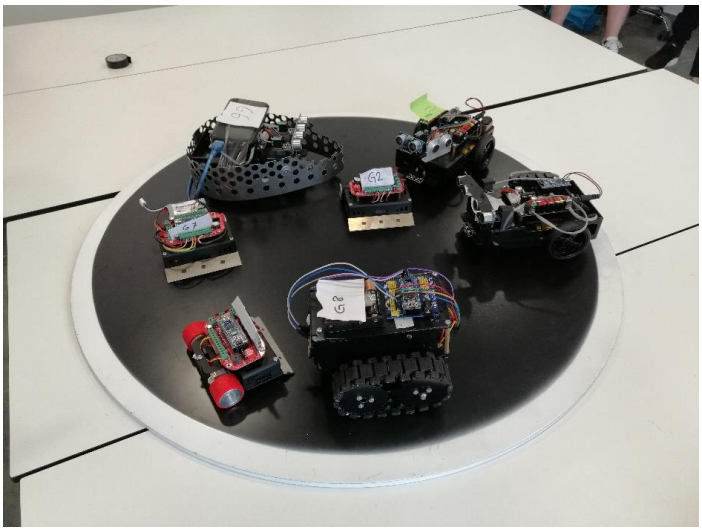
ME 456 Mechatronics Project & Competition: Mini Sumo Robot

Spring 2025

Objective

Groups of four (4) students will develop autonomous robots for the mini sumo robot competition to be held within the class. Robots will attempt to push the opposing robot out of the ring. A match consists of three rounds. Whichever robot wins two rounds will proceed to the next tier of the competition. Each round completes in one minute.



Sumo robots from Spring 2023 competition

Robot Design

Groups can purchase a readily available mobile robot kit to construct their sumo robots. Kits with two motors and two ultrasonic sensors for distance measurement will be used. Also, an IR sensor to detect the borders of "dohyo" will be needed. The following conditions must be observed in your designs:

- Robots must be self-controlled. Once the competition has started, no repositioning, remote control use or addition of power is permitted. Codes must already be uploaded to Arduino boards and robots must operate autonomously.
- When the judge announces the start of the round, the teams start their robots, and after a three second pause the robots may start operating.
- Robots must be non-offensive, non-destructive, non-harmful to humans as well as facilities. Sharp edges and appendages that can damage the ring or other robots will not be allowed. Jamming devices such as disrupting opponent's sensors by electronic means are not allowed.
- Devices that can store liquid, powder, gas or other substances for throwing at the opponent are not allowed.

Project Deliverables

- **Competition [9 pts]:** Scoring explained below.
- **Project final report [6 pts]**: Complete project report with detailed mechanical, electrical and control system design components.

Competition Scores

All teams will compete once with every other opponent in a tournament (28 matches). Match points will be counted for each team.

Team	Match points
G1	
G2	
G3	
G4	
G5	
G6	
G7	

Based on the number of points won, position of teams will be determined. In the case of a tie between two teams, match results between these teams will be used to break the tie. If that cannot result in a difference, these teams will share the same position. Final performance grades will be assigned based on the following table.

Position	Grade pts
1	9
2	8
3	7
4	6
5	5
6	4
7	3
8	2

Reporting

Your projects will be evaluated based performance scores as well as a written report to be submitted. Reports must contain the following sections:

- Detailed description of your algorithm and a flowchart.
- Mechanical design details, in case an appendage is used.
- Electrical design details, describing use of additional sensors.
- Results and performance of the vehicle must be assessed.
- Please submit a soft copy of your reports with codes and other documentation related with your project.

Reference

- Unified Sumo Robot Rules, http://robogames.net/rules/all-sumo.php