

## SUMO LEGO CRC

### GENERAL OVERVIEW

Sumo LEGO is based on designing and building an autonomous mobile robot capable of confronting an opponent with similar principles and moving him out of the confrontation arena (Dohyo). The participant who manages to move his opponent out of the Dohyo, without leaving it, will be the winner of the confrontation.

### TECHNICAL CHARACTERISTICS OF THE SUMO LEGO ROBOT

This category is based on the principles of traditional sumo and adapts the weight and dimensions so that a design based on LEGO pieces is efficient in this contest.

LEGO sumo robots must meet the following features:

- Being completely autonomous, it can in no way be connected to any radio frequency device or other communication channels. The only communication with a human operator allowed is at the moment of initiating the contest when the mentioned operator manually presses so that his robot can execute his code.
- The robot can only be built from LEGO parts. This includes: The controller (smart brick), motors and sensors to be used to assemble the robots must be from the LEGO® MINDSTORMS® line. Other LEGO® branded or LEGO® licensed elements may also be used to build additional robot parts.
- There are no restrictions on the number of motors and sensors that can be used.
- Bluetooth or Wi-Fi communications from the smart brick must be disabled at all times. Downloading of programs should only be done via the USB.
- At the time of the competition, each team must bring its programming algorithm and will present it if necessary.
- The dimensions of the robot must be adapted to fit within a square 20 centimeters long and wide.
- The robot height has no restriction limit.
- The robot total weight must be below 3000 grams.
- The robot can expand its size after the start of the contest.
- The robot cannot be physically separated, it must remain a single centralized robot. Robots violating these restrictions will lose the showdown. If parts or other parts of the robot with a total weight of less than 5% of its total weight are separated or fall off, it will not be cause for loss of the showdown.
- If the robot has any kind of communication with a control device, it will automatically lose the contest.
- The design of the robot must have a visually differentiated front and back, these characteristics must be specified by your team at the beginning of each contest to the judge on duty.
- The batteries of the smart brick must last long enough to perform a complete combat. No battery changes can be made between fights.

- The robot cannot damage the *dohyo*.
- The code of the Sumo LEGO robot must be designed in such a way that five seconds of inactivity passes at the start of the confrontation. This time is also called Safety Time.
- Robots must be manually turned on by a single human operator. The operator must be a member of the participating robot's team.
- A visible light should be included in the robot design to indicate that the mechanism is active and functional.
- The use of adhesive materials or systems that allow the robot to attach itself to the dohyo in any way is not allowed.
- Changing the robot's code is not allowed once the battles have started.

## CHARACTERISTICS OF THE ROBOT WORKING AREA

The robot's working area includes the playing platform (*dohyo*) and a reserved space around the ring. Any space outside the battle area is called the Outside Area or Out of Play Area.

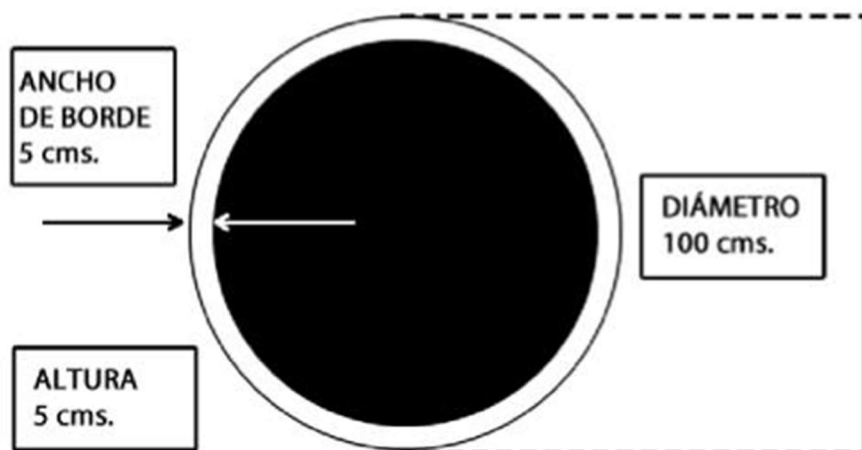


Figure 1. General description of the dohyo

As a safety precaution it will be 1 meter around the dohyo, and it will be empty from any kind of obstacle while the competitions. This space can be any color except white.

