



Baltic Robot Sumo Rules

For Sumo robots

Chapter 1 General Rules

Article 1. Objective

This document defines rules for 3 kg Sumo, Mini Sumo, iRobot Sumo and LEGO Sumo robots. These rules are almost exact copies of the official All Japan Robot Sumo Tournament rules, with adaptations for European players. Being officially certified Pre-Tournament for All Japan Robot Sumo Tournament Grand Finals, Baltic Robot Sumo strives to keep these rules as close as possible to the original Japanese rules.

Article 2. Robot classes

Baltic Robot Sumo has following classes of robots:

1. 3 kg Sumo, autonomous only
2. Mini Sumo, autonomous only
3. iRobot Sumo, autonomous only
4. LEGO Sumo, autonomous only

Chapter 2 Definition of a Competition

Article 3. Definition

For every robot, a single operator and an assistant can be registered. However, the assistant is not allowed to operate the robot. Both contestants are required to follow the competition rules, definition of winning (defined below) and compete using own made autonomous robot at the pre-allocated Dohyo area. The winner will be determined by the judges.

Article 4. Competition format

Competition format will be determined by the Tournament organizers depending on the participant count. If participant count is high, subgroups are used to decide the entrants of final tournament. Finals will be held in double-elimination tournament format. If participant count is low, everybody will compete in final tournament format.

Article 5. Sub-classes

Tournament organizers reserve the right to divide Robot classes into sub-classes based on the age, level or other attribute.

Chapter 3 Specifications of Dohyo Jyonai

Article 6. Definition of Dohyo Jyonai

1. Dohyo Jyonai (the match ring area) consists of Dohyo (the match ring) and Yochi (the outer layer area of Dohyo). The rest of the space will be deemed as area Dohyo Jyogai (outside Dohyo area). See *Appendix A* for detailed drawing.

2. The specification of Dohyo.

Dohyo (the match ring) is the circle that is covered by a board of black color.

<i>Class</i>	<i>Height</i>	<i>Diameter</i>	<i>Top material</i>	<i>Bottom material</i>
3 kg Sumo	5.0 cm	154 cm	Steel	Aluminum/steel
Mini Sumo	2.5 cm	77 cm	Plastic	Wood/plastic
iRobot Sumo	5.0 cm	154 cm	Steel	Aluminum/steel
LEGO Sumo	2.5 cm	77 cm	Wood/Plastic	Wood/plastic

3. Shikiri-sen (the starting lines)

Shikiri-sen lines are indicated as two brown lines in the center of Dohyo.

4. Tawara (the white line)

Tawara line is the white line around Dohyo. Tawara line is considered as within Dohyo.

<i>Class</i>	<i>Shikiri width</i>	<i>Shikiri length</i>	<i>Shikiri separation</i>	<i>Tawara width</i>
3 kg Sumo	2 cm	20 cm	20 cm	5.0 cm
Mini Sumo	1 cm	10 cm	10 cm	2.5 cm
iRobot Sumo	2 cm	20 cm	20 cm	5.0 cm
LEGO Sumo	1 cm	10 cm	10 cm	2.5 cm

5. Yochi

Yochi is the 100 cm area from the outer layer of Dohyo. However, the color of Yochi should be other than white and configuration and materials can be chosen freely in the extent that doesn't detract mind of this regulation.

Chapter 4 Specifications of the Robot

Article 7. The specifications of the robot

1. The size and measure limits of the robot

<i>Class</i>	<i>Weight</i>	<i>Length *</i>	<i>Width *</i>	<i>Height</i>
3 kg Sumo	3.0 kg	20 cm	20 cm	unlimited
Mini Sumo	0.5 kg	10 cm	10 cm	unlimited
iRobot Sumo	4.0 kg	Original outline		unlimited
LEGO Sumo	1.0 kg	15 cm	15 cm	unlimited

* Robot may expand after the start of the round, but shall stay in one piece.

