

A Review on Fire Fighting Robot

Mr. Amar.E.Chaudhary¹, Mr. Akash.S.Ingle², Mr.Sagar Rathod.³, Mr. Shubham.S. Humbad⁴,
Mr. Prakash.S.Palkar⁵

Professor, Dept. of Mechanical Engineering, PLIT&MS,Buldana, India²,
UG Student, Dept. of Mechanical Engineering, PLIT&MS,Buldana, India^{1,3,4,5}
Email-amarchaudhary14336@gmail.com

Abstract- From this topic we are trying to give a better solution to extinguish fire in household areas as well as the industrial areas. The fire can be caught up at any place where the temperature is high or there is open electric supply at that place the chances of fire is maximum, due to fire the heavy damage occurs that fire can not easily be controlled by fire fighters at many times fire fighters lose their lives while extinguishing fire as an option to this we can use fire fighting robots which will sense the fire and extinguish it with the help of various methods and technology embedded in it. Robots are implemented in various areas like Industries, Manufacturing, Medicines etc. Hence, Robotics can be used to assist fire fighters to perform this task of fire fighting and thus reduce the risk of their lives. Fire Fighting is a robot designed to use in such extreme conditions. It can be operated and controlled by remote user and has the ability to extinguish fire after locating the source of fire. It is equipped with a monitoring system and operates through a wireless communication system. The fire detection system is designed using the sensors mounted on the fire fighting robot.

Keywords: Fire source detection, Sensors, Fire extinguishing, Android.

1.INTRODUCTION:

Firefighting and rescuing the victims is a risky task. Fire Fighters have to face dangerous situations while extinguishing the fire. Fire Fighters extinguish fires in tall buildings, drag heavy hoses, climb high ladders, carry victims from one building to another. In addition to long and irregular working hours, fire fighters also face unfriendly environment like high temperature, dust and low humidity. Besides, they also have to face life threatening situations like explosion and collapse buildings. According to the report of IAFF in the year 2000, 1.9 fire fighters per 100,000 structure fires have lost their lives per year in USA. However, this rate was increasing to 3 per 100,000 structure fires. The different causes of Line Of Duty Deaths (LODD) are smoke inhalation, burns, crushing injuries and related trauma. Statistics shows that the deaths of fire fighters are constant every year.

This results in need of firefighting machines to assist the fire fighters to avoid deaths by handling the dangerous situations. We think that by doing together work by fire fighter machine and fire fighter it will more efficiently work during the operation. Our project is fire fighting robot with material handling during the fire extinguishing operation using the IR and RF signals and it is operated by the android application it will operate from a distance, Hence it

will help to save the lives of fire fighters and minimize the damage.

2.LITERATURE SURVEY:

Mustafa Hamza Abd-Elhamed Khalid¹ and Dr. Eltaher Mohamed Hussein² was designed a firefighting robot to extinguish the fire in private buildings and warehouses by using radio frequency, PIC 16F84A where it's designed the firefighting system which found by using LDR sensor and used C language to programming. The performance of system has been monitored through actual experience and got good results from this experiment. Based on the problems listed previously designed a car to extinguish the fire, which has a total of features including to rely on machine in firefighting operations without human intervention rendered it reduces the risk who may affect firefighter while working and to enter the places may make it difficult for fire engines to access the normal process of making extinguish the fire and easy process, to reduce the time spent waiting for the regular fire engines are designed for some private enterprises [1].

Sandip Gupta Farogh Ahmad S. Sundar and Shanmugasundaram M present a paper which represents a fire extinguishing robot which serves the purpose to reduce fatality and injuries caused due to

fire accidents. A fire-fighting robot is designed using Raspberry Pi 3 Model B equipped with equipment such as PIR, Ultrasonic, Flame, Temperature and Humidity sensors which senses the fire, human casualties, monitoring temperature and humidity of the surrounding and distance between the robot and the obstruction in front of it so that user could properly operate the robot under extreme circumstances. The increased intensity of fire may disrupt the sensor and so additional measures are taken care by using webcam which would provide a clearer view of the environment in which it is been operated by rotating it by 45 degrees with the help of servo motor in every 5 seconds. Ultrasonic sensor is also synchronized to rotate with the camera with the help of servo motor so that both point to the same object giving exact distance between the robot and the object which the camera is viewing. To extinguish the fire a 5V DC Fan is used which starts functioning as soon as the flame sensor senses for fire. To control the robot from remote location Tigt Virtual Network Computing server is used which uses Remote Frame Buffer protocol to send screen pixel data of Pi's desktop. To access the robot over different network an IOT based platform called Weaved is used which automatically does port forwarding and provides an encrypted connection on port 80(http). The robot can be controlled by a smart device such as smartphone or a laptop which have an access to internet. To make the robot more flexible it is programmed in such a way that it can also be remotely operated using an application called Telegram using Telegram Bot which enables machines to talk allowing the Raspberry Pi to receive command from user to move and reply back with temperature, humidity, human casualties and if fire is present by reading the sensors attached to the robot[2].

Sahil S.Shah¹, Vaibhav K.Shah², Prithvish Mamtora³ and Mohit Hapani⁴ they present a paper on Fire Fighting Robot is designed to search for a fire in a small floor plan of a house of the specific dimensions, extinguish the fire with the help of the front fan of a toy hovercraft, and then return to the front of the house. The fire detection to be put into use is relatively free of false alarms, it is anticipated that it will not overreact in nonfire simulations. This mission is divided into smaller tasks, and each task is implemented in the most efficient manner such as self autonomous start of the robot, navigation of the robot in every room step by step, finds the fire in a specific room, approaches the fire at a very fixed distance[3].

