Watauga Sumo Bot Competition

Part of the North Carolina Science Festival

LEGO ROBOTICS CATEGORY

Rules for the 2018 Competition.

Description: Robotic sumo is a competition where two robots, known as sumo-bots, attempt to push each other out of an arena using sensors, clever programming, and innovative design. The arena for the contest is a 4-foot diameter circle, and the time given for each round is 3 minutes. Your goal is to create a sumo-bot that can push its opponent out of the arena before being pushed out of the arena by the competing sumo-bot.

The Sumo-Bot

All participating robots, known as sumo-bots, shall be only constructed with unmodified LEGO construction components. They must also be completely autonomous—that is, programmed to act independently of humans. The robot must be able to move and use its mobility during each match (no cinder blocks allowed).

Weight and Size: For all participating sumo-bots, the maximum weight allowed is **1 kilogram (2.2 Pounds)**. In addition, there are maximum width and length specifications:

- **Maximum Width:** 10 inches (32 Lego Studs)·
- **Maximum Length:** 10 inches (32 Lego Studs)·

- **Maximum Height:** No Limit

All sumo-bots must comply with these size limitations at the beginning of a bout, **but can expand beyond these limitations after the bout has begun.**

Please note that your sumo-bot will be checked for weight and size specifications as well as mobility before being admitted. You will be given the chance to modify your sumo-bot's weight and/or size if it exceeds the 1 kilogram weight limit and/or the width and length limits. Sumo-bots that fail to meet these specifications by the end of the Check-In period will not be allowed entry.

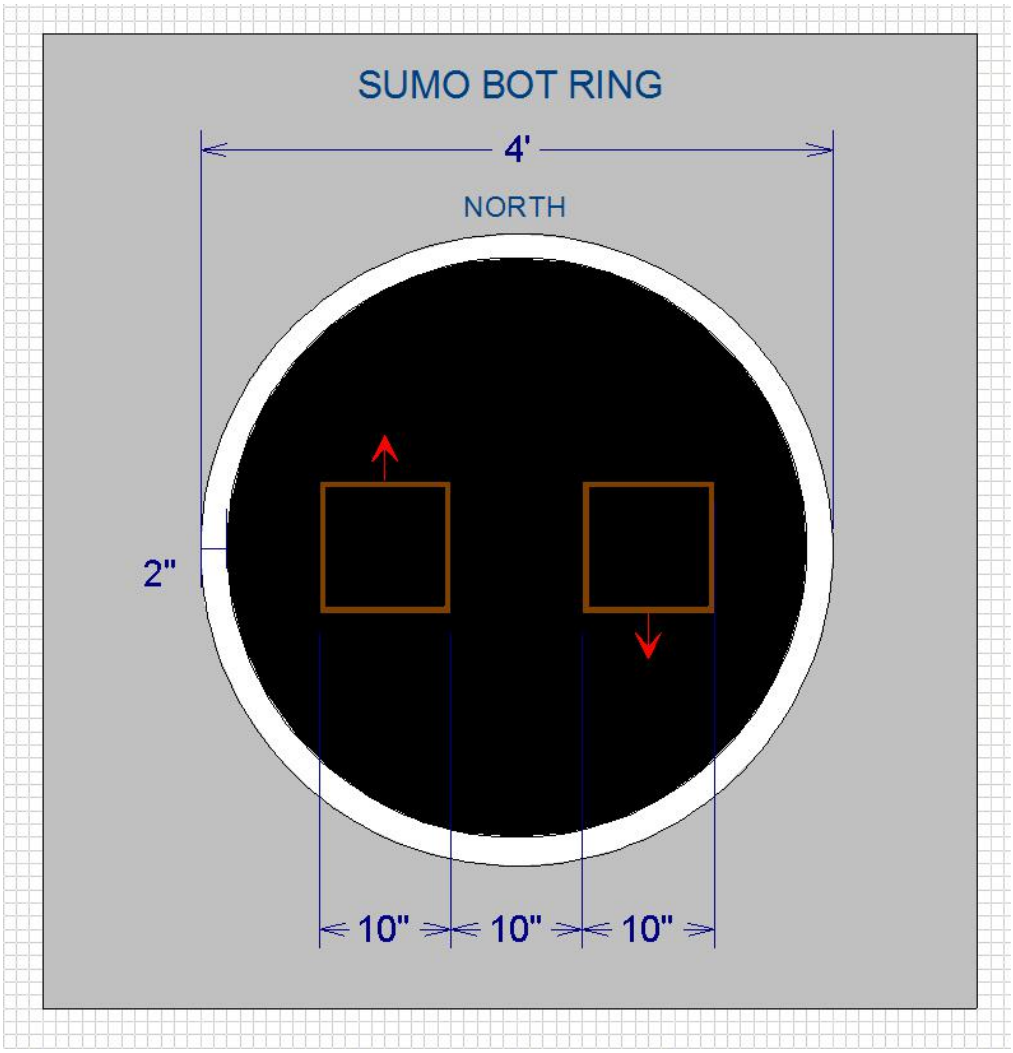
Allowed Parts: The robots for this competition may use any version of the Lego Mindstorms systems. Only Lego-manufactured parts may be used - no part may be altered or modified. HiTechnic sensors and parts are not allowed. The allowed parts are:

- **CPU**: one (1) RCX, NXT, or EV3 microcontroller (any version).
- **Sensors**: any number of Lego- manufactured sensors of any type.
- **Motors**: *any number* of Lego - manufactured motors of any type.
- **Wires**: unlimited Lego-manufactured wires.
- **Other components**: unlimited non-electrical Lego-manufactured parts.

The Programming: Contestants may use any firmware or software language for their CPU. Multiple programs on the CPU are allowed. If, during the event, any contestant deems it necessary to change or update his or her program(s), he or she may do so, as long as the contestant's sumo-bot is not currently participating and is not currently needed on the arena.

The Field

Spectator Exclusion Area Specifications: A 12 foot square area will establish a spectator exclusion area. Only three persons are allowed inside this area during a match; the judge and one robot operator for each sumo robot. Three sides of the square will be roped off to allow spectators to view matches. The fourth side of the area will be reserved for entry and egress by competitors and the judge. This area may vary by venue.



Sumo Ring (Dohyo) Specifications: In the center of the Spectator Exclusion Area the competition takes place in a circular ring 4 feet in diameter. The surface is painted flat black and is bordered with a flat white (Rustoleum), line 2 inches wide. The ring is made of 3/4-inch BC grade plywood sanded smooth on one side; the smooth surface will be used for the sumo-bots. Two flat brown starting boxes are each 10 inches square with 0.5 inch, centered 5 inches from the middle of the ring. Therefore, the starting lines are a total of 10 inches apart from each other. During play, the Sumo ring will be raised approximately 3 inches above the floor. Robots will start in the boxes and initially move away from each other as suggested by the arrows in the diagram (arrows will not be painted and the start may be either clockwise or counter-clockwise).

Contestant Exclusion Area: In opposite corners inside the spectator exclusion area there is a line that operators must stand behind after triggering their robot for a bout.

The Play

Judging: A single judge will oversee each match. Disputes will be resolved by a chief judge whose decisions are final. The chief judge, consulting with the match judge, may determine that replaying the match is necessary. In this case, the entire 3 minutes match will be replayed.

One match between two sumo-bots will have a **total time of 3 minutes**, unless extended by the judges.

Starting: Upon the judge's instructions, the two teams bow to each other in the outer ring, approach the ring, and place their sumo-bots in the starting box in a parallel position (based on the initial direction of movement). All sumo-bots must *begin* a round by moving away from the other robot; active searching is encouraged in this way. The judge of the round will verify with the contestants that their sumo-bots are positioned on the arena in a way which will result in them *initially* traveling in opposite directions – either clockwise or counter-clockwise as indicated by the judge. Robots must move in that direction **completely out of the box** before beginning to move toward the other robot.

