

## ***Arduino Based Fire Fighting Robot***

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### ***Abstract***

*Determining and extinguishing the fire is a dangerous job for a fire extinguisher. To this problem the fire fighter reaches the destination quickly and prevents the fire. Due to this fire fighter are constantly at a risk of losing their life. Technologies have come to rescue this issue. This paper gives you the technical solution to this mentioned problem. These robots are designed to use in extreme condition whereas human's interruption becomes less and robots are using several work. An Arduino UNO is microcontroller for required operation. A water tank and fire extinguisher setup with water pump is mounted on the robot body and its operation is carried out from microcontroller output through appropriate signal from sensor. The complete operation is controlled by Arduino UNO microcontroller.*

***Keywords:*** *Arudino UNO, Water pump, Smoke sensor, DC Motor*

### **INTRODUCTION**

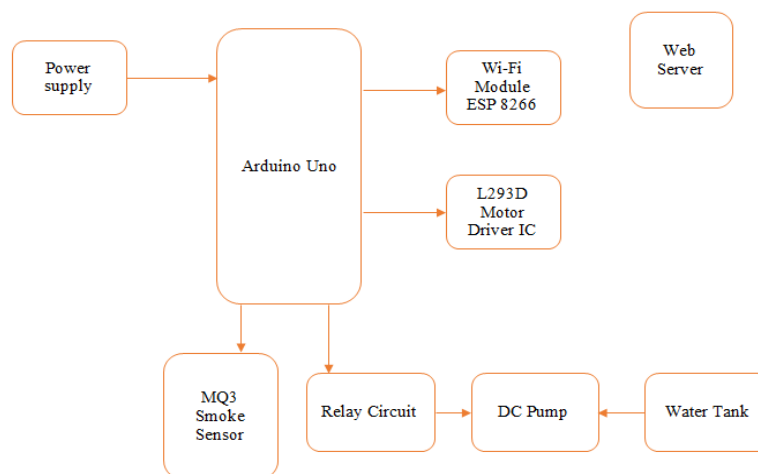
The IoT based fire extinguishing robot that detects fire. Now a day, safety from fire is also important aspect that we have to concern about. Because fire fighters have to face some problems while fire extinguishing like it may dangerous to their lives and that they need to add some unfriendly environments like high

temperature, explosions and collapsed buildings also. Thus, it is necessary to replace human with machines like robots that detect fire automatically or manually by avoiding obstacles. So, it would save human lives and heavy losses also. A robot is a machine that is designed by our computer program which is having a capability of performing human tasks or

handling complex series of actions automatically or manually. To building a robot it requires a complex programming. The robots are made by building systems and putting together motors, wires and other several important equipments. Now days various robots are developed to decrease the need for people to get into dangerous circumstances. One of them is fire fighter robot that has a small fire extinguisher and this project covers the design and construction of a robot that is capable of sensing and extinguishing the fire. Most of the fire accidents occurring in industries like nuclear power plants, petroleum refineries, gas tank, chemical factories and the other large scale fire industries and forests are suffering serious consequences. Fire fighter robot is a robot which automatically or manually detects and extinguishes the fire. While

extinguishing a fire and rescuing victims, the fire fighter has to be deal with dangerous situations, which is an indispensable part of being a fire fighter. These robots use DC motor, arduino microcontroller, sensor, pump and sprinkler. It uses smoke sensor for detection and fire extinguisher to extinguish the detected fire. Therefore this arduino based robot is designed to control the fire through a robotic vehicle. The robot rotates while fire is detected; this detection is performed by the sensors which are placed on the sides. When the fire is detected the robot can move in the direction of fire and it stops in front of the fire and the robot has a water jet spray that is used for sprinkling the water on fire. So this our proposed system used to fight the fire where humans cannot enter.

