



FIRE DETECTOR AND EXTINGUISHER MACHINE with IoT

L Neeraj kumar¹, M Teja Sai², K Vasanth Kumar³, T Krishna Vamsi⁴, S Suneetha⁵

⁵Assistant Professor, Dept of ECE, Godavari Institute of Engineering and Technology(A), Rajahmundry, AP

^{1,2,3,4}Students, Dept of ECE, Godavari Institute of Engineering and Technology(A), Rajahmundry, AP

Abstract- Fire hazards are still a noticeable problem in the world where people and properties are being lost due to some small negligence. Fire detector and extinguisher machine helps the people in the fire hazards particularly in their residents. The fire detector is embedded with new type of technology which has camera and raspberry pi. The fire extinguisher act as a first aid and responsible for ignition of fire. The IoT take care of notifications to different people to react for the incident, which include informing to fire station with a message.

Keywords- *Fire detection, fire extinguishing.*

1. INTRODUCTION

Fire is the rapid oxidation of the fuel (combustion materials) in the process of combustion which releases light, heat and various reaction products. Speaking broadly, fire is occurred due to unintentional negligence, irresponsible behaviour, or product or technology defects. Mostly fire hazards are found in the occupancy like smoking, storage, electrical appliances, trash, and heating. The fire incidents are classified into different categories, they are from ordinary fires (wood, paper, clothes, etc), liquids & gases, electrical fires, metallic fires, grease fires or cooking fires. A fire accident can be caused by any of the above class fire, the burns can be the result of many types of incidents. There isn't a standard legal process to deal with fire incidents, other than considering a workers compensation or negligence claim. In the part

of fire extinguishing, there are very few techniques to identify the fire and intimate the owner or fire station. There are different types of technologies that are under the existence to detect the fire like heat detectors and smoke detectors which are useful today to identify the fire.

The human involvement is needed to intimate the fire station to come to the location. There are four stages of fire development, they are ignition, growth, fully developed and decay. The fully developed and decay fires need fire station intimation and they need water tank involvement to stop it. The last two stages of fire development can't be managed or stopped by basic extinguishers, but the first two stages like ignition and growth are manageable by basic extinguishers like fire extinguisher (containing monoammonium phosphate). But at present to stop all of these basic fires there is need of human intervention to detect it, alert to people and station, sprinkle water, etc.

The main goal of this project is to decrease the human intervention in fire detection and extinguishing by proposing a new automatic machine which does detection of fire through camera (more efficient), shooting the water on the fire, intimation to fire station through SMS with location, and providing user information (daily updates) through whatsapp and cloud.

2. PROPOSED SYSTEM

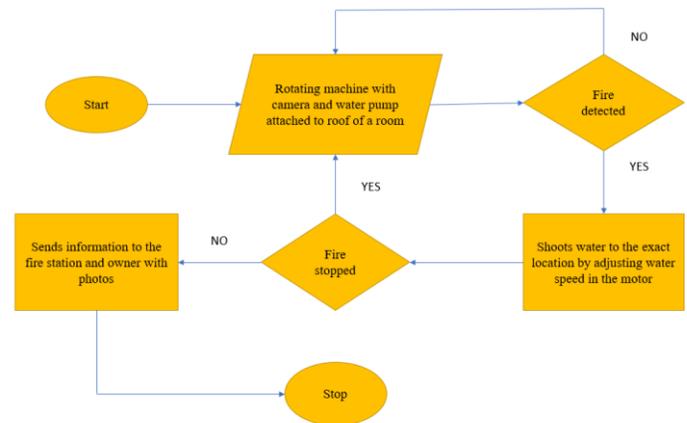
The concept of fire detection and fire extinguishing is completely deals with how to detect the fire in a location and if the fire has been detected then how to stop it and alert the fire station, here in this project the fire detection is the first and foremost step, as this machine is for closed places/ rooms the machine will be in the middle of the room which is hanged to the sealing at the centre. The machine should cover the whole room for any fire, we introduced a rotating mechanism where the machine will rotate 360⁰ degrees in a room to cover the whole place where it rotate clockwise and next back in anti-clockwise directions. For vision we used a 5MP camera module attached with raspberry PI. The code for fire detection will work live every time and it is written in python, the complete setup is done to monitor the fire.

