Fire-Fighting Robot

Group-9

Nitya Shah **21110191**
Mayur Patil **21110126**

Problem Statement

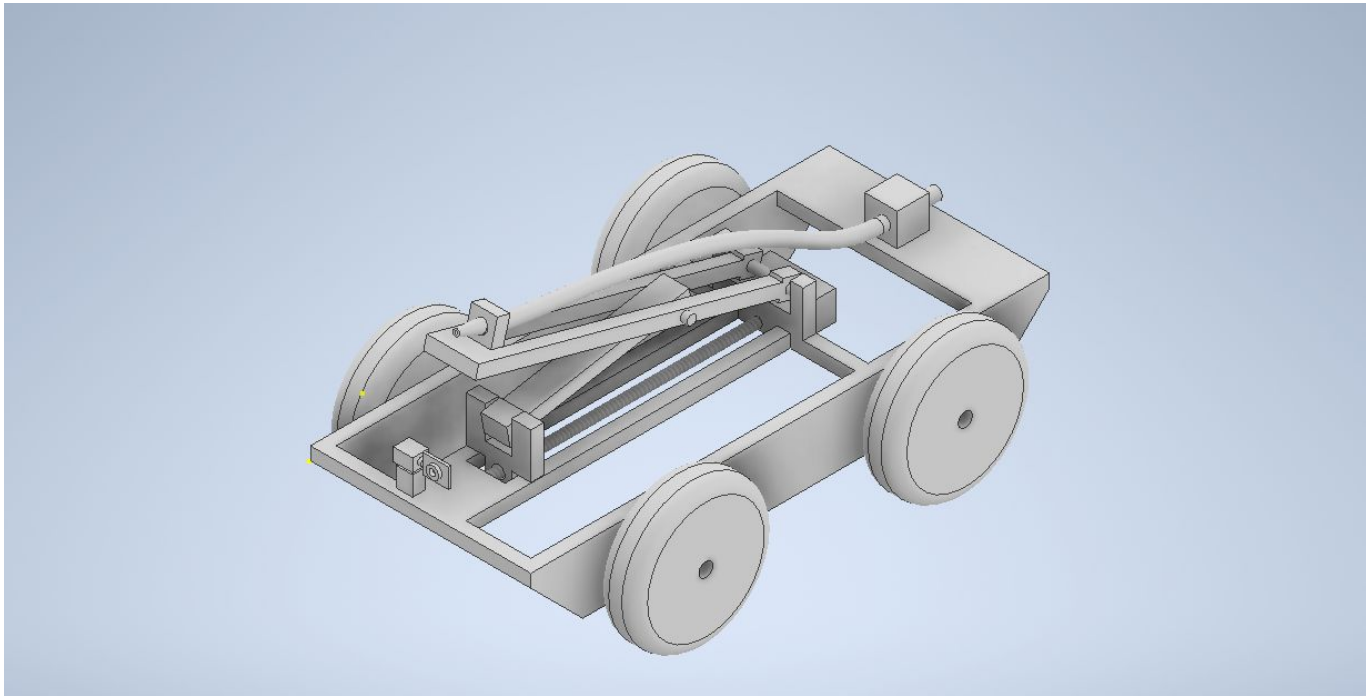
Firefighters face serious risks from heat, toxic smoke, and dangerous environments, leading to potential burns, long-term health issues, and physical injuries.

