Home Catastrophe Detection System

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Abstract— Using Arduino and GSM technology, the suggested security system is created to deliver real-time notifications for fire, gas, smoke, and PIR (Passive Infrared) sensors. The system includes motion-detecting PIR sensors as well as sensors that can detect the presence of gas, smoke, and fire. The system promptly notifies the chosen recipient(s) using GSM technology after detecting any of these occurrences to ensure quick response and action. The sensor data is processed by the Arduino board, which also controls the GSM module to start the notifications. This security system is an important safety safeguard for residential and commercial properties by providing a dependable and effective solution for the early detection of potential hazards.

Keywords—Arduino uno, GSM module, IR sensor, fire sensor, smoke sensor, gas sensor, Buzzer.

I. INTRODUCTION

Systems for detecting house catastrophes are essential for guaranteeing the security of homes and stopping catastrophic occurrences like fires and gas leaks. These systems are growing more complex as we utilise technology more frequently in our daily lives. The home disaster detection system, which uses a GSM sim tool and Arduino along with a fire sensor, gas sensor, IR sensor, and smoke sensor, is one such system that makes use of current technology. This system employs sensors positioned thoughtfully all over the house to look for possible dangers like fire, gas leaks, and smoke. Although the gas sensor can detect the presence of hazardous gases like propane and methane, the fire sensor can detect flames and high temperatures. The IR sensor can identify temperature changes, and the smoke sensor is capable of identifying smoke particles. This system uses a GSM sim tool and Arduino technology to warn the homeowner's mobile phone in real-time in addition to identifying possible threats. Homeowners may take prompt action to safeguard their homes and loved ones from potential dangers thanks to this cutting-edge technology.

Overall, a strong tool for protecting houses and averting catastrophic occurrences is the home catastrophe warning system using a fire sensor, gas sensor, IR sensor, smoke sensor, GSM sim tool, and Arduino. This system is fast turning into a crucial part of home safety and security thanks to its cutting-edge technology and real-time warnings.

II. PROPOSED METHOD

In this proposed method we use different sensors like IR sensor, flame sensor, smoke sensor, and gas sensor. These are used to monitor the home catastrophes like trespassing, fire accident, and gas leakages which are detected by these sensors based on the response given by these sensors Arduino will trigger a buzzer to alert the surroundings and a gsm sim tool to alert the owner through notification message and as well as appropriate departments, which will help to react faster and helps to save lives and resources.

III.LITERATURE SURVEY

A gadget or group of devices known as a "home catastrophe detection system" allow users to monitor and manage many elements of their homes from a distance. It can incorporate gadgets like IR sensors, gas sensors, fire sensors, smoke sensors, and many more. Using the Gem Sim tool and an Arduino Uno, we will examine the application of these sensors in a home management system in this examination of the literature.

Infrared (PIR) sensors : these are used in this system to identify the presence of individuals in a room or other living areas. The sensor operates by sensing the reflected radiation. This may be used to tell when a room is vacant or when someone enters. Energy may

be saved by using PIR sensors in a home management system to switch off lights and appliances while no one is in the room.

Gas Sensor: Gas sensors are used in home management systems to find dangerous gases like natural gas and carbon monoxide. These sensors are crucial for making sure the home's residents are safe. The system may notify the homeowner and take necessary action, such as cutting off gas lines or calling emergency services when the gas sensors detect a high quantity of gas.

fire sensor: These sensors can inform people if they find smoke or heat in the house. To put out the fire, either the homeowner or a sprinkler system might be used. Fire sensors can protect homes from severe damage and save lives.

Smoke Sensor: Smoke sensors are used to find out whether there is smoke within a house. These sensors can warn the homeowner of a probable fire by spotting airborne particles. For increased safety, smoke sensors and fire sensors are frequently used together.

GSM SIM tool: It is primarily made for mobile devices to make removing and inserting SIM cards easier. To provide cellular connectivity in the event of a network outage or to enable remote access and control through a mobile device, certain home security management systems, however, may employ a GSM module or SIM card. In these situations, a GSM SIM tool may be used to remove or reinstall the SIM card in the module or control panel, but it wouldn't directly affect the system's overall security management.

Home catastrophe detection systems frequently employ the microcontroller board known as Arduino Uno. The board is simple to use and may be configured to control different system components. Infrared sensors, gas sensors, and fire sensors may all be controlled by an Arduino Uno.

By helping this whole combined control system the user can comfortably secure his properties.

IV. METHODOLOGY

The basic block diagram for the implementation of the project is as shown in figure1.

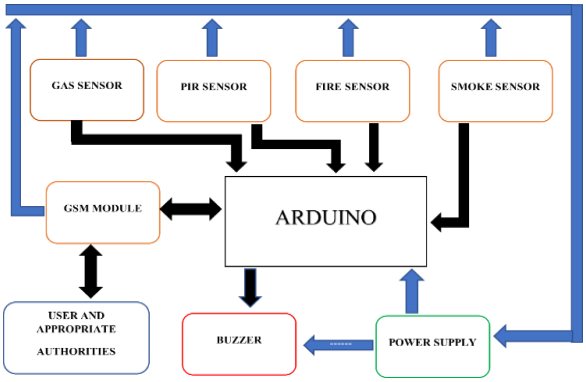

Figure .1

A.Arduino Uno

The C/C++ programming language has been streamlined for use with Arduino. The Arduino can be programmed if you are comfortable with C. There's no need to fret if you don't know C because only a few instructions are required to carry out useful tasks.

