

The Fire Extinguisher Robot “FEBO”

Yash Sharma¹, Shashwat Singh²

^{1,2}Student, Sunbeam Group of educational institutions, Varuna, Sikraul, Varanasi, Uttar Pradesh, India

Abstract - Over the scope of the latest decade, we have seen numerous mishaps caused due to fire. These fire mishaps are one of the most significant reasons for human fatalities in India and abroad the world. The current fire prevention framework isn't equipped for giving a quicker reaction to fire accidents. There are two significant reasons for the late reaction to the fire mishaps - the first is the traffic confinements inside the city and the subsequent one is the small narrow streets inside the city. If the fire engines reach on time to the accident spot, then likewise, they can't go into the streets. It takes a lot of time for them to lay their hoses from the truck to the affected spot. For this issue, we have made a robot that can be utilized by anybody to go about as first aid and attempt to extinguish the fire. It can be controlled by our smartphones. we can have a live view of what is there in front of the robot. It comprises a two-way audio communication framework that will help the controller to communicate with the person stuck inside the fire.

Key Words: Fire Extinguisher, Flame sensors, Heat switches, Thermostats, Wireless camera, Arduino

1. INTRODUCTION

The objective of this project is to sense flame with the help of the Thermostat and flame sensors to extinguish it. It can be used in societies and installed in building on each floor to control the fire and in that time, people can be rescued out. It consists of various frameworks. We can also have a live view of what is being seen by the robot through a wireless camera and also, we can have two-way audio communication. The Robot can be used in Buildings, schools, offices, shopping malls, petrol filling stations, LPG filling stations, on roads (in case if any vehicle catches fire). The main purpose is to control the fire and not let it rise and, in the meanwhile, people can be rescued out. The robot includes fire sensors, heat switches, and thermostats for the discovery of fire and heat. as soon as the sensors get a sign about a fire or fire it turns on a switch which is associated with a CO₂-type fire extinguisher. When the fire is smothered then the fire extinguisher turns off. The robot mainly consists of the following components: -

- 1) Smartphone control framework
- 2) Fire detection framework
- 3) Fire extinguishing framework
- 4) Live view framework
- 5) Two-way audio communication framework

1.1 Smartphone control framework

The robot consists of a smartphone control framework that will help people to wirelessly control the robot. For the smartphone control framework, a technology titled “Bluetooth” is being used.

[1] Arati S.N., Ambika B., Divya K, Gayathri A, and Nidhi S (2020) have given a detailed analysis of Bluetooth such as Bluetooth is a modern wireless short-range RF technology that is designed to communicate wirelessly between various machines.

1.2 Fire detection framework

The robot consists of a Fire detection framework. As the name suggests, this framework has been designed to sense the flame. This framework is made using various sensors which are used to detect fire like IR flame sensor, Thermostat, Temperature sensor. All these sensors are controlled by a microcontroller-based circuit “Arduino”.

[2] Leo I. (2014) in his paper gave a detailed analysis on Arduino. Arduino is an open-source microcontroller-based circuit that can be effortlessly modified, deleted, and reprogrammed at any moment.

1.3 Fire Extinguishing framework

This is one of the main components of the robot. The main objective of this framework is to extinguish the fire by switching on the fire-extinguisher through a mechanical mechanism.

1.4 Live view framework

The robot consists of a system that captures what is in front of the robot and transmits it wirelessly to the receiver. This helps the controller in controlling the robot and evacuating the place as soon as possible. This framework works on a wireless camera setup.

1.5 Two-way audio communication framework

This framework will establish a two-way audio communication that will help the controller to interact.

2. WORKING ON THE FRAMEWORKS

The working of all the frameworks has been explained below.

2.1 Smartphone Control Framework “S.C.F.”

As discussed in the introduction, this framework will help the controller of the robot to wirelessly control the robot without risking his life. This is a system that is capable of connecting with any smartphone through which the robot can be controlled to reach its destination. This system will be used to rescue any person. By knowing his location, we can control the robot and send it to rescue the person. Suppose there is a fire in a building and the person controlling the robot knows that where the public is gathered so the person can send the robot by guiding it to the location so the public can get rescued. This system works on Bluetooth and consists of various electronic components i.e., Arduino, Bluetooth module, L298n Motor Driver, Chassis, and a power supply unit.

