

1. Overview

Two self-controlled robots are placed in a ring. Each robot tries to avoid falling out or being pushed out by its opponent. The first robot that touches outside of the ring loses the round. The first robot to win two rounds wins the match. Different robots compete one-on-one against each other throughout the contest.

2. Robots

Robots must be autonomous—i.e. self-propelled and self-controlled, without tethers. After positioning and starting their robots, contestants may not provide any remote control, power, positioning, or other help to their robots. The robot must care for itself until the round ends. As long as all other requirements are met, robots can be made out of any material.

2.1 Mass

Sumo robots must have a mass of 1 kilogram (~2.2 pounds) or less.

2.2 Dimensions

At the start of each round, sumo robots must not exceed the following width and length:

- Width: 22 centimeters (~8.5 inches)
- Length: 33 centimeters (~13 inches)

There is no height limit. Also, as soon as movement is allowed in a round, the robot may then twist, fall, or expand without size limits. (To help ensure that the dimension limits are observed, each team is provided with a cardboard box having the correct dimensions.)

2.3 Harmlessness

At all times, robot behavior must be non-offensive, non-destructive, and non-harmful to humans, robots, and the facilities. This is an immutable principle, even if the behavior is unintentional or not by design. During inspection (and at any time during the event), the judges may require safety changes or other modifications to meet the harmlessness requirement. Harmful robots are either not

allowed to compete at all or are later disqualified if potential harmful issues are proven or revealed in battle. For example, at all times, sumo robots must not:

- Emit smoke or fire.
- Leak, stain, or soil.
- Disperse powder, grit, or grime.
- Spray, throw, or use projectiles.
- Jam, shock, or electromagnetically interfere.
- Snare, entangle, or employ nets/rope.
- Scratch, gouge, or scrape.

Naturally, some damage occurs from the battles themselves. This is expected and acceptable to a reasonable extent.

2.4 Suction, Magnets, and Sticky Wheels

Sumo robots must not use suction, glue, “sticky wheels,” magnets, or other methods of increasing downward force. If a robot is suspected to be in violation of this rule, it will be placed on a piece of paper and lifted up to see if the paper lifts too.

3. Ring

The robot sumo ring is a large, flat disc, measuring 1 meter (~3.3 feet) in diameter. It is made of a smooth, rigid material. The top surface is a dull black, except for a narrow border that is shiny white. Two starting lines in the middle are brown. All of these areas are inbounds. The ring is raised slightly to make it easier to determine when a robot has been pushed out. The height isn't very much though, to avoid damaging robots that fall or get pushed out.

An external area of at least 0.5 meters (~1.6 feet) of empty space exists around the ring. This space must not contain any people, objects, lights, or anything else that would distract or interfere with the robots. The floor may be any color but white.

Sumo rings are set up in advance. Contestants have access to these rings to inspect the surfaces and calibrate sensors for colors and lighting. Robots should be prepared to accept minor variations in sumo ring quality.

4. Contest

Competitors and audience members are expected to remain polite, sportsmanlike, and considerate at all times. Encouragement and applause for all competitors are very much appreciated.

4.1 Inspection

Each robot is measured and inspected to verify qualification. A digital scale is used for determining mass. Allow for a little free weight that can be added or removed in case your home scale doesn't match the tournament's scale. For width and length, a carefully measured box or cube is placed over the robot.

The robot must start each round of the contest in an orientation and physical position that would fit in the box. It would be unfair to measure the robot in one position (sticking out of the top of the box) but then manually rotate the robot to an unqualified length before beginning a match.

4.2 Acceptance

If the robot qualifies, an acceptance sticker is placed on the robot. Robots may be altered between rounds and matches, either for repairs, battery changes, or reconfiguration. Keep in mind that the referee may re-examine the robot at any time to re-verify qualification.

4.3 Contest Format

Depending on the number of entries, the contest format is either double elimination, round robin, or a combination, as described below:

- **Double Elimination:** Upon losing two matches, the robot is out of the contest. Winning robots are pitted against other winning robots, and losing robots against losing robots. That way, a robot won't have to compete against two top robots in row.
- **Round Robin:** Each robot faces each other robot (one at a time) in a match. Every robot gets a chance to compete against every robot. This method has the advantage of determining all robots' actual rank, not just a sole winner.
- **Combination:** A first round is conducted in pools, with a round-robin format. Based on their performance, the robots from each pool

are seeded in brackets for an elimination round.