- Heat
- Smoke and Gases
- Dangerous Locations

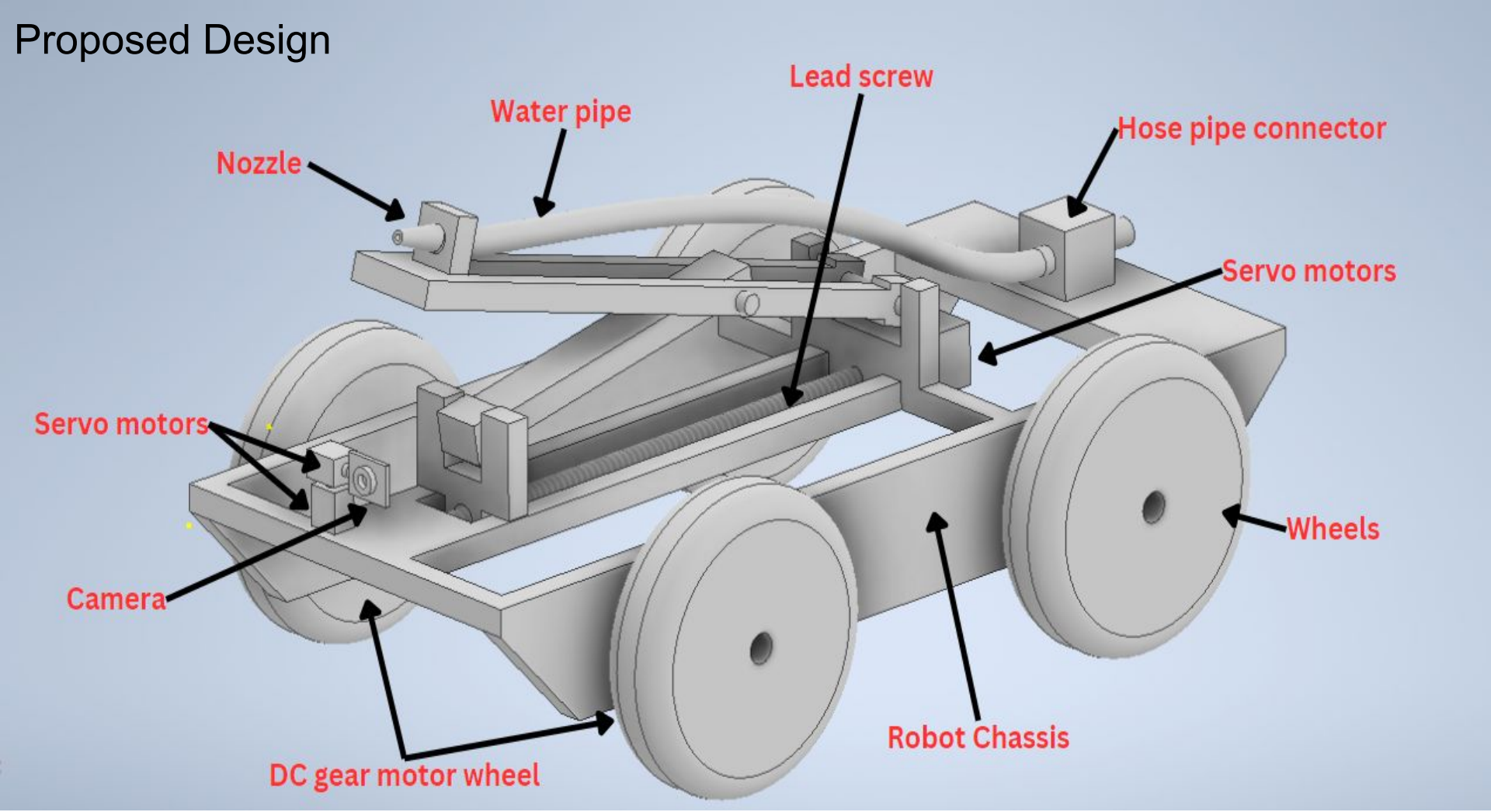
“why a problem”.

Proposed Solution