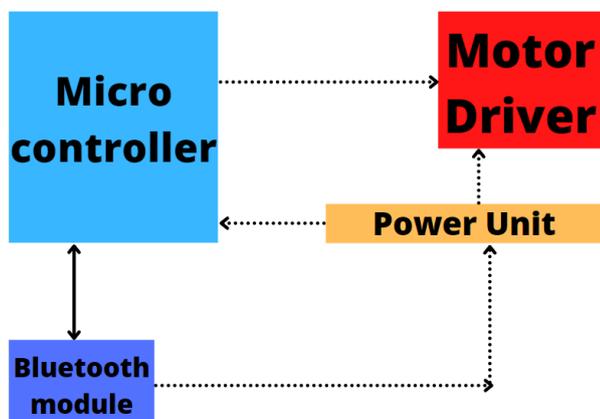


Fig -1: Block-Diagram for S.C.F.

In a nutshell, The Smartphone control framework will help in controlling the movement of the robot.

2.2 Fire Detection Framework “F.D.F.”

Fire detection is a vital part of this robot as its basic functionalities depend upon this framework. As introduced above, this framework will help the robot in the detection of flame or fire which will activate the extinguishing framework. When there is a fire, the various sensors will detect it and send the data to a microcontroller-based circuit. The circuit will switch on the motor which will further open the Fire extinguisher knob. When the Fire extinguisher knob will be ON, it will start spraying CO₂ which will extinguish the fire.

The intensity of the amount of carbon dioxide sprayed will depend on the intensity of the fire. The sensors will help the microcontroller know the intensity of the fire.

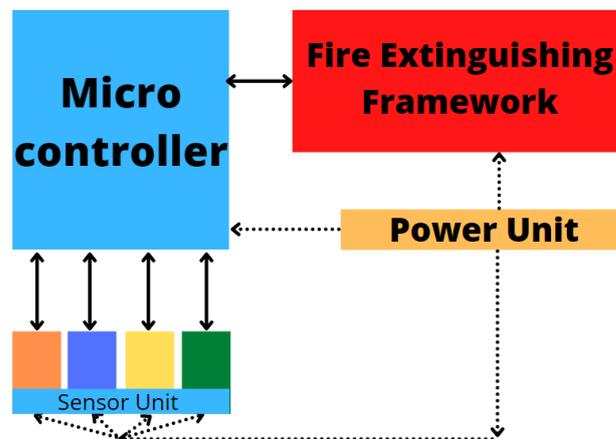


Fig -2: Block-Diagram for F.D.F.

In a nutshell, the fire detection framework will help in the detection of fire and also the determination of the intensity of the fire.

2.3 Fire Extinguishing Framework “F.E.F.”

The main objective of this robot is to extinguish the fire and help people evacuate out of the building. To accomplish this task, the fire extinguishing framework is required. As introduced above, this framework will help in extinguishing the fire through a fire extinguisher. The various sensors of the fire detection framework will sense fire and send signals to the microcontroller which in turn will activate the fire extinguishing framework. The fire extinguishing framework consists of a geared motor and various fire extinguishers. The geared motors are implemented in a mechanical system that can pull the fire extinguisher knob when commanded by the detection framework.

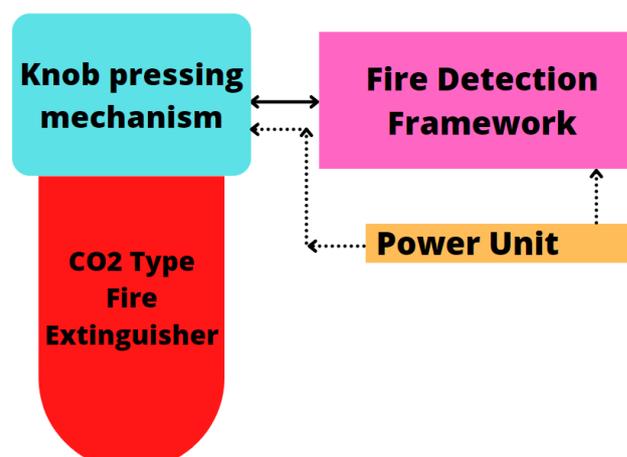


Fig -3: Block-Diagram for F.E.F.

In a nutshell, the fire extinguishing framework will coordinate with the fire detection framework to blow fire.

