ELECTRICAL TEAM TRAINING

TASK 5

Problem 1:

Autobots, the war for Cybertron isn't over. Our newest prototype, a battle mech called Sensorion, relies on **dual energy sensors** to stay calibrated in combat. Each sensor is managed by a different Autobot unit. You, our chief engineer, must build a Central Processor Unit to collect these readings and stabilize Sensorion's core by averaging the data.

Requirement

On Tinkercad, or similar software, design a **three-Arduino system** where:

- **Two Arduinos "Autobots"** each monitor a **potentiometer**.
- A **third Arduino, the CPU "Optimus Core"**, communicates with the two Arduinos and prints the **average** potentiometer reading (0–1023) to the Serial Monitor.
- **(Bonus)** Instead of using potentiometers, apply the same principle with any sensor of your choice, use 2 identical sensors on 2 Arduinos and print their average reading on the third Arduino.

Problem 2:

Hot Rod, the fearless and fast Autobot from the Transformers universe, is known for his speed and sharp instincts. In this mission, Hot Rod is sent on a crucial task: to reach a specific target position deep within an unknown environment.

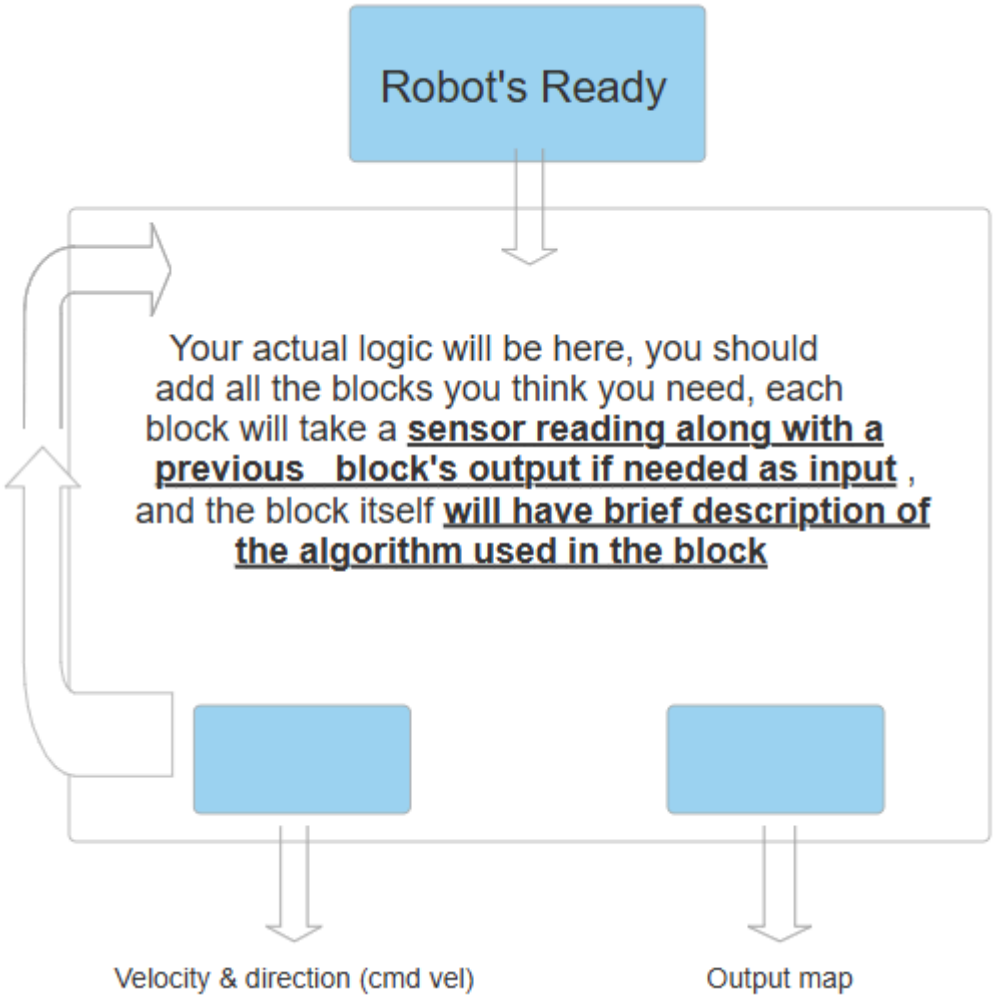
But speed alone isn't enough. To succeed, Hot Rod must rely on his advanced sensor systems. Equipped with ultrasonic sensors, and IMUs, he begins by scanning the surroundings, **building a real-time map** of the terrain and any obstacles in his path. Using simultaneous localization and **mapping (SLAM) techniques**.

As he navigates, he constantly updates this map, recalculating the optimal speed and direction he should be moving at. with every new piece of data. His goal is to find the shortest, fastest path to his destination, avoiding hazards and dead ends with precision.

Requirement

- Design a **block diagram** showing how the robot navigates.
- Include **all the sensors you think you should use** and use them as inputs to the blocks alongside with outputs of previous blocks if needed.
- Show decision-making, movement output and created map.
- Keep the diagram clear and labeled.

