



# Design and Fabrication of Fire Fighting Robot

Mohan Kumar. V<sup>1</sup>, Ramesh. S. S<sup>2</sup>, Sri Haran. M<sup>3</sup>, Pasupathi. T<sup>4</sup>

Department of Mechatronics Engineering

Akshaya College of Engineering and Technology, India

## Abstract:

The main objective of the robot is to extinguish the fire in the area where the fire men cannot enter inside. The fire sensor is using here to sense the fire. The fire sensor output is very low voltage so we amplified that voltage with help of differential amplifier. The amplified voltage is given to micro controller. The micro controller may be Atmel or PIC both is flash types reprogrammable controller. Already we have programmed in microcontroller the microcontroller run according to our objective. Therefore, it received the signal from amplifier and activates corresponding driver circuit. It any objectives related to smoke is there; the sensor detecting the smoke finds that one and gives the signal to micro controller. By which the robot movement is controlled now, the micro controller activates the alarm driver circuits. So the alarm makes sound for indication of fire. And at the same time microcontroller activates driver circuit for water pump. In addition to that the keypad can be used here to control the robot movements like as forward and reverse direction and left and direction control.

## I. INTRODUCTION

In this project we have three fire sensor and those are connected like ground looking position. The robot's path should be in some predefined path in the room or the path is determined when it detects the fire. When the power is given to the circuit the Microcontroller will on the DC motors, which are connected to the robots wheel. So the robot will move in forward direction on the floor. When the fire sensor detects fire then robot is stopped and pump relay will turn on for some seconds which helps to pour the water on fire detected area. This project is used in large industries for carrying the things. And in atomic power stations, to work in atomic explosions. This used where firemen cannot make contact with the environment directly.

## II. SYSTEM DESCRIPTION

### Frame

A chassis is the framework of an artificial object, which supports the object in its construction and use. An example of a chassis is a vehicle frame, the underpart of a motor vehicle, on which the body is mounted; if the running gear such as wheels and transmission, and sometimes even the driver's seat, are included, then the assembly is described as a rolling chassis. Fig 3.2 shows the diagram of mobile robot chassis.

### DC Motor

A DC motor is any motor inside a category of electrical machines whereby electricity electric power is reborn into mechanical power. Most often, this kind of motor depends on forces that magnetic fields turn out. despite the kind, Fig 3.3 shows the double-gear DC motors, that have some quite internal mechanism, that is electronic or mechanical device. In each cases, the direction of current flow partly of the motor is modified sporadically. The speed of a DC motor is controlled employing a variable provide voltage or by dynamic the strength of the present inside its field windings. whereas smaller DC motors are ordinarily utilized in the creating of appliances, tools,

toys, and automobile mechanisms, like car seats, larger DC motors are utilized in hoists, elevators, and electrical vehicles. A 12v DC motor is tiny and cheap, nevertheless powerful enough to be used for several applications. during this project we tend to used the 100rpm brushed gear motor to supply the high force that makes the conveyor to hold the specified weight.

### PIC microcontroller

The microcontroller that has been used for this project is from PIC series. PIC microcontroller is the first RISC based microcontroller fabricated in CMOS (complementary metal oxide semiconductor) that uses separate bus for instruction and data allowing simultaneous access of program and data memory. The main advantage of CMOS and RISC combination is low power consumption resulting in a very small chip size with a small pin count. The main advantage of CMOS is that it has immunity to noise than other fabrication techniques. Various microcontrollers offer different kinds of memories. EEPROM, EPROM, FLASH etc. are some of the memories of which FLASH is the most recently developed. Technology that is used in pic16F877 is flash technology, so that data is retained even when the power is switched off. Easy Programming and Erasing are other features of PIC 16F877.

### LIQUID CRYSTAL DISPLAY

Liquid crystal displays (LCD's) have materials, which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal. An LCD consists of two glass panels, with the liquid crystal material sandwiched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle. One each polarizes are pasted outside the two glass panels. These polarizes would rotate the light rays passing

through them to a definite angle, in a particular direction. When the LCD is in the off state, light rays are rotated by the two polarizers and the liquid crystal, such that the light rays come out of the LCD without any orientation, and hence the LCD appears transparent. When sufficient voltage is applied to the electrodes, the liquid crystal molecules would be aligned in a specific direction. The light rays passing through the LCD would be rotated by the polarizers, which would result in activating / highlighting the desired characters. The LCD's are lightweight with only a few millimeters thickness. Since the LCD's consume less power, they are compatible with low power electronic circuits, and can be powered for long durations. The LCD does not generate light and so light is needed to read the display. By using backlighting, reading is possible in the dark. The LCD's have long life and a wide operating temperature range.

