ACROPOLIS INSTITUTE OF TECHNOLOGY AND RESEARCH

PROJECT TITLE:

DEVELOPMENT OF AN INTELLIGENT IOT BASED FIRE EXTINGUISHING ROBOT

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PROJECT GUIDE:
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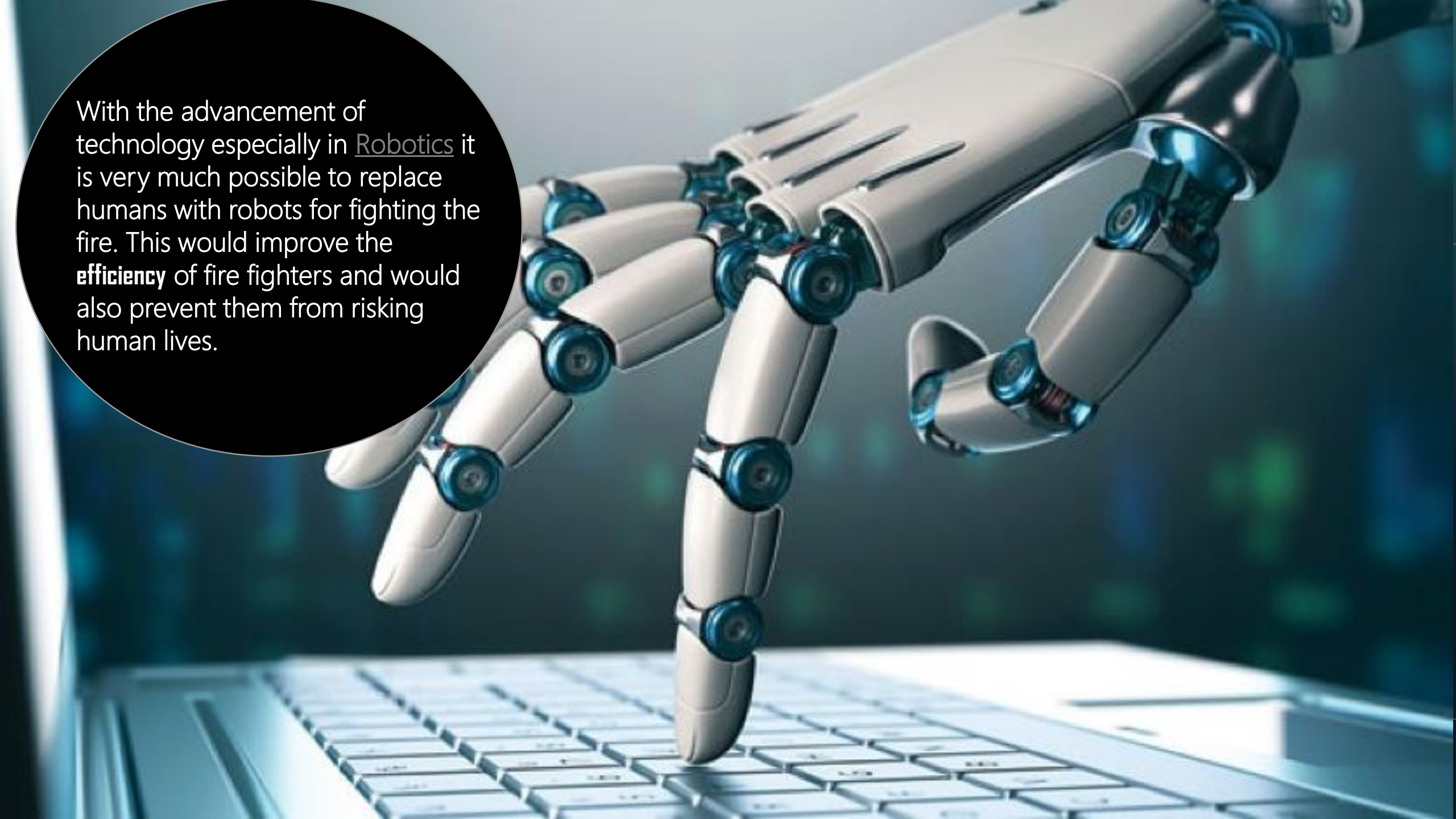
PROJECT PRESENATION OUTLINE

- Abstract
- Introduction
- Problem Statement
- Survey of Existing Systems
- Project Objectives
- Requirement Analysis
- Solution Proposed
- Models and Diagrams
- The implementation
- Testing
- The Outcome discussion
- Conclusion and Limitations

ABSTRACT

Detecting and extinguishing fire is a hazardous job for a fire extinguisher, it often risks the life of that person. This project aims to develop a fire extinguishing robot which detects the fire location and extinguish fire by using sprinklers on triggering the pump.

INTRODUCTION



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 fire fighters and would also prevent them from risking human lives.

PROBLEM STATEMENT

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 2018-2020.

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.

SURVEY OF EXISTING SYSTEM

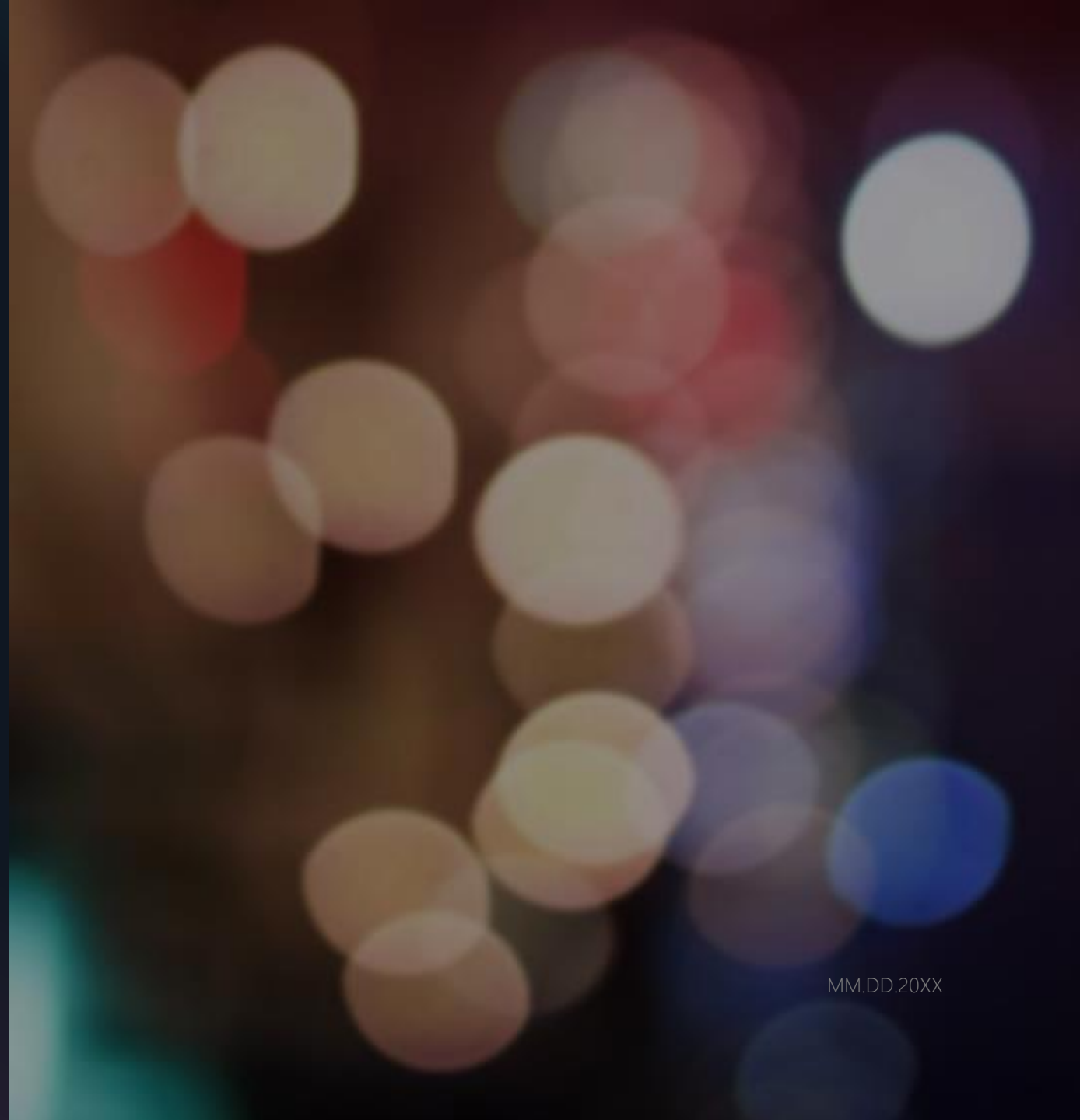
- S. Jakthi Priyanka,R. Sangeetha proposed an android controlled fire fighting robot which uses Arduino UNO R3. The robot consists of gas sensor for fire detection, gear motor and motor drive for the movement of robot, a bluetooth module to connect the robot with the android device and to control the robot with the smartphone as well. Water pump and sprinkler is also used in this. To instruct the Arduino UNO an open source software which is Arduino IDE is required to code and to implement that code in Arduino UNO.

- Tawfiqur Rakib, M. A. Rashid Sarkar proposed a fire fighting robot model which consists of a base platform made up of 'Kerosene wood', LM35 sensor for temperature detection, flame sensors to detect the fire and a water container of 1 litre capacity which is made up of a strong cardboard that makes it water resistant. The robot have two wheels for its movement.

PROJECT OBJECTIVE

- 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.