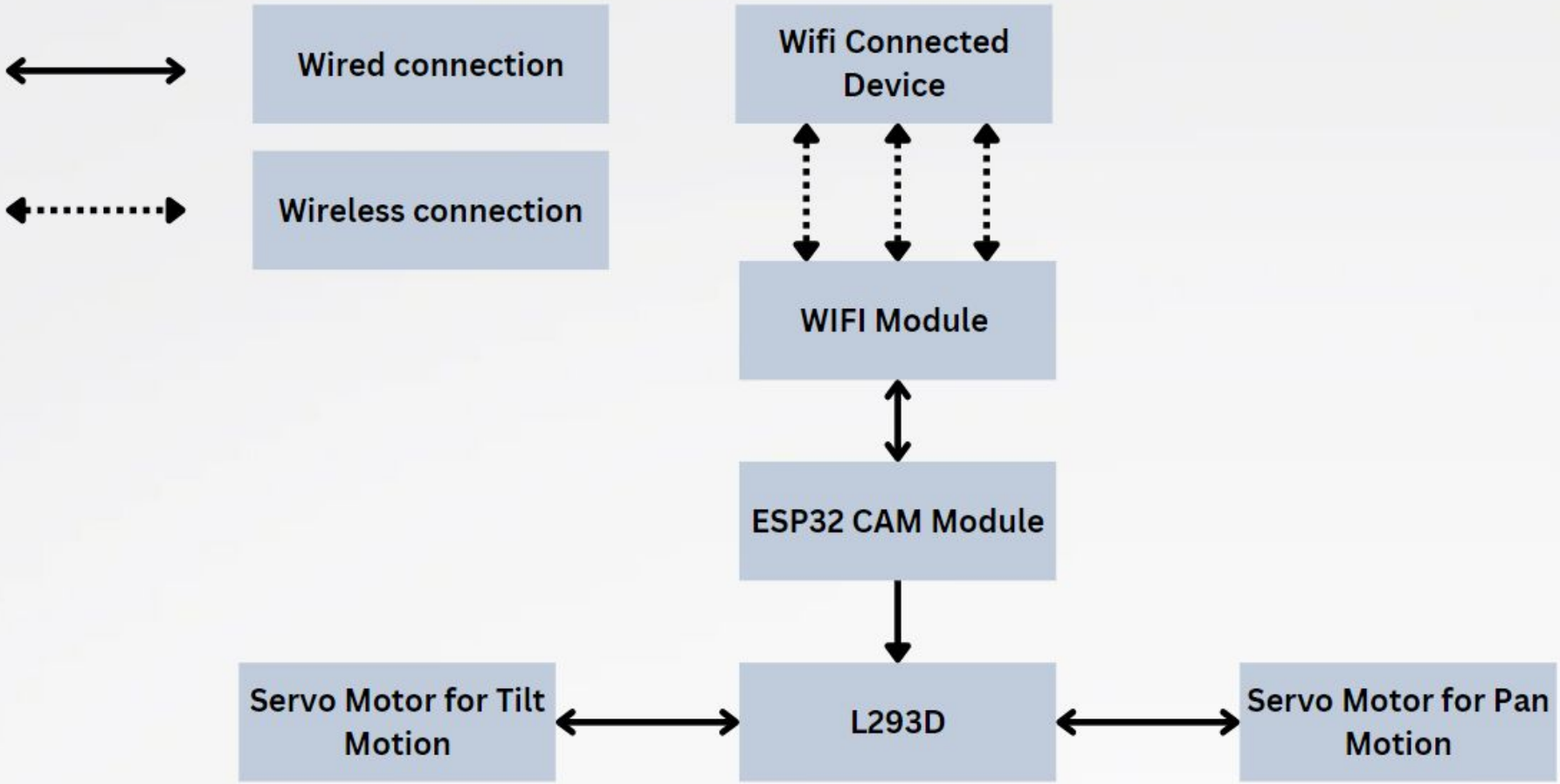
Developing the fire fighting robots to enhance the safety of the firefighters.



