

Rational Fire Revealing and Pictorial Guided Evacuation System Consuming Arduino and GSM

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Abstract- An example accomplished of distinguishing fire coincidence in actual time and as long as a pictorial management organization in circumstance of alternative in space Area is communicated in offered case. Project consumes binary parts hardware part and software part. The central and intellectual unit of the prototypical is arduino. "Hardware design comprises arduino, flame sensor, LEDs, liquid crystal display (LCD), buzzer, GSM. And software contains the programming of Arduino conferring to preparation of fire sensor and grounding of LED panels for supervisory emigration in case of fire". The sensor units are associated via common data line to ATMEL MEGA328P AU1722 Arduino. A SIM 800C GSM kit based network module, accomplished of operational in normal. GSM Bands has been recycled to send alert communication. The scheme is working on overall determination published circuit board (PCB).

Keywords- Arduino, Flame sensor, GSM Modem, SMS, LEDs.

I. INTRODUCTION

With the quick expansion of "economy, there has been an increase of the number of fire accidents in parking building car fire poses a significant danger to public security".

"It is challenging to smother flames by common Fire extinguishers, once vehicle fire occurs it spreads quickly, since cars include large numbers of flammable resources, such as fuel, plastic parts, interior lining and seats". "Thus, the study on car fire accidents has become one of the most essential research directions of fire safety science [1]". "Once a fire occurs in a Parking building, occupants may get into panic so it is vital to provide occupants appropriate information and guide them to the safe place effectively". "Thereby raising the need to develop a reliable system for fire detection and to guide occupants to evacuate safely".

II. DESIGN OF SYSTEM

Proposed project is covers of arduino, Input segment and output section.

"Arduino ATMEL mega328P is used; it acts as an interface between sensor and GSM. ATmega328 has 32kb flash memory, power supply of either 5V or 12V is needed, for this regulator namely LM7805 and LM7812 for maintaining the constant voltage".

"In input section flame sensors detect the fire in the parking building and in the output section it is having LCD, LEDs, Buzzer and GSM. LED is used to display the fire affected zone".

"A piezo buzzer is an audio signaling scheme used to alert the people in the vicinity. It produces sound when there is fire". "LEDs will guide the people to out of the building and GSM is used to send the alert message to the fire Brigade".

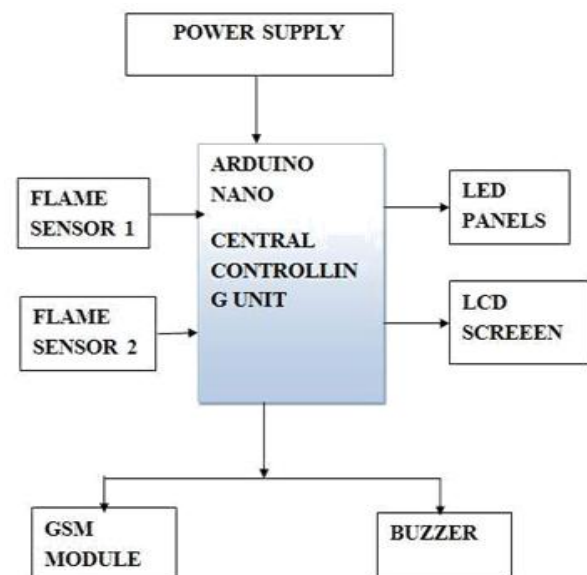


Fig 1. Block diagram of embedded system.

III. LITERATURE SURVEY

Papers followed for the implementation of the project are tabulated in the Table-2.1

Table 1. Papers referred for Design of project.

S.no.	Paper Title	Author	Sensor	Technology Used
1.	Decentralized Evacuation system based on occupants distribution and building information	Yaping Ma et.al	Fire detector sensors ,Zone detectors, elevator sensors, human tracking sensors, dynamic egress signs	Decentralized technology
2.	IoT-based Intelligent Fire Emergency Response System	Chang-Su Ryu	Flame sensor, Respberry Pi, GPS, Tiwilio communication	IOT (Internet of Things)
3.	Research intelligent fire evacuation system based on ant colony algorithm and MapX	Jing Yang et.al	Pheromone trails essence	Ant colony optimization
4.	Simulation of Intelligent Fire Detection and Alarm System for a Warship.	V.B. Patil et.al	Heat sensors, Flame sensors, Smoke sensors	Microcontroller based system
5.	Smart evacuation system	Muthupandian Mohan et.al	Human and fire detectors	IPS (Intrusion prevention system)
6.	Design of an Arduino-based home fire alarm system with GSM module.	N N Mahzan et al	Temperature sensor, GSM module	Arduino Based project
7.	Design of GSM based smoke detection and temperature monitoring system	Teji. Naga et. Al	Smoke sensors , Temperature sensors	Arduino UNO Based project

IV. METHODOLOGY

The proposal and “expansions of this project are separated into two key parts which are hardware architecture and software details”. “In the hardware architecture, the design of the circuit was constructed and the prototype of the project was built. While in the software development, the whole complete prototype was operated via programming codes”.