2. The autonomous type robots - Starting the movements

<i>Class</i>	<i>Start method</i>
3 kg Sumo	Official infrared remote control operated by judge. See <i>Appendix B</i> for technical description.
Mini Sumo	
iRobot Sumo	5 second countdown in robot. Switches, infrared and radio control devices are allowed to start the countdown.
LEGO Sumo	

3. The autonomous type robots - Terminating the movements

<i>Class</i>	<i>Termination method</i>
3 kg Sumo	Judge stops the robots by sending a stop signal with an official infrared remote control. See <i>Appendix B</i> for technical description of mandatory infrared receiver. In addition, contestants can use their own remote control devices to terminate the robot movement.
Mini Sumo	
iRobot Sumo	Contestants stop the robots with switch, infrared or radio control device.
LEGO Sumo	

4. The conditions of usage of blades

The usage of spare (duplicate) edge component for blade is prohibited. Components that may be dispersed off from the robot body when in contacts with other robot or during the movement are prohibited as well.

Article 8. Movements of autonomous type robots

The movements of the robot should be designed to detect the movements of the opponent and respond/attack accordingly. If its movement is suspicious, operation check may be made by indication of the judges. The check is carried out as the condition that a match terminates without program modification.

Article 9. The usage conditions of remote terminating device of autonomous type robots

During the competition, the contestants own remote control devices should be placed in pre-allocated station, and shall not be used until the terminating instruction is given by the judge. Judge infrared remote control device is possessed by judge.

Article 10. Prohibited items in design and manufacturing of the robots

1. Any components that may disturb the operation of opponents such as flashlights are prohibited.
2. Any components that may scratch or cause any damage on the surface of Dohyo are prohibited. An exception is accepted on robots` collision.
3. Liquid, powder or gas are prohibited to be used as a weapon or attack mechanism against the opponent.
4. Inflammable components should not be installed in the robots.
5. The robot must not include a throwing device.
6. The robot must not include any parts that fix the robot to Dohyo surface and prevents it from moving (such as suckers, glue and so on). Grip increasing magnets are allowed only in 3 kg Sumo class.

Article 11. Additional requirements for iRobot Sumo class

1. Following iRobot robots are allowed to compete in iRobot Sumo class:
 - I. iRobot Roomba®
 - II. iRobot Scooba®
 - III. iRobot Create®

2. Original driving wheels shall be the only driving element touching the Dohyo. Original power sources, motor controllers, motors and gears shall be used to drive the original wheels.

3. Following modifications are allowed:
 - I. Devices that are used only for cleaning may be removed.
 - II. Additional computing elements and electronic devices.
 - III. Additional electromechanical components.

4. Any of the made modifications has to preserve a possibility to easily identify the original robot.

5. As an exception to general rules, external computer with remote autonomous algorithm is allowed in iRobot Sumo class.

Article 12. Additional requirements for LEGO Sumo class

1. Robot shall be built only from LEGO® original or licensed third-party components.

2. It is allowed to use only LEGO® recommended disposable or rechargeable battery types.

Chapter 5 Match Principles

Article 13. Match principles

1. In principle, the match is based on three rounds and lasts up to three minutes. Team who gets two Yuko points (effective points) within the match time will be the winner. Match time is measured during rounds, not between them.
2. If only one single Yuko point has been got by the end of the match time, the team that has get the Yuko point will be the winner of the match.
3. Within the match time, if neither of the team wins any rounds, the winner will be decided according to *Article 20 - Yusei*. If Yusei cannot be decided, or the number of won rounds is the same for both teams, the match will be extended by another three minutes. In the extension time, the team who gets one Yuko point in advance will be the winner of the match.
4. Contestants have maximum of 30 seconds between rounds for maintenance.

Chapter 6 The Execution of the Competition

Article 14. Safety measurements

1. For the safety of the contestants and judges, goggles and gloves should be worn during the match in some robot classes.

