

Remote Fire Detection System using Arduino

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Abstract— In today’s day to day life security and automation is in primary concerns of the industry. Nowadays, his approach is almost standardized to industrial and home automation and security system designing. Talking of automation and security system, telecommunication very a major key factor of the system. Hence by using GSM technology, telecommunication can be very conducive to save our lives as well as households as we have tried to show in this project. We have designed and developed an Arduino circuit with a sensor array of fire sensor (basically IR sensor) which detects The IR as fire radiate a large amount of IR light, with a smoke sensor and thermistor with an LCD display and an alarm with GSM sim900. When any one of the smoke, increased temperature or fire (in the form of IR light) is detected by the sensor, it is displayed by the LCD display as “Fire detected” and alarmed through a buzzer. Besides this, we have used the GSM module where an installed Sim card send a message as “fire detected” on a programmed number. With this the person concerned to the place of accident can be aware of the accident even if the person is away from the place of accident.

Key words: Fire Sensor, Gas Sensor, Temperature Sensor, Smoke Sensor

I. INTRODUCTION

For today’s life, for security purpose fire alarm system are very essential. For the survey, there is fire hazards in almost every field. This projects is based upon the embedded system. Now, by using GSM technology we have increased the efficiency of the Fire alarm system. Thermistors are widely used temperature sensor that are used in the fire alarm and detection system. We are using IR sensor array to detect fire which radiates IR light. With this project we are going to know more about fire, fire detection, precaution and protection.

II. SENSING DEVICE

- 1) Fire Sensor
- 2) Temperature sensor
- 3) Smoke Sensor

The main concern of this project is to detect fire. For this, we have used a fire sensor which is an array of the IR sensor for covering wide area. This fire sensor detects the IR light radiate by the fire. An IR sensor can measure the heat of an object as well as detects the motion.

III. ARCHITECTURE OF THE SYSTEM

The implementation of the project can be done on any level of security system. The architecture is mainly consisting of three components which are Arduino Uno, GSM Modem and the sensor devices which are fire sensor, temperature sensor and smoke sensor. The main function of the GSM module is to remotely communicate between the user and the controller through the RS 232 serial communication standard. The

sensor devices that are connected to the Arduino controller are fire sensor, smoke sensor and temperature sensor that sends the input signal to the controller for transmission of alert signal.

The Main controller that is Arduino continuously check the incoming inputs from the sensor devices. As soon as the controller detects any input from the sensors it sends the alert message in case of accident or emergency. The GSM module is programed with the number of user and the fire brigade. The GSM module is installed with a sim card which transmits the alert message to user and the fire brigade in case of emergency occurred.

IV. WORKING OF THE DEVICES

The working of the system is depend upon the sensor and controller working together. When the sensor detect any changes in the parameter regarding to heat and smoke it will give the input to the GSM module. Controller also gives the message display signal to the LCD. As the controller give signal to the GSM module which sends the information about fire to the programmed numbers through a sim card installed in GSM module through cellular network.



Fig. 1:

A. Sensors

There are three types of sensing devices used in this project that are fire, temperature and smoke sensor.

1) Fire Sensor

The fire sensor is a 5 channel flame detector module which is used to detect flame in aa wide area (>120degree). It detects the fire with 5 IR sensors which are arranged with 30degree each.



Fig. 2: Fire Sensor

The specification of the sensor are as follows:

- Detecting range : >120degree
- Operating voltage: 3.3V – 9V

- Dimensions : 5.2cm*5.0cm*1.4cm
 - Weight : 8g
 - Analog and digital outputs
 - On-board potentiometer and indicators
- 2) The temperature device used is the thermistor which is basically a resistance thermometer. Resistance thermometer are also known as resistance temperature detector (RTD).

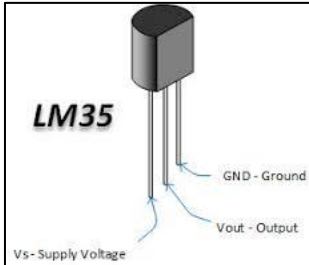


Fig. 3: RTD LM35

RTD's working principle is based on the change in resistance with change in temperature. The different materials used in the construction of the RTD results in the different relationship between resistance and temperature. Temperature sensing material used in the construction of RTDs includes platinum, nickel, and copper; in which platinum is most commonly used. The important characteristics of RTD are the temperature coefficient of resistance (TCR), the nominal resistance at 0degree Celcius, and tolerance classes.

A smoke detector is a device that senses smoke, typically as an indicator of fire. Commercial security devices issues a signal to a fire alarm panel as a part of a fire alarm system.



