

2022 Engineering Robotics Competition

SUMOBOTS: Battle Royale

Goal

Each team will design an autonomous SumoBot that will eliminate the opposition in head-to-head competition with the goal of being the last robot standing in a shrinking arena. Eight (8) SumoBots will compete at the same time. Each team is required to submit a short technical report documenting their design.

Tournament Structure

The tournament will be conducted in two stages: preliminary rounds and playoffs. During the preliminary rounds, each team will play the same number of matches. A rough schedule will be provided before the event and the official match schedule will be created and distributed once registration is complete day of the competition.

The top sixteen¹ teams from the preliminary rounds enter into the playoffs. Teams will be seeded into groups of four based on placement. Each group will play one match against each other for a total of 3 semi-final matches. The top eight scoring teams after the semi-finals will move on to the finals.

In the event of a tie the advantage will be given based on the following criteria in order. In the playoffs, criteria one and two will be skipped, proceeding directly to criteria three.

1. Technical report score.

¹ 32 teams may be allowed into the playoffs depending on registration numbers. This requires a set of quarter final matches prior to the semifinals.

2. Higher score from the most recent match both SumoBots participated in.
3. Sudden death battle following the rules of the final match.

Tournament Rules

1. **The referee's word is final** on all competition matters including but not limited to the rules and the results of matches.
2. SumoBots are to act autonomously, i.e., with no human control or interference during a match.
3. At the start of a match, each SumoBot must fit into a 20 cm x 20 cm square, with no height limitation. SumoBots will be measured before the tournament to ensure they comply with this rule. The referee has the discretion to re-measure a SumoBot before any match. Parts of the SumoBots may extend outside this area after a match has started, however they must start in the configuration that they were measured in. Failure to meet the criteria will result in either a penalty or disqualification at the referee's discretion.
4. Matches start on the command of the referee and last a maximum of 2 minutes.
5. **Each SumoBot must have a 5 second delay after the operator pushes start before their SumoBot starts to move.**
6. The SumoBots will be placed in the six corners of the hexagon competition area with their front ends facing towards the centre of the table.
7. A SumoBot is eliminated if:
 - a. It falls off the edge of the table.
 - b. It is immobilized, e.g., flipped over, flipped onto its side, caught on an edge of the table and cannot move, etc.
 - c. It is determined by the referee to be immobile. Note: If the SumoBot does not move or otherwise indicate signs that it is still functioning, it will be considered eliminated in terms of placing; however, an eliminated SumoBot may still earn points for disabling other SumoBots.
8. Points for each match are awarded as follows:
 - 1st Place: 12 points
 - 2nd Place: 9 points

- 3rd Place: 6 points
- 4th Place: 5 points
- 5th Place: 4 points
- 6th Place: 3 points
- 7th Place: 2 points
- 8th Place: 1 point

9. If a SumoBot is unable to start a match for any reason it will receive zero points for that match.
10. In the event that there is more than one SumoBot surviving at the end of a match, the points for first place will not be awarded and each team will receive points for the place corresponding to the number of tied teams. For example, if there are two SumoBots remaining at the end of the match, then they will both be awarded 2nd place and 9 points each. In a 3-way tie, the three teams will be awarded 3rd place and 6 points.
11. Teams will be awarded 2 points for each SumoBot that their SumoBot eliminates during a match. The awarding of these points is at the discretion of the referee. The purpose of these bonus points is to encourage teams to actively seek-out and engage other SumoBots.
12. After the first 2 minutes are up, the match will be paused for the stage to be reset. The arena will be bisected using white tape 4" wide. All remaining SumoBots will be placed in starting positions evenly spaced along the reduced playing area. The match will then restart with the remaining SumoBots. This process will repeat until one SumoBot remains. If the playing area becomes too small to position the SumoBots, or the SumoBots reach a stalemate, then tiebreaking criteria 1 and 2 will be used in the finals.

Arena

Sumo Ring Figure 1 shows an eight-sided Sumo ring. The Sumo ring is an octagon that is approximately 96" from edge-to-edge, with each edge 40-41" in length. The table is painted black with a 1 ½ - 2" white stripes denoting the edge of the table. Within the ring, a smaller octagon is painted in red and measures 48" from edge-to-edge. In the middle of the competition area is a square hole that is 18" from edge-to-edge. The border of the hole is marked by a 4" white stripe.