Miss. Kena Patel¹, Mrs. Bhavna K. Pancholi² present a research paper on implementation methods of fire fighting robot they were doing survey on various methods like Autonomous robot, Android application based robot, DTMF based robot, voice operated robot. Among which, Android based robot is superior. Autonomous robot gives delayed output and voice operated robot is affected due to noise interference and voice recognize is also quit complicated task. DTMF based robot requires DTMF transmitter and receiver and is a sound activated so it is very complex system. Whereas android controlled robot is a smart system with more accurate and error free results. Thus based on comparative analysis of different implementation systems, they found that android application based implementation method is the most efficient and preferable[4].

Swarnalata Bollavarapu¹, Neil K. Samuel², Maneesh Shankar³, Nihaar Shah⁴ present a paper on the topic An analytical Study of Various Methods Used to Build an Autonomous Fire-Extinguishing Robot authors compare various fire fighting robots according to them a fully autonomous fire fighting robot could help save lives and operate in an environment where humans can't reach. An autonomous robot is suitable for fire fighting in hard situations[5].

Miss. Dipali A. Mali, Miss Pratima S. Mane and Miss. Shraddha K. Dubal, Miss. Supriya S. Kadam, works on AVR based Fire Fighting Robot they used components to make robot are i. IR Fire sensor ii. RF Module transceiver set iii. GSM module iv. DC motor v. ATMEGA16A AVR Microcontroller Using the proposed technology, the robot can detect and extinguish fire. Robot can be act as automatic location finder and path tracer. It provides greater efficiency to detect the flame and it can extinguish fire before it become uncontrollable and threat to life [6]. This project will be complete addition of electronic circuits, hardware designing and software knowledge. Less human intervention is needed for the operation of the robot. It stops the spreading of fire effectively by the use of water sprinkler. The robot can be designed to avoid obstacles in its path by using IR obstacle detection sensor [7]. It can be reprogrammed easily to add modifications. It can extinguish or fight fire for a small amount of time until human fire brigade arrive. It can detect fire only in certain

locations. It will be a safest mode of operation by which many disasters can be prevented without damage.[7].

Method of working of fire fighting robot: The Robot developed by the Authors [1], were divided into the following systems, the general structure, the obstacle avoidance and driving component, software development system, fire detection and the remote supervision system. The robot makes use of 8 ultra-sonic sensors to accurate detect the distance of the robot from the fire source. The sensory devices constantly provide data to the Micro controller, which interprets this data to detect whether a fire is present within its vicinity or not. Once the fire is detected, the fire alarm is set, the robot moves towards the source of fire and the fire is extinguished using a sprinkler device. The robot for the Educational Competition by the authors [2] was built in stages with the aim of constantly improving on the design and the efficiency of the robot and at the same time to meet the criteria that was given to them. The basic model composed of an infra-red sensor to detect the fire and pneumatic system to extinguish the fire. On detection of fire by the sensors, PLC would set the fire alarm, the authors initially made use of an open loop system for co – ordinate detection and motion towards the source of fire. The authors realised that a closed loop system would work more efficiently, especially in a situation where the motion is to take place in a 3D plane. Various algorithms for path detection and tracking was tried and tested by the group to reach the fire in the least amount of time, when the source of fire was detected, compressed air will be used to extinguish it. The pneumatic system pumps air till the tank is empty. The goal of the fire fighting vehicle is to extinguish fire in the least possible time and in an efficient way that would help save life and property. The robot must be of a heat resistant material to withstand high temperatures and prevent any damage to the robot. The most important step in developing a fire fighting robot is the sensitivity and accuracy with which it can detect the presence of a fire as it acts as the triggers for the robot to get into action.

3..METHODS OF WORKING OF FIRE FIGHTING ROBOT-

The author worked on the fire fighting robot[9] , were divided into the following systems, the outlook of the robot,the, software development system, driving system and its working ,fire detection and the remote supervision system. The robot makes use of 8

ultra-sonic sensors to accurate detect the distance of the robot from the fire source. The sensory devices constantly provide data to the Micro controller, which interprets this data to detect whether a fire is present within its range or not. Once the fire is detected, the fire alarm is start and the robot will displace towards the fire and the motor gets starts it sprinkle extinguisher on the fire and try to control fire .

The robot prepared by the authors [10] was built to increased the accurateness of the robot. The infra red sensors are used to detect the fire and hydraulic are used to extinguish fire. On detection of fire by the sensors, PLC would set the fire alarm, the authors initially made use of an open loop system for co – ordinate detection and motion towards the source of fire. The author used feedback system to improve effectiveness of the robot., especially in a situation where the motion is to take place in a 3D plane. Lots of algorithms are used to find shortest route to reache to fire location, The author used compressed air as a fire extinguisher. The pneumatic system pumps air till the tank is empty. The goal of the fire fighting vehicle is to extinguish fire in the least possible time and in an efficient way that would help save life and property. The robot must be of a heat resistant material to withstand high temperatures and prevent any damage to the robot. The most important step in developing a fire fighting robot is the sensitivity and accuracy with which it can detect the presence of a fire as it acts as the triggers for the robot to get into action.[11]

4. CONCLUSION: Fire fighting robot is a option to save the lives of fire fighter which will loss their lives. Many times due to high temperature and smoke at the area where is fire, at that place robot will reach and extinguish the fire. The technology can make robot as advance as it will find source of fire and control it without affecting life of fire fighter. The use of various types of fire fighter robot can be make which are mobile can find the area of fire and sprinkle the extinguisher on the fire to control fire and minimize the damage. The material handling unit can be added to carry out the human beings or important things from fire.

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