# INDUSTRIAL BASED FIRE DETECTION AND PROTECTION ROBOT USING ARDUINO

[1]Dr.P.Karuppasamy, [2]S.Esakkiraja[3],U.Gurubalan, [4]G.Karthickkumar
[1]Professor, [2,3,4] UG Student
[1,2,3,4] Department of Electronics and Communication Engineering
[1,2,3,4] P.S.R Engineering College, Sivakasi/India

**Abstract:** Increasing human population and technological advancement has led to increase in the fire accidents. The physical limitation of humans and adverse conditions makes fire extinguishing challenging and demanding task. Extinguishing fire manually by human being is very risky task and it may involve loss of life. Robotics is the emerging solution to protect human lives and their wealth and surroundings. Fire fighting robot is a hardware model which can extinguish fire during fire accidents. It can reduce the errors and limitations faced by the human fire fighters. Robot can search the area, locate the fire and extinguish the fire before it rages out of control. In this paper we have designed a fire extinguishing robot that can extinguish any kind of fire accurately and effectively. It is able to navigate through the building while actively scanning for the flame. It can send various data from the sensors to the cloud and operated wirelessly by any person. With the help of Internet of things and other cloud technologies, it can send various updates to the mobile phone. The robot which we have proposed in this paper finds its application in fire extinguishing operations during fire accidents where the possibility of the service men to enter the fire prone areas is very less. Our designed robot can be controlled wirelessly by any user from anywhere in the world. The medium of interaction between the human and robot is through the Console.

## I.    INTRODUCTION

With the ever-increasing technology, the developments are increasing in the face of the situations that cause human life. Every day, the robot industry emerges as a model that is produced as an alternative to human element in a new branch. Flying, robots, wheeled robots legged robots, human droid robots, underwater robots are just some of them. The growing world population is bringing involuntary problems together.

Fires are among the most important of these problems. Robot industry has a lot of work in this area. Some of these are fixed mobile robots with different features, which are equipped with different sensors that detect before the fire is out, mobile rescue robots as fire search and rescue equipment, mobile locating robots used for fire detection, fire extinguishing robots in many different models designed to assist firefighters in the fire. An **Embedded system** is a special-purpose system in which the computer is completely encapsulated by the device it controls. Unlike a general-purpose computer, such as a personal computer, an embedded system performs one or a few pre- defined tasks, usually with very specific requirements. Since the system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product. Embedded systems are often mass-produced, so the cost savings may be multiplied by millions of items. An embedded system is a special-purpose computer system designed to perform a dedicated function. Unlike a general-purpose computer, such as a personal computer, an embedded system performs one or a few pre-defined tasks, usually with very specific requirements. Since the system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product. Embedded system comprises of both hardware and software. Embedded system is the fast growing technology in various fields like industrial automation, home appliances, automobiles, aeronautics etc. Embedded technology is implemented to perform a specified task and the programming is done using assembly language programming or embedded C. Ours being a developing country the power consumption is increasing on large scale to meet the growing need of the people

## II.    USING THE SOURCES
ARDUINO

It is a microcontroller based on Atmega328P. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. The Atmega 328 has 32 KB of flash memory for storing the code. It also has 2KB of SRAM and 1KB of EEPROM. The Atmega 328 provides UART TTL serial communication, which is available on digital pins 0 and 1. An Atmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer.
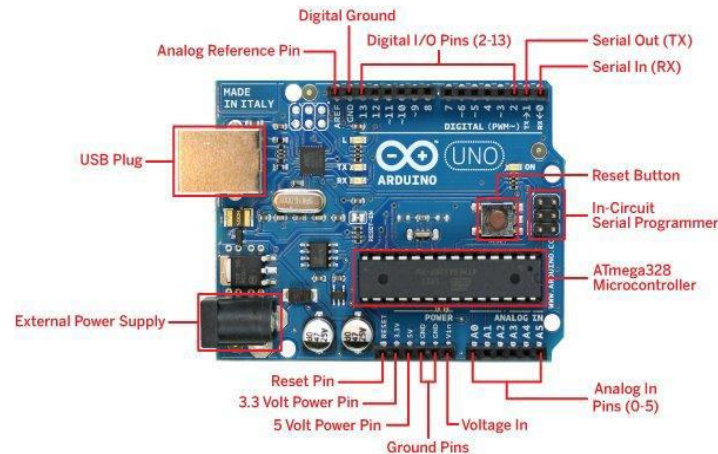


