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GSM Based SMS Alert Fire Alarm System

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Abstract: ***The design of a fire alarm with Arduino-based system by means of GSM Module. The work purposely for house safety where the main point is to avoid the fire accidents occurred to the residents and the properties inside the house. In order to prevent losses accrued from fire accidents, various alarm systems have been developed such as smoke detectors, temperature sensor based systems etc. The design and implementation of a cost effective and reliable GSM based SMS Alert fire alarm system. The device will be able to monitor the temperature of the environment, the smoke level, send SMS alert to an inbuilt GSM number. When the system detects the temperature of 100C or more, it will immediately display an alert notification on LCD display and simultaneously sending an SMS alert to the users upon the high raise temperature in the house. This fire detection system consists of a smoke sensor, buzzer, LCD display and GSM module is interfaced with Arduino board.***
Keywords: Smoke sensor, GSM Module, Arduino, LED display, Buzzer

I. INTRODUCTION

The creating an automated fire alarm system by using Arduino which will detect fire. Alarm Systems are fundamental for security reasons. In this work have taken a smoke sensor where the sensor will sense the fire. The GSM module is used to transmit the message if the smoke sensor senses any fire well in advance so that further damage can be prevented. There are many applications where this project could be employed. The importance of work to give an alert when there is a fire and sensor will detect the fire. A fire alarm system is number of devices working together to detect and warn people through visual and audio appliances when smoke, fire, carbon monoxide or other emergencies are present. These alarms may be activated automatically from smoke detectors, heat detectors. There can also be a buzzer when the smoke detector detects the fire it starts to make a sound and send the SMS alert "Fire is detected" to the owner number.

The development of fire alert is built based on Arduino board as the main controller board that interacts with GSM module which works in the communication part. The interaction is for the user to know the current situation in the house. This system works totally on wireless network communication as GSM module is performed by sending an SMS to the user. The GSM Module is responsible for the communication part. It takes information from the Arduino on where to send information and what information needs to be sent. It uses a GSM SIM card for communication purposes. It is basically just a modem which uses serial communication to interface with and needs Hayes compatible AT commands for communicating with the Arduino. The alert message and the phone number of the recipient are given by the user through the project codes. As soon as fire is detected (temperature will hit certain temperature limit) an SMS will be sent to the recipient's phone number from the SIM card inserted into the module for giving information to the user upon fire detection in the house.

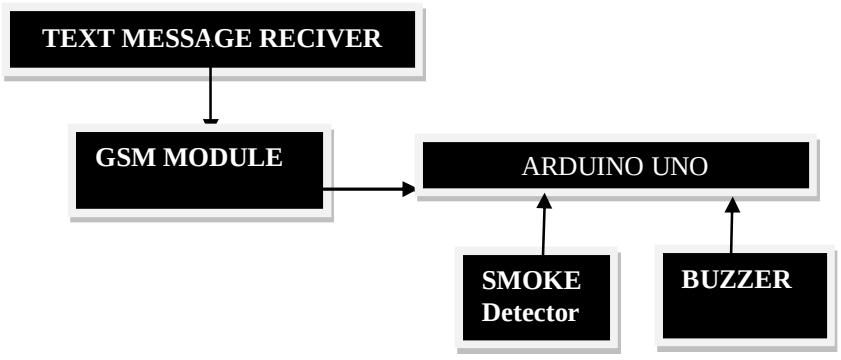


Fig 1: Block Diagram of Fire Alarm System

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II. LITERATURE SURVEY

In[10] Sensor based smart fire detection and smart fire alarm system use of different IOT devices for home automation has become very popular in recent years. Fire detection and avoidance of fire accidents is one of the necessary and important application of home automation using IOT. This prototype system can help users to improve their safety standards with immediate response by preventing accidents. This will eventually allow both the lives and the properties from the disaster. The functions of each module and its implementation are described in detail.

In [11] Iot based fire alarm system Observation center ride.-Organize hierarchical wireless sensor networks. The test results of the prototype system show that the automatic fire alarm system meets the design requirements. The project mainly includes the development and implementation of monitoring and fire extinguishing systems based on wireless sensor networks. The fire monitoring system continuously monitors the environment and records the registered temperature and intruders detected by the monitoring nodes. Once the fire extinguishing system detects a fire or the temperature exceeds the allowable value, it will activate the fire extinguisher.

