

## STUDY AND DESIGN OF REMOTE-CONTROLLED FIRE EXTINGUISHER VEHICLE

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**Abstract** - Detecting fire and extinguishing it is a very hazardous job for a fire extinguisher person, it often risks the life of that person. This project aims in giving a technical solution to the mentioned problem. A robot is a mechanical design that is capable of solving these problems in a well definite way. This model can play a very important role in solving all these types of issues. This fire extinguisher robot is a relay based controlling action in all different types of tasks. In this model RF transmitter and receiver unit can be used to control all the different types of movement actions for this robot. Other section is the fire extinguisher section which present separately on the robot. This section performed its work when smoke sensor detects smoke and provide signal to the pump through the relay action and then the pump starts pumping water through the pipe with sufficient pressure and through the to that particular point where the fire exists and then extinguishes it properly. When the smoke sensor getting the signal continuously and it also through water simultaneously. So, this mobile robot is a very helpful robot for extinguishes the fire from the particular place easily and effectively, and also reduces the human effort and saves their life. This robot can be used at various places and have a good future scope. Many house fires originate when someone is either sleeping or not at home. With the invention of such a device, people and property can be saved at a much higher rate with relatively minimum damage caused by the fire. Our main objective was to design and build a prototype system that could autonomously detect and extinguish fire easily and effectively.

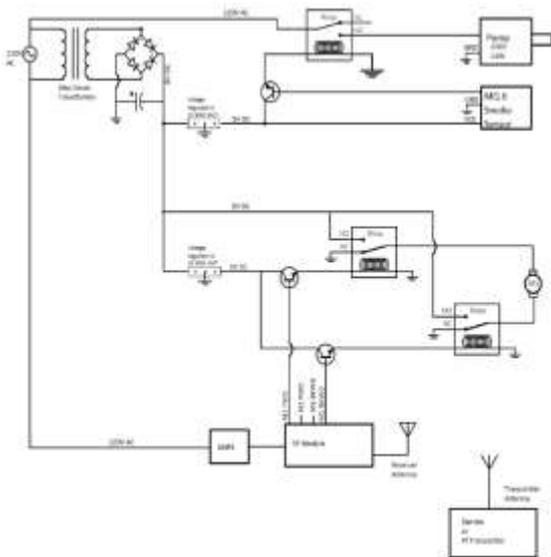
### INTRODUCTION

To deal with the fire is an important but dangerous task. A fire-fighter must be able to get to a fire quickly and safely extinguish the fire, preventing further damage and reduce fatalities. There are so many technologies are used that bridges the gap between fire fighting and those machines that allows for a more efficient and effective method of fire fighting. Many Robots are designed to find a fire existing place very rapidly, before it becomes out of control, One day these fire fighters works without causing any kind of injury or any mishappening. Due to the lack of maintenances in various types of machines and many other equipments deals with so many serious kinds of faults the chances of fire occurrences increases too much higher extent. They are also caused by the short circuiting of the wires and other electrical equipments. Therefore, fire extinguishing robot is mostly needed to reduce all such type of damages cause by natural or human made fire disaster. The project aims at designing a RF operated fire extinguishing robotic vehicle which can be controlled wirelessly.

The proposed vehicle has a water jet spray which is capable of sprinkling water. The sprinkler system starts sprinkling water automatically on sensing any kind of smoke detected by smoke sensor that is placed at the front portion of the water sprinkling arm. The RF unit makes it run wirelessly and make the operation of the movement of the robot very easy, faster and efficient. The advent of new high-speed technology provided realistic opportunity for new robot controls and realization of new methods of control theory. These technical advancement in the robot are varies time to time. This project is also very economical over various other methods.

The presented robot control system can be used for different robotic applications. This robot mainly uses the concept of controlling various types of actions on the basis of relay operation. This robot is very helpful in the future times and deals with so many of problems in a well efficient way.

**BLOCK DIAGRAM**



**WORKING METHODOLOGY**

**1. Working of RF module or Controlling the moving action of the robot.**

In this section we are going to discuss about how we control the motion of our robot using the Radio Frequency signal. There is a Transmitter section in our hand and by the help of Pressing the switches which are present in the Remote section we can easily control the movement of our robot in any direction such as- Forward, Backward, Left & Right.

Suppose we want to move the robot forward then firstly we Press the button so that a signal is send by the help of RF transmitter from the remote to the robot.

Thus it is received by the Receiver section that is situated on the robot and after receiving that signal through RF receiver it will transfer that electrical signal to the base terminal of the transistor and after that the circuit becomes completed such that the signal from the transistor goes towards the

common terminal of the Relay. So the relay start its working such that the internal connection of the relay changes and NO (Normally open) terminal of the relay changes to the NC (Normally closed) terminal.

Thus from this NC terminal the motors are connected so the motors start rotating in the clockwise direction and hence the robot will start moving in the forward direction. So in this way one operation is completed.

