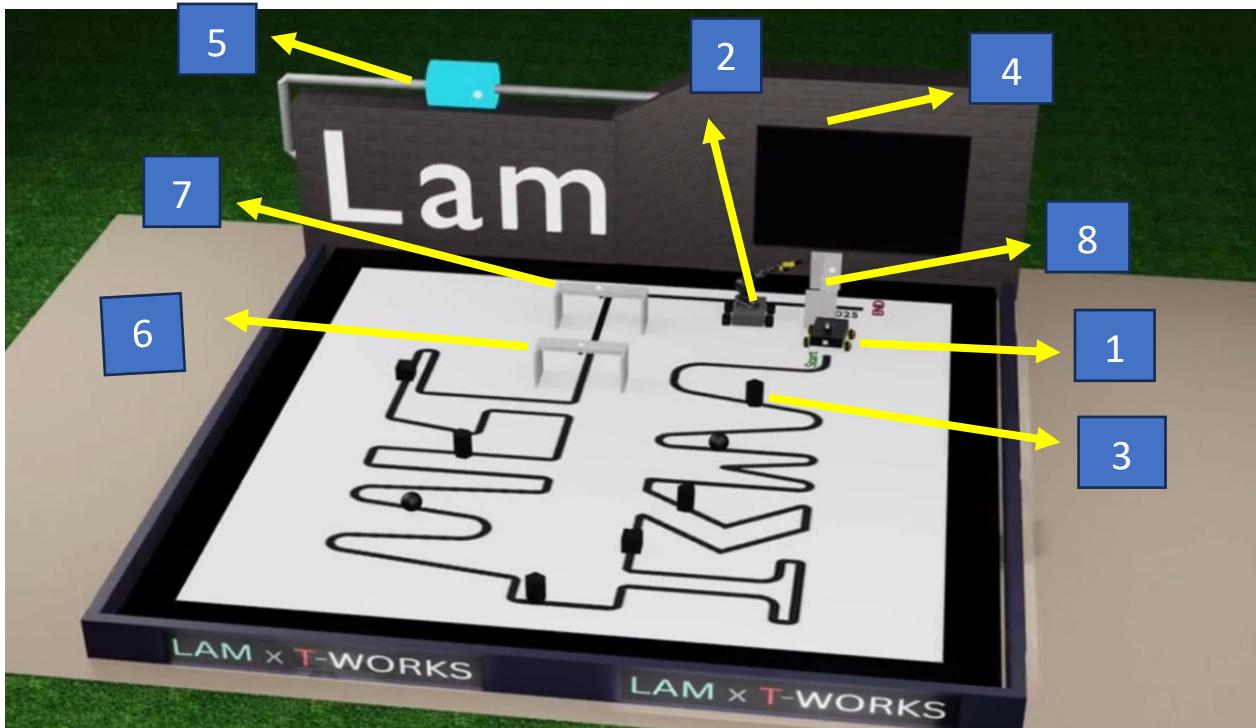


Lam Research Challenge 2025

ROUND -1:
LOGICAL LEAGUE

PROBLEM STATEMENT:

Teams will be provided with a predefined arena schematic and a gameplay challenge. They must design and build both the arena and autonomous robots, and implement the game logic using ROS with either Coppelia Sim or Gazebo.



Logical League: Lam Research Challenge 2025:

The Gen Z Tech Sprint, *where young minds fire innovation*

ROBOTIC SIMULATION ESSENTIALS:



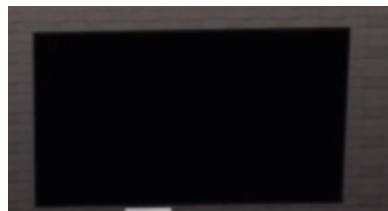
1. Advanced Line Follower



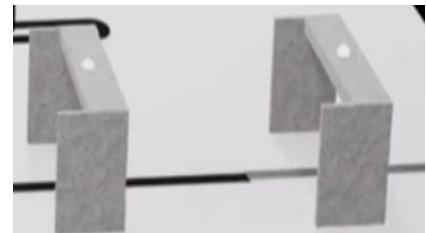
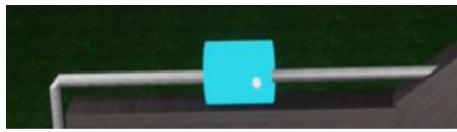
2. Single Arm Robot