If the fire is detected the machine should stop the fire and if in case fire rises more and more than the machine itself should alert the fire station and the owners. To satisfy this we presented a DC motor with adjustable speed and connected with water, the motor is useful to make water pump with a speed. The process of sprinkling the water on the fire won't help in all cases, so we offer a shooting system where the water will be thrown on to the fire because if the water hits the fire with a speed the fire stopping chances are more than sprinkling water. The motor is attached to the camera module where both are at a same point of location. So if the fire is detected at a point in a place then the rotation of the machine stops and water will be hitting that point with some speed to stop it.

If in case the fire is not stopping even after basic extinguishing by the machine for 2 minutes then the machine immediately sends the SMS to the fire station with the location of the incident mentioned in it. As there is chance to hook some more extra features to the machine, every incident's status will be sent to the owners through whatsapp messages and every incident's photo will be stored in the cloud, So here we make use of IoT.

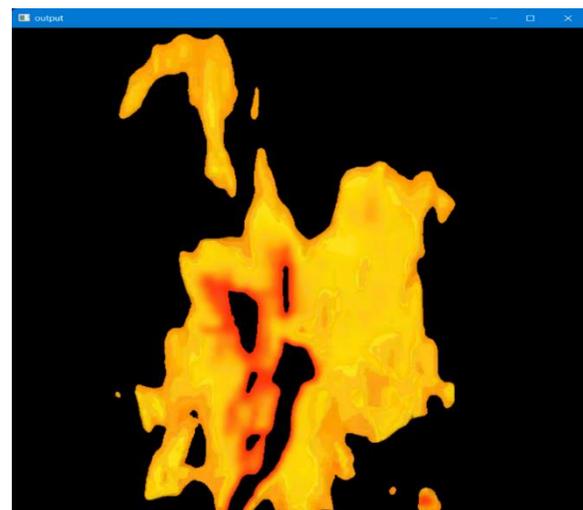
3. RESULT

The fire detector and extinguisher is a must and should machine which acts as a first aid when the fire is at it's origin. The places like industries, kitchens, schools, hospitals, etc, try fixing water sprinklers with smoke detectors embedded with them but this machine can be a best replacement for the old fashioned fire extinguishers because human involvement is not there cause the machine is automatic. Secondly it's a water saver because it will just shoot the water towards the

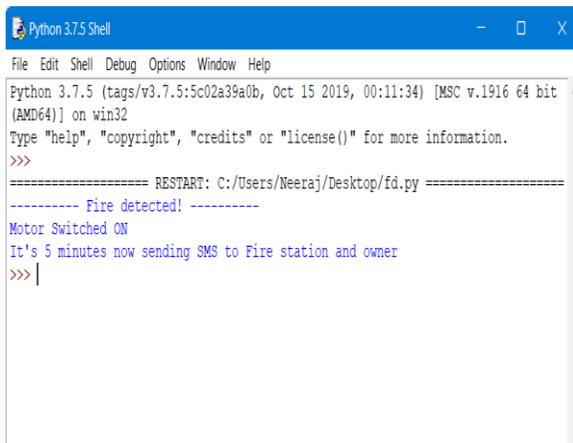


exact location of fire instead of sprinkling the water in whole room.

Initially, the machine is hooked to the ceiling of a room with water connected to the water motor through pipes. When the machine is switched ON and connected with wi-fi, the stepper motor starts it's functioning in the clockwise and anti-clockwise direction to make the camera cover the whole room. While 5MP camera module rotates with the stepper motor monitors the whole room by detecting for any fire in the live video.



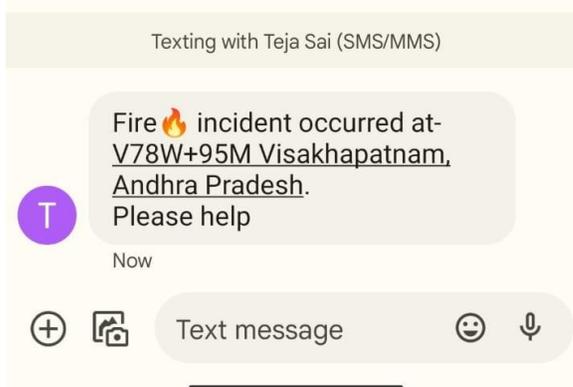
If in case the fire is detected and the smoke detector is also giving high signal then the water motor which is in the same direction will be switched ON and water hits that point with a speed. If the fire gets extinguisher which will be confirmed by the code and controller the motor will be switched OFF, else if the fire is not getting extinguished for 5 minutes then the code generates an SMS which will be sent to the fire station and owner.



```
Python 3.7.5 Shell
File Edit Shell Debug Options Window Help
Python 3.7.5 (tags/v3.7.5:5c02a39a0b, Oct 15 2019, 00:11:34) [MSC v.1916 64 bit
(AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: C:/Users/Neeraj/Desktop/fd.py =====
----- Fire detected! -----
Motor Switched ON
It's 5 minutes now sending SMS to Fire station and owner
>>> |
```

