

# **Fire-Fighting Robot**

Group-9

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# Problem Statement

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



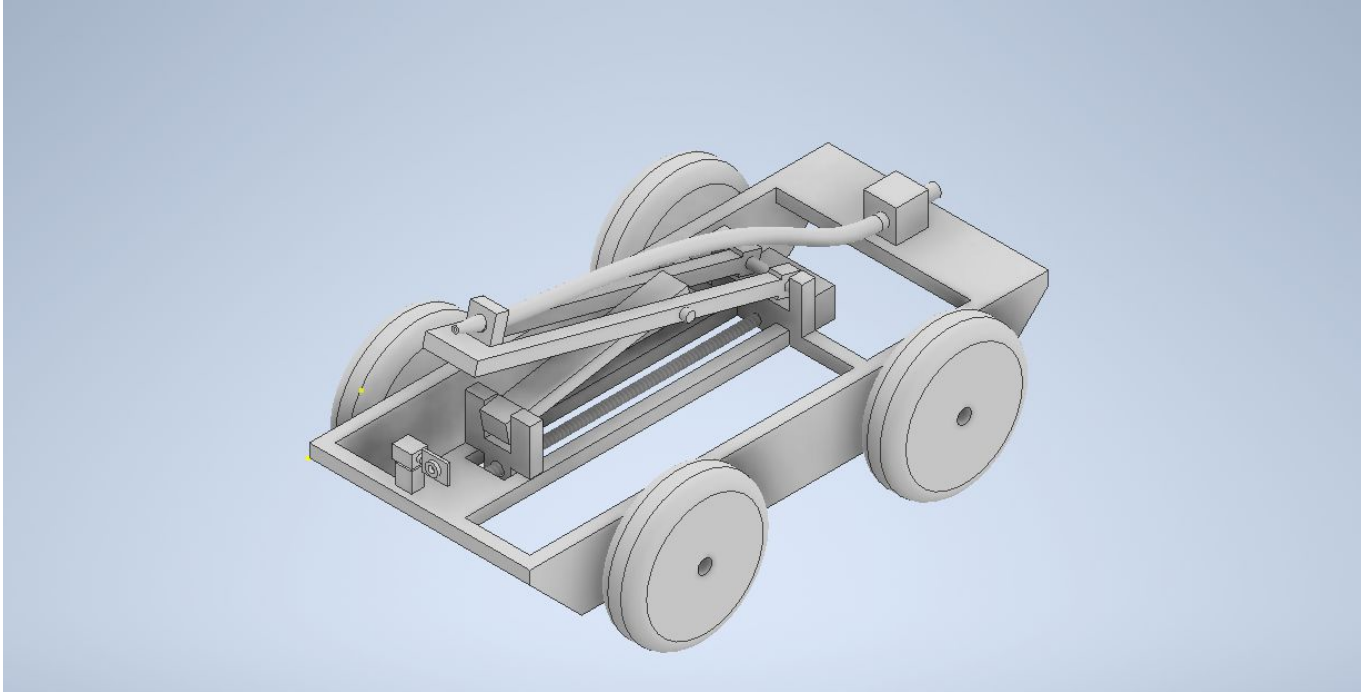
- Heat
- Smoke and Gases
- Dangerous Locations