Authors	Paper	Components	Application/Remarks
Ahmad A. A. Alkhatib [2]	"A Review on Forest Fire Detection Techniques",	Optical sensor and the Digital camera	This work will summarise all the technologies that have been used for forest fire detection with exhaustive surveys of their techniques/methods used in this application.
Mohamed Hefeeda and Majid Bagheri [5]	"Wireless Sensor Networks for Early Detection of Forest Fires",	Sensor networks Fire weather index system	do this by ana- lyzing the Fire Weather Index (FWI) System, and show how its different components can be used in designing efficient fire detection systems. The FWI System is one of the most comprehensive forest fire danger rating systems in North America, and it is backed by several decades of forestry re-search do this by ana- lyzing the Fire Weather Index (FWI) System, and show how its different components can be used in designing efficient fire detection systems. The FWI System is one of the most comprehensive forest fire danger rating systems in North America, and it is backed by several decades of forestry re-search do this by ana- lyzing the Fire Weather Index (FWI) System, and show how its different components can be used in designing efficient fire detection systems. The FWI System is one of the most comprehensive forest fire danger rating systems in North America, and it is backed by several decades of forestry re-search Presented the design of a wireless sensor network for a early forest fire detection. our design is based on the Fire Weather Index(FWI) system.
J. H. Li, X. H. Zou, and W. Lu [6]	'The Design and Implementation of Fire Smoke Detection System Based on FPGA'	GSM module , Fire sensor	The aim of the system designed is to alert the distant property-owner efficiently and quickly by sending short message (SMS) via GSM network. The system is implemented on printed circuit board (PCB) and tested under different experimental conditions to evaluate its performances.
L. Zhang and G.	'Design and	RF Chipset CC1100	In this paper, an automatic fire alarm system based on

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Wang, [7]	Implementation of Automatic Fire Alarm System based on Wireless Sensor Works'	Communication Protocol GSM module	wireless sensor networks is designed and developed with emphasis on the network architecture and communication protocol. Prototype system tests show that the system provides early extinguishing of a fire disaster so that damages will be reduced effectively.
Jaime Lloret , Miguel Garcia, Diana Bri and Sandra Sendra[8]	" A Wireless Sensor Network Deployment for Rural and Forest Fire Detection and Verification",	Deployment; fire detection; verification; wireless sensor networks.	In this paper we show all the steps followed to perform the design, research and development of a wireless multisensor network which mixes sensors with IP cameras in a wireless network in order to detect and verify fire in rural and forest
A. Cote and P. Bugbee, [12]	Design Of GSM Based Smoke Detection And Temperature Monitoring System	Microcontroller, Temperature Sensor, smoke sensor, LCD displays, Embedded-C, GSM Modem, Keil software.	This paper is embedded based, embedded means dumping of software in to the hardware. Here, software code is written by using Embedded-C and it is debugged with the help of micro vision Keil. Keil software generates asm file and converts it into hex fil
Joseph Ilouno, Gesa- Felix Newton and Tom-P Fom [13]	Design and Implementation of Automatic GSM Based Fire Alarm System	Fire Alarm System, Fire-Detector, GSM Network, Arduino Uno Microcontroller	. In order to prevent losses accrued from fire accidents, various alarm systems have been developed such as smoke detectors, temperature sensor based systems. The device will be able to monitor the temperature of the environment, the smoke level, send SMS alert to an inbuilt GSM number when necessary, and make loud sound to alert occupants on pending danger.

III. METHOD

Interfacing GSM Module to Arduino Uno Board: There are two ways of connecting GSM module to Arduino. In any case, the communication between Arduino and GSM module is serial. So it is expected to use serial pins of Arduino (Rx and Tx). Considering this method, the Tx pin of GSM module is connected to Rx pin of Arduino and Rx pin of GSM module to Tx pin of Arduino. Now the ground pin of the Arduino is connected to ground pin of GSM module. So that's all the connections required to allow communication between the Arduino and the GSM module and the wiring is over. Now one can load different programs to communicate with GSM module and make it work. The problem with this connection is that, while programming, Arduino uses serial ports to load program from the Arduino IDE. If these pins are used in wiring, the program will not be loaded successfully to Arduino. So you have to disconnect wiring in Rx and Tx each time you burn the program to Arduino. Once the program is loaded successfully, you can reconnect these pins and have the system working.