<i>Class</i>	<i>Protective gloves</i>	<i>Protective goggles</i>
3kg Sumo	required	required
Mini Sumo	required	not required
iRobot Sumo	required	not required
LEGO Sumo	not required	not required

Article 15. Beginning of the match

1. The match will begin following the instruction of the judges. Contestants will bow to each other before entering Dohyo Jyonai.
2. Before each round, contestants place robots simultaneously on the Dohyo by judge command. Any part of the robot shall stay behind Shikiri-sen line when looking from opponent side. See *Appendix A* for illustration. Robots are not allowed to be moved after they have been placed.
3. Round begins by the method set for each robot class (see *Article 7 Item 2* for technical description).

<i>Class</i>	<i>Start method</i>
3 kg Sumo	Contestants leave the Dohyo Jyonai after the robots are placed. Judge starts the round by sending a start signal with an official infrared remote control. Robots may start movement immediately after the signal is received.
Mini Sumo	
iRobot Sumo	On judge command, contestants start the 5 second countdown in robot and leave the Dohyo Jyonai immediately. Robots may start movement when 5 seconds has elapsed since judge's command.
LEGO Sumo	

4. Should there be any scratches or dirt on the Dohyo, the judges will decide if the match can continue on the same Dohyo or changing to a new Dohyo is required.

Article 16. The ending of the match

1. Upon the ending of the round, judge gives instruction to terminate the robots movement. Terminating method depends on the robot class (see *Article 7 Item 3* for technical description).

<i>Class</i>	<i>Termination method</i>
3 kg Sumo	Judge stops the robots by sending a stop signal with an official infrared remote control. In addition, contestants can use own method to terminate their robot.
Mini Sumo	
iRobot Sumo	Contestants stop their robot.
LEGO Sumo	

2. The match will officially end upon the announcement of the judge. Contestants are required to carry the robot from Dohyo before bowing to each other and leave Dohyo Jyonai.

Article 17. Torinaoshi (Restart of a round)

In the situations below, the round will be restarted.

1. Both robots are stuck facing each other and further movements are not possible or both robots are marching against each other.
2. Both robots fall out to the outside Dohyo simultaneously.
3. Other situations when win/lose is not possible to determine.
4. If winning cannot be determined after Torinaoshi, the judge may place the robots in the allocated position and resume the match within the allocated time.

Chapter 7

Yuko (effective) point, Shinitai and Yusei (pre-dominance)

Article 18. Yuko (effective) point

The winning is determined based on the following situations.

1. If the opponent robot is forced out of Dohyo. (The robot touches outside Dohyo area)
2. The opponent robot falls out of Dohyo by its own and touches outside Dohyo area.
3. As per “Shinitai” condition stated on *Article 19*.
4. As per “Yusei (pre-dominance)” situation stated on *Article 20*.
5. If “Keikoku (warning)” defined in *Article 21* was given twice to the opponent.
6. If the situations stated under *Article 22* - Hansoku (foul) were determined.
7. A winner who has been granted a win without a match in accordance with *Article 25 Item 3*, receives two Yuko points (if it has already had one Yuko point then one point will be granted) and the acquired Yuko point(s) by the opponent who lost the match remain effective.

Article 19. Shinitai

A single win will be granted on the “Shinitai” situation if one or more wheels of robot leave Dohyo, and it is not able to return to Dohyo. One Yuko point will be given to the opponent.

Article 20. Yusei (pre-dominance)

One Yuko point will be granted on the Yusei (pre-dominant) situations below:

1. In the rounds, judge may, based on the strategy, movements and skills, grant one Yuko point to the party with the Yusei (pre-dominant) condition.
2. On the conditions stated on *Article 13 Item 3*.

Chapter 8 Hansoku (foul) and Penalty

Article 21. Keikoku (warning)

A contestant who takes any of the following actions will receive a Keikoku (warning). If a contestant receives two Keikoku (warnings), one Yuko point will be granted to the opponent.

1. The operator or a belonging of the operator (remote control etc.) enters Dohyo Jyonai before the judge's call of round end.
2. There is a movement of the robot before the round begins (physical extension and movements).
3. *Article 9* is violated.
4. The robot is repositioned after it has been placed in Dohyo.
5. The contestants violate safety measurements stated in *Article 14*.
6. Any other actions that may be deemed unfair.

