Mini Sumo rules

CONTENTS

1. Description
2. Competition rules
3. Robot
4. Field a.k.a. Dohyo Jyonai
5. Competition procedure
Appendix 1. Competition area
Appendix 2. Start and stop system

1. Description

Mini Sumo is one of the most popular robotics disciplines. The goal of the competition for the robot is to autonomously push the opponent out of the Dohyo (ring area).

2. Competition rules

2.1. Each robot can be registered with one operator and several assistants. Only the operator is allowed to control the robot. All participants must adhere to the competition regulations and the rules for determining the winner in a fight.

2.2. For safety reasons, referees and participants are required to wear gloves.

2.3. The course of the competition is determined by the organizers, taking into account the number of participants. If there are many participants, subgroups are used to determine the participants of the final tournament. The final tournaments are held using a double-elimination system. If the number of participants is small, they immediately and automatically take part in the final tournament under its rules.

2.4. The competition organizers decide which of the following methods will be used to start and stop movement:

- Infrared remote control operated by the competition referee
  (See Appendix 2)
- 5-second delayed start and manual stopping
  (Using a button or a remote control operated by the robot operator)

In the school pupils' category, a 5-second delayed start and manual stopping are always used.

2.5. During the competition (during a round), remote controls must be placed in a predetermined location. Remote controls may be used only to stop the robot, and only when the referee gives the appropriate command. The official infrared remote control is held by the referee.

3. Robot

3.1. The robot must be fully autonomous. Its movements must be designed so that the robot can detect the opponent's robot and respond accordingly. If there is any doubt about whether the robot is autonomous, the referees have the right to inspect the robot's control logic.

3.2. The robot's maximum size and weight:

Length (cm)	Width (cm)	Height (cm)	Weight (g)
10	10	Unlimited	500

Table 1. Maximum parameters of a Mini Sumo robot

3.3. The robot may increase in size after the start, but it must remain in one piece.

3.4. The infrared sensor, if needed, must be placed on the top of the robot. It must not be placed on the sides or underneath it. The robot operator must ensure stable and uninterrupted operation of the receiver, as far as possible under all possible conditions.

3.5. Robots must be marked with identification number stickers. It is the robot operator's responsibility to provide space for them. The stickers are supplied by the competition organizers. If necessary, the same number tags will be attached not only to the robots but also to the participants' clothing.

3.6. It is forbidden to use any components that are designed to detach from the robot during its movement or upon contact with another robot. Double blades are not prohibited.

3.7. The following are prohibited in the robot:

- Any components made to deliberately disrupt the operation of the opponent's robot. (For example, special sources of electromagnetic waves or jamming devices, such as infrared LEDs intended to interfere with the operation of the opponent's infrared sensors).
- Any components that damage the surface of the Dohyo ring during the robot's movement. The only exception for surface damage is collisions between robots.
- Any liquids, powders or gases used as weapons against the opponent.
- Any flammable materials in the robot's construction.
- Throwing devices, such as a net that is thrown at the opponent's robot.
- Parts that attach to the surface of the Dohyo ring. (Glues, suction cups, etc.).
- Magnets.

4. Field a.k.a. Dohyo Jyonai

4.1. **Dohyo Jyonai** (competition area) consists of the Dohyo (ring area) and the Yochi (outer edge of the ring area). The rest of the area is considered Dohyo Jyogai (the area outside the ring). Protective barriers surround the Dohyo Jyogai ring.

4.2. **Dohyo** (ring area) is a circular area covered with a black coating.

Height (cm)	Diameter (cm)	Surface material
1 - 5	77	Plastic or wood

Table 2. Mini Sumo field parameters

4.3. **Shikiri-Sen** are the starting lines that are located in the centre of the ring and indicate the starting sectors.

4.4. **Tawara** is the white line along the outer edge of the Dohyo ring. The Tawara line is part of the Dohyo ring. Its width is 2.5 cm.

4.5. **Yochi** is the area around the Dohyo with a diameter of at least 100 cm. The colour and material of the Yochi can vary, but it must not be white.

5. Competition procedure

Terminology: A match consists of rounds. One round is one fight.

5.1. Match principles

- A match usually takes place in three rounds and lasts up to 3 minutes. The team that first scores 2 Yuko points (awarded points) during the match wins. Match time is measured during the rounds, not between them.
- If only one Yuko point is scored by the end of the match, the team that scored this point wins.
- If no team wins a round during the match time, the winner will be announced according to the situation, by Yusei (advantage). If Yusei cannot be determined or the number of rounds won is the same for both teams, the match time is extended by 3 minutes. If one of the teams earns one or more Yuko points in the extension, that team wins.
- The maximum time between rounds for putting the robots in order is 30 seconds.

5.2. Starting the match

- The match begins following the referee's signal. The competitors bow to each other before entering the Dohyo Jyonai ring area.
- Before each round, following the referee's signal, the participants simultaneously place their robots on the Dohyo ring. The robots must be placed in opposite Shikiri-Sen (starting line) sectors, and at least some part of the robot must remain in the Shikiri-Sen sector (see figure).

