REVIEW OF "FIRE FIGHTING ROBOT: ENHANCING HOME SAFETY"

[1]Harsh Bhosale, [2]Vishal Bansode, [3]Rushikesh Ambawale, [4]Prof. Chitralekha Rananaware

[1]Student, [2]Student, [3]Student, [4]Assistant Professor
[1]Department of Instrumentation Engineering,
[1]All India Shri Shivaji Memorial Society Institute of Information Technology, Pune, India

Abstract: Firefighting is traditionally the most dangerous job which has been resulted in loss of many innocent lives. No matter the techniques used now days the well trained people can make mistakes. The use of robots is a trend that is used in recent techniques has attracted many attentions. This is because they can be used in most hazardous as well as very dangerous places which are exposed to fire or no human can help to minimize the fire or can get involved in. A fire can start or ignite in a factory or in any remote areas for a variety of non-predictable reasons. Electrical short circuits or leaks can cause serious damage to various industries, for example, petroleum industries. Robots or rovers are key to minimize loss and a viable option for protection of human life as well as the environments. The goal is to create a FIRE FIGHTING ROBOT using various embedded systems. It will be created for battling simulated home fires. This robot creates interest and creativity in domains of robotic field working towards an attainable result of saving lives and minimizing property danger.

Index Terms - **Arduino, Flame sensor, Home Automation, Firefighting, Fire Extinguishing, Robotics, Remote control, Home safety, Smoke detector, Fire safety.**

I. INTRODUCTION

Fires are most important and massively noticeable form of problem which leads to massive destruction. Fire spreads rapidly if not controlled, which leads to various risks, such as property damage as well as environmental loss. So these problems can be minimized or resolved with the robots. A robot is machine that performs various tasks assigned to humans or machines with dynamic behaviors. Various amount of study have shown that robots are massively useful and effective medical, rescue and industrial settings. Industrial robots are the safety manipulators with functions to perform wide range of specific functions on objects, gadgets or devices using variety of dynamic system functions. A recent development robotic project has integrated machine learning to rapidly increase the robotic intelligence.

The main and only work is to deploy Firefighting robot in areas prone to fire and robot will automatically detect the fire and take necessary actions needed such as extinguishing fire. It also deals with the situation of rescue were it is needed and no human can expose himself to dangerous situation. This robot is based on IOT based technology which uses flame sensors for detection of fire and helps in extinguishing fire by activating water pump. Firefighting robot gets activated when the fire detection systems detect fire. It then reaches the breakout point where the fire is exposed and the water pump will start ejecting the water to extinguish fire. The key features of the Firefighting robot are to provide assistance as well surveillance of fire so that major fire can be minimized and be controlled to prevent any human loss and environmental damage.

II. LITERATURE SURVEY

1. Saravanan P, Soni Ishawarya [1], proposed a model with ATmega2560 as its micro-controller in which robot id divided into three units according to its functions which are fire detection unit and extinguishing unit. Separate units perform there each tasks to minimize or extinguish fire. The fire detection unit consists of LDR and temperature sensor. And the extinguishing unit consists of pump and motor(BLDC). This robot also contains Bluetooth module which has communication between smartphones in order to locate or navigate properly in specific direction.

2. Tawfiqur Rakib, M.A Rashid Sarkar [2], proposed a fire-fighting robot model consisting of platform made from 'kerosene wood', Sensors(LM35), flame sensors to detect the fire on to a desired location and a water container of capacity of 1L made up from strong fiber or plastic body. The robot contains wheels for movements.

3. Stafford Michahial, *et al.*, [3], proposed a fire extinguishing robot which uses a technology for the navigation of robot such as DTMF(Dual Tone Multi-Frequency) tones and a flame sensor for detection of fire in certain areas capable of specific wavelength range of 760nm-1100nm and range of sensitivity varying from 10cm-1.5ft.

4. S. Jakthi Priyanka, R. Sangeeta [4], proposed on firefighthing robot controlled by android by using Arduino UNO R3. The firefighting robot consists of flame and gas sensors for detection of fire and gas, the robot also consists of gear motor and motor driver used for movement of robot, also a Bluetooth module to control the robot directions and can be controlled by a smartphone and android device as well. Water pump is used with sprinkler to extinguish fire. To program the Arduino UNO Open source software Arduino IDE is used.

5. A. S Sadun1, LC Hong1 [5], proposed a model such as automatic fire fighting robot with fire notification. The robot consists of flame sensors fixed at left, right and at center direction. The robot also consists of HC-SR04 ultrasonic sensor for obstacle detection and its avoidance. When the robot detects the fire within its range its send a notification to user connected vai Bluetooth module.

6. Prof Dr-ing, *et al.*, [6], proposed Amphibious Autonomous Vehicle which is an obstacle avoidance robot. In this vehicle, a Fuzzy logic controller is used for obstacle avoidance in real time. Its main aim is to navigate or guide the vehicle along its path, avoiding path obstacles.