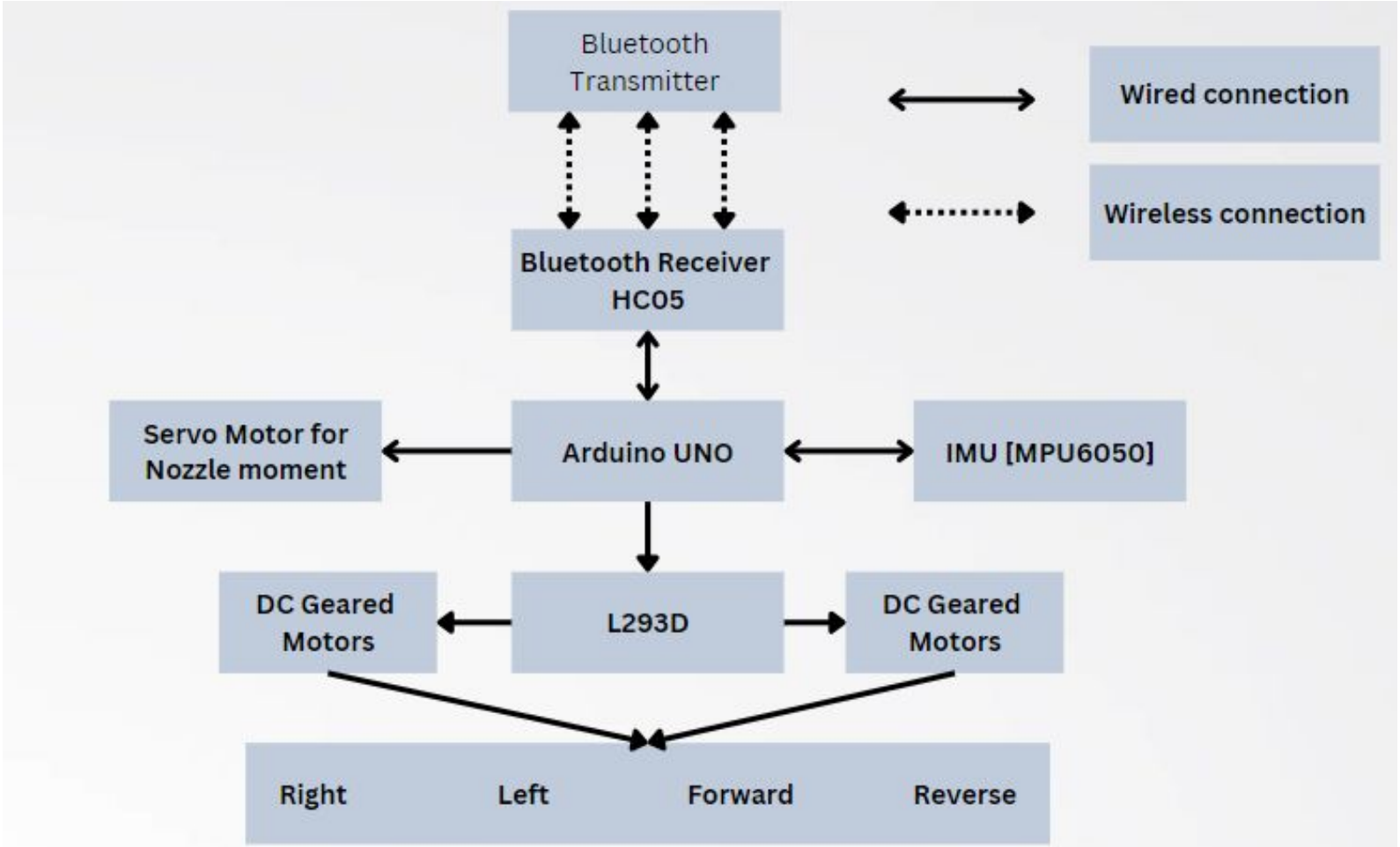
Proposed Design



Mechatronic Architecture for Vision



Mechatronic Architecture for Direction Control



Calculations for motor selection

M = 15kg, Slope Inc(θ) = 16°, Vel = 0.5m/s, Acc = 0.01m/s², Us = 0.8 Uk = 0.7 (Friction coeff)

Diameter of wheels = 11mm X 4, No of Motors = 2

Case: 1. Robot climbing the slope.

Torque required by single motor assuming 50% efficiency w.r.t to ratings = **7.7 kg cm [10 kg cm].**

Case: 2. Robot stationary on the slope and spray water.

Torque required by single motor assuming 50% efficiency w.r.t to ratings = **8.5 kg cm [10 kg cm].**

Range of water spray

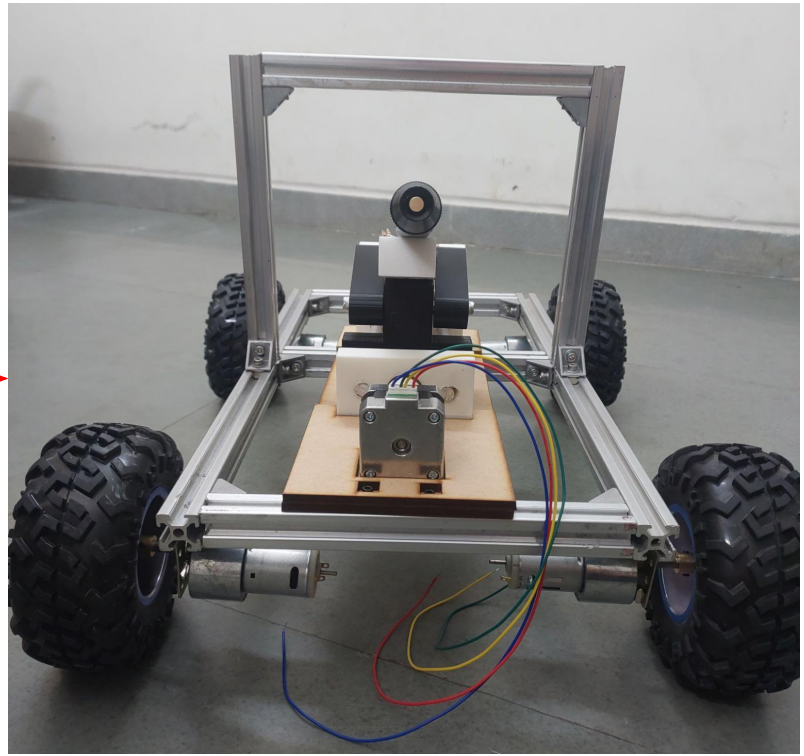
On horizontal surface: **5m**, On Slope(θ) = 16° : **3.9m**