**Flame sensor**

In automatic fire detection it is desirable to know exactly how fire sensors work. A fire sensor in its housing is the link between physical quantities in the sensor housing environment and the usually electrical signals generated by the sensor. A combination fire detection and fire suppression system may include a fire detection system configured to detect an undesirably high temperature associated with an area. The fire detection system may include a temperature sensor including a temperature sensor array and a fire alerting system associated with the temperature sensor. The fire alerting system may be configured to receive information from the temperature sensor and generate a warning signal based on an undesirably high temperature associated with the area. The fire detection system may include a fire control panel configured to receive the warning signal. The system may also include a fire suppression system including a fire suppressant delivery system configured to provide at least one fire suppressant agent to the area associated with the undesirably high temperature.

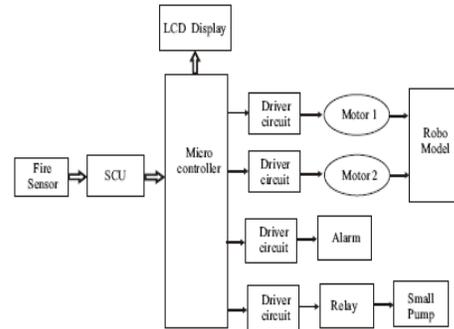


**Figure.1. Flame Sensor**

**III. SYSTEM WORKING**

The fire-fighting robot is turned ON in the area where the firefighters cannot step-in. It starts to detect the fire with the help of flame sensor, which works based on the principle of infrared transmission and reception. There are three sensors placed in center, left and right. When the left sensor detects fire the robot turns left about 90° and it moves forward to verify that the center sensor is detecting the fire and if it detects the presence of fire it will give an input signal to the microcontroller which in turn turns on the water pump through which the water is sprayed until the fire is extinguished. The process is same when the fire is in the right side only the movement is done in the right direction. If the sensor placed in the center detects the fire the robot moves

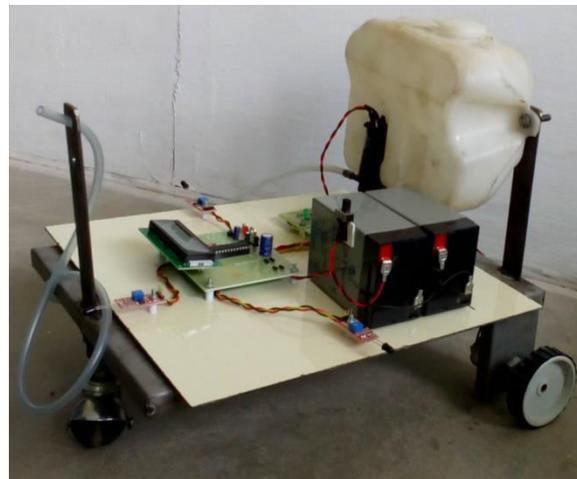
forward for a small distance to enhance the extinguishing operation.



**Figure.2. block diagram**

**Developed Hardware**

Some types allow you to adjust the sensitivity using a potentiometer or digitally. In the case of sensors that can be connected via the communication interface to the PC, it is possible to set detailed parameters of all the sensor's operating range and measured distances. Three sensors were used to detect the fire around robots environment. We used fire/ flame sensor. The sensors were installed in the front side of the robot. Design of the sensors can be seen on Fig 3.



**Figure.3. Prototype of Fire-fighting robot using flame sensor.**

**IV. RESULT**

In this design, we used sensors to detect and identify the intensity and direction of fire with its location. Flame sensor is used as a detector. The temperature sensor also can be used for direction detection. Temperature sensors are often used in automation tasks to me, such as presence detectors or in special applications.

**V. CONCLUSION**

The progress in science & technology is a non-stop process. New things and new technology are being invented. As the technology grows day by day, we can imagine about the future in which thing we may occupy every place. The proposed system based on PIC microcontroller [micro chip] is found to be more compact, user friendly and less complex, which can readily

be used in order to perform. Several tedious and repetitive tasks. Though it is designed keeping in mind about the need for industry, it can extended for other purposes such as commercial & research applications. Due to the probability of high technology (PIC microcontroller) used this “**Fire Fighting Robot**” system is fully software controlled with less hardware circuit. The feature makes this system is the base for future systems.

## **VI. FUTURE WORK**

The ongoing and future work is concentrated on improvement sensors, which are used to improve the sensitivity and transmitting speed. IOT module should be developed with android app efficiently, which contains the sensor values in it. IOT is emerging market field in the future. Additional features such as to reduce the extinguishing speed and to improve the thermal withstanding ability.

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