To avoid difficulty, it is preferable to use an alternate method in which two digital pins of Arduino are used for serial communication. Two PWM enabled pins of Arduino need to be selected for this method. So I choose pins 9 and 10 (which are PWM enabled pins). This method is made possible with the Software Serial Library of Arduino. Software Serial is a library of Arduino which enables serial data communication through other digital pins of Arduino. The library replicates hardware functions and handles the task of serial communication.

A. Interfacing LCD to Arduino

The RS pin of the LCD module is connected to digital pin 12 of the Arduino. R/W pin of the LCD is grounded. Enable pin of the LCD module is connected to digital pin 11 of the Arduino. The LCD module and Arduino are interfaced in a 4-bit mode. This means only four of the digital input lines (DB4 to DB7) of the LCD are used. Below is the description of the LCD module pins:

1) *Pin 1 (Vss):* Ground pin of the LCD module.
2) *Pin 2 (Vcc):* Power to LCD module (+5V supply is given to this pin).
3) *Pin 3 (VEE):* Contrast adjustment pin. This is done by connecting the ends of a 10K potentiometer to +5V and ground and then connecting the slider pin to the VEE pin. The voltage at the VEE pin defines the contrast. The normal setting is between 0.4 and 0.9V.

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4) *Pin 4 (RS):* Register select pin. The JHD162A has two registers namely command register and data register. Logic HIGH at RS pin selects data register and logic LOW at RS pin selects command register. If the RS pin is HIGH and feeds an input to the data lines (DB0 to DB7), it will be treated as data to be displayed on LCD screen. If we make the RS pin LOW and feed an input to the data lines, then this will be treated as a command (a command to be written to LCD controller – like positioning cursor or clear screen or scroll).
5) *Pin 5 (R/W):* Read/Write modes. This pin is used for selecting between read and write modes. Logic HIGH at this pin activates read mode and logic LOW at this pin activates write mode.
6) *Pin 6 (E):* This pin is meant for enabling the LCD module. A HIGH to LOW signal at this pin will enable the module.
7) *Pin 7 (DB0) to Pin14 (DB7):* These are data pins. The commands and data are fed to the LCD module through these pins.
8) *Pin 15 (LED+):* Anode of the back light LED. When operated on 5V, a 560 ohm resistor should be connected in series to this pin. In Arduino based projects the back light LED can be powered from the 3.3V source on the Arduino board.
9) *Pin16 (LED-):* Cathode of the back light LED.

