

MID TERM REPORT ON

IOT Based Fire Detection And Alarm

System

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## ABSTRACT:

This report describes the design of a home fire alarm with Arduino-based system by means of GSM Module. The project purposely is for house safety where the main point is to avoid the fire accidents occurred to the residents and the properties inside the house as well. It utilizes Arduino Uno board in conjunction with ATmega328 chip. The main controller used is certainly the ATmega328 which controls the home fire alert subjected to the temperature sensor. An LM35 temperature sensor is used to detect the heat from the fire. An alert message will be sent to the user via short message service (SMS) via GSM module. When the system detects the temperature of 400C 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. Results from the test are documented and discussed. Through this system, it can help users to improve their safety standards by having immediate response in preventing accidents. This will eventually allow the users to protect their lives and the properties as well from the disaster.

**INTRODUCTION:**

Amongst the occurred disasters happened in the resident area, fires have been known as the dangerous tragedy that could cause destruction, property and life losses [1]–[4]. In many disasters, fires have become recurrent, destructive and most influential disasters if compared to others hazards. With the rapid development of urban construction, the occurrence probability of the great fire and other special disaster also increased year by year [5]–[7]. Fires in the early detection and early warning are two important ways to extinguish the fire promptly and avoid great casualties and property loss. Therefore, the requirement of placing intelligent fire alarm system is important within buildings especially in the buildings where contain many people inside or valuable belongings. According to the statistic stated by Fire and Rescue Department of Malaysia (JBPM), in 2016 only, almost 5500 of fire cases reported are concerned with the households followed by transportations, electrical appliances and leaking gasses [8]. Fires in the households are often triggered by many common factors investigated which are from cooking equipment, smoking in the house, electrical appliances, candles, curious children, faulty wiring and many more. If the fire occurs when the residents are in the house, the possibility to extinguish the fire is a bit high. It is because the residents themselves can take immediate precaution from the fire to be spread all over by using fire extinguisher or call the fireman instantly. The main concern of this project is when the residents are not at home or are not aware of the existence of the fire in the house. Having said that, the home fire alert is purposely designed to alert the house residents whenever any possibilities for having fire disaster prompted in their house. For this project, the development of home 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 microcontroller inside the Arduino board is used as the mastermind of the circuit where it controls the circuit flows and execute all the decision as well. The GSM Module is responsible for the communication part of the circuit. 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.

**EXISTING SYSTEM:**

Though wireless fire alarms have several advantages, there are a few drawbacks you should keep in  mind before installing one, including the following.

**DISADVANTAGES:**

**1-Range Limitations:**

Wireless fire alarms some factors affect limitation on all wireless networks and transmissions. As such, the range may suffer and cause difficulty in Wireless fire alarms some factors affect limitation on all wireless networks and transmissions. As such, the range may suffer and cause difficulty in establishing strong, reliable connections between components. While this may not matter in close confines or small homes, it could be a problem across great distances.

**2-Lack of Centralized Monitoring:**

Another problem associated with the use of wireless fire alarms is the lack of centralized monitoring. This often happens since wireless fire alarms do not connect to telephone lines that form links with fire departments and other emergency authorities.

**3-Hardware Is More Expensive:**

A disadvantage that people find when using a wireless fire alarm hookup is increased equipment charges. Installation costs are typically less with wireless systems, but the cost of the hardware is often higher. Depending on how many components are in a specific system, this can add a little or a lot to the upfront costs.

## PROPOSED SYSTEM:

When considering a wireless fire alarm system for your home, you need to know the factors that support its installation, including the following items below.

**ADVANTAGES:**

**1-EASY OF INSTALLATION:**

One advantage offered by wireless fire alarm systems is their ease of installation. Unlike wired systems, which require connections to residential power supplies and the routing of cables, you can install wireless systems relatively quickly and easily.

With a wireless fire alarm, most of the installation process centers around straightforward mechanical tasks, such as mounting devices to walls and other locations. Other quick wireless alarm installation tasks include setting up the system and making wifi connections.

**2-FUTURE EXPANSION FLEXIBILITY:**

Another advantage provided by wireless fire alarms includes expansion flexibility. Traditional wired systems make expansion more difficult by requiring new devices to be hardwired into an existing wired network.

However, you can easily add a wireless fire alarm device by making a few changes to software settings. That means all it takes is pressing a few buttons on a keyboard or keypad in many situations.