1. Hardware Architecture:

1.1 “Arduino is the key 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, GSM, flame sensor, buzzer and many more”.

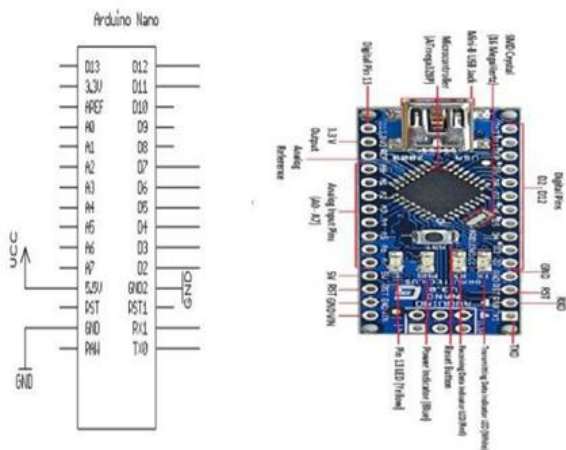


Fig 2. Arduino Nano board which uses microcontroller Atmega328 onboard.

“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”.

1.2 Flame sensor is searching to the fire and basically flame spectrum. “The way it works it just detects the light wave length between the ranges of 760nm-1100 nm, which is actually the range of typical infrared light. Its response time is very fast, which makes it a right choice to work with, for prototyping and experiment. There are digital and analog pin output with the module and a potentiometer to change the flame sensitivity”.

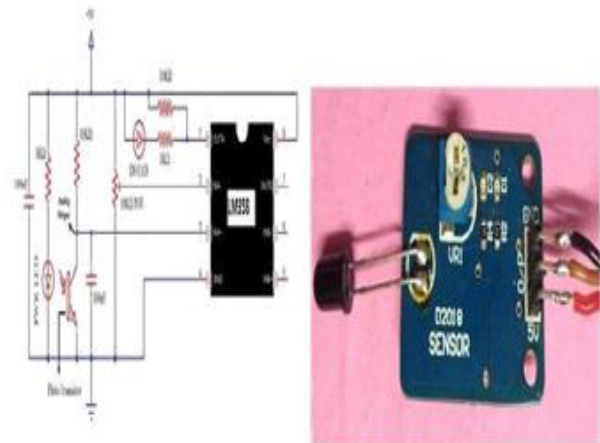


Fig 3. Flame sensor.

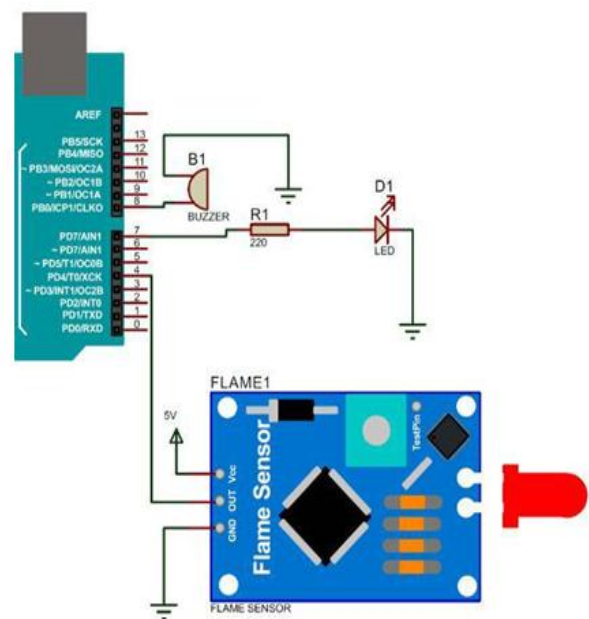


Fig 4. Flame sensor interfacing with Arduino.