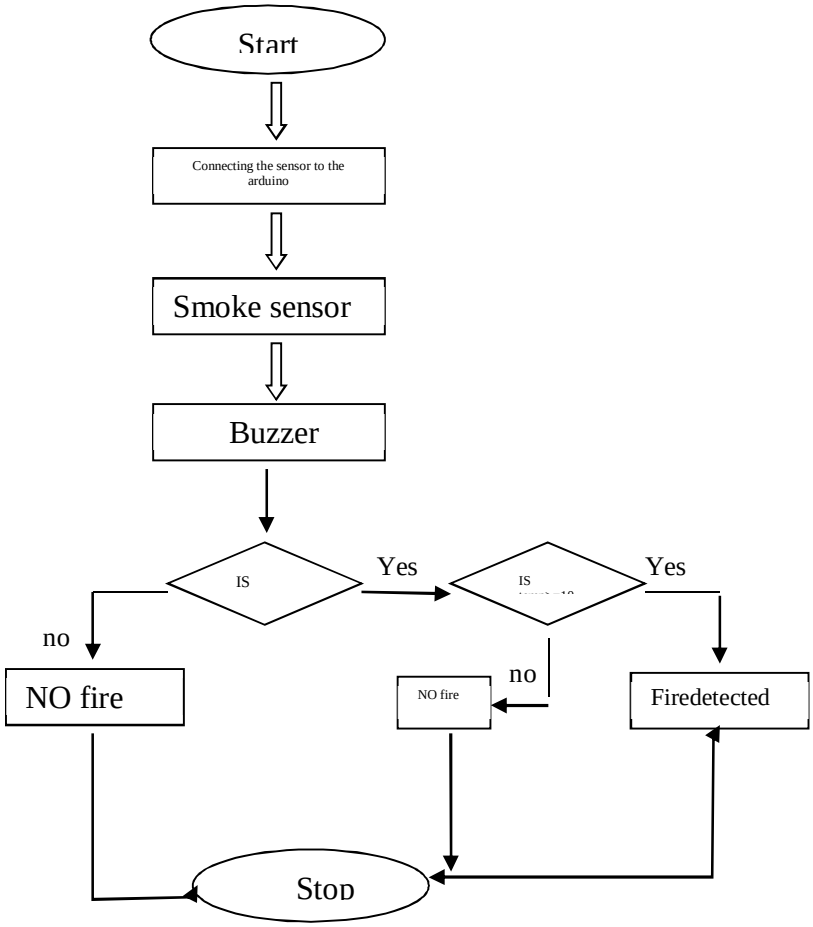


Fig 2: work flow of the fire detection system

When the smoke or the fire is detected by the smoke sensor when the fire heat is reach 100c or above 100>= then is sense the fire and it send the fire alert SMS to the number which is saved in the coding. In the LED display when the power supply is given it shows the Fire Alert after it shows “No Fire” when the fire is detected it shows “Fire Detected”. With the help of the GSM module it is used for communication with the help of this GSM module it sends the SMS alert that “Fire is detected”.