## HOMOLOGATION

- Robot design specifications will be checked as for the robot design to fulfill satisfactorily.
- A test will be performed in which they robot can take out an object from the combat area (square box as the same size or taller than the robot).
- Wireless safety control will be checked where disable any type of involuntary robot
- We will check that robot does not have any adhesive material or suction cups or any other prohibit elements in the structure of the robot.
- We will check that the robot won't damage the dohyo.

- At any moment of the competition the judges can ask to pass all these homologation guidelines at any doubt of any modification of the robot.

## COMPETITION DEVELOPMENT

1. While the realization of the first competition the next competitors must showed up two minutes earlier before the initiation of their participation
2. In the case of one of the teams won't show up or appear we will proceed to call them up by public address via and just in case they do not show up one minute after the last call, the rival team will be declared winners.
3. The combats will consist in three rounds (3), with a time frame of (3) minutes each.
4. Between rounds it will be one (1) minute max. Five (5) seconds of *Safety Time* is not considered as battle time.
5. The robot with the most Yuhkoh points in the total of the three battles will win the battle (a victory in the battle is equal to one point), with a maximum of two points.
6. In case of a tie, an extra round will be held where the winner will be the first to score a Yuhkoh point. This round will last a maximum of three (3) minutes.

If a tie continues, the referees will decide the winner according to the following criteria:

- Violations against
- Technical merits in robot movements and operation (robot fighting attitude).
- Sporting attitude of the players during the battle.

## COLLOCATION OF THE ROBOT

After the judge instructions are heard, the two teams will come to the combat area to collocate or place their robots in the dohyo. A cross in the middle of the sumo ring will divide (4) squares. The robots always be placed in opposite quadrants. The robots must be placed in borderline (at least inside the assigned quadrant, (look at picture 2). After the positioning, the judge will take away the cross, and therefore, the robots cannot move anymore.

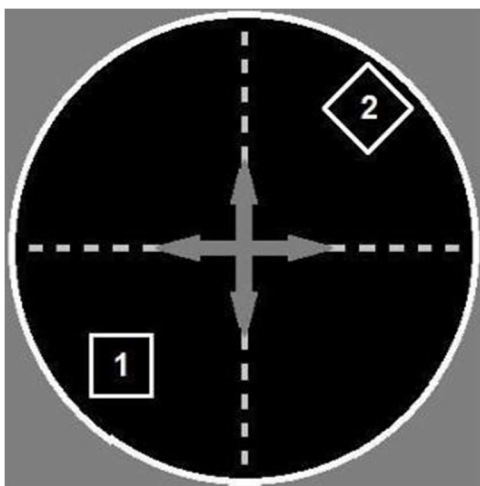


Figure 2. Cross that determines the quadrants to be used

## COMBAT INITIATION

- The judge will start each round by a start signal. As soon as the robots receive the signal the round will start immediately, without any delay. The robots will be activated using only one switch.
- The robots will not move until five (5) seconds have elapsed (Safety Time), at which time the Combat Time will be counted.
- As directed by the judges, only the representative of each team will enter the combat area and place the robot immediately behind the line.
- The rest of the team will remain outside, in the outer area or out of play.
- During the entire combat (including the time between rounds) and only with the permission of the judge, the robot leaders may enter the combat area.

## STOP AND RE START OF THE COMBAT

The contest only can be stopped or re starts when the judge indicates or tells so

The combats will stop and re starts under the following conditions:

1. If robots are tangled or orbiting between each other with no perceptible progress within 30 seconds.
2. When both robots do not move, without commuting or shifting (exactly at the same time) y remain stopped within 30 seconds without touching each other. However, if the robots stop for 30 seconds it will be declared as a “Do not have the will to fight”, and in this case, the opponent will gain one point, *Yuhkoh*, when and only keeps moving.
3. If both robots touch the outside of the dohyo within five (5) seconds or less.
4. Each participant has the right to request a time between each competition of five (5) minutes, in case his robot suffers a malfunction.
5. Repairs must be kept to a minimum and must be carried out on the dohyo and in the presence of the judges. The robot may not be taken out of the combat area.