We can easily perform the various operations such as moving forward, Moving backward, Moving left or right easily. These all the operations are completed on the same procedure as we described above.

So this will all define how the one section of the robot performs its working that describes the overall movement of the robot.

**2. Working of the Smoke sensor and the action of the Water pump.**

The Smoke sensor is present on the front side of the robot. It works when it found the smoke nearby. It is connected to the pump and it start pumping water to extinguish Fire from a particular place.

When the fire exists at a particular place and when its Smoke is detected by the smoke sensor (MQ5) then it generate an electrical signal and it sends the signal towards the base of the transistor. After that the signal reaches the common point of the relay. Thus the internal connection of the relay changes and hence the circuit is completed and the Water pump is coming into its action. The pump start pumping water through a water pipe and by the help of the nozzle and pressure of water is maintained and thus the fire is to be extinguished from that place.

Let describes all the working action simultaneously.

Suppose on getting the information of fire exists on a particular place. Thus By controlling the robot by RF transmitter and receiver unit we move the robot toward that place by the action of wheels and after reaching the site it automatically start senses the smoke exist at that place and by the action of this it will suddenly gives the signal to the pump and it

actuates and start pumping water continuously and make the fire to be extinguished from that place.

Some Important Points That Better Describes The Working Of The Project.

1. When the fire is detected at any place then we move the robot towards that location by the help of RF module.
2. Then smoke is detected by the smoke sensors, it generates the proportional electrical signal and this signal sends to the base terminal of the transistor this will complete the circuit of the relay.
3. Now relay is operated and triggered or completed the path of circuit up to the pump.
4. And this way we will be able to extinguish the fire by the help of water stored in the tank placed above the robot.

### RESULTS

It is very important to manage all the various objects and things with the responsibility of protecting and preserving an institution's buildings, collections, operations and other occupants. Giving the proper protection and attention towards all those things that is required to minimize adverse impact due to climatic conditions, pollution, theft, insects and fire. Because of the speed of spreading of fire at various places is very fast so it causes so much destructive things to be happening due to the force of fire. Environmentally damaged structures can be repaired and stolen objects recovered. Those items which are destroyed by fire cannot be recovered again. An uncontrolled fire can burn all the things that are present at any place or an entire room's things within a few minutes and completely burn out a building in a couple of hours. Hence it has become very necessary to control and extinguish the fire to protect the life of humans and those things which are very costlier. For that purpose, we planned to design and fabricate the fire-fighting robot.

Firefighting robots can act on their own, independent of any type of actions taking robot on their own. The basic idea is to build a robot that responds suddenly when it senses fire or smoke at any place. The very simple bump-and-go robot is a good illustration of how it works.

This robot motion can be easily controlled by the help of RF transmitter and receiver unit. When you turn the robot left or right by using the forward and backward command both at the same time. By the help of controlling action we can easily move the robot. After sensing the smoke it starts extinguishing the fire by pumping the water continuously on that place and easily extinguishes the fire. Advanced robots use more elaborate versions of this same idea. Robotists create new programs and sensor systems to make robots smarter and more perceptive. Today, robots can effectively navigate a variety of environment and perform various tasks.

### CONCLUSION

Overall, an autonomous firefighting robot has been successfully built with so many features in it. It can perform all the different types of actions such as moving forward, reverse, turn left and turn right function flawlessly. The robot has been able to throw the water by the help of water pump through the pipe to extinguish the fire from a particular place. Besides that, the robot also consists of a smoke sensor that can easily sense the smoke and then give the signal to the pump to pump the water. On the other hand, we can control its movement by the help of RF transmitter and receiver wirelessly. As a conclusion, the project entitled "The Fire Fighting Robot" has achieved its aim and objective successfully.

Thus, the firefighting robot will help the fire fighters to save their lives without any risk. It is a very helpful tool to extinguish the fire from a safe distance. It also employs the very interactive user interface and provides the precise movement and control of the robot. Expanding the model to fully automatic mechanism and also the whole arrangement can be made as easy reassembling in any other places. Also, the cost of power supply unit can be reduced by using solar power and also it becomes more user friendly.

In further this project can be improved as to cover a wide area for sensing the fire and very rapidly it can extinguish the fire at different places can also be possible. Also we will make an intelligence sensing for flame, smoke and heat. In future we can also capture a lot of images using cameras to work efficiently. We can make small robots to reduce its size and weight.

### ADVANTAGES

1. It has the capability that it can sense the exact location of fire.
2. It has the ability to sense accurately with increased flexibility.
3. It reduces the human effort up to much extent.
4. It saves the life of millions of people where human reach is not possible.
5. On this robot we can easily rely and it is economical because it is a one-time investment.
6. It can easily withstand under many harsh conditions.

### APPLICATIONS

1. It can be easily installed in the server rooms for better protection.
2. It is very useful in that area which is at very high risk of fire exposures.
3. It doesn't take much time to pump the water to extinguish the fire.
4. It can easily work as a helping bot in the disaster management

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