3. Obstacles



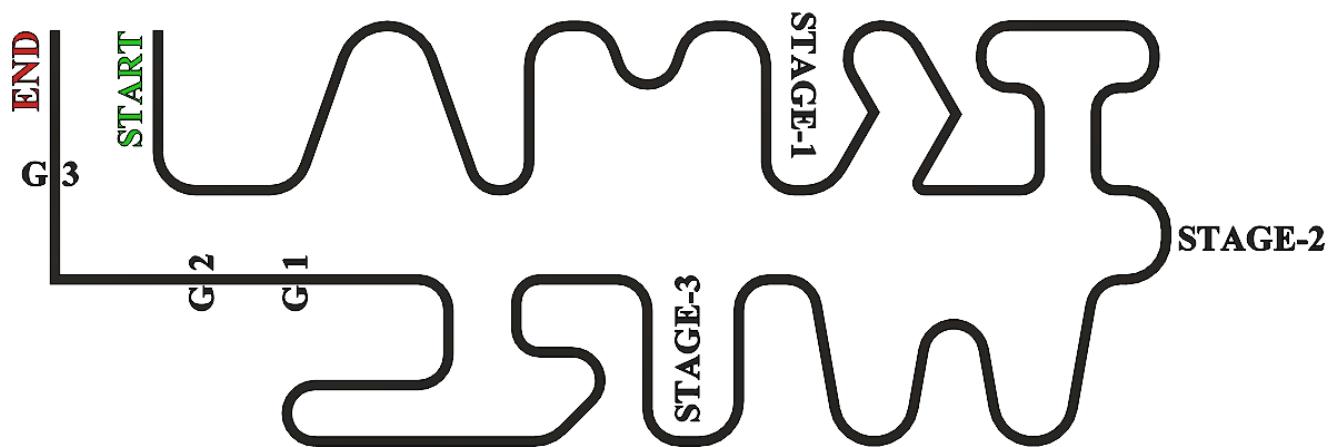
4. LCD Display



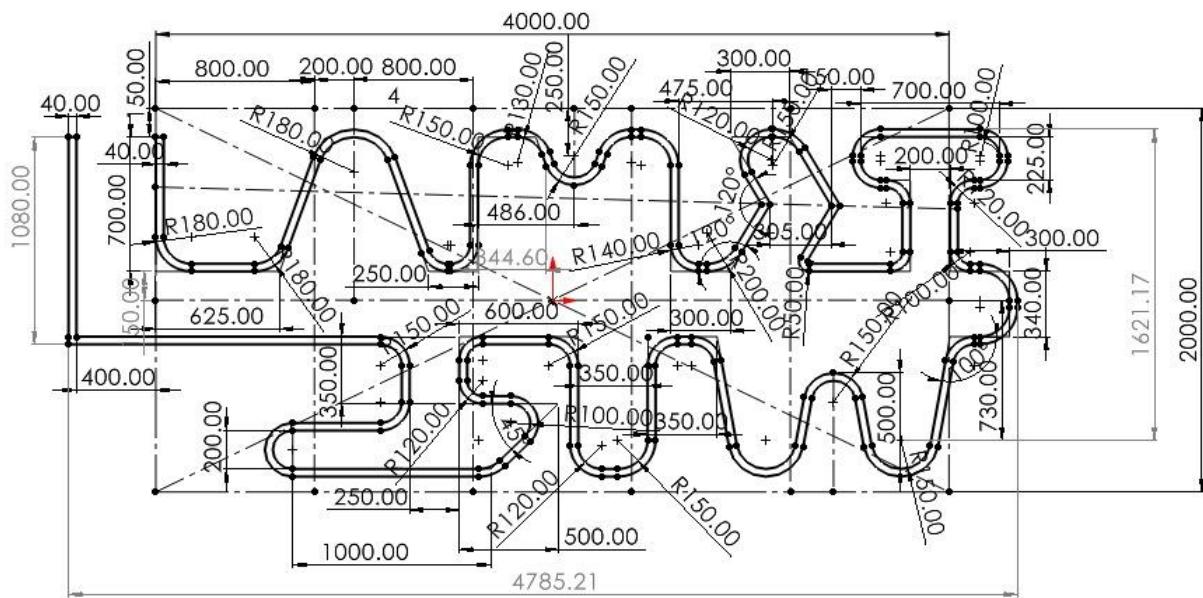
5.Peristatic Pump

6,7,8.Gate 1,2,3

ARENA:

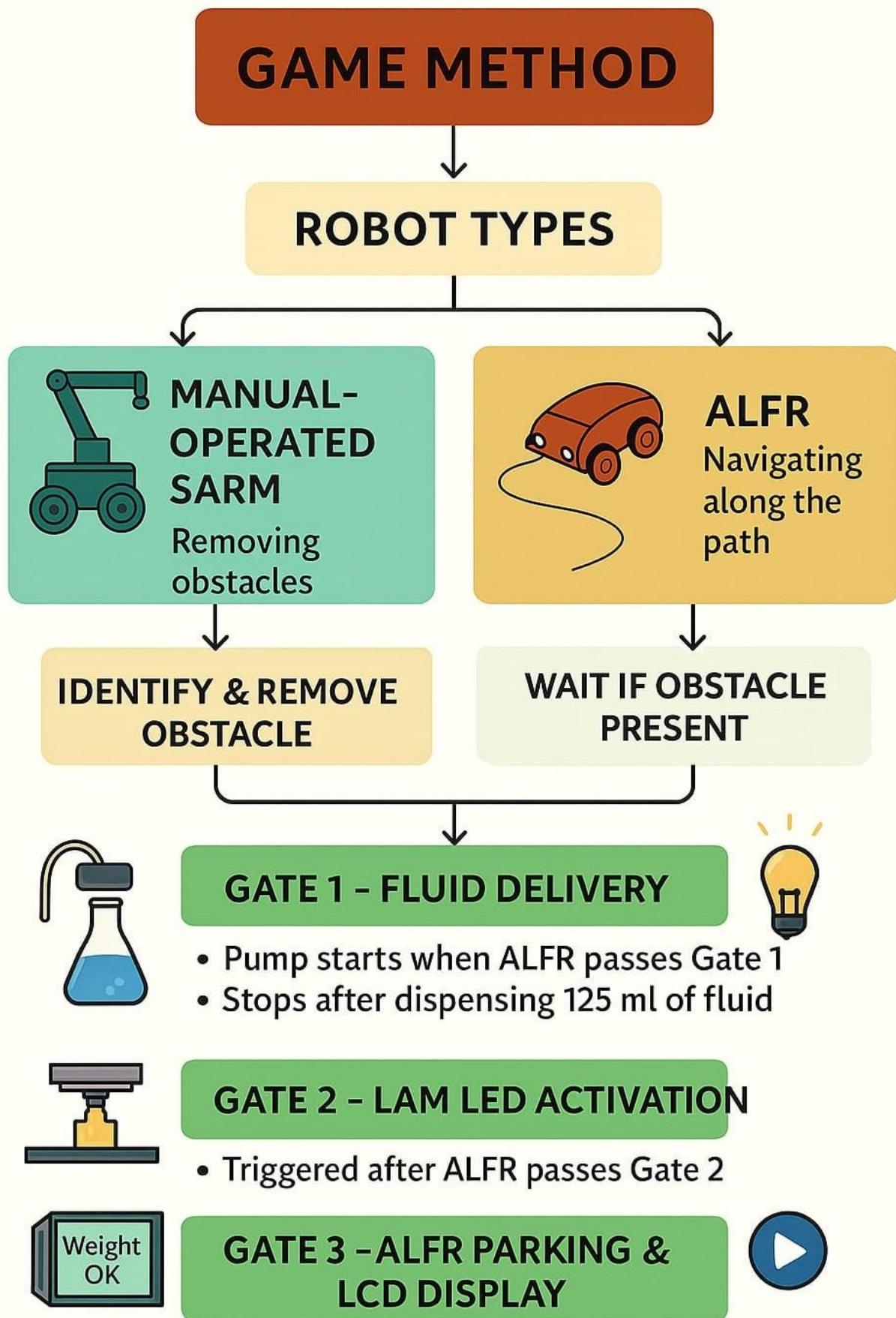


Arena for the Advanced Line Follower Robot



Dimensions of the Arena

GAME METHODOLOGY:



1. Robot Types

Each team must design, build, and operate two robots that work in coordination to complete the challenge in COPILA/GAZEBO With ROS/ROS1/ROS2:

- Manual-Operated SARM (Single Arm Robot on Mecanum/Omni Wheels Platform):
 - This robot is manually controlled.
 - Equipped with a robotic arm mounted on a mobile base with Mecanum/Omni wheels for omnidirectional movement.
 - Primary responsibility: identify, pick up, and remove obstacles from the arena path.
- ALFR (Autonomous Line Follower Robot):
 - Fully autonomous robot that follows a predefined line path.
 - Primary responsibility: navigate the arena, wait at blocked junctions, and continue only once the SARM clears the obstacles.

