SMOKE DETECTOR WITH GSM MODULE

Abstract

Smoke Detector System is an Alert system that detects the smoke and alerts the people. In this project, a gas sensor is used to detect the concentration of smoke level in a room .the value detected by the sensor is compared with the threshold value that is set by default and if the detected value exceeds the threshold value then the buzzer produces sound turning on the red LED and sends the SMS to the owner. Due to Lack of Smoke Detection and alert system, lots of properties are damaged by fire so in order to reduce the problem of fire damage we proposed to develop this product which detects the concentration of smoke in a room and Alert the owner about the incident through SMS using GSM communication.

Keywords

Smoke Detector System, Arduino, Global System for Mobile Communication

I. Introduction

Smoke Detector Circuit is a simple circuit that detects the smoke and activates the alarm. Smoke Detector Circuits are very important devices to detect fire in the right time and prevent any damage to people or property. Smoke Sensors are a part of the security systems which help in detecting or preventing damage. [1] In our Project we have used gas Sensor to detect the smoke level around it and inform the owner through text messages so that the owner can take preventive measures before anything happens serious. When the GSM communication is added to this System we get the benefit of alerting the Fire Department, Police Station and the Health Department by sending a message as soon as the buzzer produces sound. Nowadays even a small mistakes in circuit connections, an even leakage of harmful acids and gases can cause fire so to detect all these situations and saving the loss of property we planned to develop a Smoke Detector System with GSM Communication. This

is a Hardware Based Product which is Programmed Using Arduino. We can have this product in classrooms, libraries, banks, hospitals, laboratories and in many more places.

II. Literature review

Smoke Detector Circuit is a simple circuit that detects the smoke and activates the alarm. Smoke Detector Circuits are very important devices to detect fire in the right time and prevent any damage to people or property. Smoke Sensors are a part of the security systems which help in detecting or preventing damage. While the smoke detector is a relatively modern device, it was first invented over a century ago and took over eight decades to reach the market. Since their introduction to the public in 1975, smoke detectors have become an essential device in most homes and businesses, and have been credited with reducing lives lost to fires by 50 percent.

The First Smoke Detector System was invented by George Andrew Darby in 1902 in England. Later in 1930's Swiss physicist Walter Jaeger also tried to invent a sensor that detected poisonous gas but the invention failed to detect the gas and only detected the smoke from his cigarette. [2] However, due to the cost of manufacturing electrical equipment, these models did not make much of an impact.

III. Objective

Telecommunication is a very important part of our life. We can use this technology in a very sophisticated area like safety and security purpose. Using the GSM technology, telecommunication can be Useful to save our life as well as our households from fire accidents which we have shown in this project. We have designed and developed an Arduino circuit with a smoke detector, an alarm and GSM module. When the smoke detector detects smoke the alarm rings immediately. Besides, there is a GSM module where a SIM card is installed and a phone number is programmed. The SIM card sends message to the phone number that is programmed in the system. So someone can be aware about the fire accidents even if he/she is not in home at the moment.

Smoke detectors are one of the easiest and the cheapest electronic equipment that can save us from both physical and financial loss. Studies have shown that an early fire warning and use of smoke detection systems has resulted in a significant reduction in overall fire deaths. The sooner a fire is detected, the better the chances are for the survival of lives in danger, and for the reduction of property damage. Smoke Detector Circuits are very important devices to detect fire in the right time and prevent any damage to people or property. Smoke Sensors are a part of the security systems which help in detecting or preventing damage. Installing Smoke Sensors in commercial buildings like offices, movie theatres, shopping malls and other public places is compulsory.

IV. Tools Used

As this product is a hardware based product so we have used many hardware components to take on the input and display the output. The Combination of hardwares used are programmed using Arduino.

a. Arduino UNO

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. Arduino is an open-source electronics platform based on easy-to-use hardware and software. [4]