### Node MCU

The ESP8266 is the name of a micro controller designed by Espressif Systems. The ESP8266 itself is a self-contained WiFi networking solution offering as a bridge from existing micro controller to WiFi and is also capable of running self-contained applications.This module comes with a built in USB connector and a rich assortment of pin-outs. With a micro USB cable, you can connect NodeMCU devkit to your laptop and flash it without any trouble, just like Arduino. It is also immediately breadboard friendly.
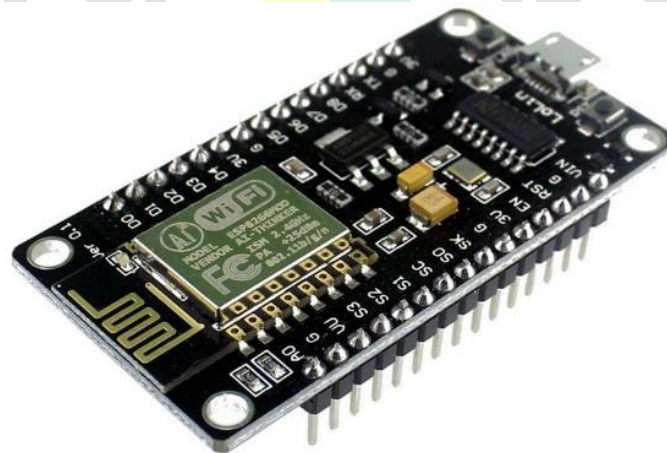
## DC MOTOR

It is said that the innovation of the AC prompting engine was the integral element in the nineteenth Century fight amongst AC and DC. Be that as it may, the DC engine has still been with us from that point forward. Great pace torque qualities and simplicity of variable rate control are the fundamental points of interest of the utilizing DC engines over AC. With the coming of force gadgets (particularly the thyristor) in the late sixties, the utilization of squirrel pen impelling in variable velocity applications beginning developing. The squirrel confine impelling engine is powerful and for all intents and purposes upkeep free when contrasted with its DC partner which utilizes brushes. In this manner there has been a constant drive to refine the force hardware to endeavor to accomplish a DC engine execution from an AC squirrel confine incitement engine. Despite the fact that the AC incitement engine has for all intents and purposes swapped the DC engine for little and medium sized establishments, the DC engine is still utilized as a part of lifts in fast gearless applications.



Figure 3.3: A DC Motor

## MOTOR DRIVER

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC.

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor.In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller.There are two Enable pins on l293d. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H-Bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin9 goes low then the motor in the corresponding section will suspend working. It's like a switch.

## WATER SPRAY SYSTEM

In this system, a water pump is connected to arduino through relay and a water pipe is attached to servo motor. Relay is an electrically operated switch. Relay use an electromagnet to mechanically operate a switch, but other operating principles are also used. Relays are used when it is necessary to control a circuit by low power signal. Water pump is used to extract water from the container and provide it to the nozzle which sprays water to extinguish fire

## EXISTING SYSTEM

In the existing system fire fighting robots are run in the platform of microcontroller. It will do the operation performed by automatically so it is not useful for the industries. It will not useful for the fire accident happen in wide range. In many existing system their used to control the robot by remote controller.