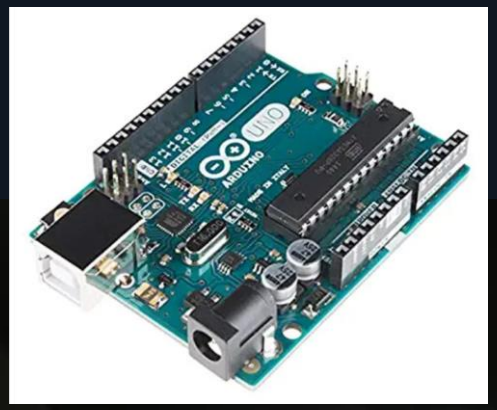
REQUIREMENT ANALYSIS

SOFTWARE REQUIREMENTS:

- The Arduino software consists of a development environment (IDE) and the core libraries.
- The IDE is written in Java and based on the Processing development environment.
- The core libraries are written in C and C++ and compiled using avr-gcc and AVR Libc.

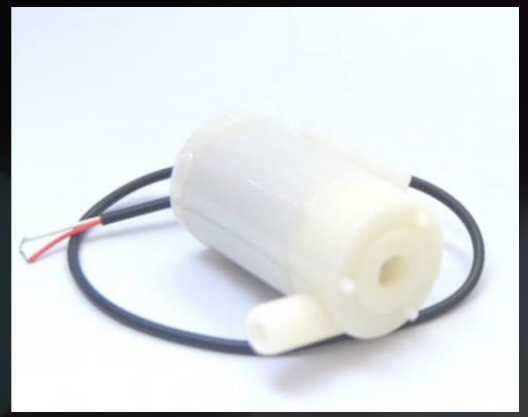
HARDWARE REQUIREMENTS

1. ARDUINO UNO

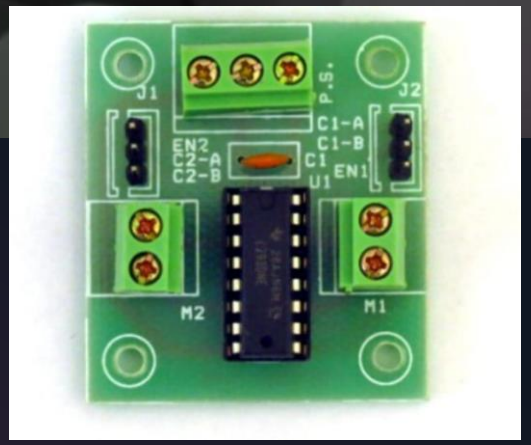


2. SERVO MOTOR

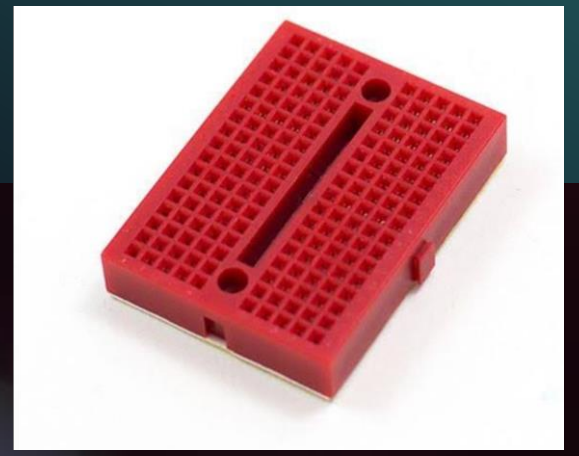
3. SUBMERSIBLE WATER PUMP



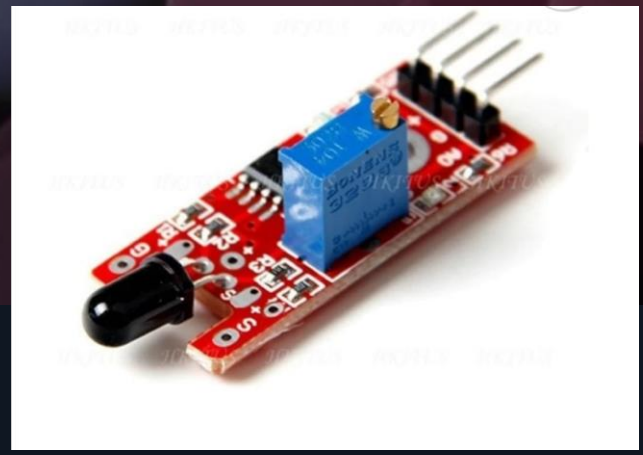
4. Motor Driver L293D Module



5. MINI BREADBOARD



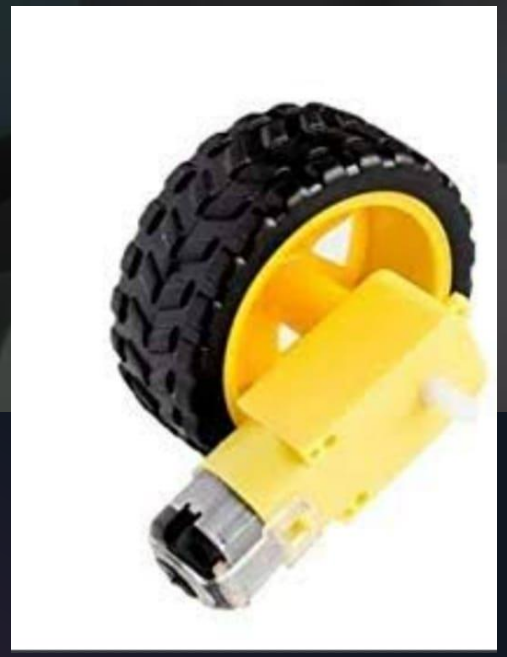
6. IR FLAME SENSORS



HARDWARE REQUIREMENTS

7. JUMPER WIRES

8. RUBBER WHEELS

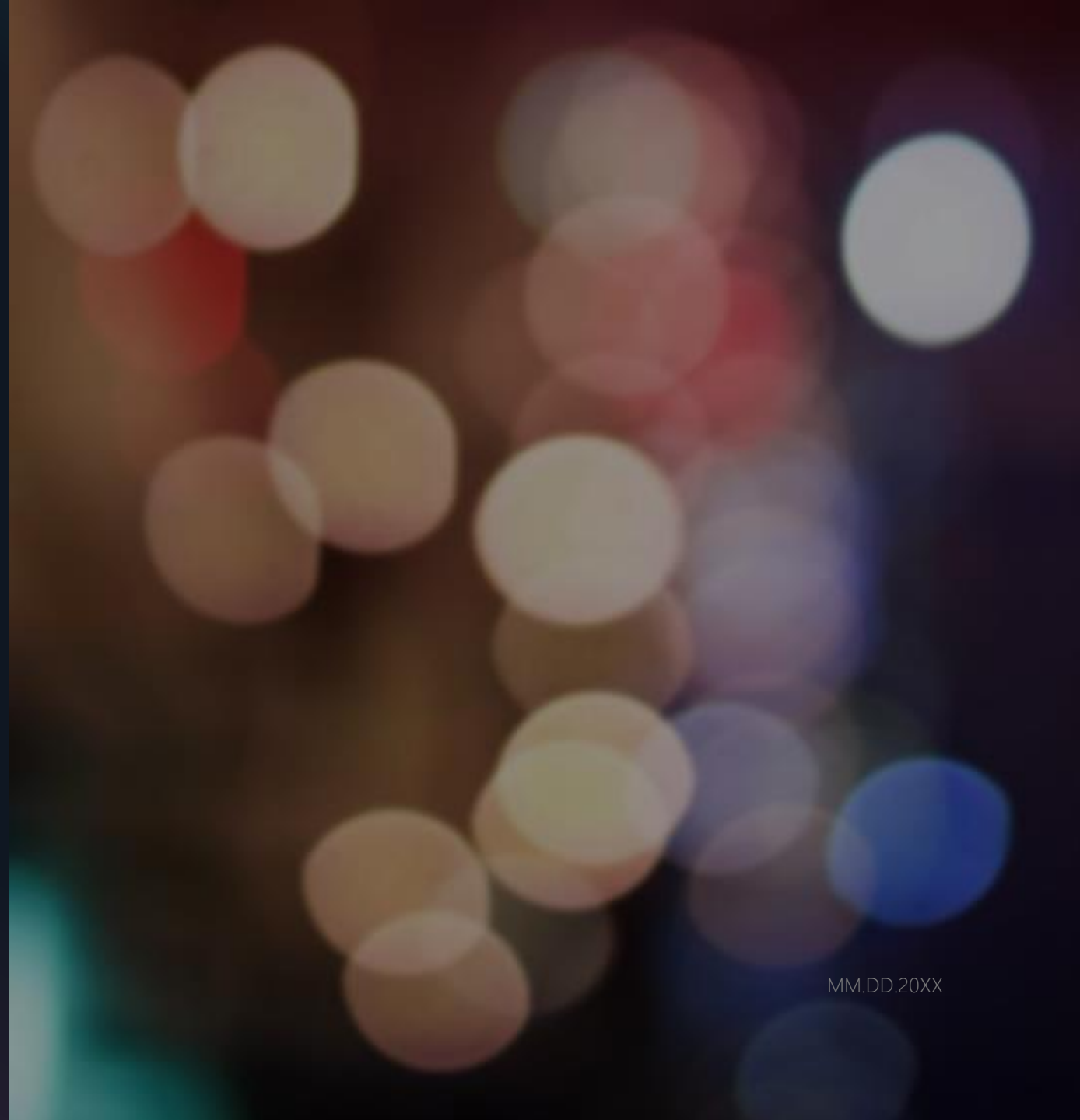


9. BO MOTOR

SOLUTION PROPOSED

- We are going to build a Fire Fighting Robot. This advanced fire fighting robotic system will independently detect and extinguish fire.