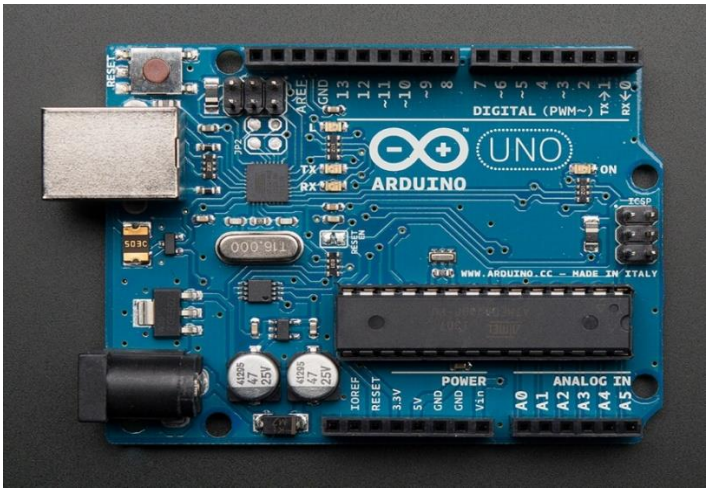

Fig: Arduino UNO

b. MQ-2 Gas Sensor

MQ-2 Gas Sensor module is useful for gas leakage detection (home and industry). It is suitable for detecting H2, LPG, CH4, CO, Alcohol, Smoke or Propane. Due to its high sensitivity and fast response time, measurement can be taken as soon as possible. The gas detected by this Sensor is mostly measured in Normal Cubic Meter(Nm^3) .The output voltage from the gas sensor increases when the concentration of gas increases. Sensitivity can be adjusted by rotating the potentiometer. [3]

Fig: MQ-2 Gas Sensor

c. GSM Module (SIM900A)

This is an ultra-compact and reliable wireless module. The SIM900A is a complete Dual-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900A delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a

small form factor and with low power consumption. With a tiny configuration of 24mmx24mmx3mm, SIM900A can fit in almost all the space requirements in user applications, especially for slim and compact demand of design.

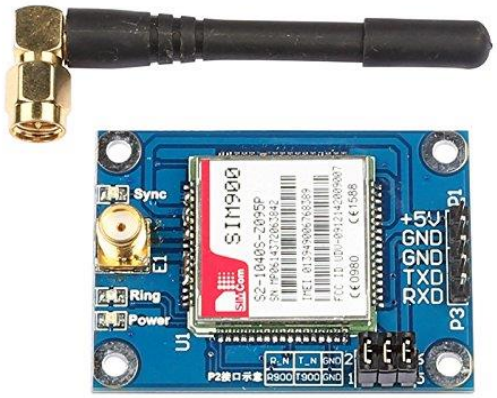

Fig: SIM900A GSM Module

d. Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

Fig: Buzzer

e. LED

A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p–n junction diode that emits light when activated. When a suitable current is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons.

Fig: Light Emitting Diode (LED)

f. Breadboard

A breadboard is a solderless device for temporary prototype with electronics and test circuit designs. Most electronic components in electronic circuits can be interconnected by inserting their leads or terminals into the holes and then making connections through wires where appropriate.

Fig:Breadboard

g. Jumper Wires

A Jumper Wire is an electrical wire, or group of them in a cable, with a connector or pin at each end, which is normally used to interconnect the components of

a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

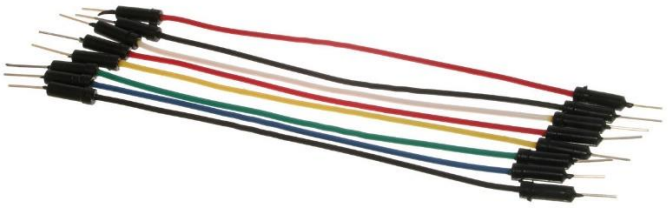

Fig: Jumper Wires

V. Methodology

At first we have interfaced MQ-2 Gas Sensor, Buzzer, LED and GSM Module with an Arduino Using Jumper Wires .A breadboard was used to make all the connections. We have taken Input with the help of MQ-2 Gas Sensor .the input taken is then compared with the threshold value that we have programmed. If the input value exceeds the threshold value then the buzzer starts triggering and the Red Led gets on .As soon as Buzzer produces the sound, the GSM module sends the message to the number which we have set in the program. All the loose Connections were checked again and fixed accordingly then the final packaging of the product was done. The final packaging was done when a matchstick was burned and the smoke detected crossed the threshold of the gas sensor which sounded the buzzer and turned the light to Red, eventually receiving a message that there is a smoke in the room. Finally, A hardware Based Smoke Gas Detector with GSM Module was successfully designed and tested.

