TEACHING CHALLENGE-BASED ROBOTICS

SUMO CHALLENGE

Colorado State University Extension

OVERVIEW

The Robot Sumo Challenge, inspired by the Japanese wrestling style, pits two robots against each other in a sumo ring to see which robot can push, pull, grapple, or flip their opponent out first. This challenge requires at least 2 teams.

Approximate Challenge Time: 2 ½ hours (2 hours build/program, 30 minutes competition)

SUPPLIES

- LEGO Mindstorms EV3 robotics kits (1 per team)
- Sumo mat (download & professionally print, or see directions below to create)

Sumo Mat Supplies

- 3' x 3' white butcher paper
- Hula hoop
- Pencil
- Black craft paint*
- Paintbrush*

**black masking tape or black permanent marker could also be used*

Creating the Sumo Mat

1. Place the hula hoop in the center of the square of white butcher paper.
2. Trace both sides of the hula hoop edge with pencil to create two nested circles.
3. Paint the area between these two circles with the black paint.

Square or rectangular "rings" can also be used. If funding permits, download the provided mat files, and print a sumo mat on vinyl banner material. This will create a more durable and reusable ring. Also, creating an elevated ring by cutting the base from foam core or wood can make judging the contest easier.

CHALLENGE INSTRUCTIONS

Build

Allow teams approximately 2 hours to build a robot that can stay inside the challenge ring, while also working to push, pull, grapple or flip their opponent out of the ring. Teams can use any standard pieces, motors and sensors included in their EV3 kit. No supplemental materials can be used.

Teams will need to incorporate the EV3 color sensor, pointed down at the floor, and mounted in front of or behind their robot, to stay inside the sumo ring.

Competition

1. Have two teams place their robots near the center of the sumo ring, from 6 to 12 inches apart. Choose if the robots face each other (like actual sumo wrestlers do), go back to back, or are set up facing another angle. For a more prolonged match, use the back to back method.
2. Have the teams cue up their programs, then count down. When ready say "go" or another phrase to tell the teams to start their programs. Teams can start their programs by using the buttons on the EV3 brick, or by using a wireless connection. At the same time as the youth start their program, start a countdown timer, set for one minute, which is the bout length.
3. Once teams start their programs, have them stand back from the mat and watch the robots grapple. Watch the wheels on the robots to judge which robot drives out or gets pushed, or thrown, out of the ring first. Be sure to establish what constitutes "out" with all of the participants, so teams can't dispute the judge's calls. Consider using over half of one wheel going outside the solid black line as out. If no robot goes out after a minute has elapsed, call the match a draw.
4. Award points to teams based on which team pushed their opponent out first, and mark the points on the scoresheets.

   Point Values:

   Win – 5 points

   Draw – 2 points

   Loss – 0 points
5. Run repeated bouts between teams, depending on the number of teams present and time available.
6. Tally scores and award the title of "Yokozuna" (grand master) to the winning team.

For fun, or for extra points, considering running one or more bouts at the end of the match that allow all of the robots in the ring at once. Use a "last robot standing" format. All robots get placed in the ring and run their program. The last one to remain in the ring gets glory, or extra points. This is a great way to have another adult mediator kill time while the organizer tallies the points from the previous bouts.