## BLOCK DIAGRAM



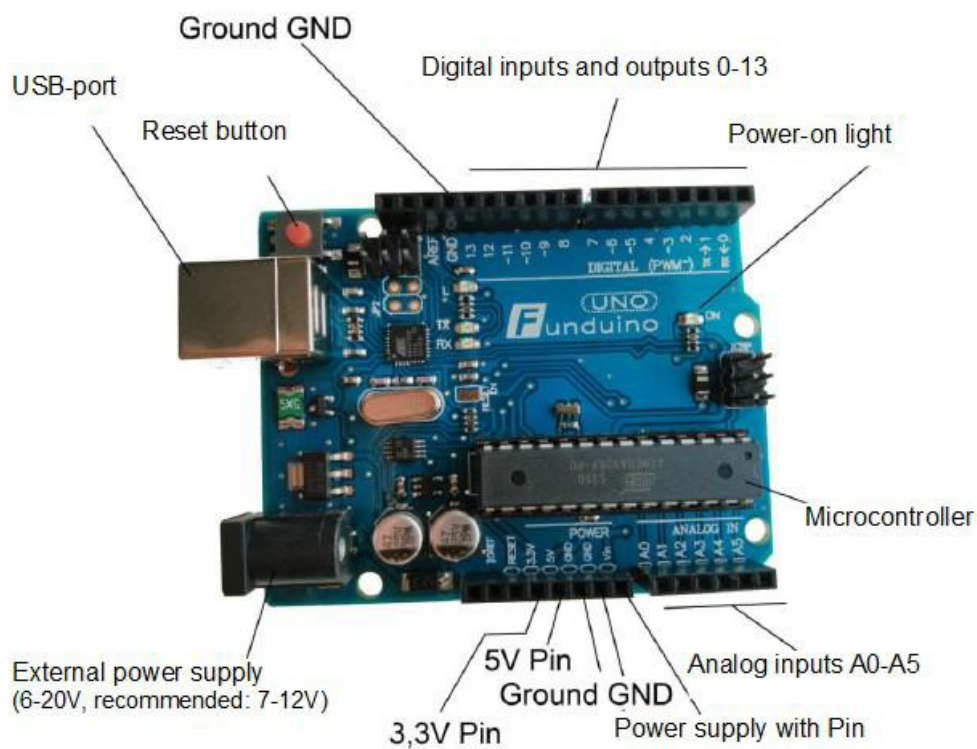
**Fig: Block diagram**

The block diagram of proposed system consists of Arduino Uno Microcontroller, DC Motor, Smoke sensor, Water pump, Wi-Fi module, Relay.

## COMPONENTS LIST

1. Arduino Uno
2. Wifi Module ESP 8266
3. Smoke Sensor
4. Motor Driver IC L293D
5. Water Pump
6. Relay circuit

### 1. Arduino UNO



The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.

## 2. WiFi Module ESP 8266



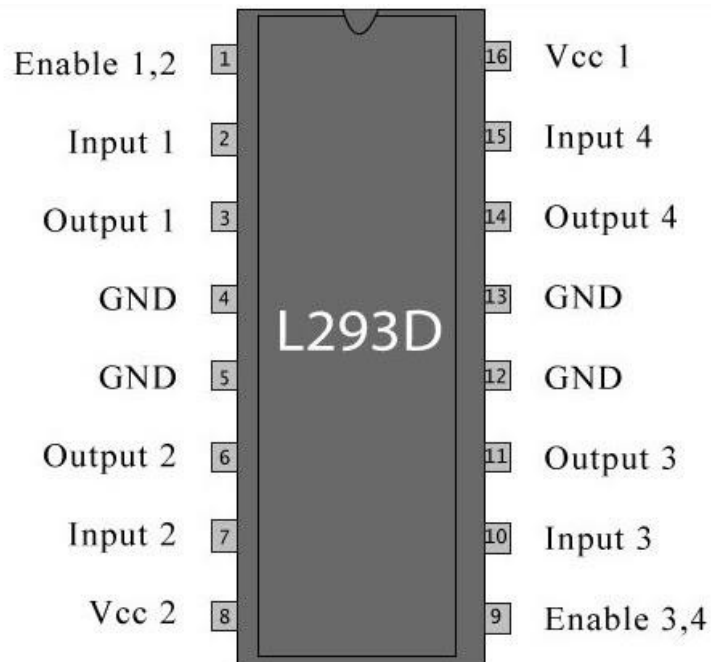
The ESP8266 is a really useful, cheap WiFi module for controlling devices over the Internet. It can work with a micro-controller like the Arduino or it can be programmed to work on its own. A WiFi Serial Module works in both directions: it not only uses a TX/RX serial link to receive and send data, thus acting as a host for your WiFi applications, but can also entrust all the WiFi network-related functions to another application processor.