Example

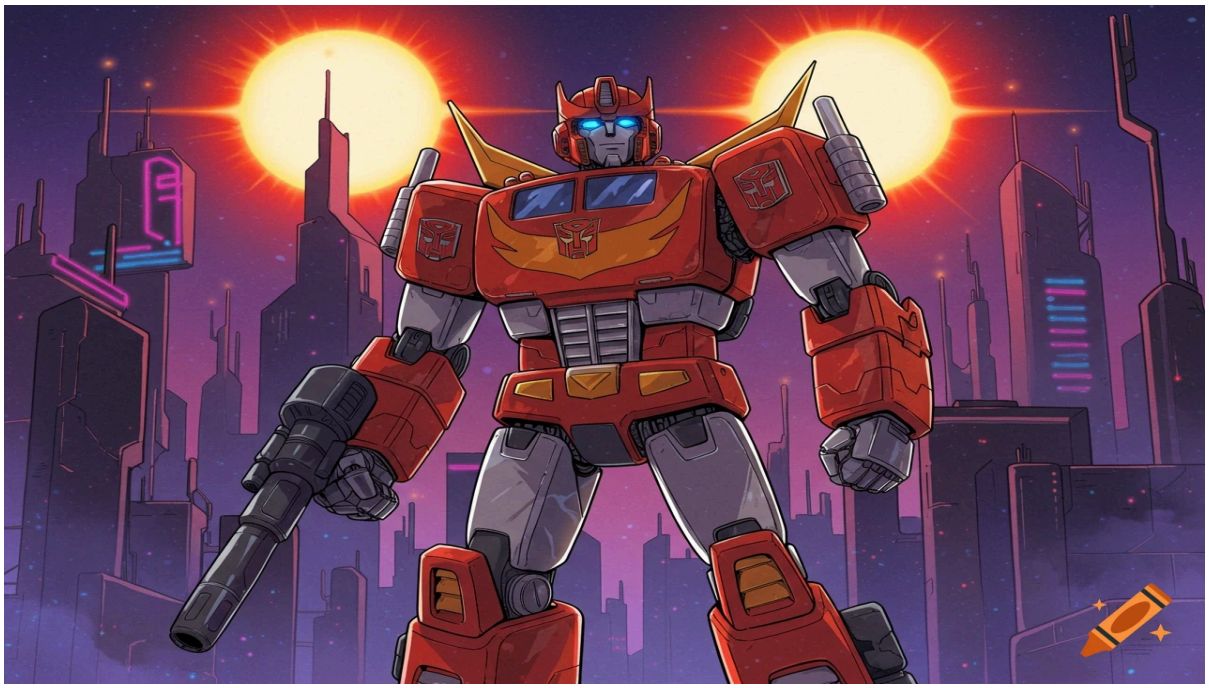


Appendix

- Creating Block diagram: Smart View (you can use any tool of your preference)
- Creating a map: What is SLAM
- Choosing sensors for Autonomous Systems: Choosing Right Sensors(and many more)

Problem 3:

Cliffjumper, the bold and tactical Autobot, is assigned a task to reach a specific setpoint on a grid-based environment filled with obstacles.



Using ultrasonic sensors, Cliffjumper detects obstacles in all directions. With a combination of wheel encoders he tracks his position on the grid. The mission begins with a user-defined target location (setpoint), and Cliffjumper calculates an efficient path to reach it.

As he moves, he constantly checks for new obstacles and adjusts his route accordingly. The path planning is grid-based, allowing him to make decisions at each intersection point, just like navigating a maze.

Requirement

- Build a breadboard circuit including:
  - Arduino board
  - Motors
  - Ultrasonic sensors (number chosen based on task needs), (you can use any other type of sensors if needed or desired)
- Write code that:
  - Accepts a user-defined destination point on a grid
  - Accepts rectangular obstacles with defined dimensions and top-left corner coordinates
  - Simulates movement by printing the robot's current position at each step
  - Navigates from the start point to the target while avoiding obstacles

Bonus Requirement:

- Add wheel encoders
- Use encoder readings to calculate and print the robot's movement rate along the grid

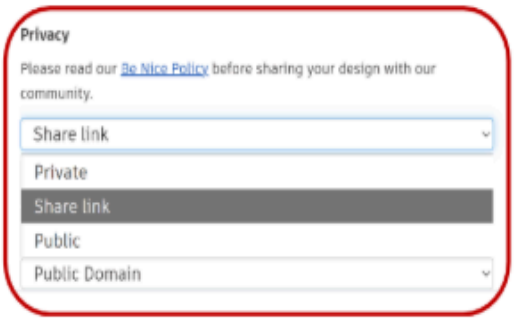
Submission

For Problem 2, submit a google drive link of your block diagram in (.pdf) format.

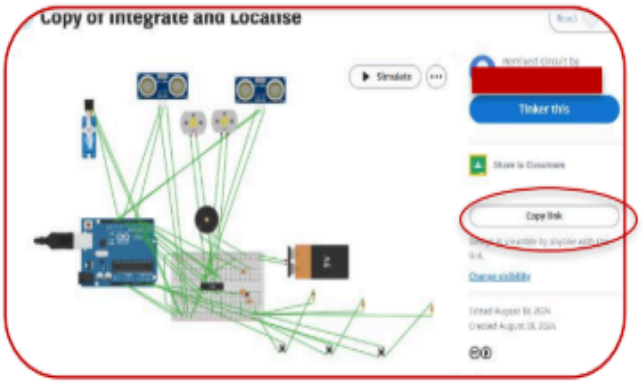
For Problems 1 and 3, submit your Tinkercad link as shown:

1. After selecting your project

2. Select change visibility



3. Make sure it is set to share link or public and save



4. Submit this link