7. Sushrut Khajuria, *et al.* [7], proposed on RF based Arduino firefighter robot to operate the robot and its water pump. Within range of 7 meters the robot can be controlled by the user. It also consists of camera controlled wirelessly to help user to move the robot in required direction.

8. Hossain, et al. [8], proposed on fire extinguisher robot operated automatically which is a device based on hardware that can move towards the fire which it's detected. Robots shield consist of calcium silicate that can withstand temperature up to 573 o K. The vehicle or robot can reach to certain locations of fire were no military cannot able to rescue. The robot can automatically OPEN when fire is detected. In exchange of thermocouple, Fire sensor and temperature sensors are used. To pump water for both amplifier and simulator IC741 is used. The movement of robot is by barrier and sensors. The images are also captured using MATLAB.

9. Hemalatha K. N, *et al.*, [9] highlighted IOT-based robot designed for support and surveillance for firefighters in dangerous situations. The presence of gas leak is detected by gas sensors in robot and similar for fire, flame sensors are used. And a human presence is detected by passive infrared sensors (IR). And a temperature sensor measures Humidity and Temperature.The advantage of this robot is it operated on both manual as well as independent control systems. An IOT-based communication system is used for monitoring of area which is affected by fire using WIFI. The data is stored and transferred to cloud server. Based on the performance of robot which is further analyze and tested.

10. Senthil Armugam, *et al.* [10] , the ability to provide work and with single smartphone with android. Specific server is designed to on webpage on server settings to manage the robot. The robot will take pictures from phone such as video streaming from smartphones.The temperature can be monitored using temperature sensor. All data can be monitored and analyzed and delivered to phone using Bluetooth module. Web server is connected to controller via bluetooth module to control the functions of robot and analyze it

11. H. Guo, *et al.* [11] highlighted that safety of ones personal health depends on home, office and industries. As robot is made with multiple sensors included in fire- fighting robot. Its frame consists of aluminum to make it more rigid and tough against fire. The fire detection system consists of flame sensors for detection of fire which also combines extinguishing system to extinguish fire. All the sensors are used for fire detection and extinguishing fire.

III. CONCLUSION

The "Fire Fighting Robot" has potential to enhance the home safety and to it from Fire hazards. It's wireless control robot to detect fire and follow towards location of fire. The integration of various sensors and IOT technology allows it to detect fire and extinguish it before any damage. The literature survey provided valuable insights into the current trends and advancements in robotics and fire detection, emphasizing the importance of using technologies such as IoT, wireless communication and mobile applications to develop efficient and safe systems. The development of "Fire Fighting Robot" combines robotics, fire detection and various technologies to create advanced systems capable of detecting and extinguishing fire.

REFERENCES

[1] Saravanan P., Soni Ishawarya,.2017. Android controlled semi-autonomous Firefighting robot, International journal Innovative Science Engineering and technology, Vol. 3.

[2] Tawfiqur Rakib, M.A Rashid Sarkar, June 16. Design of an autonomous Firefighting robot with multiple fire detection using PID, ICIEV, Vol. 23.

[3] Stafford Michahial, Deepika T V, Nagesh M S, December 16. Fire Extinguishing robot. International Journal of advance research in computer and communication technology, Vol.5 , Issue 12.

[4] S. Jakthi Priyanka, R. Sangeeta, 2017. Firefighting robot controlled by android, International Journal of innovative science and technology Vol. 3.

[5] A S Sadun1, LC Hong1,D Misan1, August 2019. Automatic Firefighting robot with notification. IOP conference series, Science and Engineering materials, 3rd journal international conference on Robotics and Mechatronics (IcRoM 2019).

[6] Prof Dr-ing, Khaled Sailan, Klaus Dieter, 2015. Obstacle avoidance using fuzzy logic steering control. International journal of science and technology, Vol. 2.

[7] Sushrut Khajuria, Varenyam Sharma, Abhideep B, May 2017. Arduino based firefighting robot, IJSER, International journal Of scientific engineering and research, Vol. 5 issue 5.

[8] Hossain, Md Anowar, Himaddri Shakhar Roy, Md Fazlul Karim Khondakar, Md Hasib Sarowar, and Md Azad Hossainline. 2021. Design and Implementation Of an IOT based Firefighting robot. 2nd international conference on Robotics, Electrical and Signal processing techniques (ICREST) pp.552-556 IEEE.

[9] Pramod, B.N., K.N.Hemalatha, B. J. Poornima, andR.Harshitha. 2019. Fire-Fighting Robot. 2019 International conference on Information and Communication Technology Convergence(ICTC), pp.889-892, IEEE.

[10] H. Guo , Chien, Ting L., Kuo L. Su, and Sheng V. Shiau, 2007. Multiple interface based firefighting robot. 2007 IEEE International Conference on Mechatronics, pp.1-6.IEEE.