## 3. Smoke Sensor



MQ sensor module is a useful module for detecting smoke concentration. A smoke detector is an electronic fire-protection device that automatically senses the presence of smoke, as a key indication of fire, and sounds a warning to building occupants.

#### 4. Motor Driver IC L293D



Motor Driver ICs are primarily used in autonomous robotics only. The L293D IC receives signals from the microprocessor and transmits the relative signal to the motors. It has two voltage pins, one of which is used to draw current for the working of the L293D and the other is used to apply voltage to the motors. The L293D switches its output signal according to the input received from the microprocessor.

The L293D is a 16 pin IC, with eight pins, on each side, dedicated to the controlling of a motor. There are 2 INPUT pins, 2 OUTPUT pins and 1 ENABLE pin for each motor. L293D consists of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor.

#### 5. Water Pump

We can use this water pump as a water spray for extinguishing the fire. When fire is detected, robot turns into that direction and water is sprinkled on the fire from water pump.

#### 6. Relay Circuit

A relay is an electrical switch that uses an electromagnet to move the switch from the off to on position instead of a person moving the switch. It takes a relatively small amount of power to turn on a relay but the relay can control something that draws much more power.

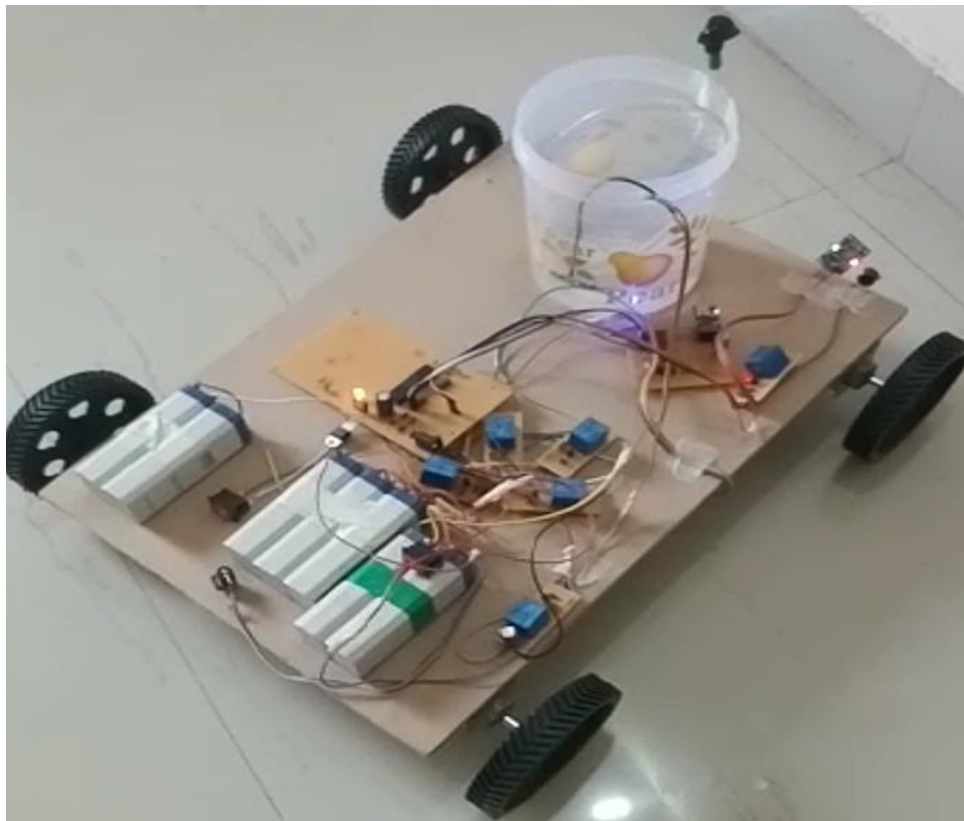
#### WORKING

The project consists of user controllable or automatically operable fire fighting robot

