ME 456 Mechatronics

Workshop Assignment #4: Autonomous navigation on dohyo

06.05.2025

Goal:

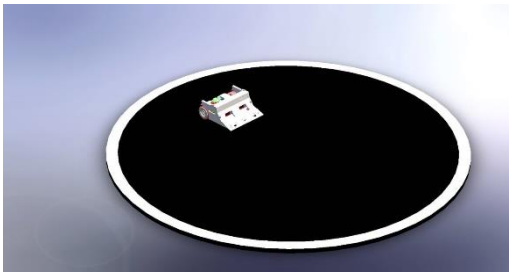
In this last workshop, detection of the dohyo border (white edge) by an IR (line-follower) sensor will be implemented. Also, your robot will be autonomously move on the dohyo without leaving the borders.

Prelab [5 pts]:

- Fix an IR sensor (also called a line-follower sensor) underneath your robot's front section.
- Connect the IR sensor to Arduino controller so that the sensor can detect color of the surface (black/white).

Lab Tasks [10 pts]:

1. Demonstrate that your robot can detect black surface and white surface when placed on the platform.
2. Task1 [+5 pts]: Now create a program so that your robot moves forward until it reaches the white border and then it stops.
3. Task2 [+5 pts]: Implement autonomous motion on Dohyo – move forward until line is detected then perform a reverse and 90 degree left or right turn.



📝 Homework Assignment [15 pts]:

🎯 **Objective:** Design and implement a basic autonomous behavioral strategy for a mobile robot using an Arduino-based platform. The robot must switch between different modes (e.g., search, attack, evade) based on sensor input, simulating a simplified sumo robot or environment-aware robot.

📚 Task Description:

1. Design a Behavioral Strategy

- Identify 3 main behavior modes:
  - **Search**: look for an object or opponent.
  - **Attack**: move toward detected object.
  - **Evade**: avoid edge or danger.
- Use a **Finite State Machine (FSM)** approach:
  - Define state transitions based on sensor input.
  - Prioritize safety (e.g., avoiding the edge) over other behaviors.

2. Implement in Arduino

- Write Arduino code that:
  - Reads from IR and line sensors.
  - Switches between behavior modes.
  - Controls motors for each mode.
- Use if/else or switch statements to manage states.

3. Demonstration

- Record a short video (30–60 sec) of the robot demonstrating the 3 behaviors.

- Show transitions between states clearly.
- Include simple debug output via Serial Monitor (optional).

📤 **Submission Requirements**

- Arduino sketch file (.ino)
- Diagram or pseudocode of behavioral strategy (PDF or image)
- Short demonstration video (MP4 or YouTube link)
- Prepare a short report (2-4 pages) with your codes and results. Give a short discussion on robot's performance.