# Design and Implementation of Fully Automated Fire Fighting Robot

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## ABSTRACT

In rural/urban areas there are many chances/possibilities a fire accident can happen. For example in elastic companies ,industries ,cotton mills/industries ,  garments, fuel industries etc., Electric wire accidents can lead to colossal damages. This damages lead to loss of financial and can affect the many mortals in those places. To protect or to take care of the human lives and their wealth such that the motto here is to buildup standalone system. Hence it is capable of doing a simulation of the setup. It is a robot which works automatically navigate through the where the fire or flame is happening and its setup with an alarm. In case of any emergency in surroundings its main aim is to extinguish the fire and send automatic message to a fire station and to the particular owner of the home. This kind of robot was very helpful for the people which can save them and their belongings from the fire accidents. Though it is a robot it doesn't lead the flame which rages out of control and happens less injury to the victims. Since it is a real world application its main aim is to reduce the air pollution. In that case if fire originates when the owner of the house is either sleeping or they may not be in home. By the use of this robot it reduces a much higher rate with equally minimum amount of damages caused.
**Keywords:** Comparator, monostable NE555, water blower, GPS, display board..

## I. INTRODUCTION

The fire fighting ROBOT is based on the robotics technology and by using Arduino Uno processor. Fire fighting and rescue is recognized as a risky mission. Fire fighters face risky situations when extinguishing fires and rescuing victims, its an inevitable part of being a fire fighter. As an electrical engineer our major role is to buildup or setup a prototype model of the fire extinguishing robot which scans the flame and it would then extinguish the fire immediately as per its capacity. The robot which can move through the scanning process and find the oil derrick and it then extinguish the flame by the process of spraying technology.

In this paper we describe about how the robot is will function while the fire accident takes place. Actually the robot is described to extinguish the fire in the industries of the particular surfaces or dimensions, by the help of the automatic water sprayer or blower fixed at the front of the robot. After that it then sends a automatic message to the owner of the home. Whenever the mission is started when it search/scan the flame where it is happened and then it settled down back to its place.
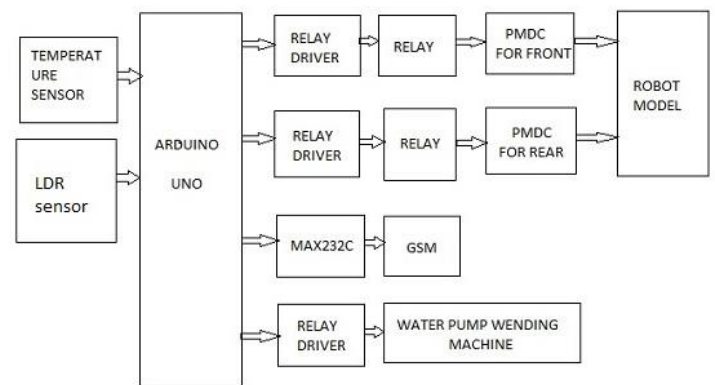
## II. METHODS AND MATERIAL

### 1. Literature Survey

Design of an autonomous firefighting robot introduced by Linette Miller, Mathew Moore. This robot was created to complete in the IEEE southeaston 2003 hardware competition. The system proposed the development of each component of the robot is that is designed to find a small fire represented by a light emitting diode in a model home and extinguishing it. The robot was initially lowered in the designated home area and will start withion 30 seconds upon hearing the starting signal. this design allowed for the robot to used line following. The small fire is represented by a cylindrical red object with six red light emitting

diodes(LED). The candle can be found in any one of the four rooms respectively.

Autonomous fire protection robot with notification developed by Nor AyuniBintiAbd Majid,(2004). In this proposed system is an intelligent multi sensor based security system that contains a fire fighting robot in our day to day life. The destructive burnt cause by electrical is the highest source in it. Besides, user had difficulties to detect the small burnt cause by electrical appliances. User may take a late time to extinguish fire like finding the water source to extinguish fire when want to extinguish the fire. So, "Autonomous Fire Protection Robot with Notification" design with extinguisher for the intelligent building to control by microcontroller PIC18F4550 and supported by autonomous board CYTRON SK40C board and another additional circuit. This robot equipped with 3 LDR sensor where each sensors has its own function and control by PIC18F4550. This robot will move to the fire source when the LDR sensor detected the fire and it will send message to any phone of the GSM network through the modern connected to the programmable device. This robot is also programmed to stop before the robot hit the flame. This robot also can extinguish fire at 45 degree for upper side and 45 degree for lower side. This robot is implicated the function of finger to clip the fire extinguisher clipper.

ALPHA I (Fire Fighting Robot) was designed by Anand Mohan Misra, (2008). It detects the fire via RF module by human controlling it from the very distance. ALPHA I equipped with the camera for the display and is controlled through RF receiver which is placed on its body and RF transmitter which works as a medium for the controlling actions. This ALPHA I rpbot can be used for dangerous tasks, such as disarming bombs and extinguishing fire. They can workwhere it is too dangerous for human beings. A primary purpose of this undertaking is to provide an incentive for the robotics community to develop what will be a practical application for a real world. ALPHA I is the outcome of combined functioning of various modules.