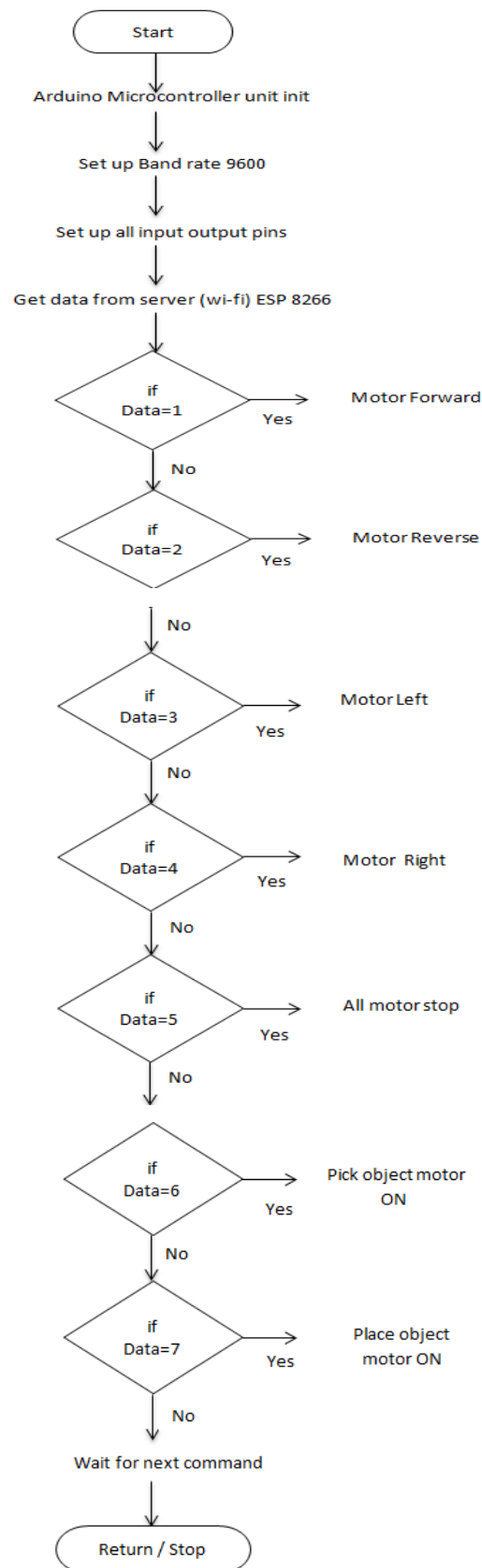
which has a water pump, relays, DC motor, Wi-Fi module, sensors attached to it for extinguishing fires. Fire fighting robot is operated using arduino microcontroller, the program has developed for robot using Arduino software.

Our project is switched on either automatic modes or manual mode. if robot itself detects the fire automatically, then its relay gets ON and it goes to the fire detected area and then extinguishes the fire by sprinkling the water on to it. Initially ESP8266 Wi-fi module is attached to arduino microcontroller & it acts as client

node. Through MQ3 sensor if it senses the fire, it sends the signal to microcontroller. as soon as microcontroller receives the signal a buzzer sounds. after sounding the buzzer microcontroller actuates the driver circuit (L293D). if we give the input '01' then motor rotates in clockwise direction, else input '10' then motor rotates in anticlockwise direction and if input is '11' then motor stops. This L293D driver drives the robot towards fire place, as the robot reaches where fire exists, microcontroller actuates relay and pump switched ON and finally through sprinkler water is sprinkled on the fire.



## FLOWCHART



## CONCLUSION

This project is mainly focused on improving security of houses, industries, forests against harmful fire flame. This machine is very robust and helps the user to warn about if there is any gas leakage or fire. In the fire extinguishing robot project, we developed a system that detects and extinguishes the fire before the fire starts and informs the electronic environment. It provides better feature that make it a more practically usable robot in real time. With the help of this proposed system, we can conclude that a robot can be used in place of humans, this reducing the risk of life of fire fighter.

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