4.4 Match Format

The robot must be ready at the appointed times. Contest organizers may grant reasonable leeway, but a referee may declare a round or entire match lost if a robot isn't punctually prepared to compete. Throughout the contest, the algorithms, settings, and components on the robot can be shaped, angled, or configured differently for facing each opponent and being placed in different starting positions.

4.4.1 Positioning

Contestants may place their robots in any position, angle, or location on the ring except that no portion of the robot may cross the extended starting line nearest the contestant. The better-ranked robot or the robot that just won the prior round is positioned first. The lesser-ranked robot or the robot that just lost the prior round is positioned second. It is an advantage to be the second contestant to place a robot in the ring, so one shouldn't forget or dismiss this opportunity. By placing the second robot out of the direct line of sight, at sideswiping angle, or closer/further to the first robot, it may be possible for the second robot to gain a quick victory.

4.4.2 Ready? Set? Go!

A robot is usually started by pressing a button. However, a robot may be started by any means, such as hand clapping, a whistle, a laser pointer, an infrared signal, or RF communication. Robots may even have multiple starting buttons or starting configurations if designed with more than one opening move. (Upon starting, no additional control, commands, configuration, or information may be communicated to the robot.)

Both contestants place their fingers on their robot's starting buttons and await the referee's signal. If a problem is encountered before the referee gives the "Go!" command, a contestant may alert the referee, without penalty, that the robot isn't ready.

4.4.3 Clear Exterior

Upon pressing the start buttons, the contestants immediately leave the exterior area around the

ring. During the round, all people and objects must be kept out of the ring and exterior area to avoid distracting the robots or altering the outcome. Upon pressing the start buttons, each robot must not move at all for five seconds. However, countdown lights, buzzers, sounds, or other entertaining motionless activity is encouraged.

4.4.4 No Start

During the countdown, if the contestant notices their robot has failed to start its countdown, the contestant may alert the referee and halt the countdown. Both robots are reset to start the round over. The contestant is given a warning. A second warning of any kind in a single round results in the robot losing that round. It is to the benefit of the contestant to stop the countdown if the robot fails to start the first time. It may still be to the benefit of the contestant to stop the countdown a second time (losing the round) if the robot is likely to suffer damage by failure to start.

4.4.5 False Start

If a robot begins moving during the five-second period, the robot has committed a false start. A warning is issued and both robots are reset to start the round over. A second warning of any kind in a single round results in the robot losing that round.

4.4.6 Out

A robot loses a round when any portion (including touch sensors, whiskers, scoops, or skirts) of the robot touches outside of the ring. It doesn't matter if the robot falls out on its own or is pushed out. The first robot touching outside of the ring loses, even if the second robot subsequently touches outside of the ring. If the referee determines that both robots touched outside of the ring at the same time, the round is nullified and started over.

If any piece of the robot, no matter how small or even if detached, touches outside of the ring, the robot is considered out. For example, if a nut drops off a robot within the ring, the robot doesn't immediately lose. However, if the nut is then pushed out or rolls out, the robot loses.

4.4.7 Not Out

Starting to fall or breaking the plane of the ring isn't considered out. Some portion of the robot must actually touch outside the ring.

4.4.8 Contestant Stoppage

At any time after the five-second starting countdown is over, a contestant may choose to enter the exterior space or otherwise signal stoppage to the referee. That contestant's robot loses the round. If the robot is malfunctioning or in a position in which damage could occur, it might be in the contestant's interest to halt the round and take the short-term loss.

4.4.9 Referee Stoppage

At the referee's discretion, the referee may choose to restart a round if:

- Three minutes have expired.
- The robots fail to touch each other for some period of time.
- Both robots fail to start or both contestants signal stoppage.

At the referee's discretion, the referee may choose to end a round and choose the round winner if:

- Smoke, fire, damage, or any other violation has occurred.
- No progress is likely to be made even if the round is restarted.

4.5 End Of Round

At the end of a round, the contestants retrieve their robots and prepare them for the next round.

4.6 End Of Match

The first robot to win two rounds wins the match. This means there can be as few as two very quick rounds to win a match. Or there can be as many as three, three-minute rounds (not counting restarts). In the latter case, each robot must have won a round to force the third-round tiebreaker. Of course, a match may also end if a contestant or robot is disqualified or otherwise unable to complete. At the end of the match, the contestants leave the ring area to prepare their robots for any additional matches in the contest.