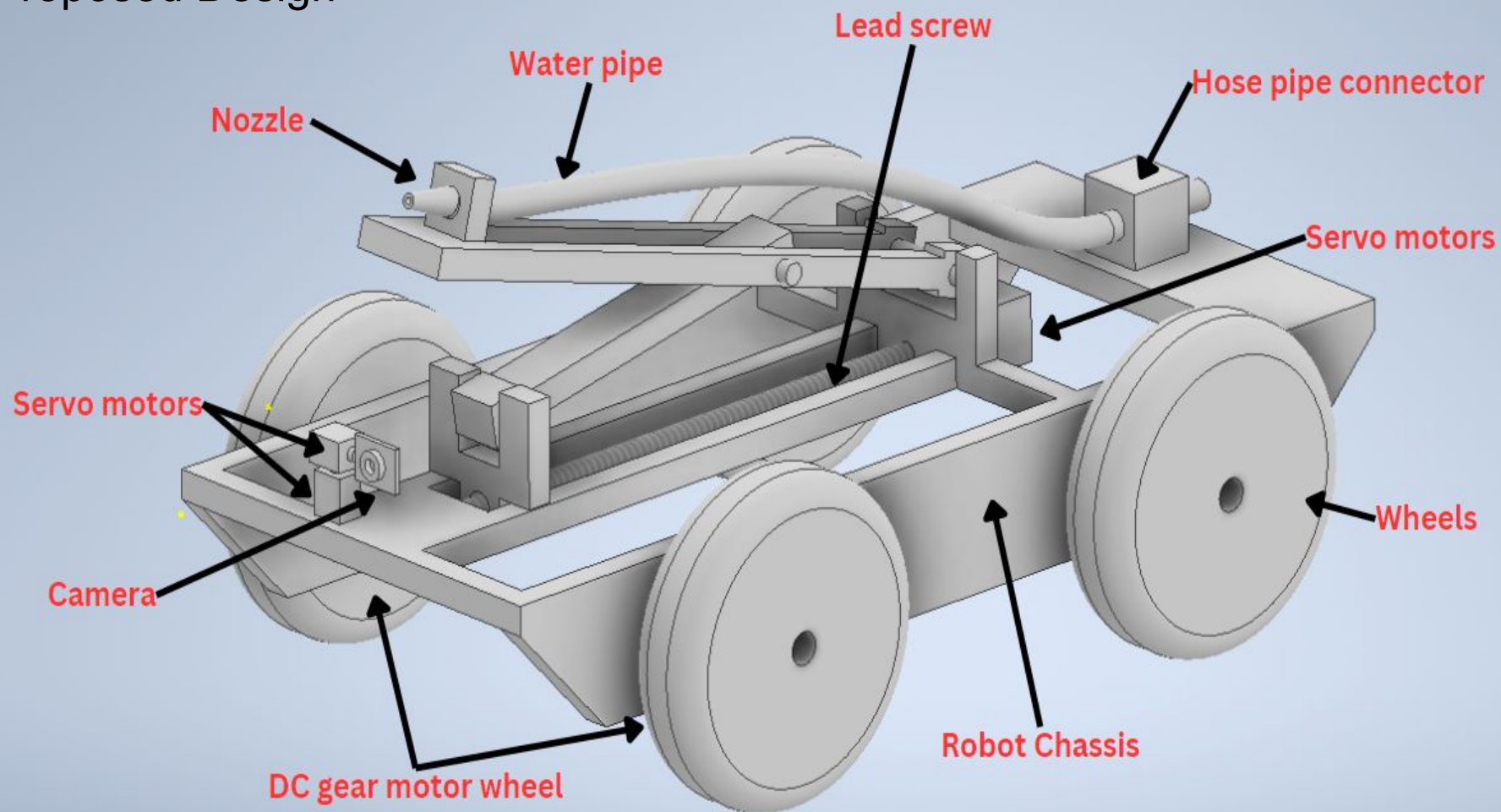
“why a problem”.