VI. Circuit Diagram

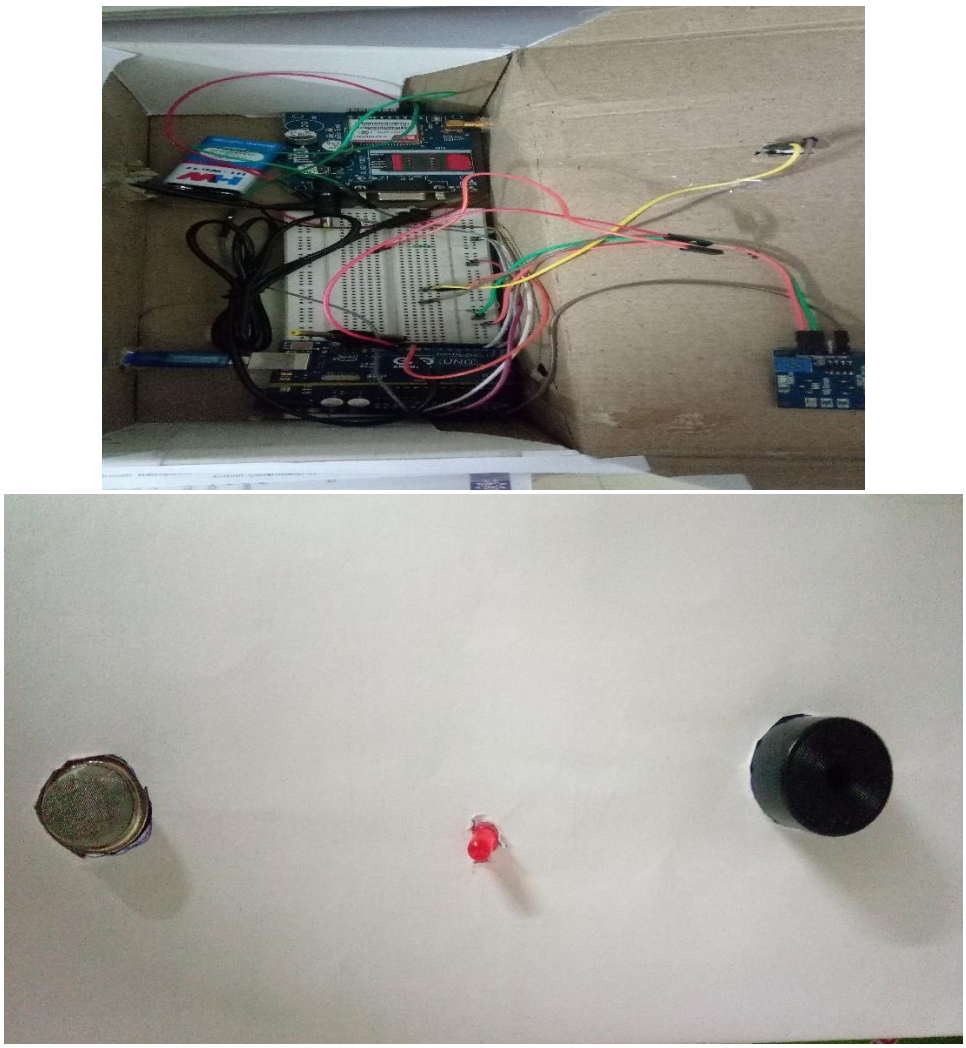

Fig: Circuit Diagram

VII. Results And Discussion

With the assembly of the various components in the circuit we were able to detect Alcohol, Smoke and Perfume. For each gas a particular code has to be written and then uploaded to the Arduino board. We developed this product on the basis to detect the smoke. A particular code was written and executed successfully to perform the smoke detection using the MQ-2 Gas Sensor and sending message using SIM 900A GSM Module. We have written the code in such a way that we can increase or

decrease the smoke threshold in order to meet the requirement of a particular house, commercial building, bank, factory and many other infrastructures. Threshold value differs according to the location so this is a minimum requirement as a code in order for the smoke detector alarm system to work. After Successful Completion of the product, we were able to test working of all the component and finally a gas detection and alerting process was tested successfully so the result was as expected for some gases.

VIII. Conclusion and Future Development

The Smoke Detector Alarm System using GSM Communication has been designed and developed for making our life easier and secured. We have used the GSM module for sending the message to the concerned body after receiving signal from the Arduino. Finally, we have designed and developed the whole system and tested using matchsticks, Alcohol and perfume. We have fixed all the problems encountered during the design and testing of the system. Finally, we have successfully achieved our goals. After successful Completion of this product, it can be concluded that Smoke Detector System along with GSM Communication makes the life of people more safe .Such Systems Have a Huge importance in Schools, hospitals, Shopping Malls and other places where small mistakes can lead to fire. So, our Smoke Detector System using GSM communication is suitable.

This Product can be further developed by adding multiple number of features in it as per the requirement of the situation. A door Unlocking Mechanism can be implemented in it so that when the room is full of smoke then the door can be automatically opened .Along with the Detection System, A fire Extinguisher can be attached so that damages can be reduced more. Hence, This Product Can Be Made More Precise and Useful by adding many more Features in it along with the Requirement of the Environment.

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