1.3 GSM Module, “GSM SIM800C type is selected to carry the task in communication part.SIM800C is a quad-band GSM/GPRS module that works on frequencies GSM850 MHz, EGSM 900MHz.DCS1800MHz and PCS1900 MHz”. “It has an recognized presentation, industrial grade interface Typical plus embedded TCP/IP protocol which makes it to be presentable and suitable for the electronics project”. “Since it consumes small of power in its operation, thus it is said able to communicate with any low power consumption microcontroller interface”.

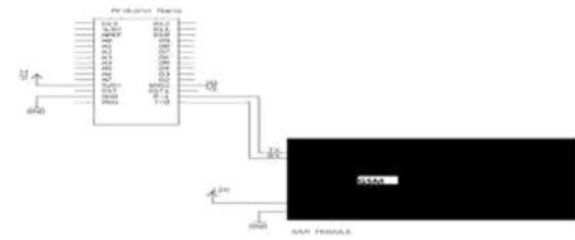


Fig 5. GSM Module interfacing with arduino.

2. Software Development:

The software of the project is based on the flow chart in figure 3.5. When there is fire, IR radiations are detected by flame sensor and microcontroller on the Arduino Nano board will notify GSM module to send an alert message to the fire brigade, Buzzer will produce sound and LCD screen show the affected fire zone. By referring to both figures, the complete program can be constructed later in Arduino IDE software with flame sensor, GSM module, LCD display screen.

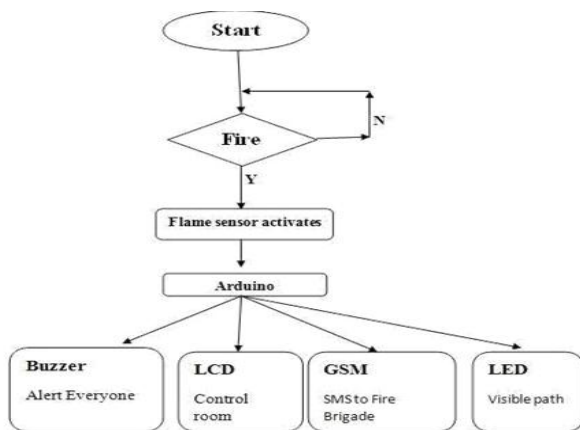


Fig 6. Flow chart of fire alert system.

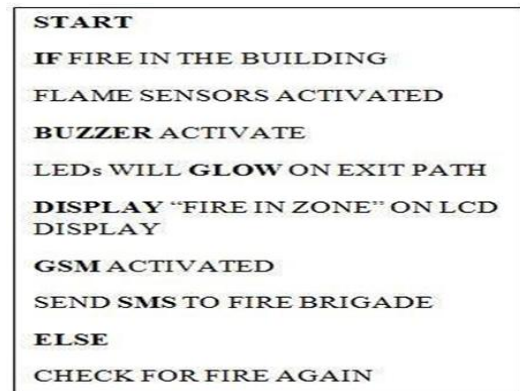


Fig 7. Pseudo code for the Project based on the flow chart.

V. CIRCUIT DIAGRAM

Circuit diagram shows the connection and interfacing of Arduino Nano board:

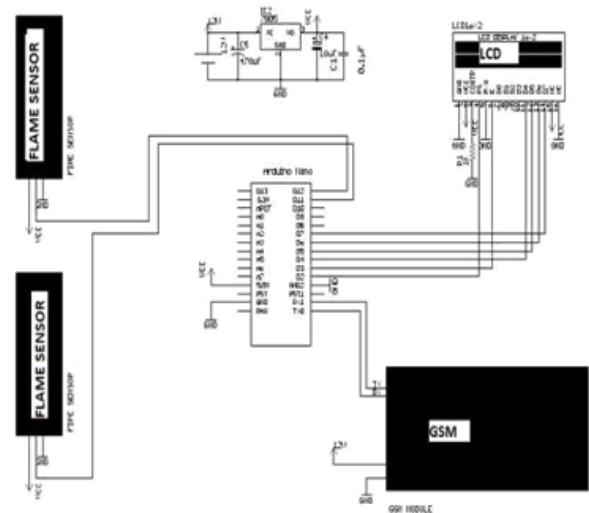


Fig 8. Circuit diagram.

VI. RESULT

Few tests were taken to observe the system performance. The tests were conducted by applying Fire near to Flame sensors in two different parking zones.