Fig. 4: Smoke Sensor

B. Controller & Transmitter

The controller used in the project is Arduino Uno. Out of whole Arduino family, UNO is the best board for the starters in electronics coding. Arduino UNO is a microcontroller board based on the ATmega328P, it has 14 digital input/output pins (out 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. The specifications of Arduino is given below:

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA

SRAM	2 KB (ATmega328)
Clock Speed	16 MHz
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by boot loader output
EEPROM	1 KB (ATmega328)



Fig. 5: Arduino UNO

For the transmission purpose we are using the GSM SIM900A module. GSM module is built with dual band GSM engine- SIM900A, which work on frequencies 900/1800 MHz. the module comes with RS232 interface, which allows user to connect PC as well as microcontroller with RS232 chip (MAX232). The baud rate is configurable from 9600-115200 through AT command. The GSM module is having internal TCP/IP stack to enable user to connect with cellular network suitable for sending SMS. Voice as well as DATA transfer application in M2M interface. The onboard regulated power supply allows user to connect wide range unregulated power supply. Using this module, user can make audio calls, SMS, read SMS, attend the incoming calls and internet etc., through simple AT commands. The specifications of the module are given below

- Quad-Band 850/ 900/ 1800/ 1900 MHz
- GPRS multi-slot class 10/8
- GPRS mobile station class B
- Compliant to GSM phase 2/2+
- Class 4 (2 W @850/ 900 MHz)
- Class 1 (1 W @ 1800/1900MHz)
- Dimensions: 24* 24 * 3 mm
- Weight: 3.4g
- Control via AT commands (GSM 07.07 ,07.05 and SIMCOM enhanced AT Commands)
- SIM application toolkit
- Supply voltage range 3.4 ... 4.5 V
- Low power consumption
- Operation temperature:
- -30 °C to +80 °C

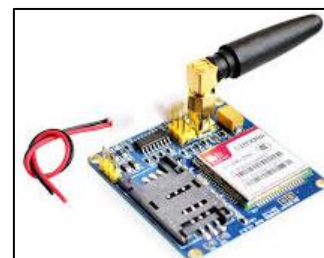


Fig. 6: GSM SIM900A

Interfacing with Controller and Transmission Unit

C. Interfacing of GSM900A with Arduino

As the fig shows the Arduino is interfaced with the GSM module. When the sensors gives the input signal in case of emergency it gives the signal to the GSM

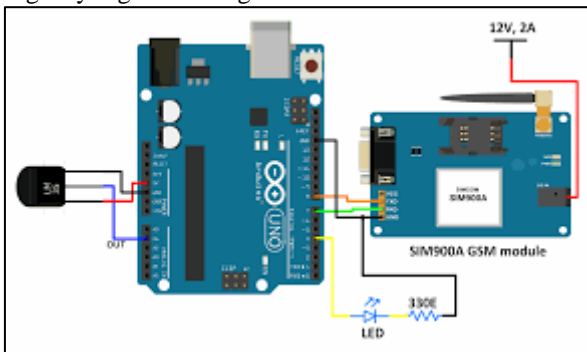


Fig. 7: Interfacing of GSM with Arduino

When the GSM gets to know about the emergency, it transmits the signal about the emergency to the user as well as the fire brigade as the number of either is programmed in the module. Besides this the problem is also shown on the LCD screen as LCD screen is also interfaced with the Arduino.

D. Interfacing of LCD with Arduino

The LCD is interfaced with the Arduino to show about the emergency alert. When the signal is given to the Arduino by the sensors, it gives the signal to show on the LCD.

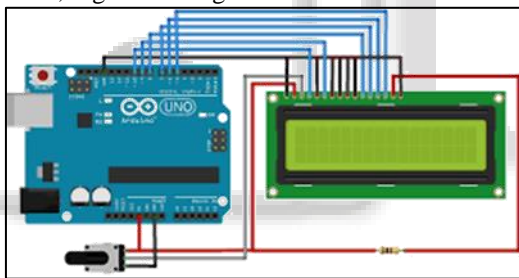


Fig. 8: Interfacing of LCD with Arduino

E. Interfacing of LM32 with Arduino

LM32 is the temperature sensor which detects the temperature in the environment. It is used in the project to detect the increase in the temperature that occurs in case of fire.

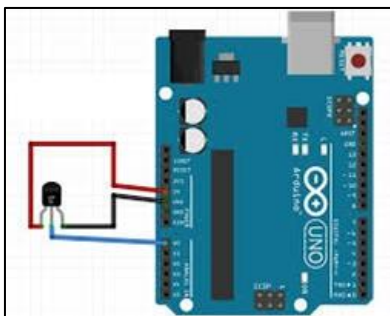


Fig. 9: Interfacing of Im35 with Arduino

V. CONCLUSION & FUTURE SCOPE

This project gives the scope to do a project which is low cost and user friendly. It is an error free system which gives the

real time security system developed with the simple hardware structure. It is enhancement of the previous fire security based system with the maximum reliability and and provides high degree of security and prevention of major accidents

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