Article 22. Hansoku (violations)

If the following situation happens, the opponent or both parties will be granted one Yuko point.

1. If components were dropped off from the robot.
2. If the robot is unmovable.
3. If both of the robots are moving but no contacts are made.
4. If there is fire from the robot, or the situation that identified as similar with fire from the robot.
5. If there is an application from contestants to terminate the round.

Article 23. Hansokumake (loss by violation)

A contestant who takes any of the following actions will lose the match by violation:

1. A contestant does not show up at the appointed Dohyo when called at the beginning of the match or contestant exceeds the time given for maintenance in *Article 13 Item 4*.
2. A contestant who sabotages the match. For example by intentionally breaking, damaging or defacing the Dohyo.
3. A contestant violates the specification of the robots in *Article 7*.
4. If the movements listed on *Article 8* are not made.

5. If the contestant does not meet requirements stated in *Article 14* even after Keikoku (warning).

Article 24. Sikkaku (disqualification)

A contestant who takes any of the following actions will be disqualified and forced to leave the competition and will not be on the ranking list:

1. A contestant's robot doesn't meet the specifications of the robots stated in *Article 7*.
2. A contestant displays unsportsmanlike behavior. For example using offensive language or assaulting opponents or judges.
3. A contestant intentionally injures the opponent.

Chapter 9 Injuries and Accidents

Article 25. Request for suspension

1. When a contestant is injured, and the match cannot be continued, a suspension can be requested by the contestant.
2. On the event above, the judges will make necessary arrangements for the match to be resumed immediately.
3. If the arrangements made do not enable match to be resumed, the opponent will be granted a win without the match.

Chapter 10 Objections

Article 26. Objections to the judges

No objections to the decisions of the judges will be entertained.

Chapter 11 Specifications of robot markings

Article 27. Mark on the robot

Robots shall have stickers with robot number on them. Stickers are provided by the Tournament organizers.

Article 28. Participant marking

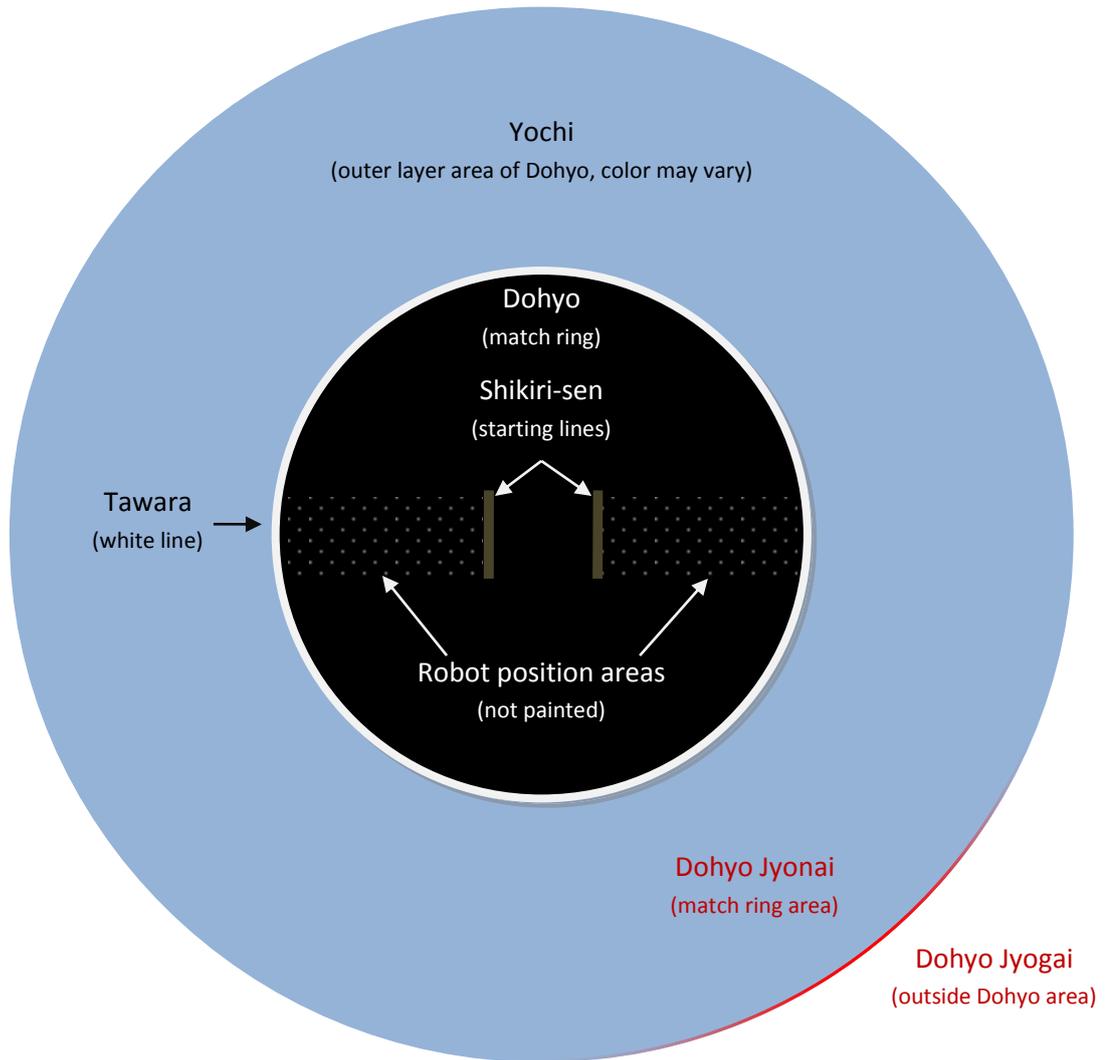
Participants shall wear vests or other dress given by the Tournament organizers to simplify finding them. Vests will have the same number stickers as participant's robot.