When a judge ends the combat. The two responsible of the team will retire the robots out of the combat area. When the combat already has finished, the combat will start immediately from the start position. The pause will not be counted as a combat time.

## END OF THE COMBAT

The combat will finish when the judge indicates so. Only at this moment, the two teams will retire their robots from the combat area opposite case; the opponent team will receive a point, *Yuko*.

## TIME BETWEEN ROUNDS

- If one team takes more than one minute in place in the dohyo, his robot between rounds, the representative of the team can ask the judge five (5) minutes between a pause and the judge will decide if he grants it or not.

- It the pause is not granted; this will be considered a violation.
- In case in not asking for the pause or if this lapse of time conceded beats the time pause, this will be considered a penalization and the round will be lost.

## YHUKOH POINTS

The YHUKOH point will be granted when:

1. The opponent robot remains stationary or unmoved inside the dohyo.
2. Only the opponent robot touches the space outside the dohyo alone for five (5) seconds.
3. Two direct Yuhkoh points will be awarded if the opponent is penalized or commits two violations in the same combat.

## VIOLATIONS TO THE REGULATIONS

As it follows

1. Enter into the combat area without previous judge authorization.
2. Unjustified petition to stop the combat.
3. Take more than 30 seconds to re start the combat after an interruption. requested by a judge.
4. Activate the robot before the referee requested.
5. Entrance of one of non-permitted member into the combat area.
6. Falling parts from the robot, as long as such parts are greater than or equal to 5% of the maximum allowed weight of the robot.
7. Act in unappropriated way so that attacks the integrity of the combat and/or the organization.

## PENALIZATIONS

1. It will be considered a penalization (implies the combat lose)
2. Failure to respect the five (5) seconds safety time.
3. The separation in different parts of the robot once the fight has started is greater than 10% of the maximum allowed weight of the robot.
4. The non-presence of the robot one minute after the last call to the competition.
5. Causing damage to the playing area or to the opponent's robot.
6. The use of devices that throw liquid, powder, gases or solids at the opponent.
7. Insulting the judge, or the opponents, as well as putting words that denote offense to the robot or to someone present.
8. To introduce modifications to the robots once they have been approved.
9. Endanger in any way the integrity of the participants, judges and / or public.
10. Use sticky substances to improve the traction of the robots. The tires and other components of the robot in contact with the ring must not be able to hold a letter sheet (standard size) for more than five seconds.

## PETITION TO STOP THE GAME

A team member can ask to stop the game if the robot has suffered an accident so the game cannot continue. Once time per combat maximum two times while the competition. The pause will be just for five (5) minutes. The judge will have the last word whether he concedes or not the interruption of the game.

## IMPOSSIBILITY TO CONTINUE THE GAME

1. If the robot has suffered an accident cannot continue the game and the team who causes the accident will lose the game.
2. When it is unclear who or what was the cause, the team that cannot continue with the game or who has asked to stop it will be declared loser.
3. Objections might be presented by the team mates to the judge or to the coordinator on the competition before the game is over, if there is any doubt regarding the compliance of the rules.
4. The judges have the power to stop the combat at any moment and for any cause. the combat will start at the time and the way judge's order.

## EXPELLED FROM THE GAME

1. The judges will reserve the right to suspend from the competition the team that awards and deserves it. The expelled team has the right to go to the coordinator with the sanction who will dictate a definite and an unappeasable sanction.
2. At any moment, at any place (competitor's area, main floor) at any action that goes against the contest, the organization, or against the participants can cause the immediate suspension. At any doubt, the judges will have the last word.

## JUDGES

- I. The image of the judge in the competition is very important, he will be the person in charge of the rules and laws established that are compiled by the organization committee.
- II. The judges for this competition will be designed by the organization committee.
- III. The participants can present the objections to the judge in charge of the category before the game is over.
- IV. The judge will have the last word in case at any doubt in the application of the rules.
- V. If happens to be a controversial issue towards any decision from the judge. A written complaint can be presented towards the Judges counseling, once the competition is finished, they will evaluate the presented arguments and then a decision will be taken to this respect. And this decision is unquestionable.