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```
Lcd.clear ();
Int value=analogRead (A0);
Serial.Pirntln (A0);
If(value>=100) //if the value of the fire is greater then or equal to 100 degree Celsius
then
lcd.setCursor(0,0);
lcd.print("FireDetected");
Serial.println("FireDetected");
digitalWrite(led,HIGH);
digitalWrite(buzzer,HIGH);
SendMessage();
```

IV. RESULTS AND DISCUSSION

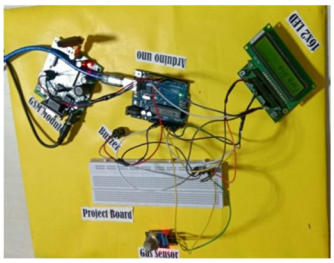


Fig: 3 Working of GSM Module

GSM based fire alarm system works based on the GSM module where when the gas detector detect the fire in the surroundings then it sends the signal to the arduino where it immediately sends the signal to both buzzer and the gsm module to make the owner alert that tae fire has been detected through the help of the GSM module the text alert message 'Fire detected' is sent to the multiple numbers which are added in the coding.

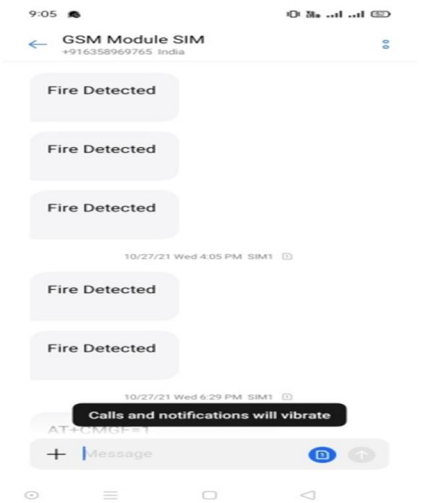


Fig:4 Message alert of Fire Alarm System

The fire alarm system works based on GSM module where GSM module sends a text message to the user's number from the SIM Card that is inserted in to the module. The code run on the Arduino determines which number to send message, and how many times message needs to be sent, if the fire takes place the temperature of the surroundings start increasing as soon as temperature crosses a threshold value, the Arduino sends a signal to the GSM module to do its job. The GSM module sends the text message to the user number that "Fire is Detected".

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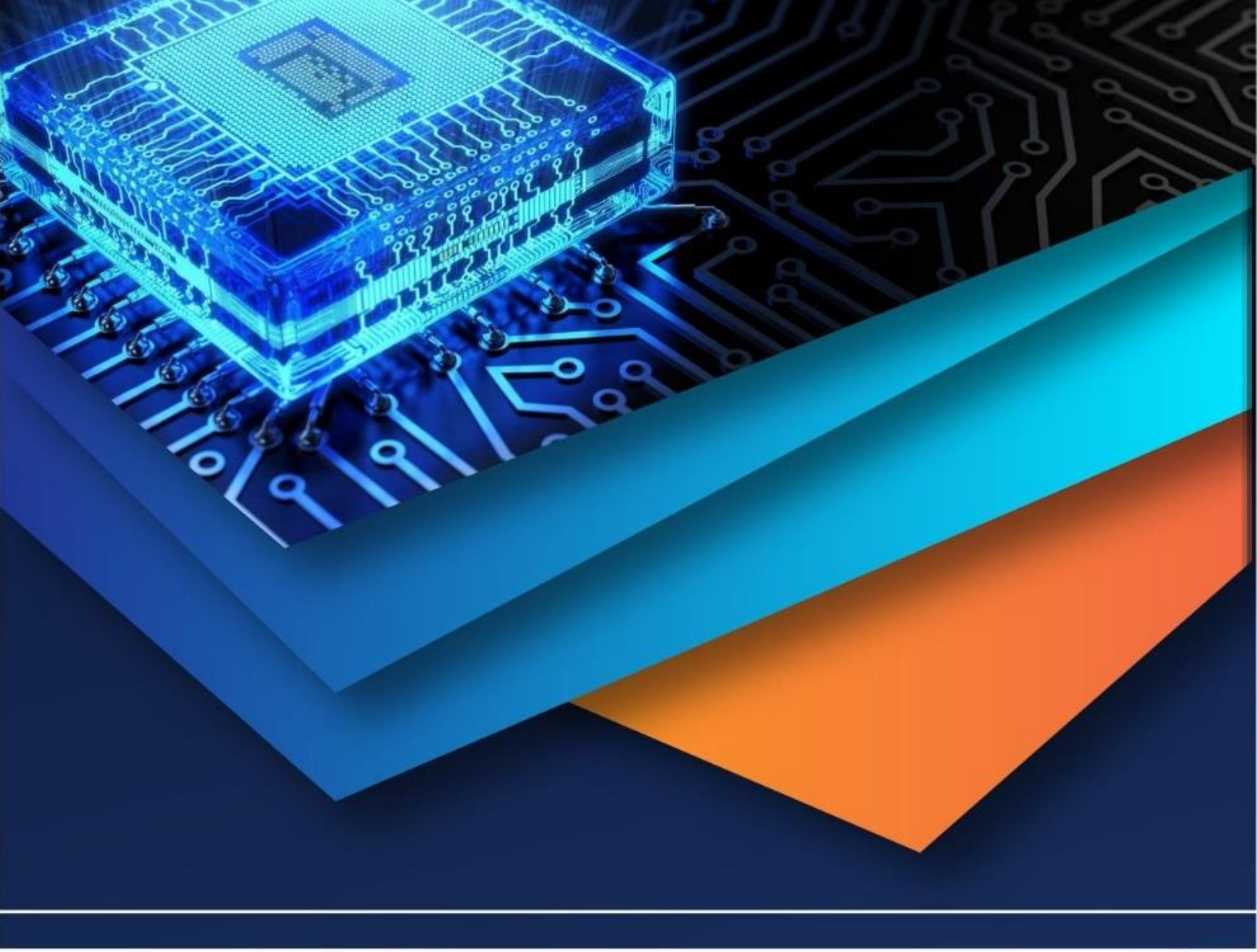
V. CONCLUSION

The proposed work has been made in order to help building owner to overcome the problem which is fire spreading whenever the owner is not in the building. The unpredictable situation or critical situation always occurs in the building or resident areas without the residents' notice. Based on the o, the home alert system is doable and functional to the residents to protect their houses. In fact the system built is cheap in value compared to other existing alarm system in the market and easy to apply to the houses. Proposed model can be applied in varied areas due to its flexibility and simplicity in handling; for instance in houses, hostels, hotel industries, factories, vehicle industries and many more areas which are related to the crowd, people or beneficial things. Users can simply apply the device in their interested area to protect the area from the existence of fire. Whenever the temperature reaches the limit (100C), the device will instantly alert the users by sending a message via GSM. It will make the users become aware of the dangerous situation and can easily prevent it from happening by quick prevention.

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