Fire-Detection Algorithm

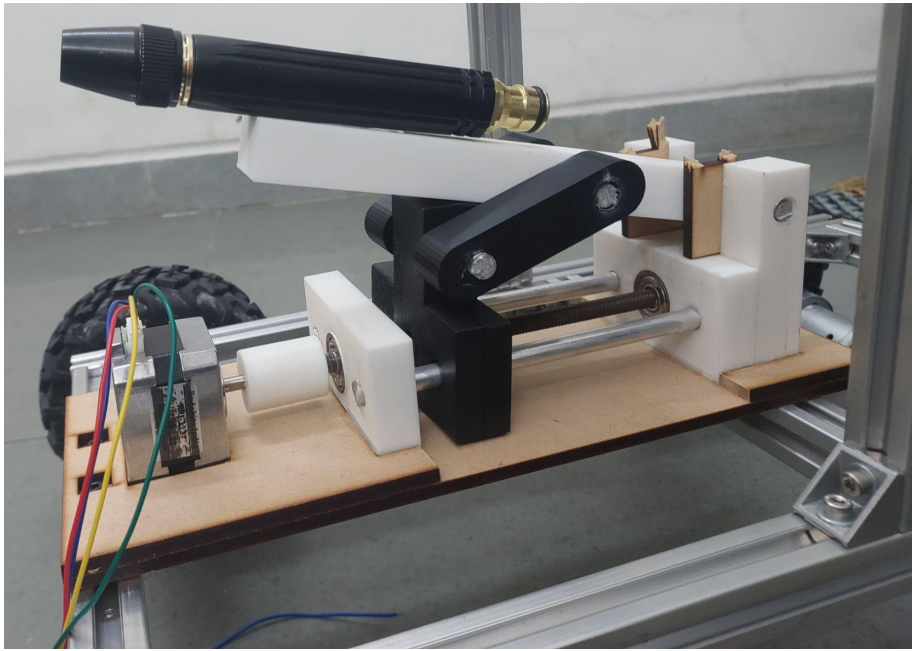
Known width = __
Focal Length = __
Distance = (known_width * focal_length) / perceived_width
Upper_Bound & Lower_Bound = __
Start Video Capture:
    Convert into HSV color space
    Binary Masking & Plot Contours
    Draw Bounding-box
    Estimate distance

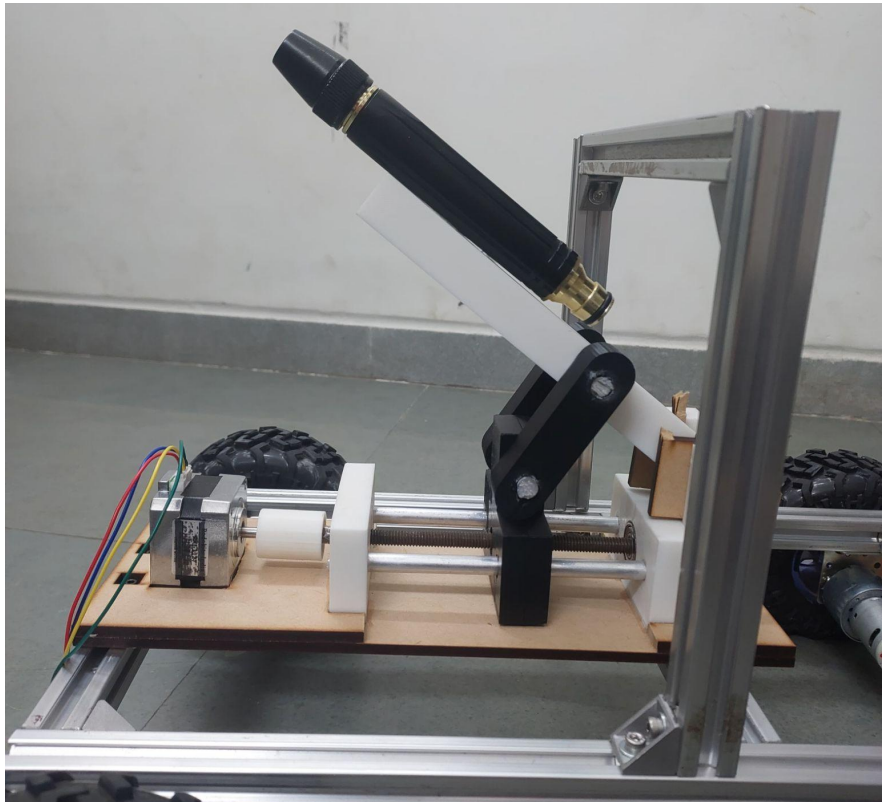
Work	Assigned to	Status (Before)	Status (Now)
Designing and CAD modelling	Nitya	Done	Done
Bill of Materials & Materials Ordering	Both	Remaining	Done for Chassis
Construction of Robot Chassis	Both	Remaining	Done (80%)
Connection of electrical hardware	Both	Remaining	Started Purchasing
Codes	Mayur	Remaining	Looking for Sources