**PROPOSED SYSTEM**

In our proposed system, it is a movable robot that consists of  flame sensor for detecting the fire, gear motor and motor driver for the movement of the robot, relay driver for pump control and air receiver which are used for detecting and extinguishing the fire. Usually, the robot moves at a steady speed. When the gas sensor detects the fire in the environment, the signal indicating the presence of fire will be sent to the Arduino through which the extinguishing is done. In the extinguishing process, whenever the detection of fire is positive the robot will stop at the place of fire occurred and starts the pump and sprinkle water through a sprinkler until the smoke is put off. The entire control is achieved using Arduino which is interfaced with the infrared sensor, so that the control of the robot can be achieved automatically. The basic theme of this paper is to sense the environmental fire and extinguish it with the help of a water pump. The Arduino UNO Microcontroller board based on the ATmega328P. The ATmega328P is good platform for robotics application. Thus the real time fire extinguishing can be performed. The Arduino software runs on different platforms such as mac, windows and Linux. Simple and clear programming is possible in case of Arduino.
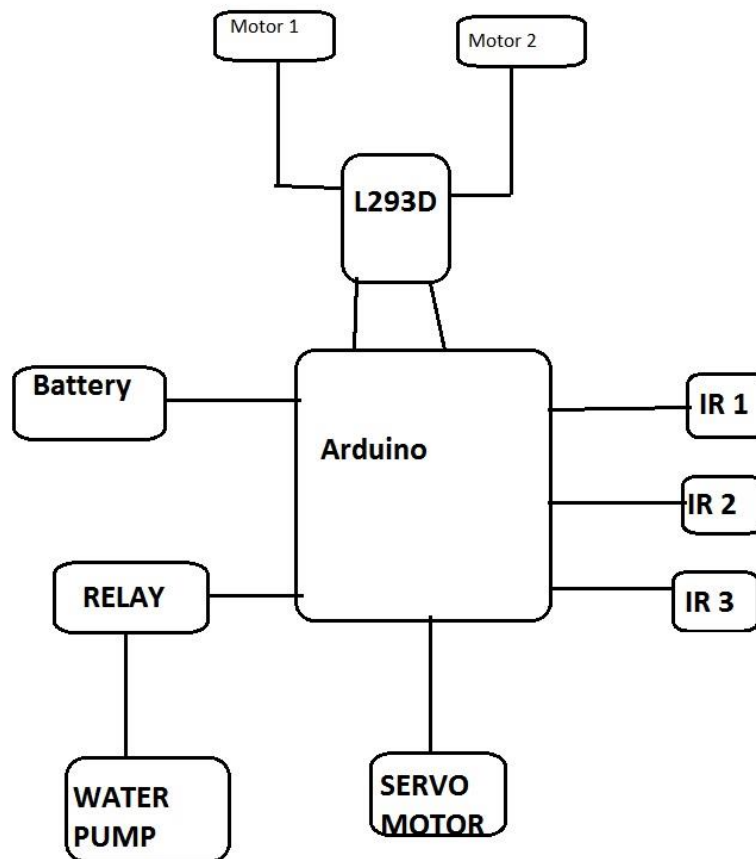


The Arduino libraries play a major role in making the programming easier by providing wider range of libraries. There are many built in libraries available in the Arduino software and it allows to add additional libraries that are available in the open source for download. Adding of new boards to Arduino software is possible. Since, Arduino C is derived from C and C++ programming and is much easier when compared other controller programming.

The microcontroller in turn controls the extinguishing system. The Operating Voltage of the controller is 5V and the Clock Speed is 16 MHz, and the recommended Input Voltage 7-12V, whereas the limitation of Input Voltage between 6-20V. The direction of movement of the robot is described by the motor driver board. It is used to give high voltage and high current is given as an output to run the motors which are used in the project for the movement of the robot. In this project a simple DC motor is used for the rotation of the wheel which are responsible for the movement of the robot. DC motors usually convert electrical energy into mechanical energy. To extinguish the fire a pump is used to pump the water on to the flame. A simple motor is used to pump the water. The pumping motor in extinguishing system controls the flow of water coming out of pumping. The Node MCU board is used for the purpose of send the notification to person.

This board connects with the arduino board. Once the fire will detect by sensor and the alert notification is send to the authorized person.

### III.     CONCLUSIONS

We have successfully designed the fire extinguishing robot which is capable of taking and analyzing inputs from sensors and responds to the commands send by the user. The robot has capability to detect any kind of obstacles and fire anywhere in the room. The robot can perform its operation under adverse circumstances effectively. In future we want to integrate more sensors with the robot so that more readings can be analyzed by the user so that precise commands can be given to the robot to perform its operation effectively in lesser time and we want to combine laser range finder to get more exact and quickly environment mapping.

### REFERENCES

- Abdülkadi ÇAKIR, Nyan Farooq Ezzulddın EZZULDDIN, "Fire-Extinguishing Robot Design by Using Arduino"
- Sushmitha .R, Uma Bharathi .S, Sandiya .S , "Arduino Based Fire Fighting Robot with High Pressure Water Sprinkler "
- Nagesh MS, Deepika T V, Stafford Michahial, Dr M Shivakumar, "Fire Extinguishing Robot"
- B.Swetha Sampath "Automatic fire extinguisher robot" songdo conventia, Incheon, Korea.