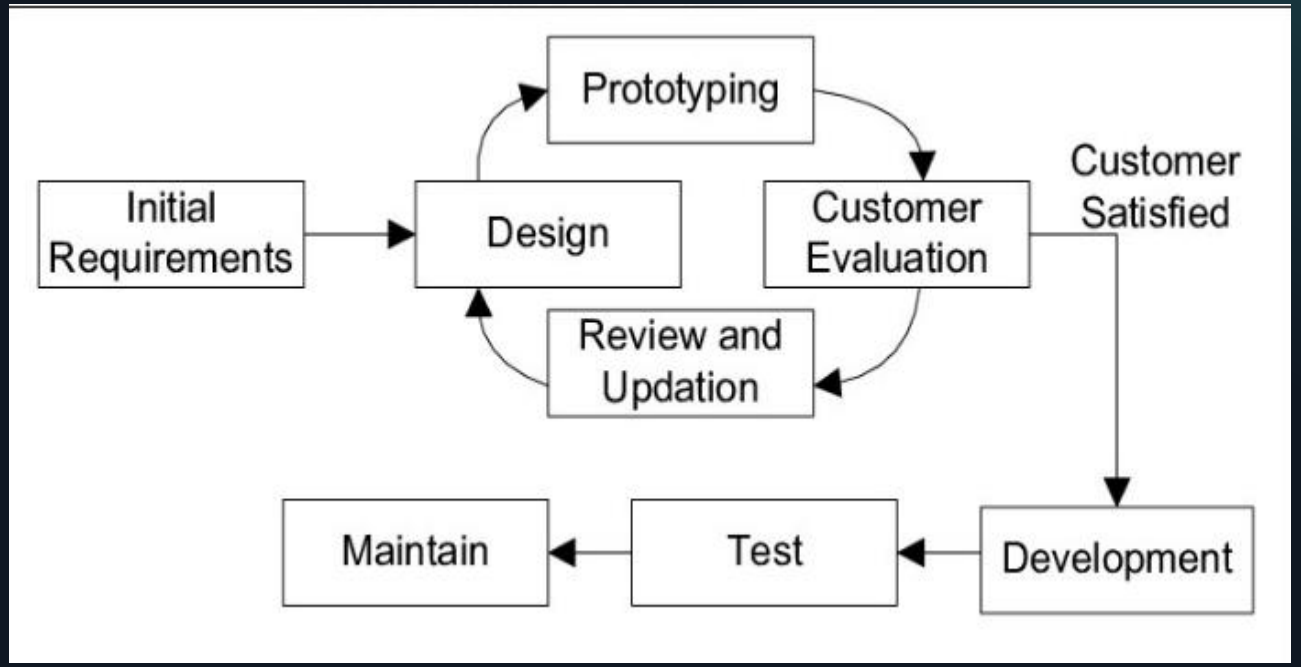
- Once the location is determined, it will move out of its guiding track, approach fire source and extinguish the flame by using the built in fire extinguishing system.



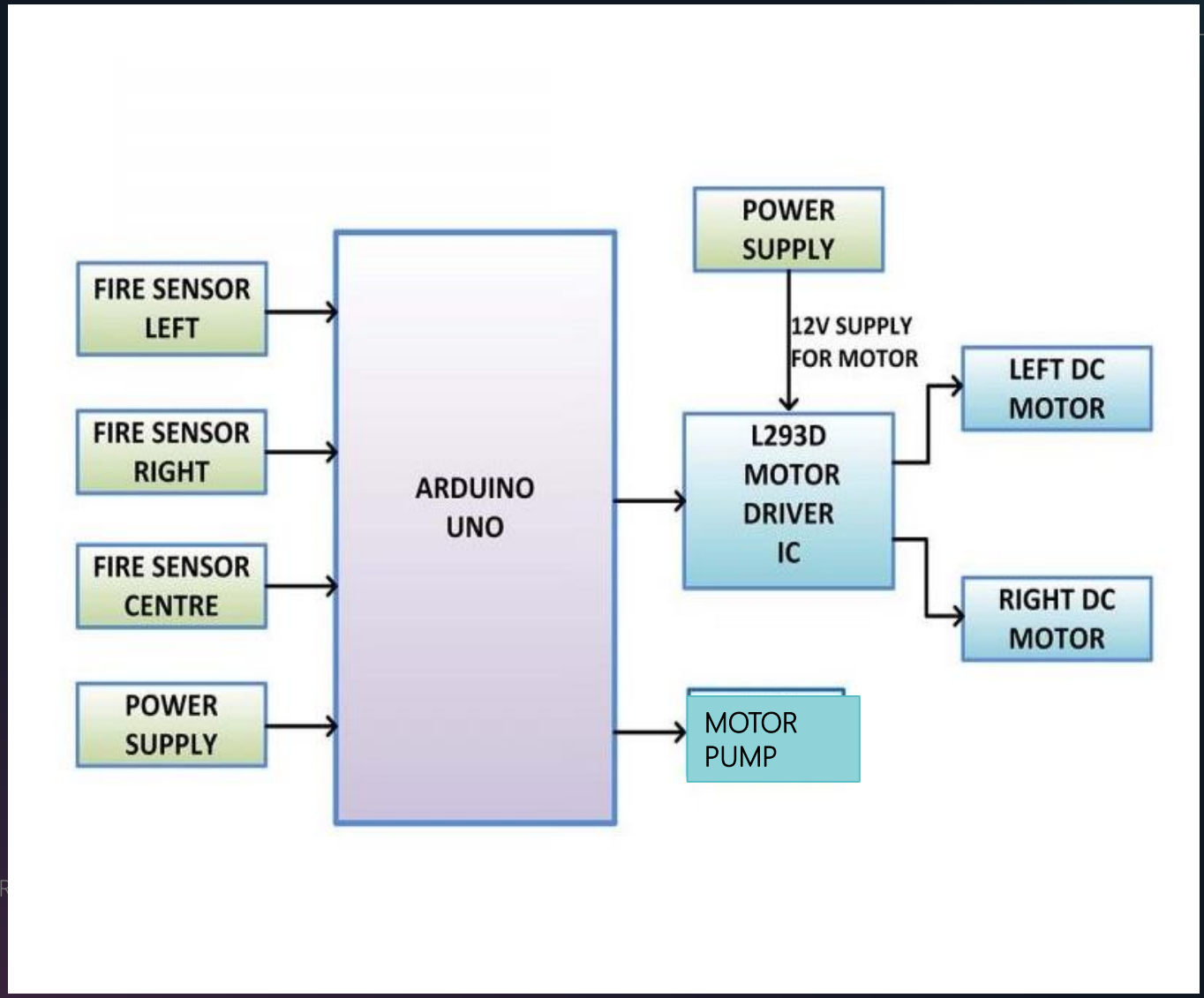
MODELS AND DIAGRAMS

MODEL USED:

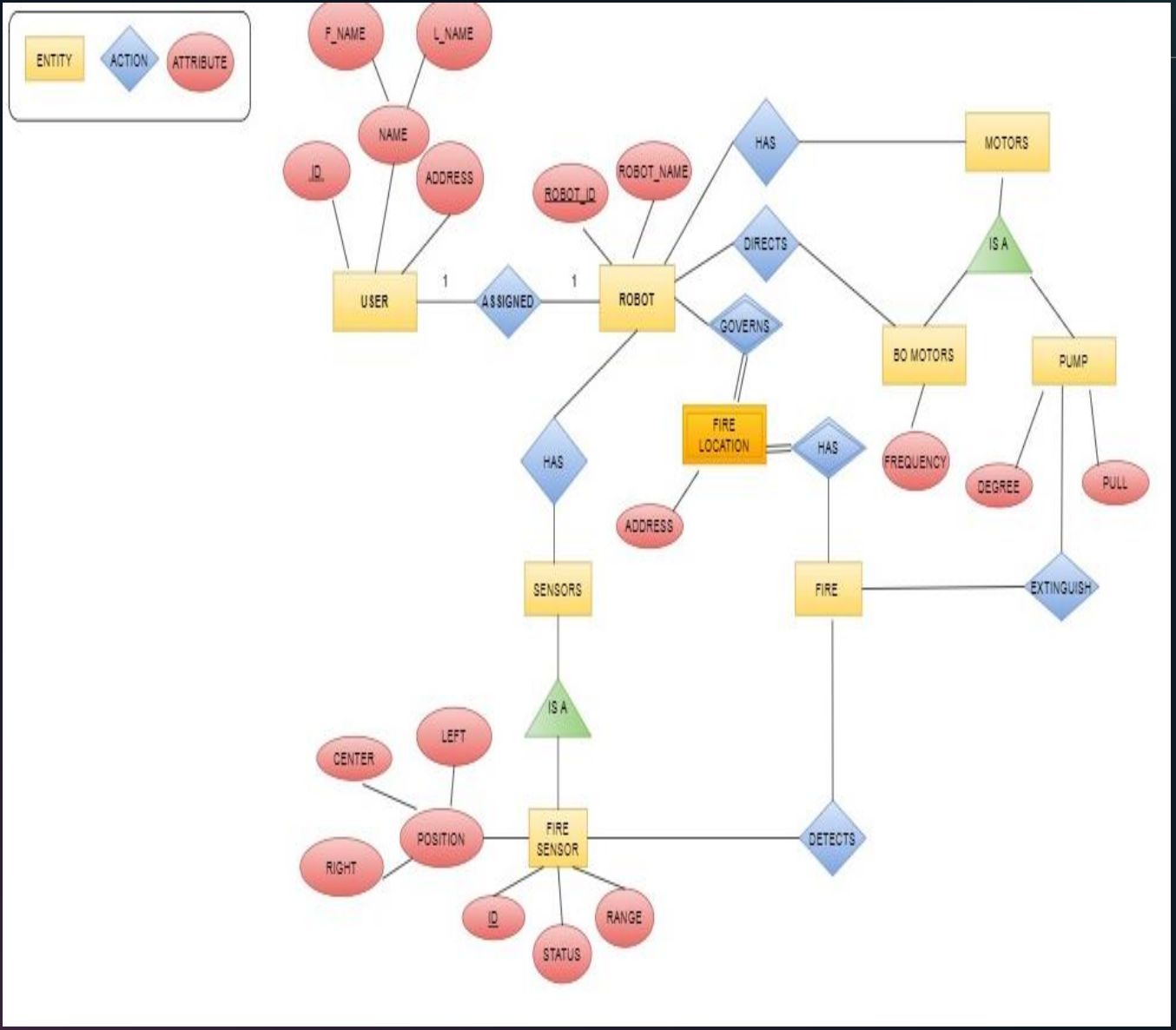
For our project we are going to use the prototype software development methodology because we are building a prototype which can be further developed for future .