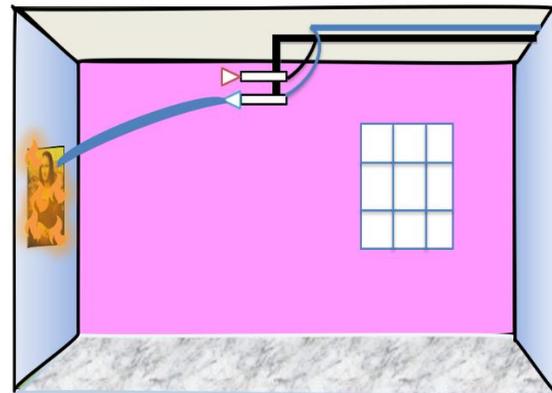
As to give extra work to controller as a new feature, the every day data will be stored into the cloud and gives any kind of information through WhatsApp to the owner of the property. 1. The user can ask for 360° degrees view of the room, the WhatsApp bot shows it. 2. If any incident of the fire detected and extinguished the owner will get photos and time of the incident.

As a controller the Raspberry Pi is embedded with all codes to rotate stepper motor, make 5MP camera module to capture, point to the exact location of fire, switch ON water motor, sending SMS to fire station and sending daily info to the property owner.



4. CONCLUSION

At present an average of 358,500 fire incidents are occurring in each year in whole over the world, where 3,800 civilian deaths and 14,700 injuries resulted in 2021 which is one of the highest number of incidents. In conclusion, this paper brings a best and efficient fire extinguisher technique which is automatic and with less human intervention. As we involved most of the existing techniques and extended our project to do everything to stop a fire incident and save people, instead of using fire extinguishers(Co2 cans) or water sprinklers we can use this machine which is more efficient with more features embedded with it. The fire detector and extinguisher machine helps saving people and saving water at same time, while it does alerting fire station and people which makes it an all rounder.



FUTURE SCOPE

This machine is already an all rounder which does everything to stop fire in fire incidents, but there are some extra features which can be installed in it like (1)live view to the owner of the room to, (2)live video call to fire station to make them very clear about the incident where the fire officers can see if any people should be rescued from fire incident.

REFERENCES

- [1] Tony Prosser and mark Taylor, “fire and rescue incident command: A practical guide to incident ground management”, 1 July, 2019.
- [2] David W. Dodson, “ Fire Department Incident safely Officer”, 4 August, 1998.

[3] Dr. Marcus O. Durham, PE, CFEL, CVFI , Dr. Robert A. Durham, PE, OFILCVF, “Electrical failure Analysis for fire & Incident Investigations: with over 400 Illustration”,28 July 2011.

[4] Rosemany Durham, CFEL, CVFL Jason coffin, CFEL, CVFL standard for pre-incident planning 2010.

[5] John Coleman, “Incident management for the street-smart fire officer”, 1997.

[6] Jason self, “fine alarm Teot log book: fire alarm jornal fire register” , 2019.

[7] Thomas. c. cable, “On fire: A Carrer in wild land fire fighting and incident management”, 2012.

[8] Karen Owens, “Incident command for Ems”, 2011.

[9] Donald W. Walsh, “Notional Incident management system : Principles and practise”, 2006.

[10] “Standard on Emergency Service incident management system and common safety”, 2019.

[11] USA patent - 1,010, 870, filed on April 6th, 1910,

[12] USA patent -1,760, 274, filled on September 26th, 1926.

[13] “fire detection System 0710”, Notifier fire system, web.

[14] “fire detection and alarm System Barrier”, new-courses.jnotice.eku.edu, web.

