



**Global Academy of Technology**  
Rajarajeshwari Nagar, Bengaluru-  
560098



**Department of Electronics and Communication  
Engineering  
Mini-Project Presentation  
(20ECEP69)**

on

**“Fire Fighting Robot”**

**PRESENTED BY:**

**Akash J [1GA20EC010]**

**Aswin Jayadasan [1GA20EC025]**

**Chandan P [1GA20EC032]**

**Under The Guidance of:**

**Mrs. Kruthik Chand D C**

# CONTENTS

- ❖ Introduction
- ❖ Literature survey
- ❖ Problem definition
- ❖ Objectives
- ❖ Method of Implementation
- ❖ Expected outcomes
- ❖ Advantages and Disadvantages
- ❖ Applications
- ❖ Future Scope
- ❖ References

# INTRODUCTION

- ▶ In the face of rising fire incidents, the need for effective and efficient firefighting technologies has become increasingly crucial. The traditional approach of sending human firefighters into hazardous environments poses significant risks to their safety and often results in challenges to control and extinguish the flames promptly.
- ▶ To address these issues and enhance firefighting capabilities, the development of Fire Fighting Robots has emerged as a revolutionary solution.
- ▶ Fire Fighting Robots are advanced, autonomous or remotely operated machines equipped with specialized tools and technologies designed to combat fires in various settings.



# LITERATURE SURVEY

SL NO	TITLE OF THE PAPER	AUTHORS OF THE PAPER	PUBLISHED IN	DESCRPITION OF THR PAPER
1.	Firefighting Robotics	Khushvinder Singh, Milind Dawande, Chirag Shah	Proceedings of the 2016 ACM Southeast Conference (ACMSE '16)	Sensing and Perception
2.	Design of a mobile robot for fire fighting applications	Burra,N.A,Jain R ,Prasad N R	International Journal of Robotic systems	Navigation mapping techniques
3.	Autonomous Firefighting Robot for Aeronautical Applications	Filipe Neves dos Santos, Eduardo Silva, Nuno Cruz, Pedro Gonçalves, Nuno Rodrigues	Advances in Intelligent Systems and Computing, 2019	Robot design
4.	Development of a Remote Control Firefighting Robot for Fire Rescue	Liu, H., Zeng, Y., & Zhang, H. (2015).	Proceedings of the 2015 IEEE International Conference on Robotics and Biomimetics (ROBIO), pp. 1692- 1697	Fire Suppression Mechanisms

# PROBLEM STATEMENT

- Generally, humans control each and every aspect of locomotion whether it may be industries or transportation. And human tend to make errors such as accident, lack of inaccuracy etc
- The firefighting environments are normally hard to reach and restricted in accessibility by obstacles, tumbledown architectures and visibility by smoke, dangerous gases or dust.
- The sprinkler set up is very non reliable method because the sprinkler pipes has any defect may not provide enough pressure and it is suited to cover large areas.

# OBJECTIVES

1. **Fire Suppression:** The primary objective of a firefighting robot is to extinguish or control fires. The robot should be equipped with fire suppression tools such as water cannons, foam generators, or chemical agents to effectively combat different types of fires.
2. **Remote Operation:** The robot should be designed for remote operation, allowing firefighters to control it from a safe distance.
3. **Navigation in Hazardous Environments:** Firefighting robots are designed to navigate through challenging and hazardous environments, such as collapsed structures or buildings with heavy smoke, where it may be difficult for human firefighters to access.
4. **Search and Rescue:** Some firefighting robots are equipped with sensors and cameras to locate and rescue trapped or injured individuals within the fire-affected area. They can assist in locating victims more quickly and efficiently.
5. **Real-time Data Collection:** Firefighting robots can gather real-time data, such as temperature, gas concentration, and structural integrity, to help firefighters make informed decisions and adjust their strategies accordingly.

# METHOD OF IMPLEMENTATION

This robo consists of several types of sensor and the vital part of this robo is arduino mega2560 which controls all other components.

- 1) **Flame Sensor**: This sensor is mainly designed for detecting as well as responding to the occurrence of a fire or flame.



- 2) **Aurdino mega** : it is basically a microcontroller which is mainly used to controlling purpose,here we are controlling the flame sensors and pump motors.



- 1) **Buzzer** : it is used to give the signal that fire is detected.

