



The Fire Fighting Robot

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Abstract

It is generation of machines and robotics, so automation plays major role in industries. In this paper the construction and environmental working of fire fighting robot is proposed. It has ability to climb on walls. It can withstand up to the temperature of (approximately 700°C). It can be used at a time of emergency. The communication can be made through remote control. The robot can also send videos and audios of present situation..

Keyword- *Robotics, fire Fighting Robot*

I.INTRODUCTION

The word robot first appeared in play by the Czech writer Karel Capek. Robot is mechanical or virtual intelligent agent or any operated machine that can perform task automatically or with guidance and replaces human efforts typically.

Robot reduces a human effort and does intelligent work. Robotics is one of the fastest growing engineering field today. Robotics has gained popularity due to advancement of many technologies of computing and Nano-technology making human life easier and comfortable. The need of fire extinguisher robot is to detect and extinguish the fire on its own before it goes out of control. Technology must be able to fulfill gap between firefighting and machines allowing for a more efficient and effective method of firefighting.

It is smart working machine that can be controlled according to need. Making the robot wireless increases the effective area of operation. The need for these devices that can detect and extinguish the fire on its own. Many house fires originate when someone is either sleeping or not home. Firefighting robots are special robots, which as special firefighting equipment can replace fire fighters near the scene to fight and rescue effectively and carry out reconnaissance missions of fire.

II SYSTEM OVERVIEW

The fire fighting robot is designed in such way that, it can be controlled with remote. It has two in-build fire extinguishing cylinders, flame detector, sensor, and cameras. The body of robot is coated with Ag. It can withstand under the temperature of (approximately 700°C). Insulation is provided inside of robot to protect the interior body from heat and high temperature gases.

Two fire extinguishers cylinders with the nozzle are mounted on the body of robot. Following fig. shows construction of robot.



FIG1. ROBOT

III DESIGN OF FIRE-FIGHTING ROBOT

A. Mechanical Design

The main frame of the FFR is consist of a steel chassis so it can support the load of the consisting parts including the main heavy parts such as battery, manipulator parts, driving motor and track chain that using driving gears or chains as drive sprocket after it have been modified. The modification of different mechanical parts by including hard thermal plastic pads into tracker parts to be fastened to bicycle chain with bolts and nuts. The sprocket gear that supports the track. The gear tooth was modified in such way to neglect one tooth next to the left. Pump is used, it is connected to the water reservoir small discharge with high pressure pump is used.

B. Electrical Design

Four car windshield wiper DC motor used as driving sprockets instead two motors. Due to this more power is generated. Flexibility in choosing parts due to increasing torque power. Increase reliability of FFR in case of failure one of the motor.

Remote control unit use small microcontroller in the transmitter and receiver to send, receive and interpret data send via radio frequency. The receiver box has PCB (printed circuit board) which comprises the receiving unit and small servo motor controller. 8051 Microcontroller is used at transmitter and receiver end to communicate with robot through RF waves.

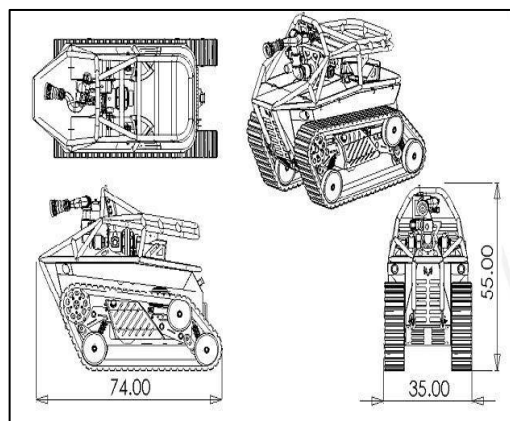


Fig 2. Actual Views

The above diagram shows the ideal design of fire fighting robot which has two modes of operating system manual and automated as per the requirement.

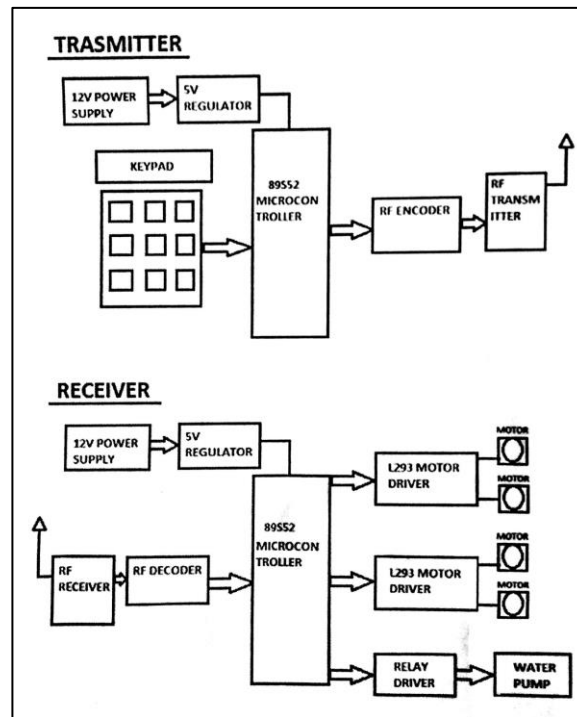


Fig 3. Transmitter and Receiver System

Multifunction radio transmitter and receiver is there for the wireless communication system and microcontroller is used.