Chapter 12 Others

Article 29. Modifications and abolition of the Rules

Modifications or abolition of the Rules are adopted by the chairperson of the Tournament through deliberation of Tournament committee's regulation.

Appendix A. Match area drawing



Appendix B. Remote start and stop control

Baltic Robot Sumo uses the robot remote start and stop control system which is also used in RobotSM and RobotChallenge competitions. Intention of the remote control system is to have fair and fast round starts. As a safety feature it also serves stop/kill switch purpose. Having a common control system between several competitions is convenient for participants.

System is based on the infrared transmitter which is operated by the judge and infrared receivers which are based on the robot. Protocol used for infrared transmission is RC-5. RC-5 message is a Manchester coded bitstream modulated at 38 kHz. Message payload consists of 5-bit address and 6-bit command which contains the remote command (program, start or stop) and Dohyo ID. Dohyo ID is used to differentiate between nearby parallel matches.

Following table lists the remote commands and their respective RC-5 payload content:

<i>Command</i>	<i>RC-5 message fields</i>
Program	Address[4..0] = 0x0B, Command[5..1] = Dohyo ID
Start	Address[4..0] = 0x07, Command[5..1] = Dohyo ID, Command[0] = 1
Stop	Address[4..0] = 0x07, Command[5..1] = Dohyo ID, Command[0] = 0

Program command is used to write new Dohyo ID into robots infrared receivers just before the match. Judge transmitters have separate low-power IR LED for this purpose, so only the close-by robot will be able to receive this command. Programmed Dohyo ID shall be used to filter start and stop commands.

Start and stop command have the same message address, only the first bit of command field is used to determine the action. Robot infrared receivers need to verify that received message Dohyo ID is the same as the one programmed into them and take action only if it's the same.

Infrared receiver component(s) shall be placed in a way that allows robot to receive the message from any direction.

As a requirement, robots or the infrared receivers shall have clearly visible status LED(s) to be able to verify that it receives the judge transmitter commands. In case of program command, status LED needs to flash quickly two times. When robot receives start command it shall light the LED up constantly. When robot receives the stop command it shall start flashing status LED slowly.

More information about the remote control system:

<http://www.startmodule.com>