Project Synopsis /Proposal Guidelines

1. Abstract

- With the advancement of technology especially in Robotics it is very much possible to replace humans with robots for fighting the fire. This would improve the efficiency of firefighters and would also prevent them from risking human lives.
- According to National Crime Records Bureau (NCRB), it is estimated that more than 1.2 lakh deaths have been caused because of fire accidents in India from 2010-2014. Even though there are a lot of precautions taken for Fire accidents, these natural/man-made disasters do occur now and then. In the event of a fire breakout, to rescue people and to put out the fire we are forced to use human resources which are not safe.

2. Introduction of the Project:

- We are going to build a Fire Fighting Robot using Arduino, which will automatically sense the fire and start the water pump to extinguish fire breakouts.
- The main aim of this project is to develop a fire extinguishing robot which detects the fire location and extinguish fire by using sprinklers on triggering the pump.
- Fire causes tremendous damage and loss of human life and property. Recently, in order to cope with such catastrophic accidents, research on fire-fighting robots has been carried out in many countries.That why we have chosen this topic.
- It is sometimes impossible for fire-fighting personnel to access the site of a fire because of explosive materials, smoke, and high temperatures. In such environments, fire-fighting robots can be useful.

3. Objective :

- The main objective of this project is to design and implement the Robotic firefighting systems at low cost.
- Robotic firefighting systems include analyzing and locating fires, conducting search and rescue, monitoring hazardous variables and the primary task of fire control and suppression.
- Our Fire Fighting Robot will automatically detect the fire with the help of sensors.
- Once it detects the fire breakout location, it navigates itself accordingly to reach the fire source and extinguishes the fire by using built-in fire extinguishing system.

4. Scope :

- It is sometimes impossible for fire-fighting personnel to access the site of a fire because of explosive materials, smoke, and high temperatures. In such environments, fire-fighting robots can be useful.
- The advent of IOT with revolutionizes the information system and computing technologies.
- For future enhancements additional features can be integrated onto the system namely:
    - Obstacle avoidance
    - Image processing technique to analyze fire source in accordance with flame sensors.
    - Using cloud technology for wireless communication module.

5. Study of Existing System :

No.	Existing system/website/software	Features	Disadvantages	Limitations/Gaps
1.	Fire Extinguisher Robot Using Ultrasonic Camera and Wi-Fi Network	The propose of this study is to developed a fire extinguisher robot that connected to the Smartphone via Wi-Fi networks so that it can be controlled at a certain distance.	Human control using Bluetooth and Wi-Fi networks.	This will not be able to detect flame and smoke on its own without any human intervention.
2.	An autonomous fire fighting robot with multisensor fire detection using PID controller	When the fire is detected and the robot is at a distance near to fire, a centrifugal pump is used to throw water for extinguishment purpose. A water spreader is used for effective extinguishing. It is seen that velocity of water is greatly reduced due to the use of water spreader. Two sensors: LM35 and Arduino Flame Sensors are used to detect the fire and distances on its way towards fire.	It has only two wheels for the movement of the robot.	It is difficult to navigate the robot to the fire breakout place with two wheels only.

3.	Android controlled Integrated Semi - Autonomous Fire Fighting Mobile Robot	This has four integrated ultrasonic sensor and infra red sensor forms the location system, LDR and thermistor forms the detection system, water container and sprinkler forms the extinguishing system and the communication system is by the blue-tooth module through which the locomotion of robot are also controlled.	It becomes heavy as it consists many types of different sensors.	Difficulty in rotation of the robot.

6. Project Description:

- Fire accidents are very common and sometimes it becomes very hard for a fireman to protect someone's life.

- This project is based on detecting the fire and extinguishing it in real-time. Firefighting robots with some artificial intelligence can be very helpful to overcome such situation without risking human lives.

- Robotic firefighting systems include analyzing and locating fires, conducting search and rescue, monitoring hazardous variables and the primary task of fire control and suppression.

- Our Fire Fighting Robot will automatically detect the fire with the help of sensors.

- Once it detects the fire breakout location, it navigates itself accordingly to reach the fire source and extinguishes the fire by using built-in fire extinguishing system.

- The key feature of our system is to provide surveillance of fire so that major fire accidents can be prevented and loss of human lives gets minimized.

7. Resources and Limitations:

REQUIREMENT:

SOFTWARE REQUIREMENT:

- **Arduino IDE Software:**

  - Arduino is open-source software. Arduino are able to read inputs - light on a sensor, a finger on a button, activating a motor, turning on an LED, etc.
  - The IDE is written in Java and based on the Processing development environment.

HARDWARE REQUIREMENT:

- Arduino UNO
- L293D Motor Driver
- IR Flame Sensor
- BO Motor
- Wheels
- Servo Motor
- Jumper Wires
- Submersible Water Pump
- Mini Breadboard

LIMITATIONS:

- It is not used to put out large fires.
- No remote control for the robot movement
- No monitoring system for the robot.
- It cannot leave outside for long period of time due to battery life.
- It cannot work beyond the limit.

8. Conclusion:

Our project aids to share out the burden of fire fighters in firefighting task as our robot will be able to prevent massive fire breakout. Our project aims to build a real time firefighting robot which moves in a constant speed, identify the fire and then extinguish it with the help of pumping mechanism. The detection and extinguishing was done with the help basic hardware components attached with the robot. Firstly, IR Flame sensors are used for the detection of fire. Secondly, BO Motors and Rubber wheels are used to navigate the robot to reach the fireplace. Finally, the robot extinguishes the fire with the help of submersible water pump and servo motors.

9. Bibliography:

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Annexure-I

Fire Extinguishing Robot

A Minor Project Synopsis Submitted to

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