects visible or invisible particles of combustion. It can detect LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and Carbon monoxide concentrations ranging from 200 to 10000 ppm. The voltage that the sensor outputs changes accordingly to the smoke/gas level that exists in the atmosphere. The sensor outputs a voltage that is proportional to the concentration of smoke/gas.

4.3 Arduino uno board

Fig -3: **Arduino uno board**

Arduino is an open source electronics platform that is based on beginner level hardware and software. The hardware component of Arduino board is a programmable circuit board that is also known as a micro controller. A microcontroller is a small computer with a processor, memory, and other peripherals designed for embedded applications. The software component is called Arduino IDE (Integrated Development Environment) where developers write and upload code onto the microcontroller.
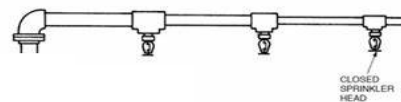
4.4 Water sprinkler system

Fig -4: **water sprinkler system**

Water sprinklers are closed and normally there is no water in the piping. A detection system is used when faster response is desired (versus a dry pipe system). When fire occurs, detection system (more sensitive than the sprinkler elements) senses the fire and automatically opens a water control valve which allows water to flow into the piping system. Subsequent water discharge occurs from individual sprinklers as they respond to the heat of the fire.

4.5 Exhaust Fan

Fig – 5: Exhaust fan

Exhaust fan is a mechanical ventilation device which ducted to the exterior of the house, draws out stale, impure and very humid air there by improving the quality of indoor air. The main use of an exhaust fan is to remove hot, steamy, or contaminated air from a space.

4.6 GSM module

Fig – 6: GSM module

GSM full form is Global system for mobile communications. GSM requires a SIM card just like the mobiles to activate the communication with network. A GSM module can receive, send or delete SMS in a SIM card and can read, add, search phonebook entries of SIM.

5. BLOCK DIAGRAM
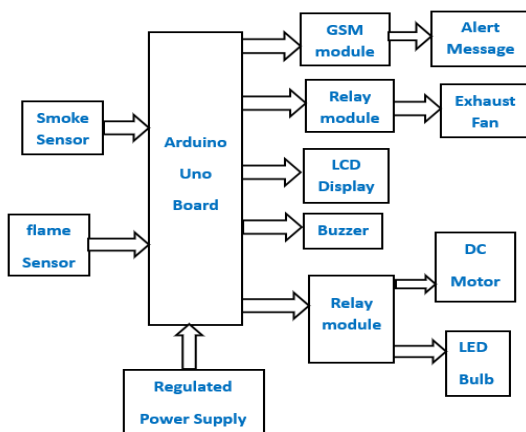
Fig -7: Block diagram

The system takes the power from the distributor. This supply consists of 230 volts. This system has an Arduino uno board, flame sensor, smoke sensor, GSM module, relay board, LCD display connected to it. Here we used power supply circuit to convert the 230 volts power supply into 5 volts because our system needed 5 volts. The 5 volts power supply is given to the Arduino by using Arduino power cord. Initially the main switch will be in on position. When the fire is detected by the flame sensor, a message (Danger flame detected) will be sent to the user and the main switch will be opened. At the same time DC motor will be switched on to suppress the expansion of the fire by sprinkling the water. When the smoke is detected by the smoke sensor, a message (Danger Gas detected) will be sent to the user and the exhaust fan will be switched on to suppress the smoke.
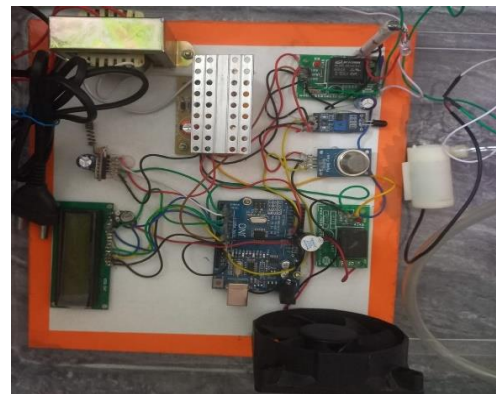
6. WORKING MODEL

Fig -8: working model

The experimental setup for the smart fire detection system using GSM technology with automatic sprinkler is shown in the above figure (fig 7). A single phase supply is given to the transformer and the voltage is step down to 5v and supplied to the Arduino board. Relays are assembled along with flame sensor, smoke sensor, exhaust fan, Dc motor, GSM module, LCD display to the Arduino board to control the process.

7.RESULTS
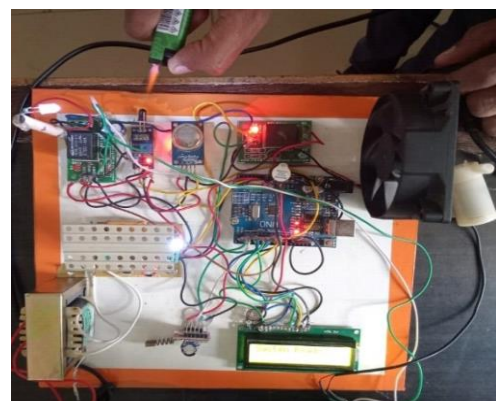
CASE-1 : When flame is detected

CASE-2 : When smoke/gas is detected
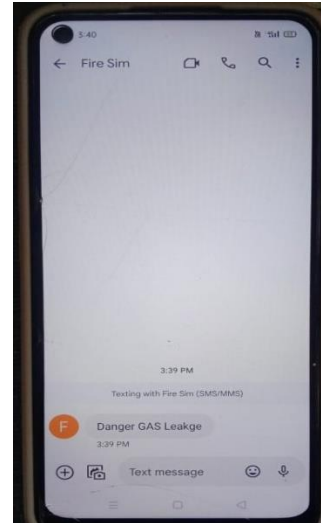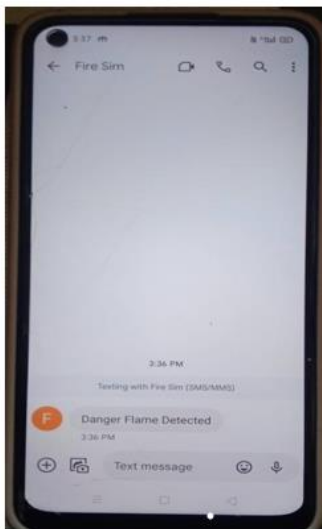
8.CONCLUSION

The fire detection systems proposed is designed to stop fires without regard for responsiveness. Also, consideration has been made in the area of cost and size (packaging) compared to other similar designs. The microcontroller is used to process the sensor circuitry input, and also used to turn on the LCD, exhaust fan, water pump motor and the main supply switch will be switched off (switch open). It turns on the GSM modem after that, it continues to send SMS to mobile number for alerting danger to the people. The system is capable of indicating its status on an LED display, buzzer, and detecting system and putting out the fire. The structure of this system enhances the effectiveness and efficiency of fire detection. As a result , the proposed method overcome the challenges of affordability, effectiveness, and responsiveness.

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