

## Arduino Based Fire Detector and Extinguisher Robot

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### ABSTRACT

This advanced firefighting robotic system independently detects and extinguishes fire. In the age of technology, the world is slowly turning towards the automated system and self-travelling vehicles, fire fighters are constantly at a risk of losing their life. Even though there are a lot of precautions taken for Fire accidents, these natural/man-made disasters do occur now and then. In the event of a fire breakout, to rescue people and to put out the fire we are forced to use human resources which are not safe. With the advancement of technology especially in Robotics it is very much possible to replace humans with robots for fighting the fire. This would improve the efficiency of firefighters and would also prevent them from risking human lives Fire spreads rapidly if it is not controlled. In case of a gas leakage there even may be an explosion. So, in order to overcome this issue, safe guard live of our hero, our system comes to the rescue. This firefighting robotic system is powered by Arduino Uno development board it consists of the ultra-sonic sensor mounted on a servo motor for obstacles detection and free path navigation, it is also equipped with the fire sensor or flame sensor for detecting and approaching fire it also makes use of water tank and spray mechanism for extinguishing the fire. Water spraying nozzle is mounted on servo motor to cover maximum area. Water is pumped from the main water tank to the water nozzle with the help of a pump. This water pump needs driver circuit as it consumes a lot of current, much more than the controller provides.

**Keywords :** Firefighters, Microcontroller

### I. INTRODUCTION

An autonomous fire extinguisher robot is designed. The robot has fire sensors interfaced in its control circuitry which senses the presence and intensity of fire and take the responsive action accordingly. The robot is designed to detect intensity of fire and operate first at place where the intensity of fire is more. It is also an automatic robot as it does not need to be operated from any remote control. One only needs to deploy the robot in a fire prone zone and the robot will automatically initiate action once it detects a fire breakout. This Robot finds its applications in Rescue operations during fire

accidents where the possibility for service men to enter the fire prone areas is very less.

### II. EXISTING METHOD

In this model we are using 8051 micro-controller along with RF receiver and transmitter. The software used in this model is Keil  $\mu$ Vision IDE and C language is used for programming. In this we are using remote controller to control the direction of the fire fighting system. Water spraying nozzle is also controlled by using the remote controller.

### III. PROPOSED METHOD

Fire sensor (IR receiver) is used to detect the fire which are placed in all three directions (i.e, left, right and centre) of the robot. The software used in this model is Arduino IDE. In this model we are using Atmega 328p micro-controller. We can extinguish the fire automatically by pumping water with the help of 5V water pump.

### IV. BLOCK DIAGRAM

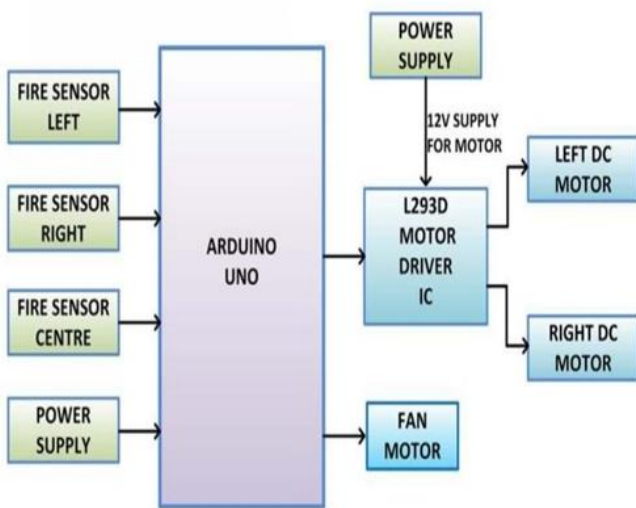


Fig 1 : Block Diagram of Fire Detector & Extinguisher Robot

#### FIRE SENSORS

A Fire Detection Sensor is sensitive to the flame but also can detect ordinary light. It detects a flame or a light source of a wavelength in the range of 760 nm to 1100 nm. It can detect the fire from a distance about 1m to 2m. IR receivers are used as fire detection sensors in the circuit.

#### POWER SUPPLY

Arduino board and fire sensors need a 5V regulated DC for their operation while the motor driver ICs needs 12V DC. The supply from the battery is regulated to 5V and 12V using 7805 and 7812 ICs . The pin 1 of both the voltage regulator ICs is connected to the anode of the battery and pin 2 of both ICs is connected to ground.