IV COMPONENTS USED IN FFR

- A. Two fire extinguishing cylinders.
- B. UV/IR Flame detector.
- C. IR Camera.
- D. Nozzle.
- E. Driving camera.
- F. IR Light sensor.

V WORKING

It works on wireless unit with the help of radio frequency (433 MHz). It has temperature sensor which detects the more heated or temperature area and give signal to operator. If it is in automated mode then according to programme embedded in GUI it starts working and extinguish the fire.

It is in manual mode then, the mobile robot sends information of fire scene to remote terminal wirelessly in real time remote terminal receives fire information which will processed by the managers by getting full data from transmitter operator operates robot properly.

The FFR have detecting system in drawing maps for the separation of the fire for the fireman, the infrared waves

should be captured through wireless IR camera which will broadcasting alive images.

A. Mechanical Parts Working

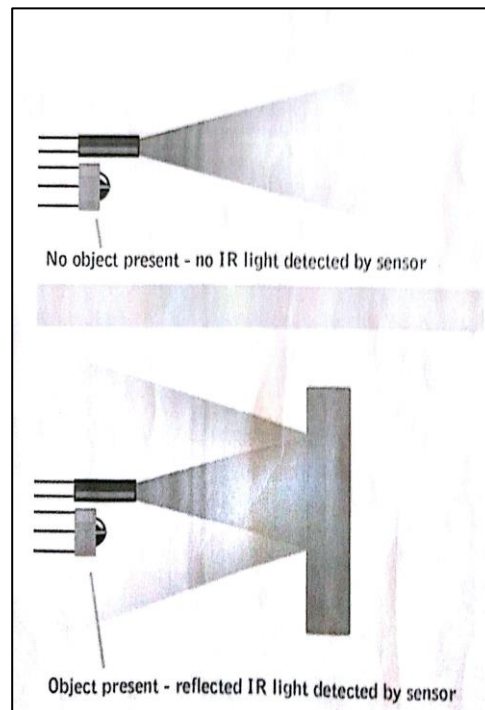
After getting signal from sensor Robots have to actuate. Steel chassis works to support all the parts of FFR. Use of Chain Drive instead of wheels the advantage of these is it can work in obstacle region i.e. on staircase, in Hillside areas etc. Water reservoir is connected to the pump, pump is used to pressurize the water and with that pressurized water we are able to extinguish the fire. Water tank has fire hose with the 3 degrees of freedom there is no need to displace the robot, we can extinguish the fire by adjusting the water hose.

B. Electrical Parts Working

Four wind shield DC motor is used to drive all the function of robot. There is microcontroller which is used to communicate with robot at receiver end. Transmitter end also uses same microcontroller. These microcontroller gives indication to IC and IC actuate. As per the capacity of motor we can choose the IC build in FFR. High pressure of water is used to extinguish the fire. In water the some carbon dioxide is added, as we know the carbon dioxide is considered as best fire extinguisher.

VI WHAT FFR ACTUALLY DOES

The main function is to extinguish the fire. Firstly robot sense the high temperature region with the help of sensor and gives the indication to the operator, after that operator operates the robot from wireless transmitter end gives signal to the receiver end microcontroller from receiver end actuate the IC and IC drives the motor. With the help of remote we can change the position of fire hose and can displace the robot. With the help of motor pump can actuate and pump suck the water and sprays water on the fire and extinguish it.



The fig. shows how IR light sensor works. The IR light sensor is used to detect the obstacle comes in rout of FFR, by these it can avoid the obstacle and works faster and complete the goal what is have. It is best way to extinguish the fire in modern days.

VII ADVANTAGES

1. The main advantage is, it separates fireman from the fire.
2. It works on the both modes ie.mannual as well as automated.
3. Mobile robot.
4. No line of sight.
5. Long range.
6. Not blocked by common material.
7. Not sensitive to weather conditions.
8. It detects the high temperature region so it can extinguish fire before it goes out of control.

VIII DISADVANTAGES

1. Communication device mostly used similar frequency so interference occurred if address is not specified.
2. It cannot be work beyond limit.
3. It detect high temperature region but it can't able to determine it is harmful or not.

IX APPLICATIONS

1. In residential societies and colonies.
2. In industries where fire hazardous is more like oil industries.
3. In commercial and domestic sectors.
4. Can be used in record maintaining rooms where the valuable data is stored.
5. Can be used in server room for immediate action in case of fire.
6. The application of FFR is in group of chemical and oil industries, nuclear plant, military storage, as well as mine field and in transportation.
7. In cloth godown.
8. Fire cracker market.

X. FUTURE SCOPE

In the present condition it can extinguish fire only in the way and not in all the rooms. It can be extended to areal fire extinguisher by replacing the water carried by a carbon dioxide carrier and by making it to extinguish fires of all the rooms using microcontroller programming also the robot could not be run through the batteries because acts

some conditions the current requirement for the circuit rises to about 0.8A which is very high and cannot be operate using batteries.

XI SUMMARY

Fact that both automated and manual mode is required in FFR is that the FFR is the first version and control is not perfect, for this reason sometimes operator need to make decision in some situation, in other word the human supervision is required.

As per the above report the FFR works efficiently and its detection of the fire and extinguish the fire with very high speed will save the many lives as well as human properties so we conclude that its must required in modern days, as we see in news, fire increases due to irresponsible human beings.

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