

2019 Engineering Robotics Competition

Ontario Tech University Engineering Outreach

SUMOBOTS: KING OF THE HILL

Competition Rules

Goal

Each team will design an autonomous Sumobot that will eliminate the opposition in head-to-head competition. Eight (8) Sumobots will compete at the same time.

Each team is required to submit a short technical report documenting their design. This is due Friday, November 8, 2019 by 5:00 pm and is to be submitted electronically to uoiroboticscompetition@uoit.ca. A template and a rubric will be provided.

Sumo Ring

Figure 1 shows a six-sided Sumo ring. The Sumo ring is a hexagon or octagon that is approximately 96" from edge-to-edge, with each edge 40-41" in length. The table is painted black with a 1 1/2 - 2" white stripes denoting the edge of the table. In the middle of the competition area is ramp that is approximately 1 1/2" (one-and-a-half inches) in height and 18" from edge-to-edge. The boarder of the ramp is marked by a 4" white stripe. The ramp has an approximately 7 1/2:" green stripe down the middle as a guide line. Note that this is Rona-brand green painters tape.

Figure 1: The octagonal Sumo ring. Note that netting will be added to catch SumoBots



Sumobot Tournament Rules

1. The referee's word is final on all competition matters including but not limited to the rules and the results of races.
2. 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.
3. Sumobots are to act autonomously, i.e., no human control or interference during a match.
4. At the start of a match, each Sumobot must fit into a square 20 cm x 20 cm, 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 the Sumobot is participating in. Parts of the Sumobots may extend outside this area after a match has started, however they must start the race in the configuration/pose as they were measured in. Failure to do meet the criteria will result in either a penalty or disqualification at the referee's discretion.
5. The starting position for each SumoBot will be one of the corners of the octagon. Each SumoBot's starting position in that corner will be such they it overlaps both of the white lines that intersect at that corner.
6. Matches start on the command of the referee. Each Sumobot must have a 5 second delay after the operator pushes start before their Sumobot starts to move. 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. Matches will last a maximum of 2 minutes.
8. A Sumobot is eliminated:
 - a. If it falls off the edge of the table.
 - b. If it is immobilized, e.g. flipped over, flipped onto its side, caught on an edge of the table or the ramp and cannot move, etc.
 - c. If it is determined by the referee to be immobile, which would include not moving for more than approximately 20 seconds. *Note: this means that if the SumoBot does not move or otherwise indicate signs that it is still functioning, it will be considered eliminated in terms of its placing in that match, however it will remain on the table and it could still "come back" to life and earn points for disabling other SumoBots, however its placement in the match would not change from its earlier elimination under this rule.*
9. Sumobots may not spray any material on the ring or on their opponents, or in any way deform the Sumo ring. Sumobots are not allowed to use any flying components or projectiles.
10. 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' Sumobots' detectors.
11. Neither the Bluetooth nor the WiFi functionality of the NXT brick may be used.

12. The Sumbots may be programmed using languages or IDEs other than the Mindstorm NXT or EV3 software.
13. Additional Lego parts and sensors are allowed, as are and third party sensors, however, they must be detailed in the Engineering Report and the referee will review these part lists prior to the competition. 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. The SumoBot 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. 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.

Sumobot Tournament Structure

The Tournament will be conducted in two stages: the preliminary rounds and the playoff rounds. During the preliminary rounds, each team will play the same number of matches (a schedule will be sent out prior to the event).

Preliminary Round

For each match, points will be awarded as follows for an octagon (8-SumoBot) match:

First (last one surviving)	12 points
Second	9 points
Third	6 points
Fourth	5 points
Fifth	4 points
Sixth	3 points
Seventh	2 points
Eighth (first one eliminated)	1 points

If a SumoBot is unable to start a match, e.g. by not being ready to start or being eliminated under rule 7(d) without having moved from its starting position, it will receive zero (0) points for that match.

For the technical report, up to 12 points will be awarded to each team and will be announced at the end of the preliminary round.

In addition to the above points, one bonus point for each Sumobot that a team eliminates during a match will be awarded. 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.

Sumobots will also receive points for completely crossing the ramp, which requires exiting the opposite side of the ramp from which it entered, as follows: 1 point for the first crossing in a match and 1/2 point for each subsequent crossing in that match, to a maximum of 3 points per match.

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 teams will share placement and receive the corresponding number of points. For example, if there are two Sumobots remaining at the end of the match then they will both be awarded second place and 9 points each, if there are three Sumobots remaining at the end of the match then all three will be awarded third place and 6 points, etc.

Playoff Round

The number of teams to enter the finals will be determined once the total number of participants is known, possibly as late as the day of the final event.

At least the top 16 teams based on total number of points from sum of the technical report and preliminary races of the tournament will advance to the playoff rounds. In the event of a tie for the final position in the playoffs the tie-breaker will be the technical report score. If they are still tied after this then scores received when the teams met in one or more preliminary races will be used. If it is still tied (or if it is more than a two-way tie and the previous tie-breaker did not give a clear winner as determined by the Referee) then a single race between the remaining tied teams will determine who advances.

The playoffs will use the same scoring system as above. It will consist of at least a set of semi-final matches and final matches and may include quarter-final matches. Each round will be best of one to three contests (i.e., up to three matches) depending on the available time. The top four teams from each quarter and semi-final group will advance to the next round. The final will be a best of one to five contests (i.e., up to five matches).

In the playoff rounds, the choice of starting lane will go to the team with the higher technical report scores, in order. Ties in this will be determined by a coin toss.

In the event of a tie during the playoff rounds, a one-off match between the tied teams will take place to break the tie to determine who moves on.

Prizes

Prizes will be awarded for the top eight finishers. In addition, there will be an award for the best engineered robot, and a special award for women in engineering. Judgment for the best engineered robot will be based on the robot design/performance in addition to the technical report.