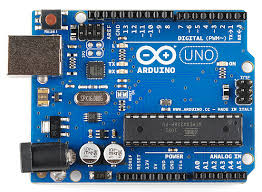
**3-BATTERY OPERATIONS:**

An advantage of wireless fire alarm systems is their reliance on battery power as opposed to AC wall power. Since batteries eliminate the need to tie into household power supplies, wireless fire alarms can function even when a home's electrical service is disconnected.

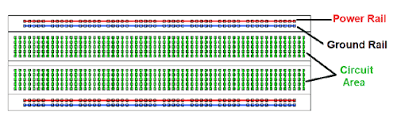
**HARDWARE DESCRIPTION:**

**1-ARDUINO:**

Arduino is the main board, microcontroller on it which is ATmega328 is used as the main controller to manage the circuit accordingly. It is a well-known open source microcontroller-based kit for creating digital devices and interactive tool that can interact with LEDs, LCD display, switches, buttons, motors, speakers and many more. The Arduino system offers a set of analog and digital pins that can be integrated to many other boards and circuits which absolutely have different functions in a design. Arduino board provides a USB serial communication interfaces for loading the codes from computer. To do the codes, Arduino has prepared its own software called integrated development environment (IDE) which completely supports C and C++ programming languages. shows the Arduino UNO board that is used throughout the project.

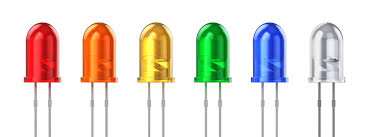


**2-BREAD BOARD:**

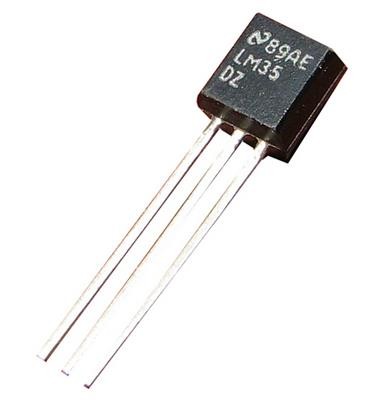
A thin plastic board used to hold electronic components (transistors, resistors, chips, etc.) that are wired together. Used to develop prototypes of electronic circuits. 

**3- LED(Light-emitting diode) :**

A Light-emitting diode(LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes. Releasing energy in the form of photons. The color of the light(corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the swmiconductor.

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**4-TEMPRATURE SENSOR:**

Other than the two main components mentioned, another component which is essential in this project is the temperature/heat sensor. LM35 is chosen for measuring the temperature since it is an analog and linear temperature sensor which has a linear relationship between output voltage and temperature changes (oC). Besides, the LM35 does not require external calibration to deliver the accuracy of ±(1/4)oC at room temperature or ±(8/4) oC at the temperature range of -55oC to +150oC [10]. Due to its low-input impedance, linear output, and accurate inherent calibration of LM35, it does make the sensor’s readout and control circuitry interfacing become easy [10], [11]. The device is usually used with single power supply or with plus or minus supplies It can receive an input range of -2V up to 35V and result the output voltage range of -1V to 6V. displays the LM35 sensor which is used to measure the temperature for this project.

**CODE**:

const int ledpin=13; // ledpin,flamepin and buzpin are not changed throughout the process

const int flamepin=A2;

const int buzpin=11;

const int threshold=200;// sets threshold value for flame sensor

int flamesensvalue=0; // initialize flamesensor reading

void setup() {

Serial.begin(9600);

pinMode(ledpin,OUTPUT);

pinMode(flamepin,INPUT);

pinMode(buzpin,OUTPUT);

}

void loop() {

flamesensvalue=analogRead(flamepin); // reads analog data from flame sensor

if (flamesensvalue<=threshold) { // compares reading from flame sensor with the threshold value

digitalWrite(ledpin,HIGH); //turns on led and buzzer

tone(buzpin,100);

delay(1000); //stops program for 1 second

}

else{

digitalWrite(ledpin,LOW); //turns led off led and buzzer

noTone(buzpin);

}

}

**CONCLUSION:**

This project 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 results obtained, 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. The ability to detect heat or high temperature is undeniable because of the use of LM35 in the system. This device 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 (40oC), the device will instantly alert the users by sending a message via GSM. This will make the users become aware of the dangerous situation and can easily prevent it from happening by quick prevention (use fire extinguisher, call firemen etc.)

## FUTURE SCOPE :

The proposed system deals with the detection of the fire. But this can be extended by using in proper manner we can avoid the problem like bushfire in Australia

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* + **WEBSITES:**

1. <https://en.wikipedia.org/wiki/Arduino>
2. <http://www.coastalwiki.org/wiki/Temperature_sensors>