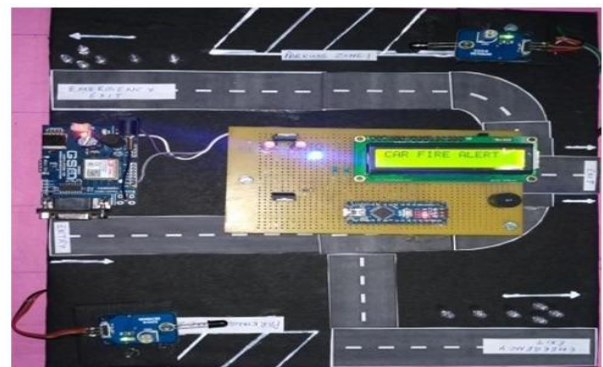


Fig 9.Flame sensors ready to detect fire in both zones.

When fire is detected by zone 1 or 2, the buzzer will activate, LEDs on the Emergency exit paths will activate, LCD screen will show fire affected zone and an alert is also send to fire brigade.

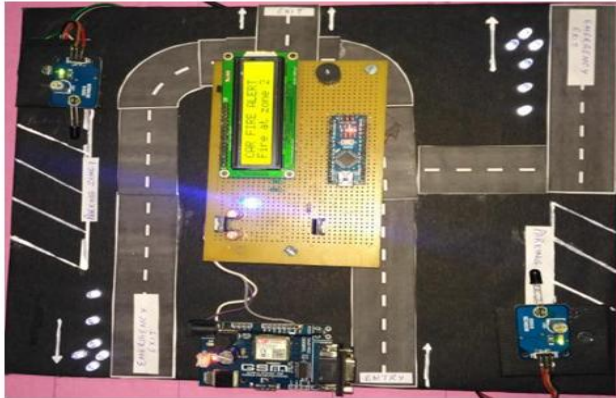


Fig 10. Fire in Zone 1.

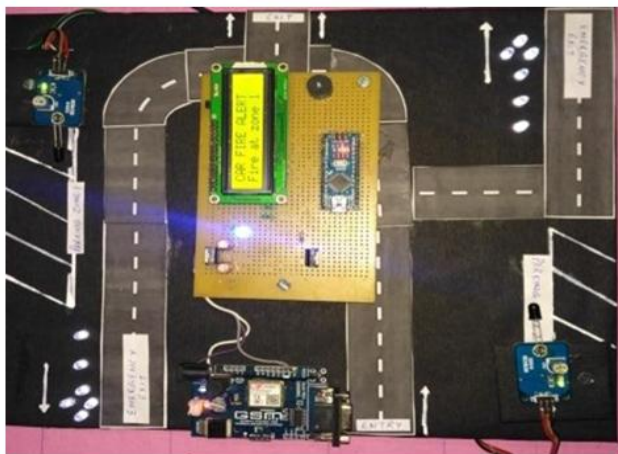


Fig 11. Fire in zone 2.

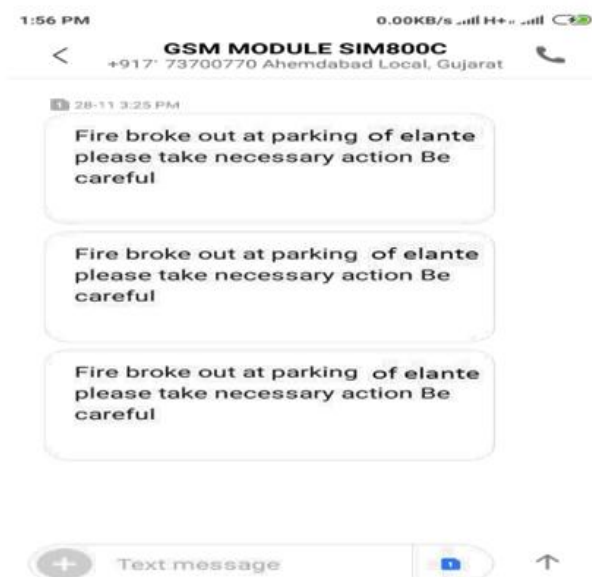


Fig 12. Message alert to fire brigade.

VII. CONCLUSION

The proposed project is a low cost, intelligent and easy to install fire response system in parking area. With increasing size and complexities of building and other infrastructure, such quick response system are the need of the time to avoid or minimize the loss of human life and property due to fire accidents.

The proposed intelligent fire detection and visual guided evacuation system can reduce casualties by determining the point of occurrence of a fire in a building and prevent directional confusions by providing visible evacuation path. It reduces the time required for evacuation by guiding evacuees toward safe areas by bypassing the location of the fire, this intelligent detection and evacuation system can also aid fire brigade with the help of GSM module because it allows for a quick assessment of the exact location of the fire accident.

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