2.4 Live View Framework "L.V.F."

This is one of the additional features offered in this robot. The live view framework will help the controller of the robot to see what's coming in front of the robot and guide accordingly. This will ensure the correct path being followed by the robot. This framework consists of a wireless camera that can be accessed on the web through authorized personnel or anyone in time of emergency.

2.4 Two-way audio communication Framework "A.C.F."

This framework will work in coordination with the live view framework and will help in establishing communication with the controller of the robot and people caught inside the place. Through this framework, we can have a live talk with anyone who is stuck in the fire so that we can guide them out of the place.

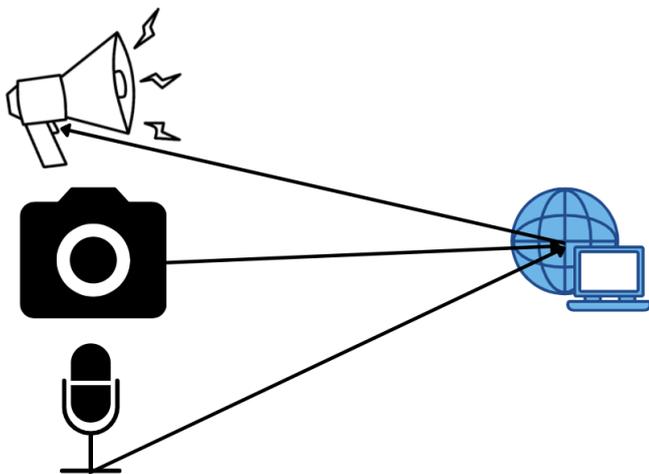


Fig -4: Block Diagram of the L.V.F. and A.C.F.

3. DIFFERENT VERSIONS

3.1 Building Version

This version can be deployed in high rise buildings



Fig -5: Building version of the robot

3.2 Kitchen Version

This version can be deployed in the kitchens. This is comparatively a small-scale robot.

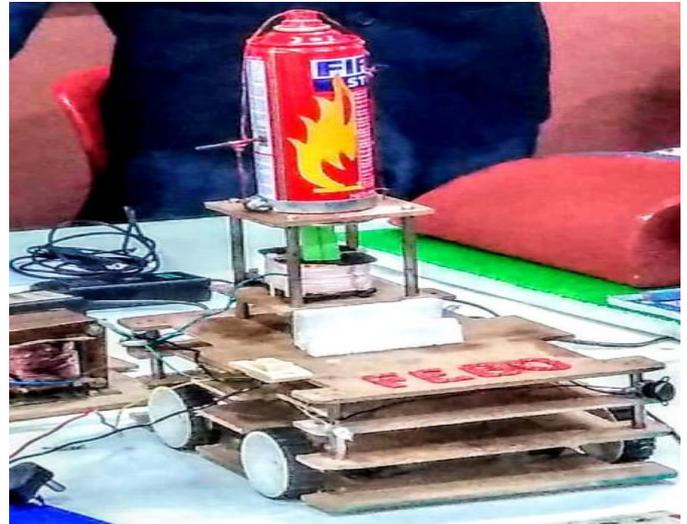


Fig -6: Kitchen version of the robot

3.2 Public Place Version

This version can be deployed in public places like malls, restaurants, petrol pumps, etc.



Fig -7: Building version of the robot

This version is comparatively bigger than the previous ones.

3.4 Heavy duty Version

This version can be deployed in industrial places such as factories. This version is the most durable.



Fig -8: Heavy-duty version of the robot

3.5 Experimental Version

This version cannot be used in practical life but it can be used for research and experiment.



Fig -9: Heavy-duty version of the robot

*All these versions have been made by us (Yash Sharma and Shashwat Singh) and have been displayed at Exhibitions.

4. CONCLUSIONS

This is a robot whose basic use is to rescue people from fire accidents. It consists of various frameworks which get the job done. It can be controlled via a smartphone and can be guided to the place where the fire is there. After going there its fire detection framework will detect fire and will activate the fire extinguishing framework. This framework will try to extinguish the fire and create a place for rescuers to enter the place and people stuck to go out. This robot also consists of a live view framework which helps the controller to get a view of what is there in front of the robot. The two-way audio communication framework incorporated with the live view framework helps in establishing contact between the controller and people inside the place.

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