# Proposed Solution

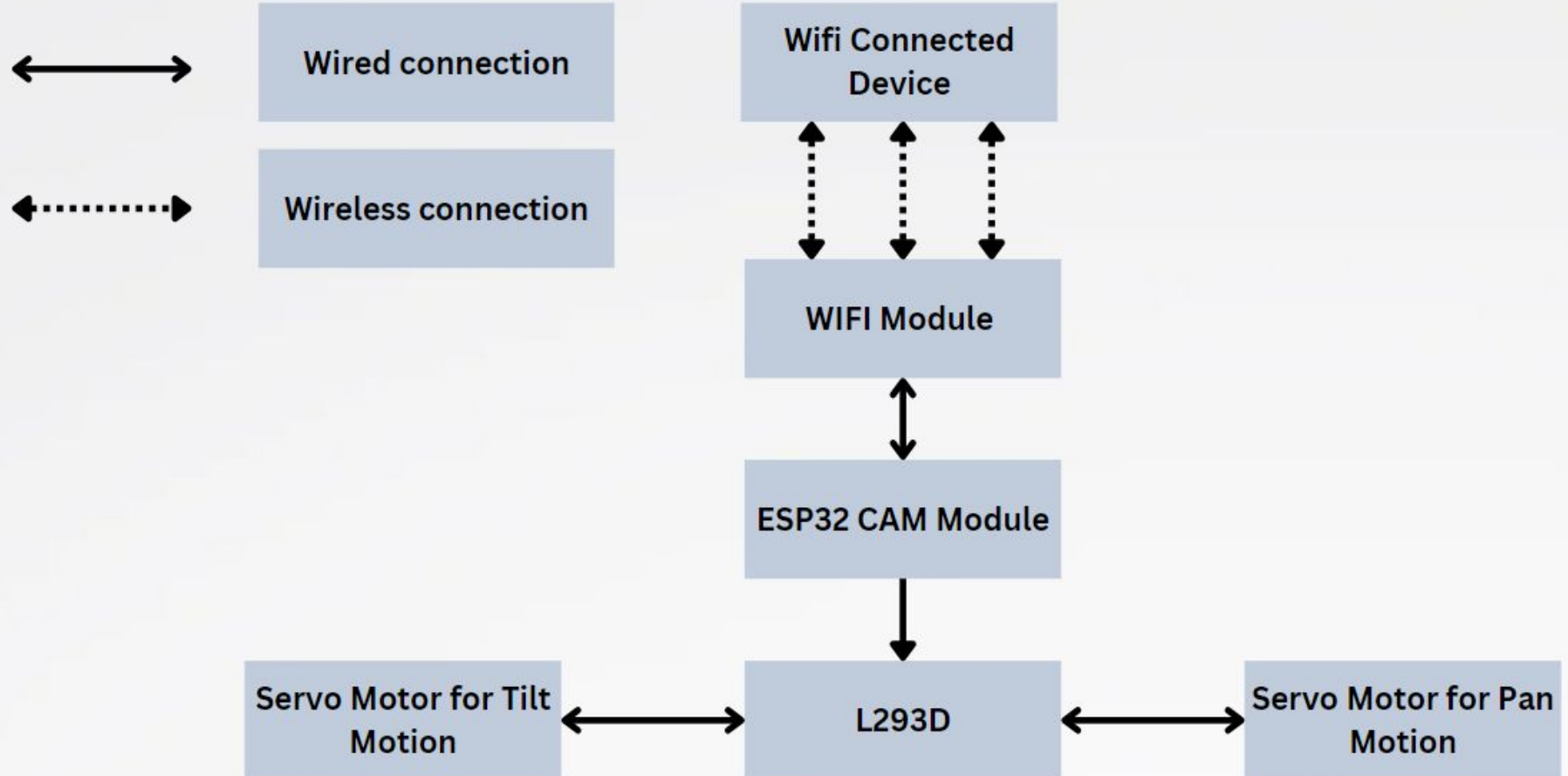
Developing the fire fighting robots to enhance the safety of the firefighters.