BLOCK DIAGRAM:

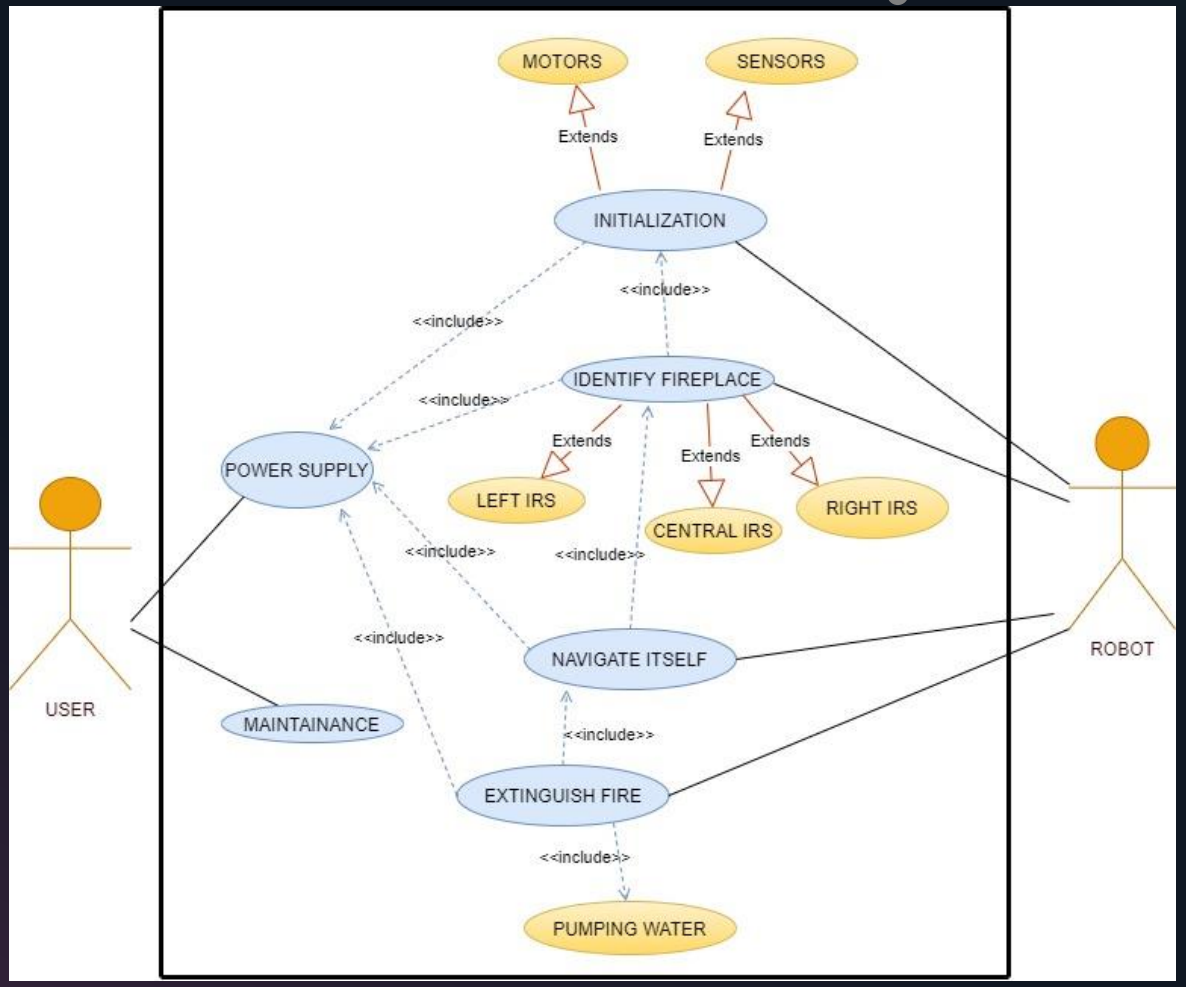


ER DIAGRAM:

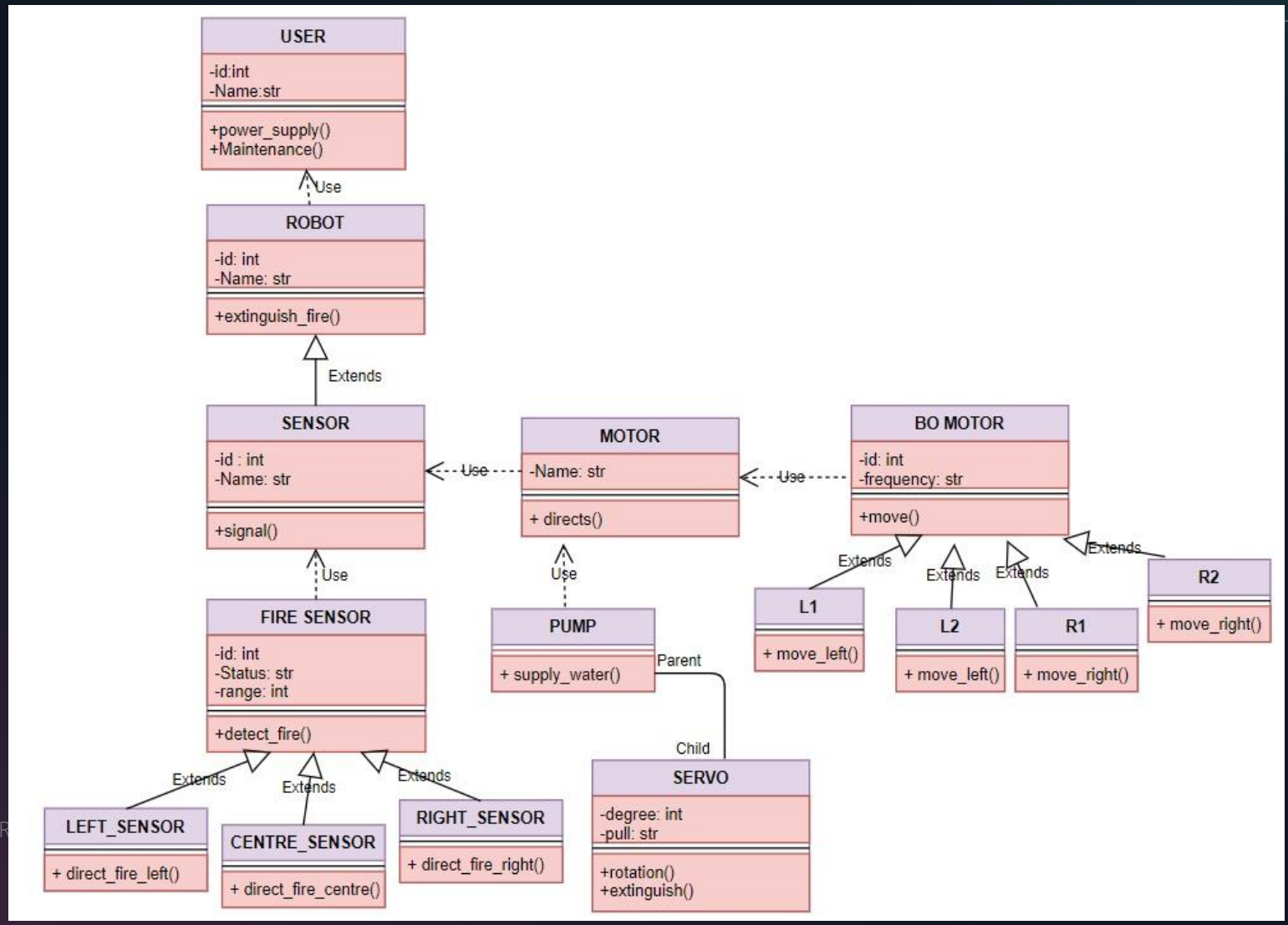

ENTITY
ACTION
ATTRIBUTE
F_NAME
L_NAME
NAME
ID
ADDRESS
USER
1
ASSIGNED
1
ROBOT
ROBOT_ID
ROBOT_NAME
HAS
MOTORS
DIRECTS
IS A
GOVERNS
50 MOTORS
PUMP
FREQUENCY
DEGREE
PULL
FIRE LOCATION
HAS
ADDRESS
HAS
SENSORS
FIRE
EXTINGUISH
IS A
LEFT
CENTER
POSITION
RIGHT
FIRE SENSOR
DETECTS
ID
STATUS
RANGE

