

# **A Survey on Fire Fighting Robot Controlled Using Android Application**

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**ABSTRACT:** Detecting fire and extinguishing it is a dangerous job that puts life of a fire fighter at risk. There are many fire accidents which fire fighter had to loose their lives in the line of duty each year throughout the world. The research and development in the field of Artificial Intelligence has given rise to Robotics. 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 Fighter 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 fighter robot. The robot is controlled autonomously using Android application. Android mobile phone platform developed by Google has gained popularity among software developers due to its powerful capabilities and open platform. Therefore, Android is a great platform to control a Robotic system. Android provides many resources and already integrates lot of sensors. This concept helps to generate interest as well as innovation in field of robotics while working towards a practical and obtainable solution to save lives and mitigate the risk of property damage.

**KEYWORDS:**Fire source detection, Autonomous Navigation, Sensors, Fire extinguishing, Android.

## **I. 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.

So if a robot is used instead, which can be controlled from a distance or which can perform actions intelligently by itself, which will reduce the risk of this task of fire fighting. Robot is a mechanical device that is used for performing tasks that includes high risk like fire fighting<sup>[1]</sup>. There are many types of robots like fixed base robot, mobile robot, underwater robot, humanoid robot, space robot, medicines robot etc. Fixed base robot has limited workspace due to their structure. Workspace of the robot can be increased by using a mobile platform. These type of robots are called mobile robots. Mobile robots are used in mining, military, forestry, security etc. Mobile robots can also be used for extinguishing fire in tunnels, industries, hospitals, laboratory and in homes A fire fighting robot will decrease the need of fire fighters to get into dangerous situations. Further the robot will reduce the load of fire fighters. It is impossible to extinguish fire and rescue many victims at a time of huge disaster. Robot technology can be very efficiently used in such cases to rescue much more victims. Thus robotics makes human life easier and safe as well as save a lot of time. The rapid development in technology improves the tools and equipments used in firefighting. These advance tools and

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equipments can be more effective and efficient. Moreover, it reduces minimum risk level. This will also reduce the damages caused due to an fire incident.

Android is based on Java programming language and is platform independent. Therefore it can be used in student projects. Android application is a program that can run on Android operating system and provide the required functionality to the user. The Android platform includes support for Wifi communication. Using the Wifi APIs, an Android application can scan for Wifi devices, connect to other devices, transfer data to and from other devices.

## II. LITERATURE SURVEY

In today's era fire fighting is an dangerous issue. Many authors are working on different techniques for fire fighting. Author Ratnesh Malik et al. has developed an approach towards fire fighting robot. The robot is designed and constructed which is able to extinguish fire. The robot is fully autonomous. It implements the concept likes environmental sensing and awareness, proportional motor control. The robot processes information from its sensors and hardware elements. Ultraviolet, Infrared and visible light are used to detect the components of environment. The robot is capable of fighting tunnel fire, industry fire and military applications are designed and built. Ultraviolet sensors are used to detect fire. Once fire is detected, robot sounds an alarm. Then the robot activates an electronic valve which release sprinkles of water on the flame. Detailed concept of robot is explained which automatically detects fire and extinguishes it in short time by the use of sensors, microcontroller etc. This robot is used in places where human lives are at high risk<sup>[2]</sup>.

Author Kristi Kokasih et al. has developed intelligent fire fighting tank robot. Tank robot is made from acrylic, plastic, aluminum and iron. Robot components are two servo motors, two DC motors, ultrasonic sensor, compass sensors, flame detector, thermal array sensor, white detector (IR and photo transistor) , sound activation circuit and micro switch sensor. The objective is to search certain area, find and extinguish the flame for different flame positions, room configuration with disturbance. Robot is activated through DTMF transmitter and receiver<sup>[3]</sup>.

Control Of An Autonomous Industrial Fire Fighting Mobile Robot is developed by H.P. Singh et al. The paper describes the construction and design of mobile fire fighting robot. The system contains two optically isolated D.C. motors. Robot performs analog to digital conversion of the data provided by infrared sensors. Five infrared sensor are used. Two sensors control the motion of the robots and three are for flame detection. The extinguisher comprises of D.C water pump and a water container. The basic theme of the paper is to sense the flames of fire and extinguish it. For this infrared sensor is used as input sensor which senses the infrared rays coming out of the fire. The microcontroller controls the extinguishing system.<sup>[4]</sup>