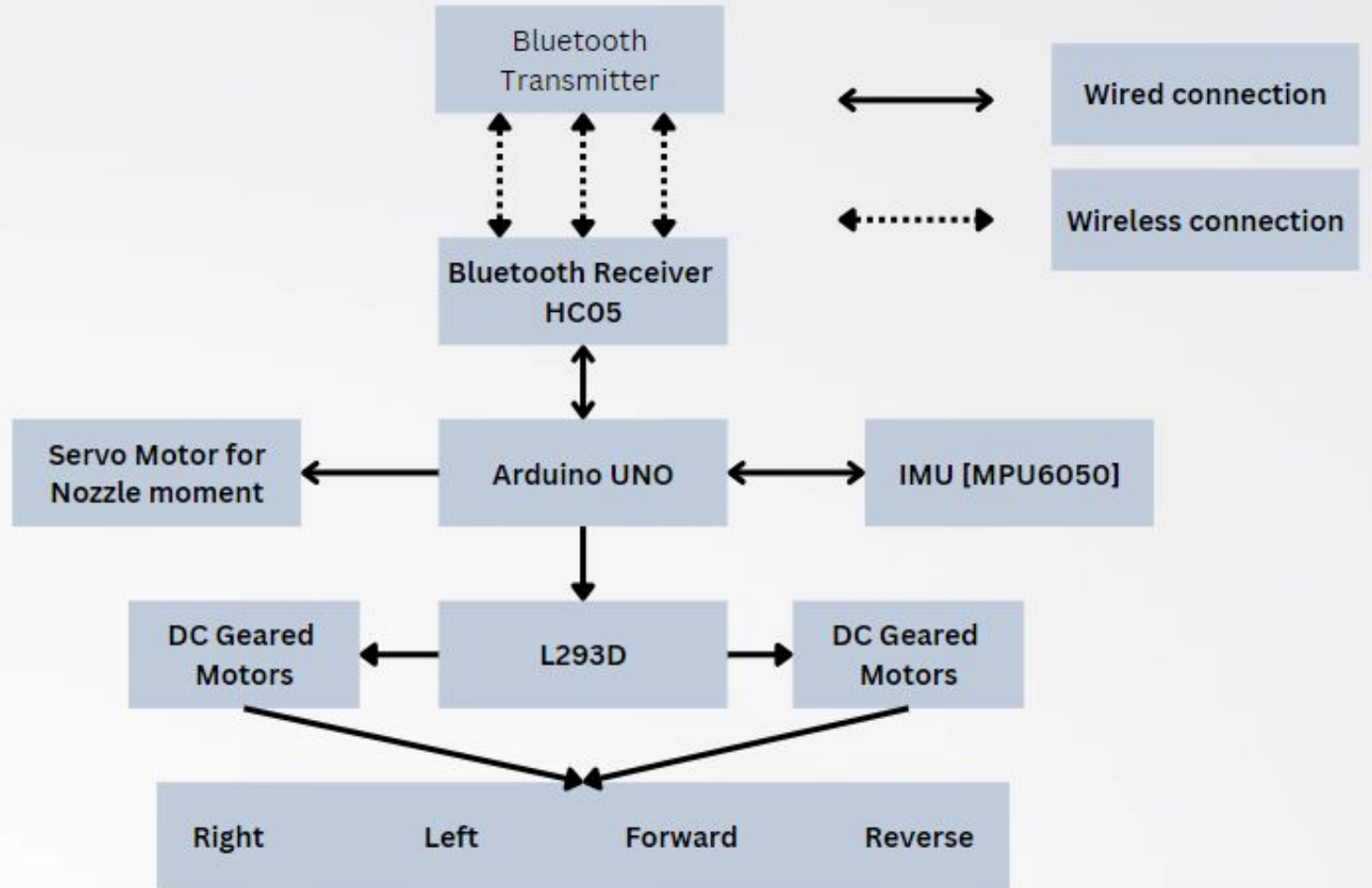
# Proposed Design



# Mechatronic Architecture for Vision



# Mechatronic Architecture for Direction Control



# Calculations for motor selection

$M = 15\text{kg}$ , Slope  $\text{Inc}(\theta) = 16^\circ$ ,  $\text{Vel} = 0.5\text{m/s}$ ,  $\text{Acc} = 0.01\text{m/s}^2$ ,  $U_s = 0.8$   $U_k = 0.7$  (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( $\theta = 16^\circ$ ) : **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



<b>Work</b>	<b>Assigned to</b>	<b>Status (Before)</b>	<b>Status (Now)</b>
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