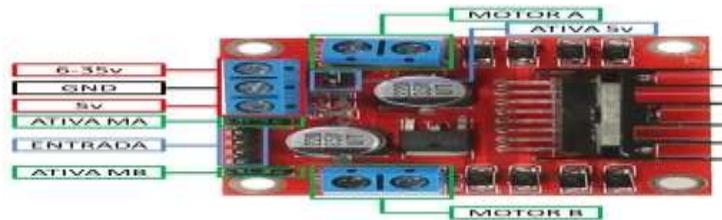


# METHOD OF IMPLEMENTATION

4). **DC Motor:** A DC Motor is a type of electric motor that converts DC electrical power to mechanical power .Although motor gives 60RPM at 12V, motor runs smoothly from 4V to 12V and gives the wide range of RPM, and torque



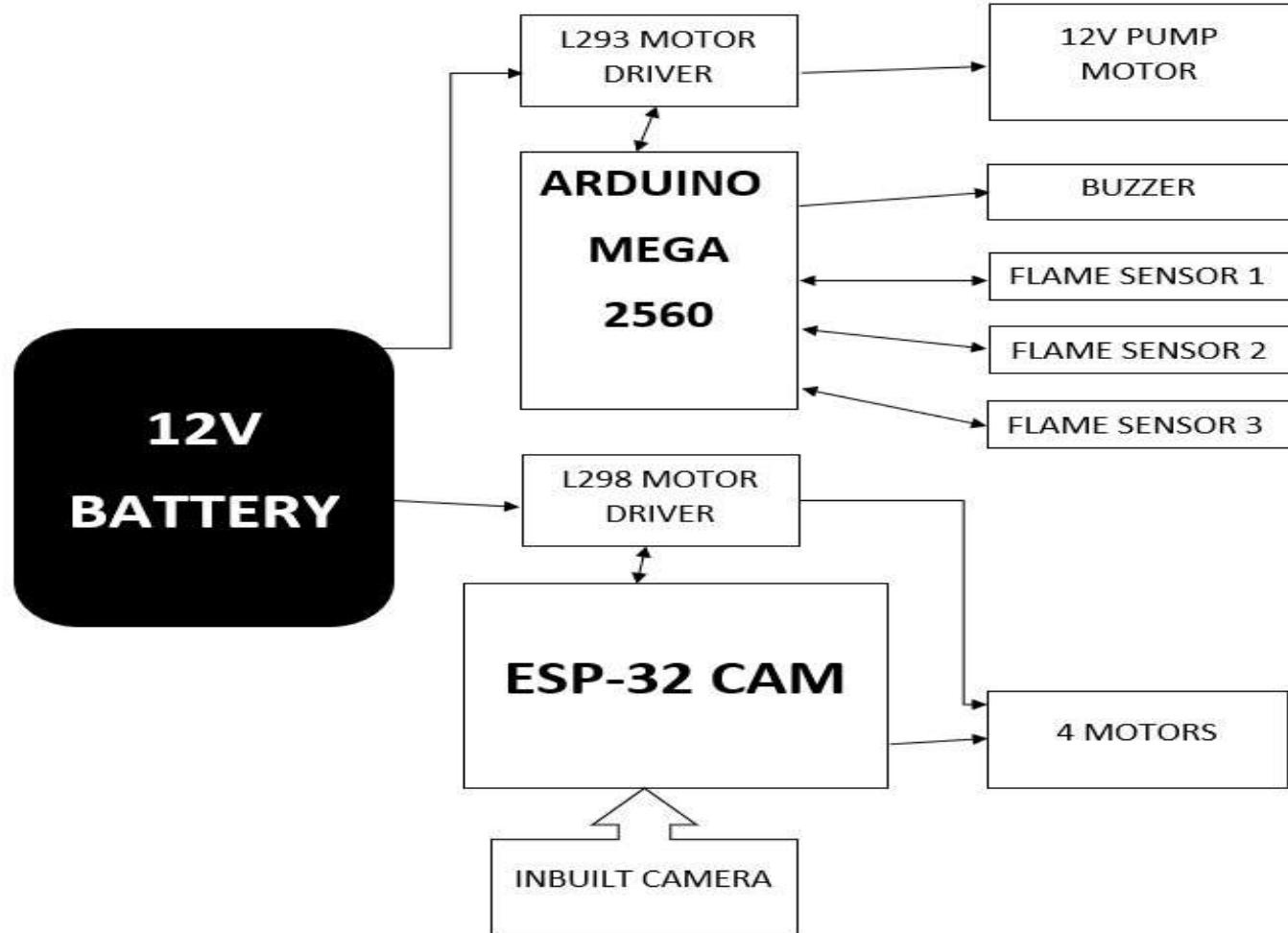
5) **Driver Module:** Motor drive module comes with its own four L298 chip. Can drive 4 DC motors, or two 4-wire 2-phase stepping motor. Suitable for the motor range: motor operating voltage 2.5V-12V.