Wireless fire fighting robot is developed by Swati Deshmukh et al. It comprises of machine which has ability to detect fire and extinguish it. The fire fighting robot can move in both forward and reverse direction and can turned in left and right directions. Thus fire fighter can operate the robot over a long distance and there is no need for human near the area on fire. Light dependent resistors are used for detection of fire. These resistors are highly sensitive devices and are capable of detecting very small fire. The robot provides security at home, buildings, factory and laboratory. It is an intelligent multisensory based security system which contains fire fighting system in daily life.<sup>[5]</sup>

Cell phone controlled robot with fire detection sensors developed by Lakshay Arora consist of mobile phone which controls a robot by making a call to the mobile phone which is attached to the robot. During the call activation period, if any button is pressed on the phone, the tone corresponding to the button pressed is heard at the other end of the call that is placed on the robot. The robot perceives Dual-Tone Multiple-Frequency (DTMF) tone with the help of phone mounted on the robot. The received code is processed by the microcontroller and then the robot performs actions accordingly. In the proposed system DTMF technology is used to position the shaft of motor at a required point with different sensors, each performing its own task. Rugged, Simple and cost effective system is proposed here.<sup>[6]</sup>

Android Phone controlled Robot Using Bluetooth is developed by Arpit Sharma et al. Various techniques of Human-Machine interaction using gestures are presented. Gestures are captured by using the accelerometer. The paper analyses the motion technology to capture gestures using an android smart phone which has inbuilt accelerometer and Bluetooth module to control kinetics of the robot. The microcontroller controls the signals of the Bluetooth module. Features like user friendly interface, lightweight and portability OS based smart phone has overtaken the sophistication of technologies like programmable glove, static cameras etc making them obsolete.<sup>[7]</sup>

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Author SaravananP has designed and developed an Integrated Semi-Autonomous Fire Fighting Mobile robot. The System controls four D.C. motors powered by Atmega2560 and controlled autonomously by navigation system. Navigation system comprises of integrated ultrasonic sensors and infrared sensors. The robot is fitted with wireless camera which captures the video and transmits it to the base station. The fire detection comprises of LDR and temperature sensor. If there is a fire the sensor detects it and the robot will be moved to the source and extinguishes it. The extinguishing system consists of a BLDC motor with water container. The SABOT can be operated manually for extreme conditions. It comprises of a GUI support through which robot can be controlled from the base station.<sup>[8]</sup>

Intelligent Fire Extinguisher System is developed by Poonam Sonsale et al. The paper proposes of an adaptive fusion algorithm for fire detection. It uses a smoke sensor, flame sensor, temperature sensor for fire detection. It contains intelligent multisensory based security system that contains a fire fighting system in daily life. The security system can detect abnormal and dangerous situation and notify. Intelligent buildings are expected to be safer convenient and efficient living environments for society. The purpose of Intelligent Fire Extinguisher System is to extinguish flame in a certain amount of time. The system detects the fire location and extinguish fire by using sprinklers. As being Intelligent System, it cuts off the electricity of area where fire has been caught and starts the sprinklers only of that area.<sup>[9]</sup>

Remote Controlled Fire Fighting Robot developed by Phyto Wai Aung describes the functions of remote control fire fighting robot. It contains two main parts that is transmitter and receiver in which two sets of RF modules are used. One RF module is used to transmit the data to the motor driver and another RF module is used to know the condition on fire. Microcontroller PIC16F887 is used operate the whole system of the fire fighting robot. The motors are driven by the L298 and ULN2003 drivers in this system. The operator controls the robot by using wireless camera mounted on the robot. If the temperature of fire sight is above 40 degree Celsius, the alarm will be ringing so that operator can control the fire fighting robot and avoid the damage of heat.<sup>[10]</sup>

### III. CONCLUSION

Fire causes tremendous damage and loss of human life and property. It is sometimes impossible for the fire fighter personnel to access the sight of fire because of explosive materials, smoke and high temperature. Through this we can conclude that robot can be placed where human lives are at risk. The robot can operate in the environment which is out of human reach in very short time. In such environments, fire fighting robots can be useful for extinguishing fire. These robots should be controlled remote operators who are located far away from the fire site using remote communication systems. The robot accurately and efficiently finds the fire within minimum time after the fire is detected. In future work Project aims to promote technology innovation to achieve a reliable and efficient outcome. Mobile robot that can move through a model structure, find fire and extinguish it. The movement of the robot is controlled by the sensors which are fixed on the mobile platform .is to provide security of home, laboratory, office, factory and building is important to human life. We develop an intelligent multisensory based security system that contains a fire fighting system in our daily life. We design the fire detection system using sensors in the system, and program the fire detection and fighting procedure using sensor based method.

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