UML

USE CASE:

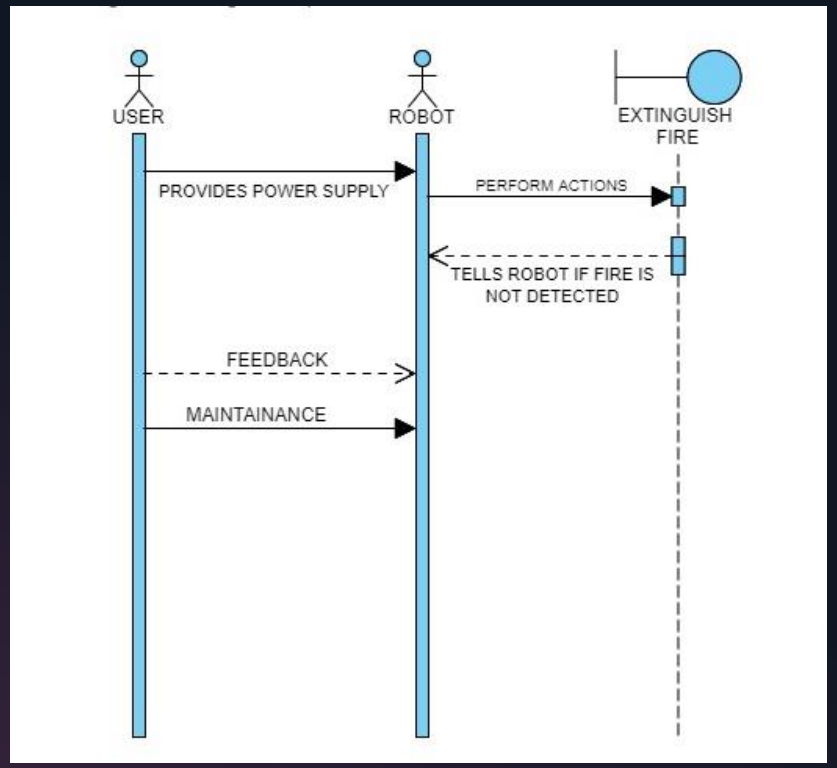

MOTORS
SENSORS
Extends
Extends
INITIALIZATION
<<include>>
<<include>>
<<include>>
IDENTIFY FIREPLACE
POWER SUPPLY
Extends
Extends
Extends
LEFT IRS
CENTRAL IRS
RIGHT IRS
<<include>>
<<include>>
<<include>>
NAVIGATE ITSELF
USER
ROBOT
MAINTAINANCE
<<include>>
EXTINGUISH FIRE
<<include>>
PUMPING WATER

CLASS DIAGRAM:

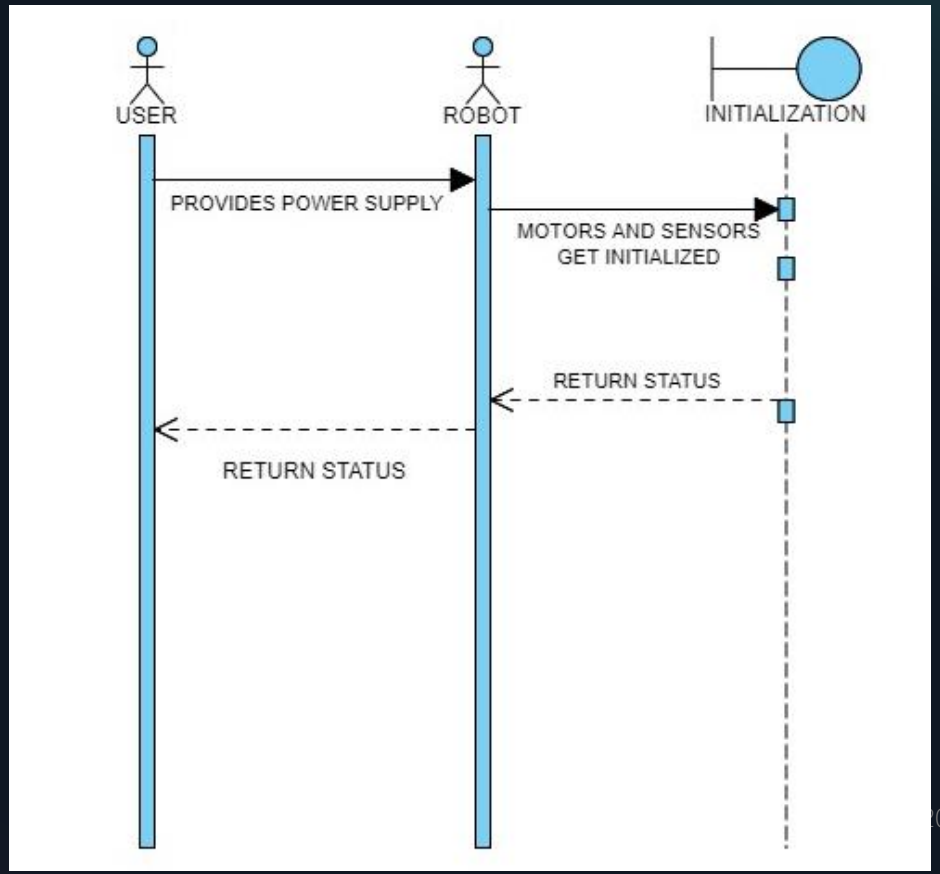


SEQUENCE DIAGRAM

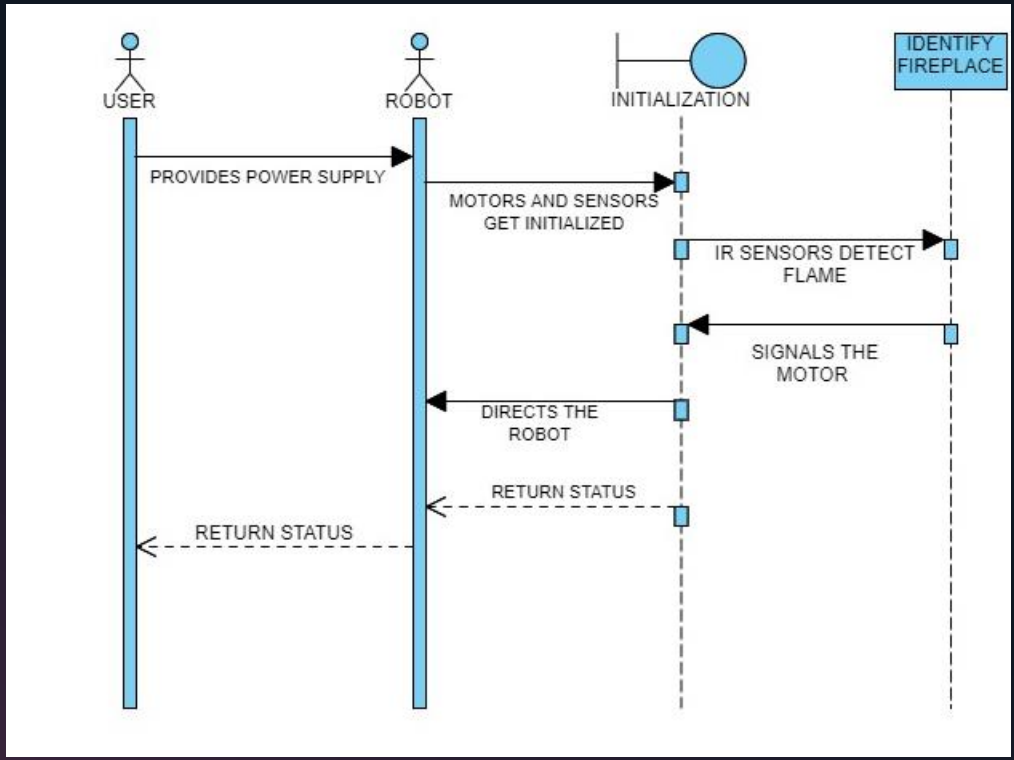
1. POWER SUPPLY AND MAINTAINANCE



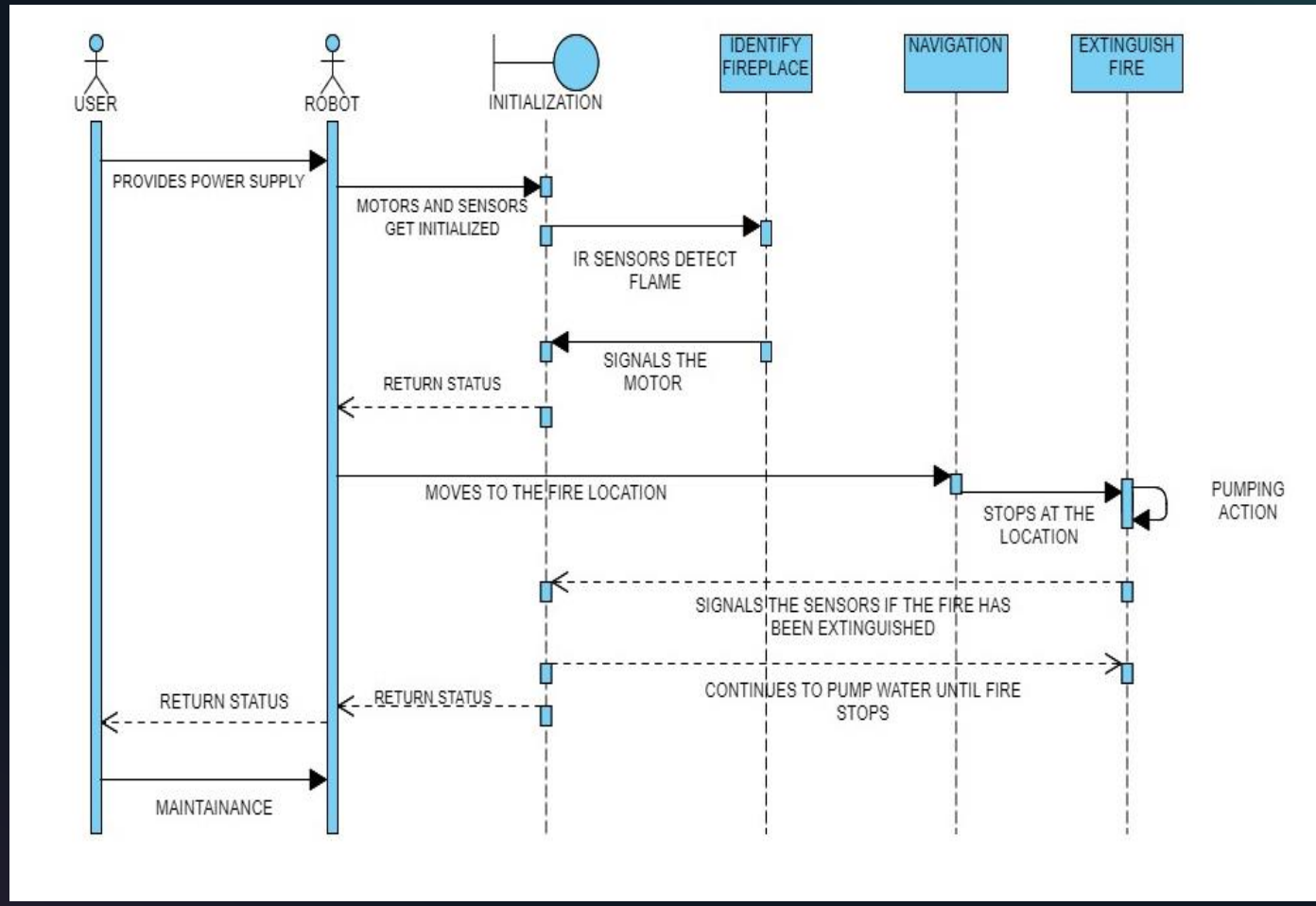
2. INITAILIZATION



3. IDENTIFICATION OF FIREPLACE

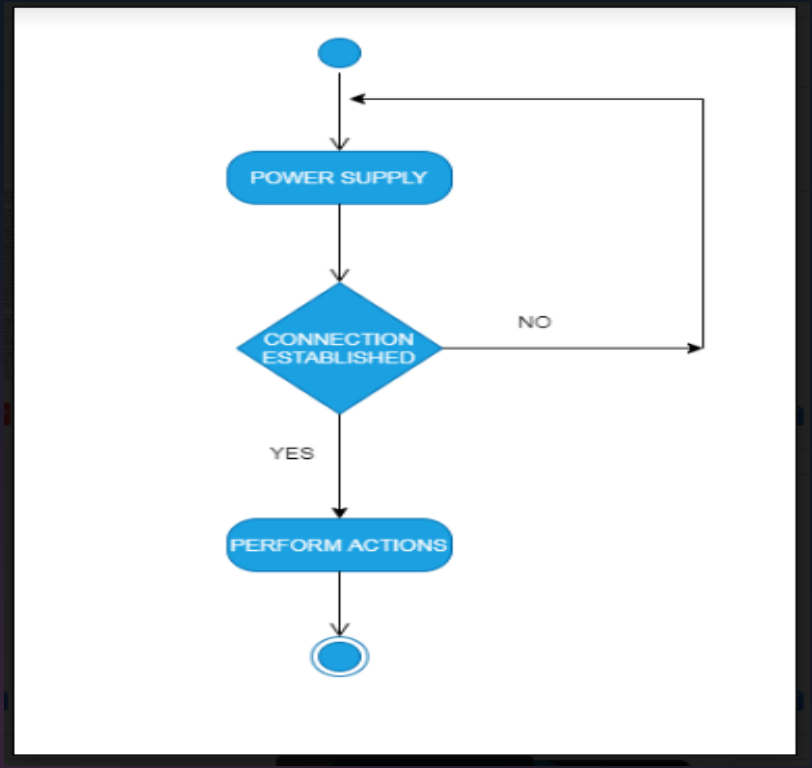


4. NAVIGATING AND EXTIGUISHING FIRE

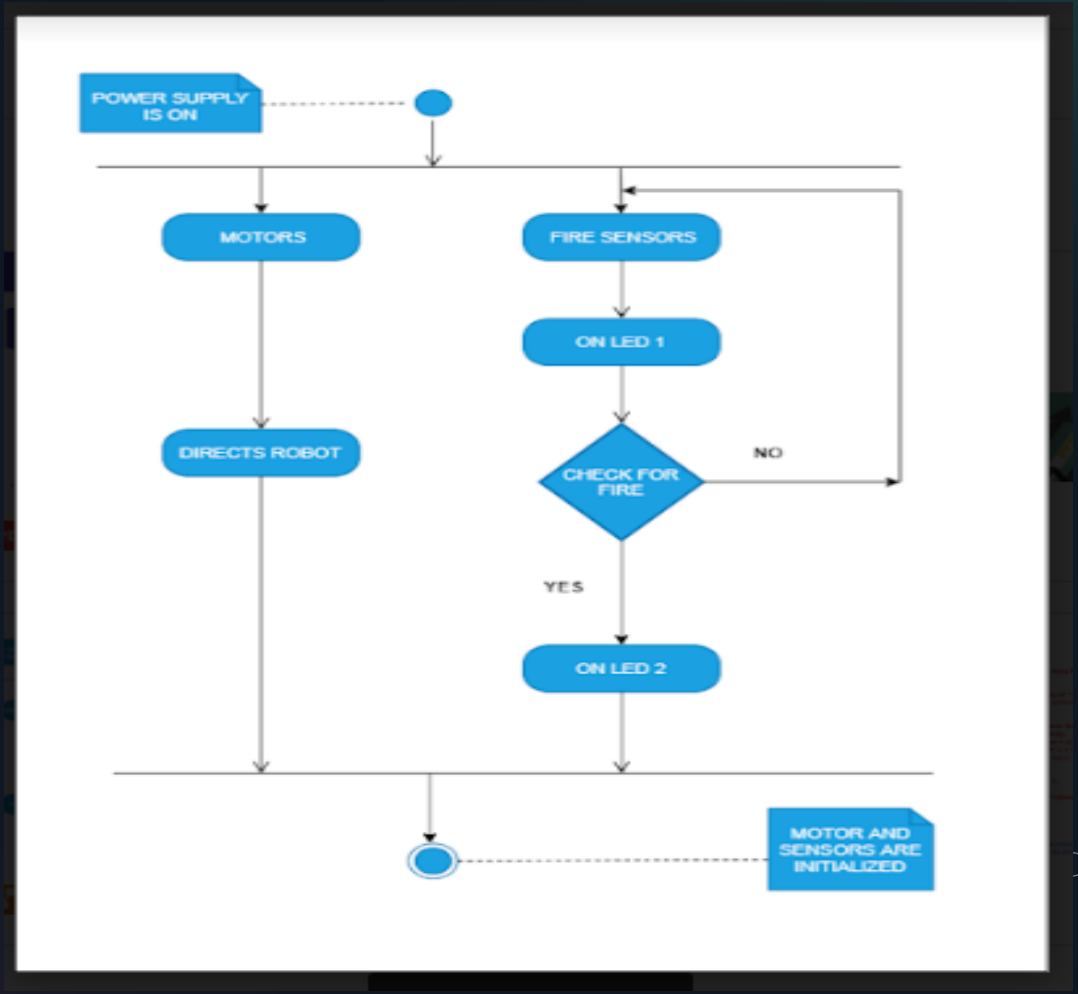


ACTIVITY DIAGRAM

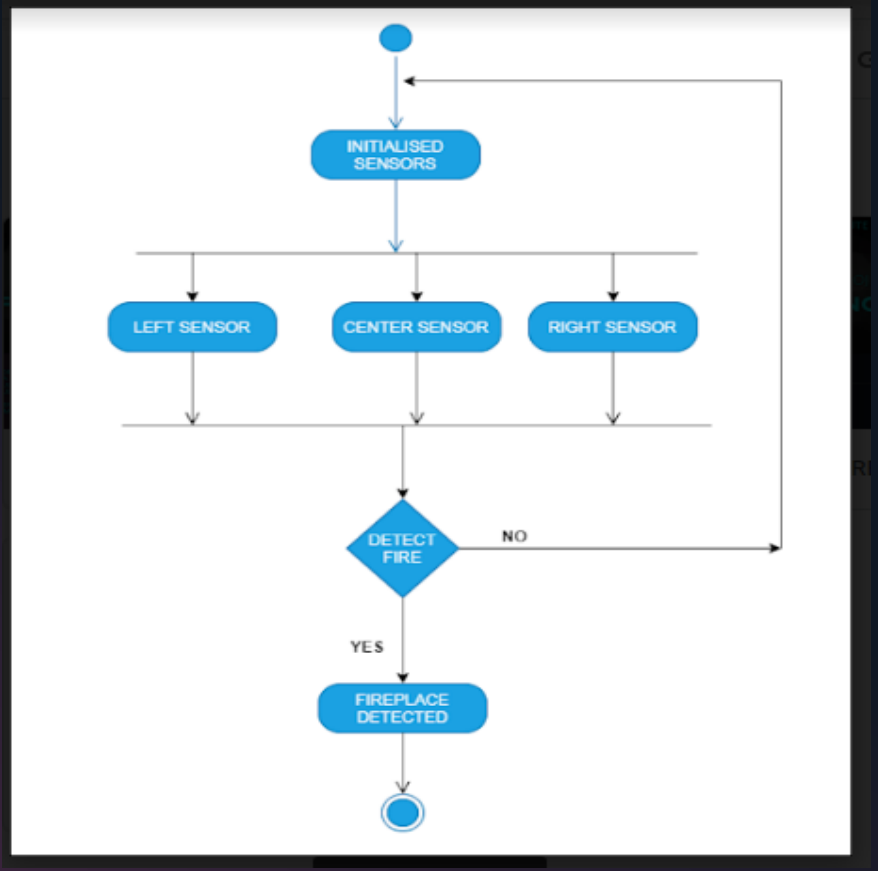
1. POWER SUPPLY



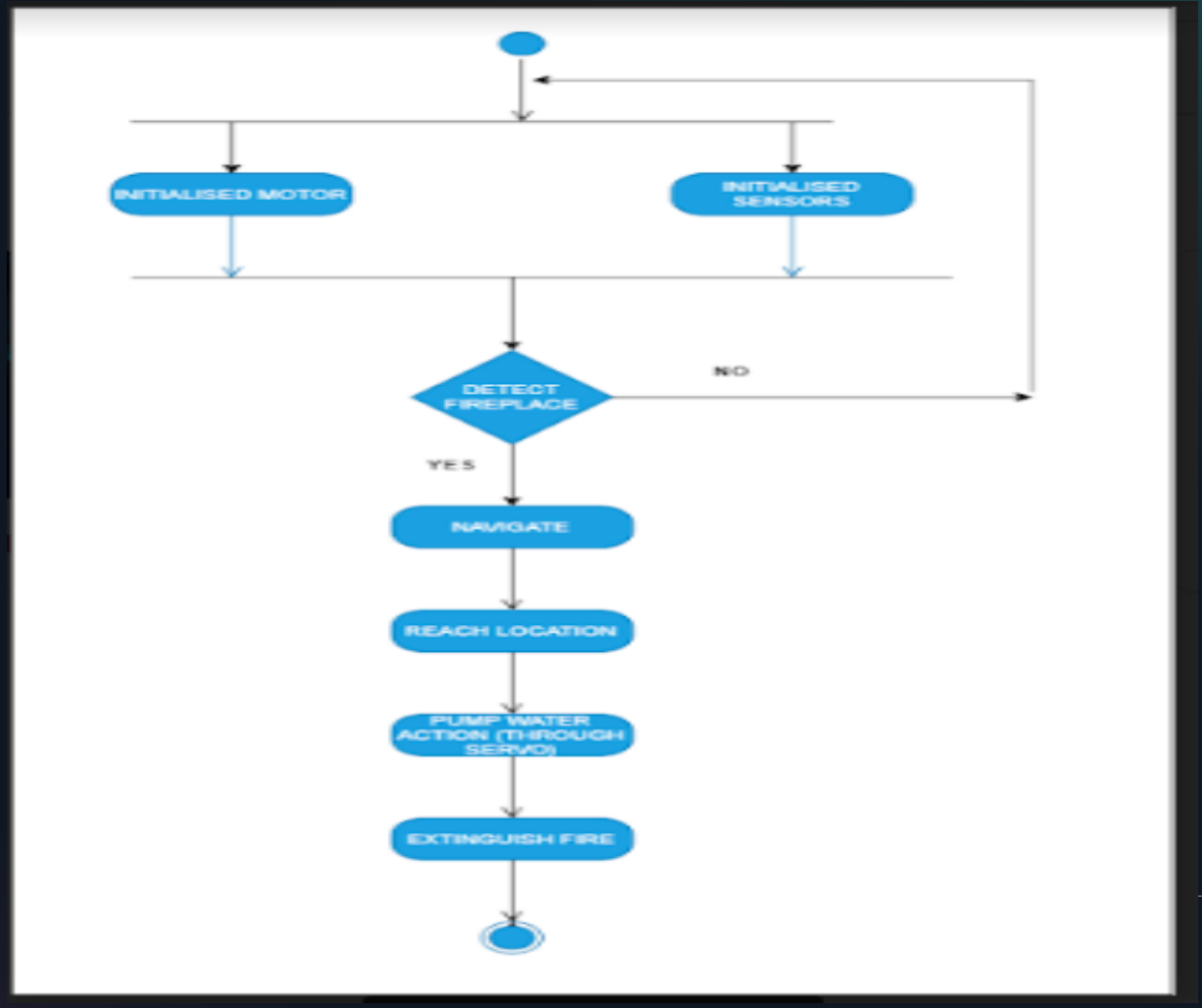
2. INITAILIZATION



3. IDENTIFY FIREPLACE

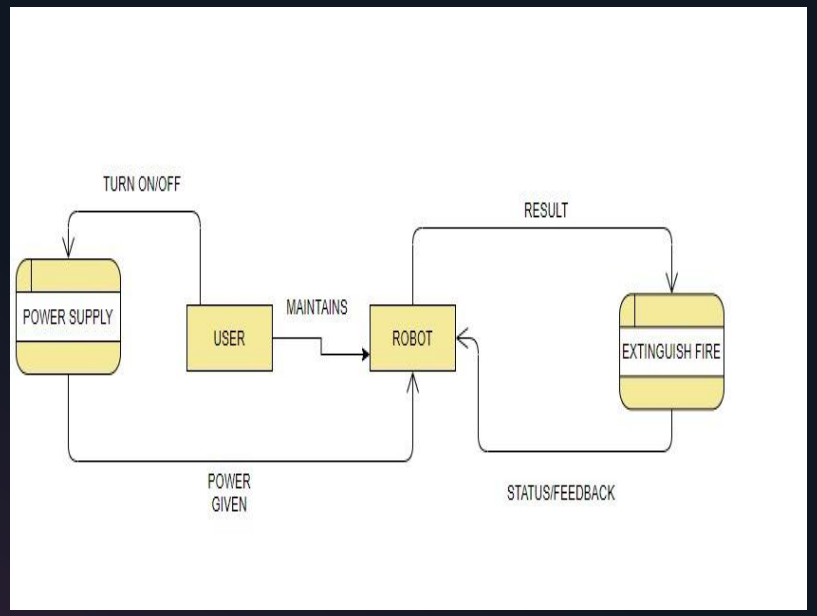


4. NAVIGATING AND EXTINGUISHING FIRE

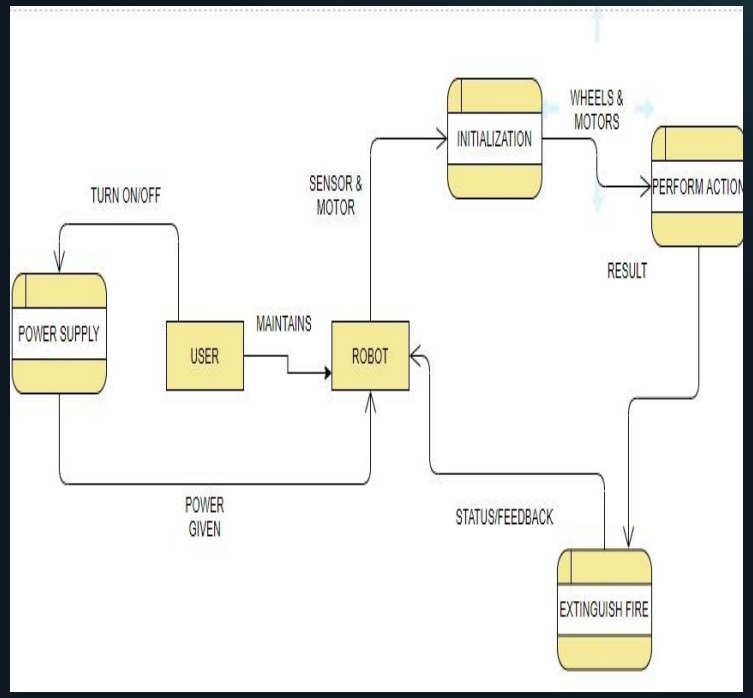


DATA FLOW DIAGRAM

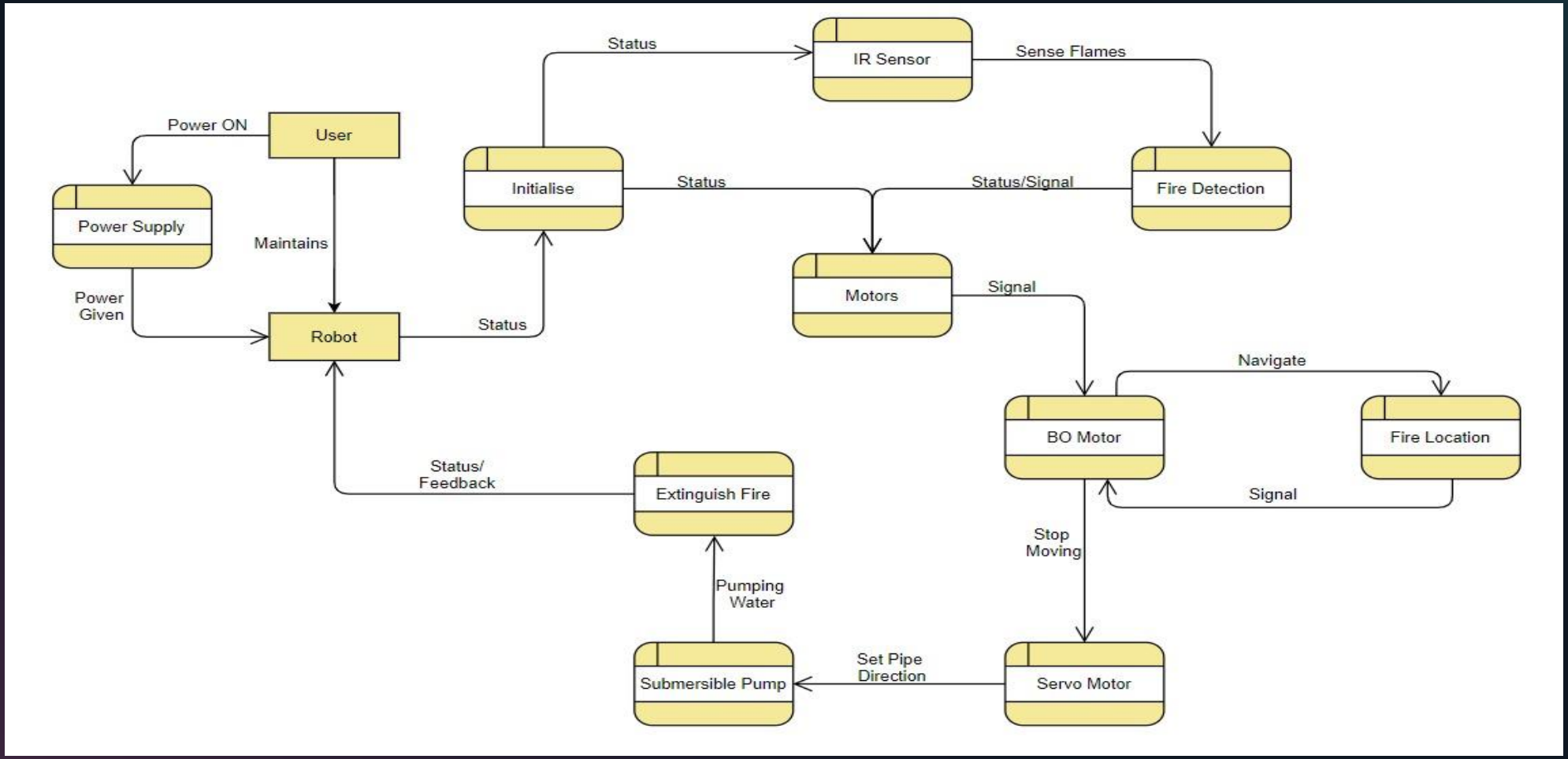
1. LEVEL 0 DFD



2. LEVEL 1 DFD



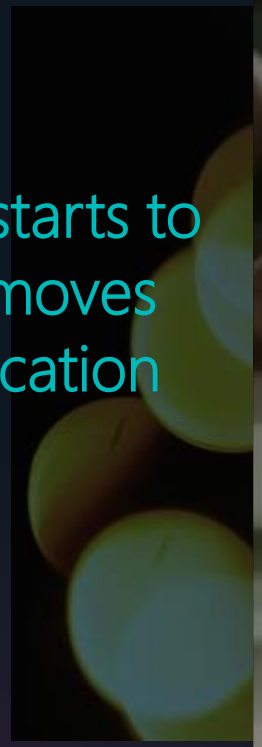
3. LEVEL 3 DFD


Status
IR Sensor
Sense Flames
Power ON
User
Initialise
Status
Status/Signal
Fire Detection
Power Supply
Maintains
Motors
Signal
Power
Given
Robot
Status