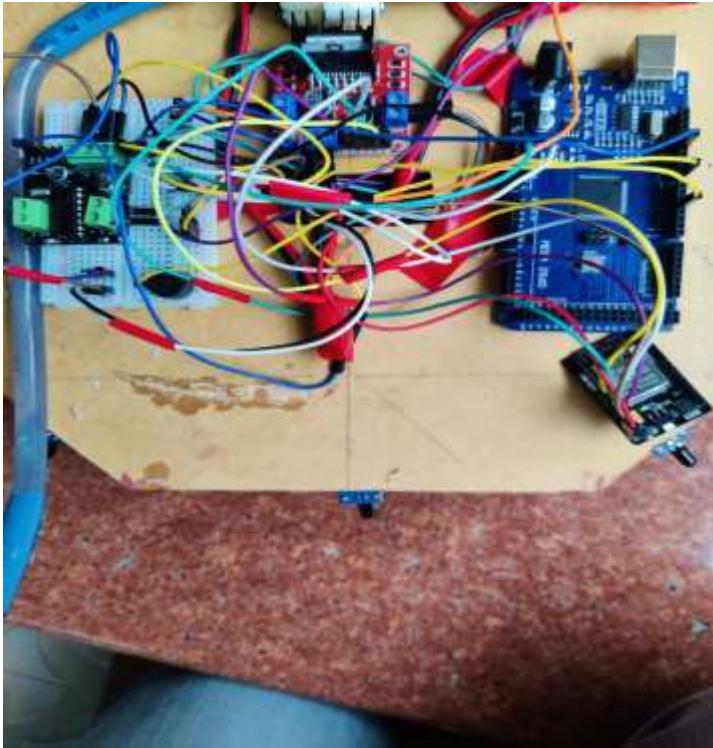
6) **ESP32 Camera Module:** A ESP32 Camera module is the one which is wifi enabled

And also it contains a general purpose pins which we are using for driving the motors.

# BLOCK DIAGRAM



# IMAGES



CIRCUIT CONNECTION



INNERVIEW OF ROBOT

# EXPECTED OUTCOMES

1. **Fire suppression**: The robot should be able to apply firefighting agents such as water, foam, or dry chemicals to extinguish the fire effectively. It may use various methods, such as spraying, misting, or directed streams, depending on the type of fire and the environment.
2. **Remote operation**: The robot should be controllable from a safe distance, reducing the need for human firefighters to enter dangerous areas. It might be operated using a remote control, a computer interface, or even autonomous decision-making algorithms.
3. **Navigation and mobility**: The robot should be capable of navigating through challenging terrain, debris, or obstacles commonly found in fire-stricken environments. This might involve using wheels, tracks, or even specialized legged mechanisms.
4. **Heat and smoke resistance**: The robot must be able to withstand high temperatures and resist damage from flames and smoke to function effectively

# ADVANTAGES AND DISADVANTAGES

## ► ADVANTAGES

- ✓ SAFETY
- ✓ ENHANCED EFFICIENCY
- ✓ REMOTE OPERATION
- ✓ REAL TIME DATA COLLECTION
- ✓ REDUCING DAMAGE

## ► DISADVANTAGES

- ✓ COMPLEXITY AND COST
- ✓ LIMITED FLEXIBILITY
- ✓ DEPENDENCE AND TECHNOLOGY
- ✓ SIZE AND ACCESSIBILITY

# APPLICATIONS

- ▶ Fire Suppression
- ▶ Search and Rescue
- ▶ Hazardous Material Handling
- ▶ Heat Mapping
- ▶ Reducing Risk to Firefighters
- ▶ Fire Investigation
- ▶ Structural Assessment

# FUTURE SCOPE

- ▶ Some of interfacing applications which can be made are controlling home appliances, robotics movements, Speech Assisted technologies etc.
- ▶ By making it GPS enabled, robot can be controlled from remote station also.
- ▶ A CO<sub>2</sub> booster can be attached to make it powerful extinguisher.
- ▶ It can be further expanded with voice interactive system facility

# REFERENCES

- [1]- P.H. Chang and Y.H. Kang, et al., “Control Architecture Design for Fire Searching Robot using Task Oriented Design Methodology”, SICE-ICASE 2006, Oct. 2006.
- [2]- Daniel J. Pack; Robert Avanzato; David J. Ahlgren; Igor M. Verner; “Fire-Fighting Mobile Robotics and Interdisciplinary Design-Comparative Perspectives”, IEEE Transactions on Education, 3 August, 2004, Volume 47, No. 3.
- [3]-Young-Duk Kim; Yoon-Gu Kim; Seung-Hyun Lee;Jeong-Ho Kang; Jinung An; “Portable Fire Evacuation Guide Robot System”, Intelligent Robots and Systems, IEEE/RSJ International Conference, 11-15 October 2009. Pages: 2789-2794.
- [4]-Kuo L. Su; “Automatic Fire Detection System Using Adaptive Fusion Algorithm for Fire Fighting Robot”, Systems, Man, and Cybernetics, IEEE International Conference, 8- 11 October 2006, Pages: 966-971.
- [5]-Scott Dearie; Kevin Fisher; Brian Rajala; Steven Wasson; “Design and Construction of a Fully Autonomous Fire Fighting Robot”, 2004 IEEE, Pages: 303-310.
- [6]- Kashif Altaf; Aisha Akbar; Bilal Ijaz; “Design and Construction of an Autonomous Fire Fighting Robot”, 2007 IEEE

# THANK YOU