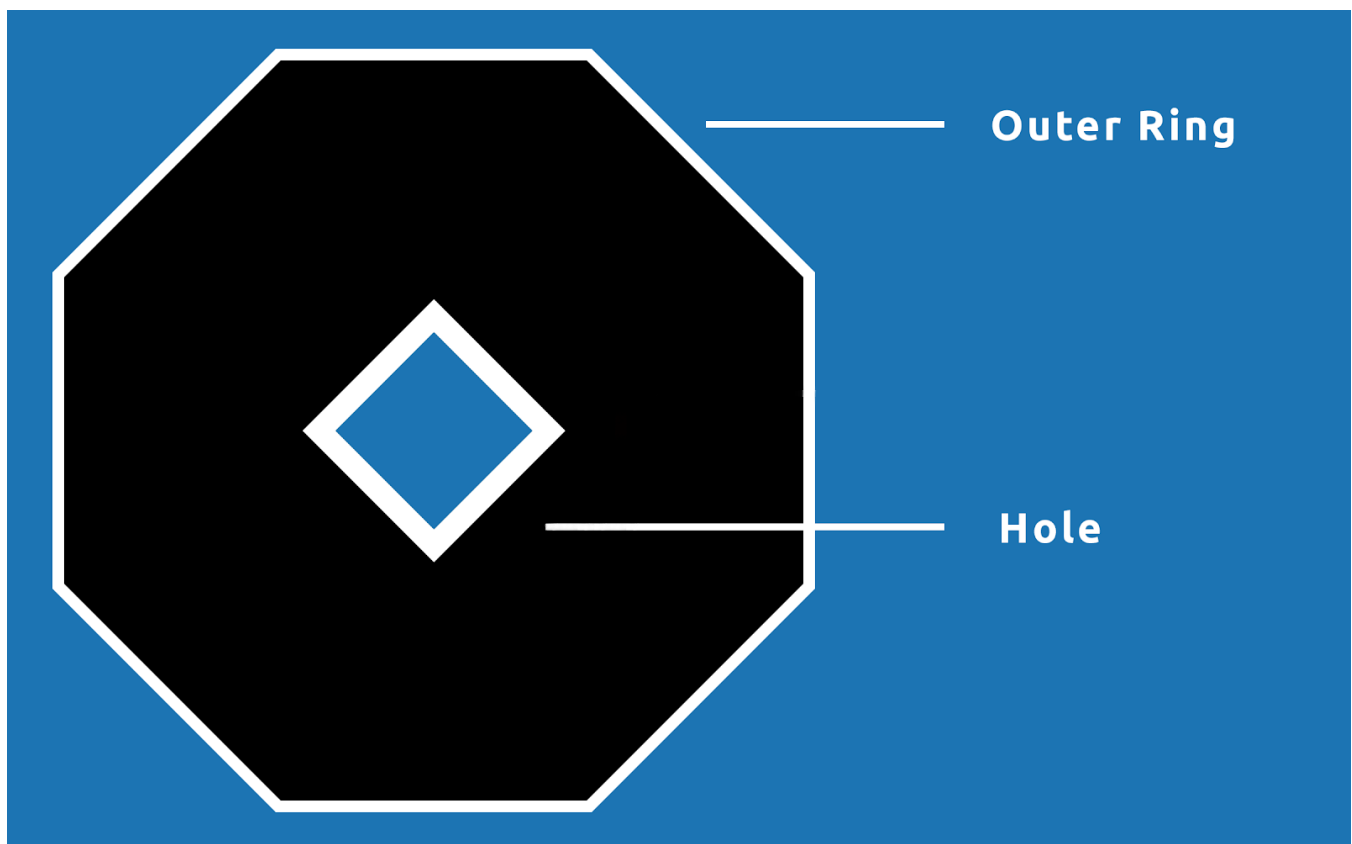


Figure 1: Competition Table

Engineering Design Rules

The following rules govern the design, build, and coding of the SumoBot. Any infractions will result in point deductions, match disqualification, or competition disqualification at the discretion of the referees or tournament committee.

1. Teachers are NOT allowed to build, program, or in any other way do work on the SumoBot. Teachers are there to be a guide to the students of the team.
2. SumoBots are to act autonomously, i.e., with no human control or interference during a match. Neither the Bluetooth nor the WIFI functionality of the NXT brick may be used.
3. The SumoBots may be programmed using languages or IDEs other than the Mindstorms NXT or EV3 software.
4. The number of sensors is limited to four, the number of motors is limited to three, and tracks (e.g. instead of wheels) are not permitted.
5. SumoBots may use various forms of detection to locate the opponents' SumoBots. They may also incorporate stealth technology to avoid detection by the opponents' SumoBots. Signals may be used to try to confuse the opponents' detectors.
6. The competition committee reserves the right to create a list of ineligible components at any point or to assign a penalty for using certain components (or failing to report them in the Engineering Report) in the event that these certain components are found to give a significantly unfair advantage to a SumoBot.
 - a. Teachers are strongly encouraged to provide the committee with the specifications of any component(s) that they are considering that may be such so that an early ruling can be made. Such rulings will be posted on the competition website.
7. The technical report should include an analysis of the challenge, and detail the group's unique solution. The objectives and function of all hardware and software components of the SumoBot must be described along with a copy of the SumoBot code. The report should be approximately 1000 words not including code or captions.

Awards

Awards will be given for the following merits:

- 1st, 2nd, 3rd – Based on placement in the final match.
- Best Engineering Design – Determined by judges.
- Best New School - Based on points from the preliminary round.
- Referee's award for Sportsmanship – Determined by referees.
- Women in Engineering – Determined by the referees and judges.
- Most Novel Design – Determined by referees and judges.