The ability to write a control programme on the host Computer and have it run from the top each time the reset button is pressed is a key feature of the Arduino. The Arduino board should be de-bacterized and stored in a closet for six months. The most recent programme you stored will start when the battery is reconnected. To build and debug your software, you link the board to the host PC, but after that's done, you no longer need to do so.

Figure. 2

Pin description:

Vin: This is the Arduino board's input voltage pin used to supply input power from an external power source.

The Arduino board's 5V pin serves as a controlled power supply voltage, supplying power to both the board and its internal components.
3.3V: This board pin is used to deliver a 3.3V supply that is produced by a voltage regulator on the board.
GND: The Arduino board is grounded via this board pin.
Reset: It is used to reset the microcontroller. The microcontroller is reset with its help of it.
Analog Pins: The analogue input range for the pins A0 to A5 is 0 to 5 volts.
Digital Pins: The Arduino board's pins 0 to 13 are utilised as digital inputs or outputs.
Serial pins: Another name for these pins is a UART pin. The Arduino board and other devices may communicate with one another via it. Data is transmitted and received, respectively, using pins numbered 1 and 0 for the transmitter and receiver, respectively.
Pins for External Interrupts: The Arduino board's pins 2 and 3 work together to create the external interrupt.
PWM Pins: These pins on the board are used to change the pulse width to transform a digital signal into an analogue signal. PWM pins are utilised on pins 3,5,6,9,10, and 11.
SPI Pins: Using the SPI library, this Serial Peripheral Interface pin is utilised to sustain SPI connection. SPI pins consist of:
Pin 10 serves as the Slave Select, while Pin 11 serves as the Master Out Slave. While using MISO, pin 12 serves as a Master In Slave Out.
SCK: The serial clock is activated by pin number 13.
LED Pin: The board uses digital pin 13 to power an integrated LED. Only when the digital pin is high does the LED begin to shine.
AREF Pin: The Arduino board's AREF pin serves as an analogue reference. It serves as a reference voltage source from an external power source.

B. PIR Sensor

An electrical sensor known as a PIR (Passive Infrared) sensor detects motion by detecting variations in infrared light. It is frequently used in security systems, lighting that turns on when motion is detected, and other situations.

Figure.3

Pin Specification:

VCC: This pin serves as the device's power supply and is generally wired to a 3-5 volt s DC power supply.
GND: It is normally connected to the power supply's ground.
OUT: This is the output pin, which is often a digital output that toggles from high to low depending on whether motion is being detected.

Working:

A PIR sensor detects variations in infrared radiation to function. There are two infrared-sensitive sensors on it, and a small strip of material separates them. The temperature of an object changes as it moves in front of the sensor, and the sensors are able to detect this temperature change. Following that, the sensor signals the output pin that motion has been detected.
It is significant to remember that PIR sensors are passive, which means they don't produce their own light or energy. They can only pick up radiation that is emitted by other things. Their energy efficiency makes them perfect for battery-powered gadgets.

C. Smoke Sensor:

The MQ2 sensor is a gas detector that can pick up smoke, LPG, propane, and other gases. It operates on the idea that a chemical interaction between the gas and the sensor element results in a change in the sensor's resistance.

Figure.4

Working:
Tin dioxide (SnO2) film serves as the detecting element in the MQ2 sensor, which is heated by an internal heater. The tin dioxide layer on the sensor element interacts with gases as they come into touch with it, changing the resistance of the sensor. Gas presence or absence may be determined by measuring and interpreting the change in resistance, which is proportional to the gas concentration.

Pin Specification:
Typically, the MQ2 sensor has four pins:
VCC: This pin is attached to the circuit's positive supply voltage (usually 5V).
GND: The circuit's ground is linked to this pin.
AOUT: The analogue signal that comes out of this pin is inversely proportional to the gas concentration.
DOUT: This pin produces a digital signal (HIGH or LOW) that denotes whether there is gas present or not over a certain level.
The VCC pin, GND pin, and either the AOUT or DOUT pin to a microcontroller or other input device are commonly connected to the MQ2 sensor's pins in order to utilise it in a circuit. If you use the AOUT pin, you must link it to a microcontroller's analogue input pin; if you use the DOUT pin, It must be attached to a digital input pin. By adjusting the load resistor attached to the sensor's AOUT pin, the sensitivity of the sensor may be changed.

D. Fire Sensor:
A fire sensor is an instrument that looks for flames or fire. It normally operates by spotting temperature changes or by spotting the presence of smoke or other fire-related substances.