When the judge announces the start of the round, the teams start their robots, and after a five second pause the robots may start moving. During these five seconds, players must clear out of the ring area.

- **Sumo-bots shall have a manually initiated 5 second delayed start.** Please program your sumo-bot(s) to remain stationary for 5 seconds after being activated by the press of a bumper, switch, etc.·
- **Sumo-bots are not allowed to have random start-up directions.** Please program your sumo-bot to **begin** motion by traveling out of the starting box in the direction indicated by the judge.

Scoring: A robot earns a point if the opposing robot leaves the ring first, either on its own or being pushed out.

The first robot that earns two points, within the time limit, shall win the match.

A point is earned within a match when the following happens:

- A sumo-bot is either pushed off or falls off the arena. A sumo-bot is not considered "out" until it has fallen off the arena and the floor below the arena is supporting at least part of the weight of the robot. Hanging over the edge does not disqualify a sumo-bot. One point shall be awarded to the sumo-bot that remains on the arena. If both robots fall, the last one to touch the floor earns the point.
- One of the sumo-bots becomes disabled (not moving under its own power) for any reason. The other sumo-bot will be awarded a point.

If the time limit is reached before one robot can earn two points, the robot with more points wins the match. When a match is not won by either robot

within the time limit, a 1 minute extended match (sudden death) will be fought, during which the robot that receives the first point shall win the match. If a winner has not been determined after the extended match, the judge will flip a coin to determine the winner.

If the sumo-bots are entangled for 10 seconds, the judge will restart the match from the starting position. Entanglement is defined as engaged robots that are not making significant progress toward the edge of the arena. This call will be made by the judge.

Stop, Resume: A match stops and resumes when a judge announces so.

End: The match ends when the judge announces so. The two operators retrieve the robots from the ring area, and bow.

Please note the following:

A Replay:

Various Rules: In addition to the main set of rules, there are a few other rules that must be recognized for the safety and fairness of all participants:

- Intentional damage or alteration of the arena's surface is prohibited. Mechanisms on your sumo-bot that can harm or alter the arena's surface are prohibited; any sumo-bot that the judge deems harmful to the arena will be disqualified.
- Intentional damage to the opponent robot or the robot arena is prohibited. Robotic sumo is a game of pushing, not destruction. Everything from flame-throwers, to sharp objects, to liquids, to bombs are absolutely and entirely prohibited. Only LEGO pieces are allowed in this event.
- Your sumo-bot may not intentionally drop any LEGO piece(s) or any other object on the arena's surface. Anything that may be dropped on the arena, intentionally or unintentionally, will be immediately removed. Note that pieces that accidentally come off of the robot and land off of the arena do constitute the robot leaving the arena.
- Electronic interference is prohibited. This includes, but is not limited to, flooding the arena with infrared rays, or broadcasting other electromagnetic interference.
- Electronics other than the allowed LEGO electronics are prohibited. Only parts manufactured by LEGO are allowed in this event.
- All participating sumo-bots must possess a form of mobility and use that mobility during play. Immobile sumo-bots will not be admitted, and sumo-bots that do not use their mobility during match play will be termed disabled (point earned for the opposing robot).
- A false start in a match (pushing the wrong button on your robot or beginning too soon) will result in a restart for the first fault. A second false start will result in forfeiting the round.
- If, at any time, the judge decides that a participating sumo-bot should be removed, the judge has the right to disqualify that sumo-bot. This can

be due to harmful violence, disregard for the rules, or any other reason that the judge declares.

Tournament play: Initial tournament matches will begin in groups that compete in round robin fashion. Group placing will determine seeding for a single elimination tournament. Each team is guaranteed a minimum of 4 matches.

Groupings will be predetermined in random order.

These rules are subject to change for clarification. Please check for updates, posted here.