Navigate
BO Motor
Fire Location
Status/
Feedback
Extinguish Fire
Signal
Stop
Moving
Pumping
Water
Set Pipe
Direction
Submersible Pump
Servo Motor

IMPLEMENTATION

IMPLEMENTATION TILL NOW:

Till now our robot starts to sense the fire and moves according to the location of fire.

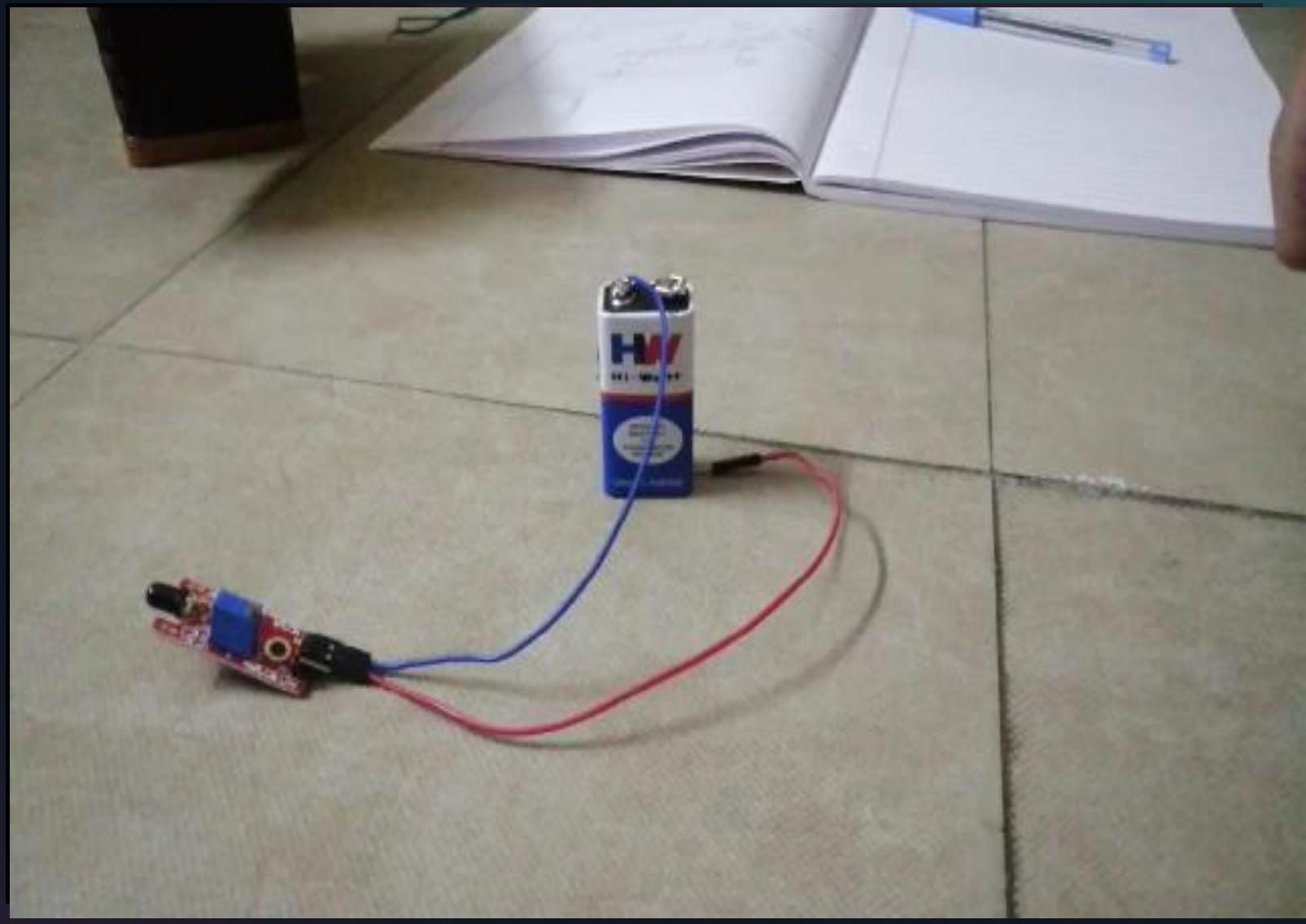


TESTING

We have done the testing of the individual parts of the robot.

FIRE SENSOR TESTING

WE HAVE TRIED TO TEST FIRE SENSOR. AS THE FIRE SENSORS DETECT THE FIRE THE SECOND LIGHT OF THE SENSORS GLOWS.



MOTOR TESTING

WE HAVE ALSO TRIED TO TEST BO MOTORS. AS THE POWER IS SUPPLIED TO BO MOTORS WHEELS SARTS TO MOVES.

THE OUTCOME DISCUSSION

- It would eventually be able to save lives by preventing major accidents at an early stage.
- Can be helpful in preventing massive fire breakouts, preventing damage from hazard.
- It can be of great importance in offices and record maintaining rooms where fire can cause loss of valuable data.

CONCLUSION AND LIMITATIONS

CONCLUSION

- Given the number of lifes lost regularly, the system we envision is crying for adoption.

- Based on the findings, integrating all the hardware such as flame sensors motor driver circuit, LDR sensors and fire extinguishing tasks are possible to be carried out.

- Our project aids to share out the burden of fire fighters in firefighting tasks as our robot will be able to prevent massive fire breakout

LIMITATIONS

- It is not used to put out large fires.
- It cannot leave outside for long period of time due to battery life.
- It cannot work beyond the limit.

REFERENCES

- 1.http://www.iosrjournals.org/iosr-jce/papers/Vol18-issue6/Version-5/U1806051131l9.pdf

- https://www.researchgate.net/publication/317610964_Fire_Extinguishing_Robot

- https://www.researchgate.net/publication/332415751_F2R_AN_ARDRUINO_BASED_FIREFIGHTING_ROBOT

Bibliography:

- Google
- Wikipedia

THANK YOU!