## 2. Proposed System



## 3. Proposed System of Fire Fighting Robot

The proposed firefighting robot is used to detect fire. It sense by means of two sensors, they are

- Temperature sensor
- LDR sensor

The temperature sensor consists of a sensing device that can be detect temperature. It is already stored with a particular value of temperature, when the temperature goes beyond this value it will sense and display in the LCD monitors that "TEMPERTURE DETECTED". LDR sensor also does the same function. An Arduino Uno controller is also controller is also used. This is used because it can easily access comments and C, C++, JAVA programs quickly. This consists of analog signal and digital signal. In this proposed project of fire fighting robot A0, A1 pins are connected to the temperature and LDR sensors. This robot uses five relays four robot movements and the other relay is used to activate DC motors to spray water automatically after when the fire has been detected. GSM is also used so that when fire has been detected a call will be sent to the number that has been dumped in the program. So the message will be passed to the certain person, so that he could take of the necessary safety precautions. The fire fighting robot is consisting various blocks. The block diagram is given in the above figure: The various blocks in the systems are as follows

- Temperature sensor
- LDR sensor
- Arduino Uno
- Relay driver
- Relay
- GSM
- DC motors

## 4. LDR Sensor

LDR (Light dependent resistor is a component which is very useful ,especially in light /dark sensor circuit panels. Usually the resistance of an LDR sensor is much high, sometimes as high as 100000 ohms, but when it illuminated with light resistance drops dramatically to it. It is also called as a "PHOTO RESISTOR". It works based on the principles of photoconductivity. Hence it is an optical phenomenon in which the materials conductivity is much increased when the light is absorbed by the material. By the use of this sensor, the flame can be detected much easily.

## 5. Smoke Detector Or Temperature Sensors

It is one of the kind of sensor. It is otherwise known as "SMOKE ALARM", which is a device that scan or detects the smoke, typically as like an indication of flame. Where the commercial, industrial and also a huge residential devices issue a signaled alarm to a fire alarm system to start alerting the people around the smoke whereas, fire sensor used to detect/scan the flame before it gets fired out and then it gets smoke. By this way, it is very advantageous than the smoke detectors respectively.

## 6. Arduino Uno

The Arduino is a microcontroller board based on the Atmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, av16MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller, simply connect it to a computer with USB cable or power it with an AC – DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FDTI USB-to-serial driver chip. Instead it features the Atmega16U2 programmed as a USB-to-serial connector. There are many Arduino-compatible and Arduino-derived boards. Some are functionally equivalent to an Arduino and may be used in interchangeably. Many are the basic Arduino with the addition of commonplace output drivers, often for use in school-level education to simplify the construction of buggies and small robots. Others are electrically equivalent but change form factor, sometimes permitting the continued use of shields, sometimes not. Some variants are completely different processors, with varying levels of compatibility.

## 7. IR Receiver

The IR sensors senses the infrared rays coming out from the flame and then it feels the signals to the microcontroller. An Infra-Red sensor can able to measure the heat of an object or material as well as detects the motion. It is a type of sensor which measures only the IR radiation, rather than it emitting is known as "passive IR sensors".

When the IR receiver does not receive a signal, where the potential at inverting/reversing the input went much higher than that of the non-inverting reversing input of the comparator goes low, but in there the LED wont glow till the output comparator goes high.

## 8. Relay Driver

A relay is an electro-magnetic switch which is useful if you want to use a low voltage circuit to switch on and off a light bulb(or anything else) connected to the 220v mains supply. In many situations in which you use a relay, you will also need a bistable flip flop. One useful integrated circuit flip-flop is the 4013. (This IC actually contains two flip-flops). With the connections as shown in the circuit below, when the voltage on pin 3 changes(rapidly) from 0v to the positive supply voltage, the flip-flop changes (it "flips"). The next time the same thing happens, the flip-flop changes back to its original state again (it "flops").

## 9. Relays

A relay is a kind of switch which operates electrically. Most of the relays are used as an electromagnet to operates a switching mechanism, but then the other operating principles are also been used. They find applications where it is necessary to control the low power signal. Relay which can handle the high power that needs to directly drive an electric motor is known as "CONTACTOR".

## 10. GSM

GSM stands for Global System for Mobile communication and is an open, digital cellular technology used for transmitting mobile voice and data services. It uses narrowband Time Division Multiple Access (TDMA) technique for transmitting signal. TDMA is a technique in which several different calls may share the same carrier. Each call is assigned a particular time slot. A GSM modem is specialized type of modem which accepts a sim card, and operates over

a subscription to mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks like a mobile phone.

## 11. DC Motors

An electrical motor is a motor which converts electrical energy to mechanical energy, very typically through the interaction of magnetic fields and a current-carrying conductors. It is a DC motor type where it runs on direct current (dc electricity). In this we are using 2 or 3 dc motors. The advent of the power electronics has made replacement of dc motors with ac motors possible in many applications.

## III. RESULTS AND DISCUSSION

## APPLICATIONS

- The robot is designed to guide the visitors from the way they entered in to the home.
- Its main usage is to protect the people from the flame accidents by extinguishing the flame in a building or a place.
- Used to pass the message or to communicate with the owner of the particular building at the time of fire accidents taken place.
- Used in the server rooms take an action in case of fire has occurred.
- Used in nuclear plants, cotton mills, garments, oil industries, cracker godowns, etc.,

## IV. CONCLUSION

The project "Fire Fighting Robot"isused to detect fire. The design of the fire detection system is done by the LDR Sensor and Temperature Sensor. The Arduino Unois used as the controller which controls the overall function of the robot. In this proposed system fire fighting robot usesfive relays. Four realys are used for the movement of the robots and other relay is to activate DC motor to spray water automatically soon after the fire has been detected. The GSM used will send a call to that particular number and the message will be passed to the cetain person, so that it could take the necessary safety precautions.

## V. FUTURE SCOPE

The robot can be equipped with sprinkler system which can be used in remote areas for fire extinguishing.

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