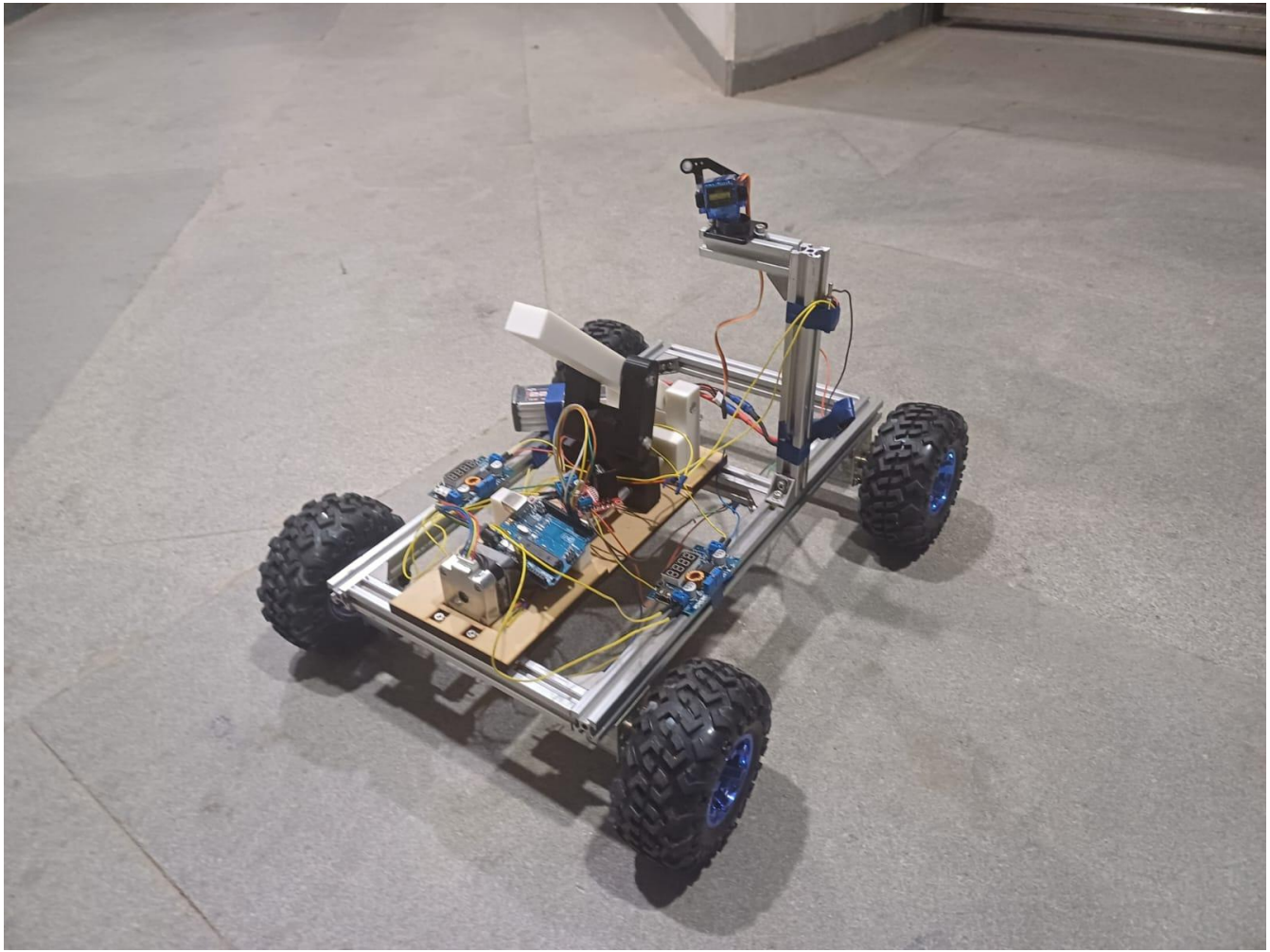
Robot chassis



Robot chassis







Video Demonstration

Electronics setup

Camera setup is not installed
Yet

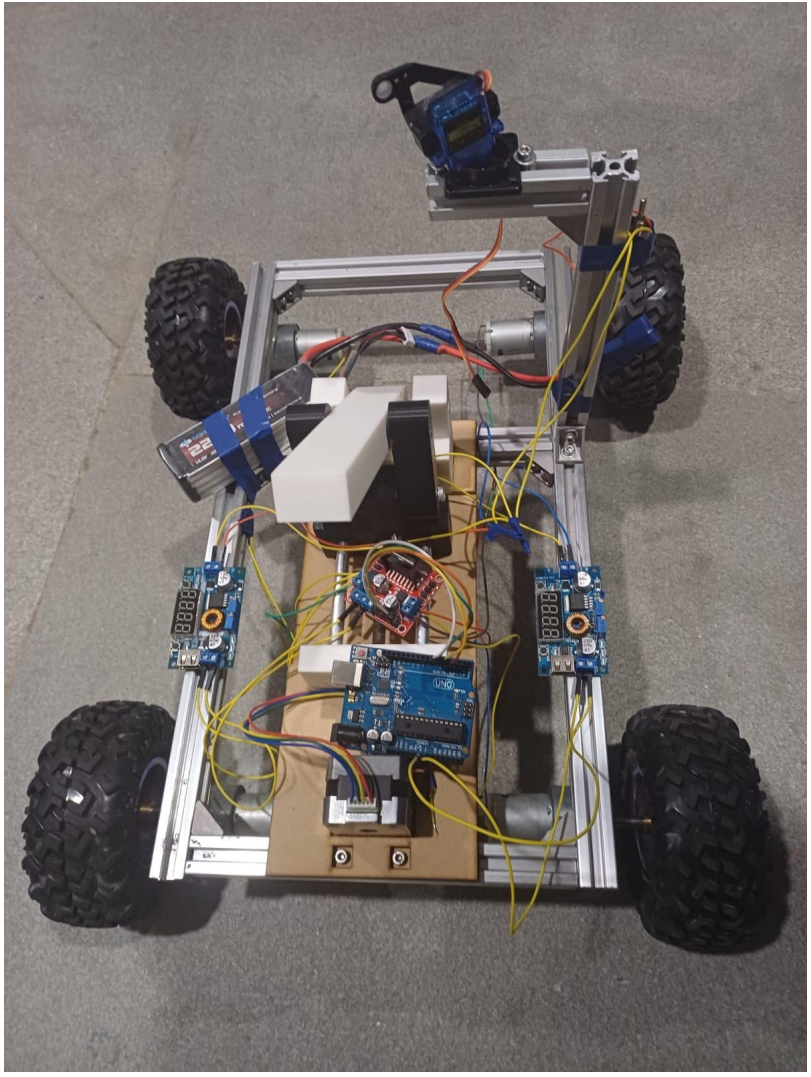
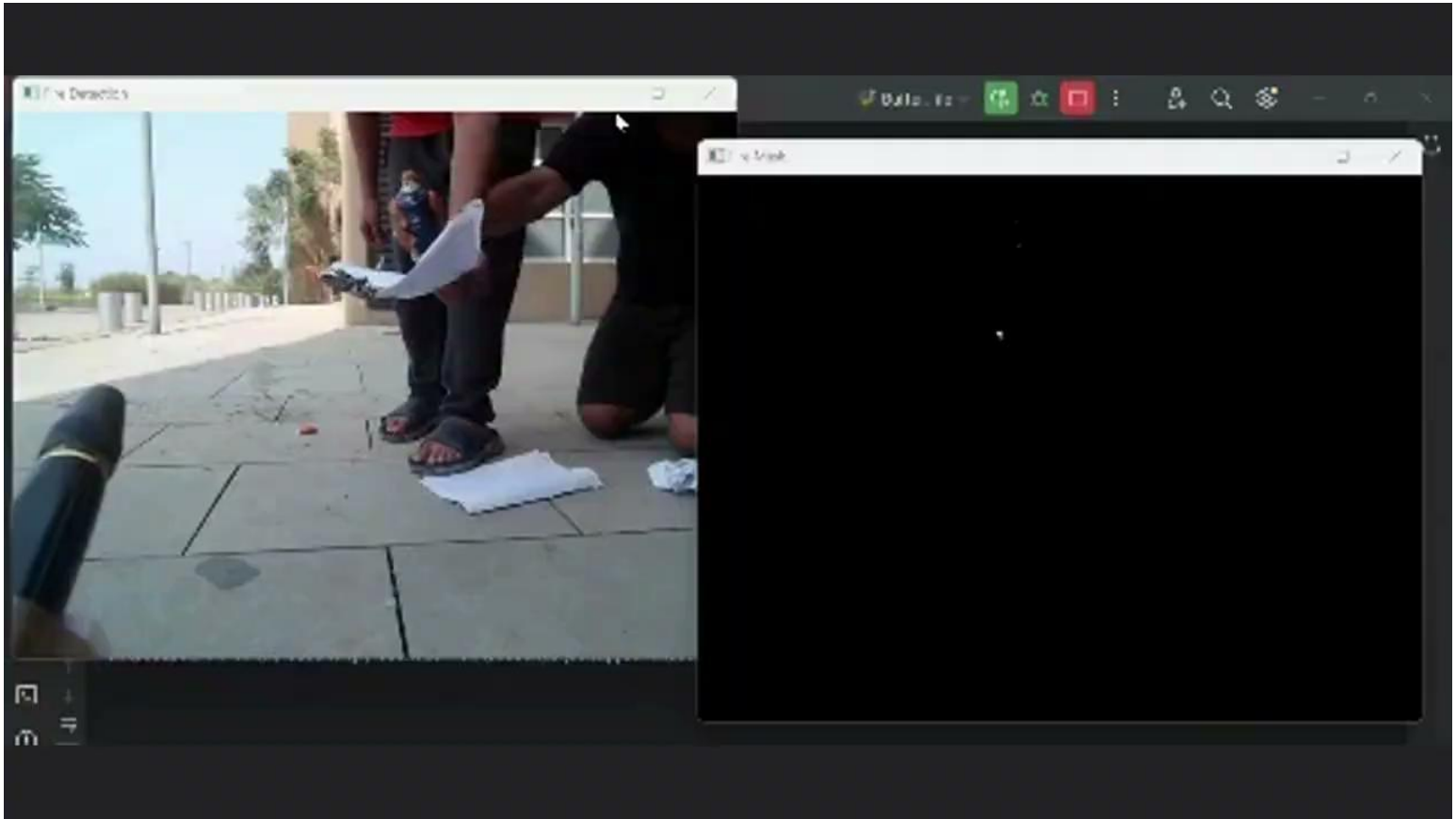
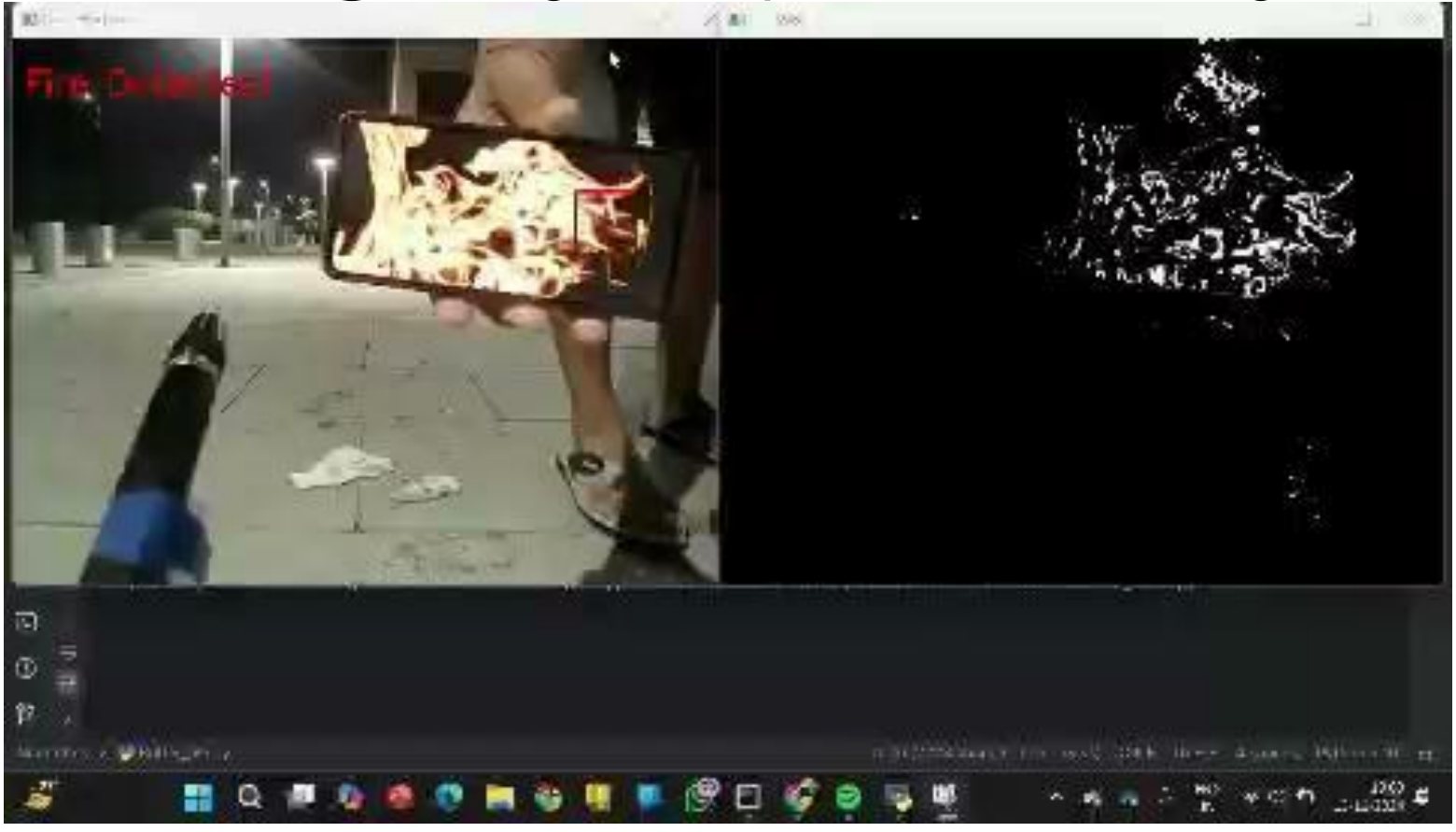



Image of
prototype

Video Demonstration



Fire Detection @ low light setup with mobile image



Fire Detection @ low light setup with fire

Things used for fire Detection

Kagle Trained Dataset for fire detection

open cv

Yolo V5 algorithm

And additional libraries needed

Things to do be done before finals

- Solve problem of Tilt mechanism.
- Last try to replace Webcam with ESP32 Cam and run fire detection on it.
- Update Github Page.
- PPT Formatting [Update- Mechatronics Architecture, progress images to be added].
- Bill Settlement.