2. Obstacle Configuration

- Multiple obstacles of different sizes are strategically placed at designated points across the arena.
- The placement ensures varying levels of difficulty for clearance and navigation.

3. Obstacle Interaction Logic

- The SRM is responsible for:
 - Manually detecting obstacles along the line path.
 - Picking them up and relocating them away from the line path so they do not interfere with the ALFR.
- The ALFR must:
 - Stop and wait at any junction where obstacles are present.
 - Resume navigation only after the SRM clears the path.

4. Line-Following Objective

- The ALFR must follow the defined line path autonomously.
- On successful navigation, the robot must reach a checkpoint line.
- Upon arrival, an LED array spelling “Lam” will illuminate.

5. Switch-Controlled Fluid Delivery Sequence

The arena includes three sequential switch-activated stations that integrate robotics with fluid delivery:

- **Gate 1 – Fluid Delivery (G1):**
 - Once the ALFR crosses Gate 1, a peristaltic pump needs to be activated automatically.
 - The pump dispenses 125 ml of liquid into a designated container.
 - Once the exact 125 ml is dispensed, the pump should stop.

- **Gate 2 – LED Activation (G2):**
 - As the ALFR passes Gate 2, the **LAM-shaped LED** should glow.
- **ALFR Parking and Load Cell Activation – Final Stage:**
 - The ALFR parks at the final container station.
 - An L-shaped light should activate again.
 - The load cell measures the liquid weight and bot weight for accuracy.

6. LCD Display Integration

Upon **successful fluid dispensing** and **ALFR parking** and the weight measurement:

- If the **measured weight matches the required weight**:
 - The **LCD display** will show one of the following:
 - Team Name
 - Video Clip
 - Team Photo
 - Success Message (e.g., “*Simulation Completed!*”) or any unique identifier.
- If the **measured weight does not match**:
 - The **LCD display** will show:
 - Error message (e.g., “*Weight Mismatch – Retry*”)

- Gate 1 = Pump ON → Dispense 125 ml → Pump OFF
- Gate 2 = LAM LED ON
- Gate 3 = Load cell check → Trigger LCD Display if correct

7. Time Limit

- Game must be completed within 10 minutes.
- For every minute saved, +5 marks will be awarded.

8. Google Drive:

https://drive.google.com/drive/folders/16Q7NmYzyu5Iy_XiRhRxiAbMPOE5CraQg?usp=sharing

- a) Game Video
- b) Game Rule Book
- c) Arena.PNG – Directly you can import in your simulation environment.
- d) Arena – SolidWorks 3D Solid Model
- e) SARM – Solid works 3D model for Single Arm Robot – Tentative Design
- f) Platform for keeping the SARM – SolidWorks 3D model
- g) ALFR – Advanced Line Follower Robot – Solid works 3D model

Scoring Table

| S.No | Description | Marks |
|------|---|------------|
| 1 | Development of the Arena Circuit with Pump & LCD Screen display | 50 |
| 2 | Single Arm Robot (SARM) with Omni-Wheeled Platform | 25 |
| 3 | Advanced Line Follower Robot (ALFR) | 25 |
| 4 | ALFR Successfully Crosses Obstacle – Stage 1 | 25 |
| 5 | ALFR Successfully Crosses Obstacle – Stage 2 | 35 |
| 6 | ALFR Successfully Crosses Obstacle – Stage 3 | 55 |
| 7 | Design & Development of Peristaltic Pump | 25 |
| 8 | 3D Model Bonus – Own design for SARM with Omni Wheels | 25 |
| 9 | Making a Unique Document where your Identity reflects. | 10 |
| 9 | 3D Model Bonus – Own design for ALFR | 25 |
| 10 | Time Bonus – Each 1 min saved (under 10 min) | +5 per min |
| | Total (excluding bonus) | 250 |