#### ARDUINO UNO

It is one of the most popular prototyping boards. It is used frequently in robotic applications. It is an Atmega 328p based controller board. In this project, three analog input pins of the board are utilized to connect fire sensors and 6 GPIO pins are used to interface L293D motor driver ICs.

#### DC MOTORS:

In this robot, 12V geared DC motors are attached to the wheels. Geared DC motors are available with wide range of RPM and Torque, which allow a robot to move based on the control signal it receives from the motor driver IC.

#### L293D DC MOTOR DRIVER IC:

The L293D is a dual H-bridge motor driver integrated circuit (IC). The Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors. It has 16 pins.

#### WATER SPRAYING NOZZLE:

Water spraying nozzle is a mechanical device which is used to pump water on to the fire to extinguish it. It uses a simple motor to pump water.

### V. SOFTWARE

#### ARDUINO IDE:

The **Arduino** Integrated Development Environment (**IDE**) is a cross-platform application. It is used to write and upload programs to **Arduino** compatible

boards. The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software. This software can be used with any Arduino board.

## VI. SIMULATION RESULTS

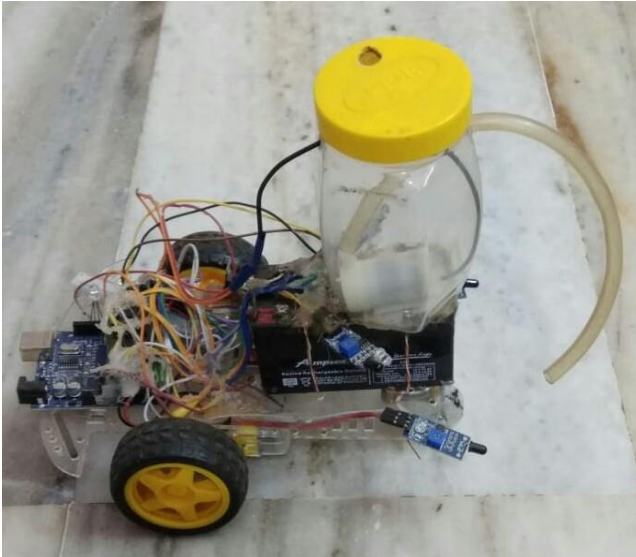


Fig 2 : Photocopy of working model

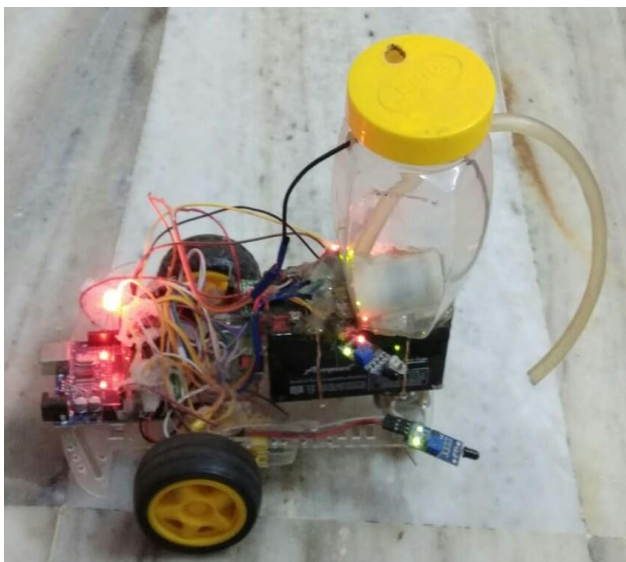


Fig 3 : Output of Fire Detector & Extinguisher Robot

## VII. CONCLUSION

Thus we developed a robot which will be used for firefighting purpose. This proposes a great chance

for automation and will be useful at places where human cannot reach or is dangerous. This robot will be helpful in automation industry also. Proposed approach of modular design strategy was a good solution in implementing the firefighting robot to help people at the critical condition. The proposed robot makes movements in forward, backward, left, right and stop also. It reduces the human efforts and also protect their property. Robot detects fire and extinguish the fire with the help of water sprinkler pump. For extinguishing that fire robot need to reach up to there and it starts movement towards the target and halts the fire.

## VIII. FUTURE SCOPE

Further the project can be enhanced by interfacing it with a wireless camera. The camera is mounted on the motor so it rotates in all directions and captures the images or the video. so that the person can view the operation of the robot.

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