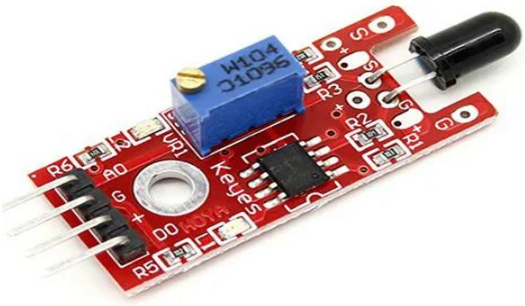

Figure.5

Working:
Temperature-based fire sensors: These sensors function by identifying the temperature increase brought on by fire. They have a thermocouple or thermistor inside that measures the temperature of the surroundings. The sensor sets out an alarm when the temperature goes over a certain threshold.

Pin Specification:
VCC: This pin is attached to the circuit's positive supply voltage(3.5v-5v).
GND: The circuit's ground is linked to this pin.
OUT: This pin emits either an analogue voltage signal (showing the presence of fire) or a digital signal (HIGH or LOW) indicating the absence of fire.
The VCC pin of a fire sensor should be connected to the positive supply voltage, the GND pin to the ground, and the OUT pin to a microcontroller or other digital /analogue input device in order to use it in a circuit. The microcontroller can use the signal to activate additional parts like a buzzer, a relay, or a display once the OUT pin sends an alert when a fire is detected.

E. GSM Sim Tool:
A GSM (Global System for Mobile Communications) module is a piece of hardware that permits mobile phone network connectivity. It normally comprises of a SIM card slot for storing the identification of a subscriber and a modem that may send and receive data over the cellular network.

Figure.6

Working:
Data transmission and reception through the cellular network are how a GSM module functions. It commonly uses AT (Attention) instructions to connect with a microcontroller or other digital device. The module initially connects to the cellular network via the SIM card in order to transfer data across it. The module may transmit and receive data via the

cellular network after a connection has been made, including text messages, voice calls, and internet data.
Pin Specification:
A GSM module's pinout generally contains the following pins:
VCC: This pin is attached to the circuit's positive supply voltage (usually 3.3V or 5V).
GND: The circuit's ground is linked to this pin.
TXD: Data is sent from the module to a microcontroller or other digital device using this pin.
RXD: Data from a microcontroller or other digital device is received on this pin.
Resetting the module to its default state requires using the RESET pin.
PWRKEY: To turn the module on and off, use this pin.
The TXD and RXD pins of a GSM module are normally connected to a microcontroller or other digital input/output device, while the VCC and GND pins are typically connected to a positive supply voltage and ground, respectively. The power and reset states of the module are managed by the RESET and PWRKEY pins. The TXD and RXD pins of the module are commonly used to deliver and receive AT commands via the cellular network.

F. Gas Sensor:
The MQ135 gas sensor module is frequently used to identify the presence of dangerous gases in the atmosphere. Nitrogen oxides (NOx), carbon monoxide (CO), ammonia (NH3), and other gases are among the principal gases that it is intended to detect.

Figure.7

Working:
The sensing element of the MQ135 gas sensor module is made of a metal oxide semiconductor (MOS). The resistance of the sensor fluctuates when exposed to various gases since this MOS is quite sensitive to them. An analog-to-digital converter (ADC) included inside the sensor module analyses variations in resistance and generates an analogue voltage proportionate to the gas concentration. A microcontroller may then transform the analogue voltage into a digital value.
Pin Specification:
Typically, the MQ135 sensor module has four pins:
VCC: This pin is attached to the circuit's positive supply voltage (usually 5V).
GND: The circuit's ground is linked to this pin.
AOUT: This pin generates an analogue voltage proportionate to the amount of gas the sensor detects.
DOUT: This pin generates a digital signal (HIGH or LOW) that denotes whether a specific amount of gas concentration is present or not. A potentiometer on the module may be used to change the threshold level.
You normally link the VCC pin to the positive supply voltage, the GND pin to ground, and either the AOUT or DOUT pin to a microcontroller or other digital device to utilise the MQ135 sensor module in a circuit.

G. Buzzer:
A beeper or buzzer, for example, might be electromechanical, piezoelectric, or mechanical in design. The signal is converted from audio to sound as its primary function. It is often powered by DC voltage and used in timers, alarm clocks, printers, computers, and other electronic equipment. It may produce a variety of sounds, including alarm, music, bell, and siren, according on the varied designs.

Figure.8

The buzzer's pin configuration is seen below. It has two pins: a positive pin and a negative pin. The "+" sign or a longer terminal is used to indicate this's positive terminal. The positive terminal is represented by the "+" sign or long terminal, and it is linked to the GND terminal. This terminal is supplied by 6 volts.

V.CONCLUSION

This proposed method can perform tasks like take reading from different sensors like IR sensor, gas sensor, smoke sensor, fire sensor. when this sensor get's high or reaches limited value then the microcontroller will trigger gsm sim tool to send emergency call and messages to the owner and appropriate departments and also triggers buzzer to notify the surroundings

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