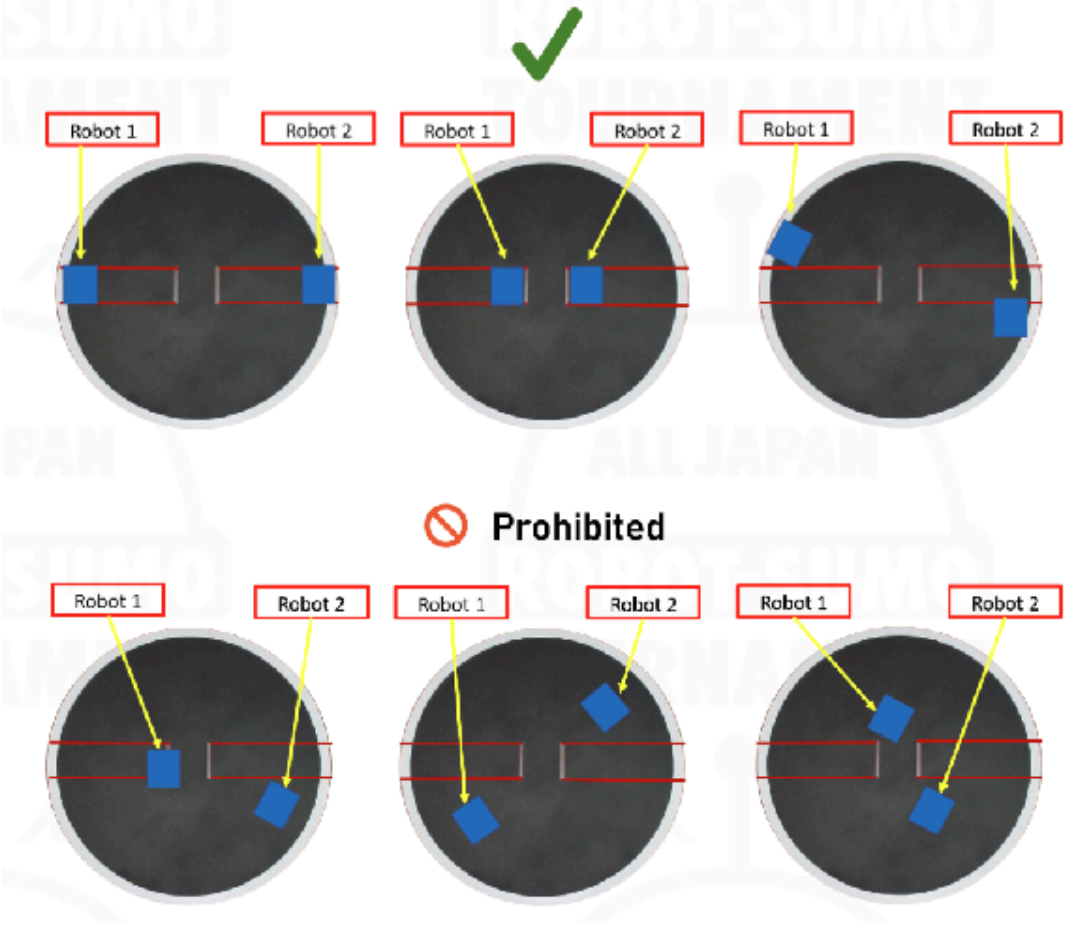


Figure 1. Permitted and prohibited starting positions of the robots on the Dohyo

- After the robots have been placed on the Dohyo ring, the following is not allowed:
  - Touching or moving the robot.
  - Changing the robot's settings (including with the remote control).
- The round starts with one of the starting methods selected and announced in advance by the organizers.
  - After the robots have been placed on the ring, the participants leave the Dohyo Jyonai ring area. The referee starts the round by giving the robots a command with the official infrared remote control. The robots can start moving after receiving the start signal.
  - After the referee's signal, the robot operators switch on the 5-second delayed start timer and immediately leave the Dohyo Jyonai ring area. The robots can start moving 5 seconds after receiving the delayed start command.

- If the Dohyo ring area is scratched or dirty, the referees decide whether to continue the match on the same ring or to replace it with another one.

5.3. Ending the round

- The referee gives the signal to end each round and stop the robots. One of the stopping methods selected and announced in advance by the organizers is used.
  - The referee stops the robot by giving a signal with the official infrared remote control. In addition, the robot operator may use their own methods to stop the robot.
  - The robot is stopped by the robot operators.

5.4. Ending the match

- The match is officially over upon receiving the referee's corresponding signal. The participants must take their robot from the Dohyo ring, bow to each other and leave the Dohyo Jyonai ring area.
- If a participant is injured and the match cannot continue, the participant may request the end of the match.
- In the situation described above, the referees take the necessary actions so that the match can continue immediately.
- If the actions taken by the referees do not allow the match to continue, the opponent wins the competition without a match.

5.5. Torinaoshi a.k.a. round repetition

The round is repeated in the following situations:

- Both robots are facing each other and their movements are obstructed or are not taking place.
- Both robots fall off the Dohyo ring at the same time.
- Other situations in which it is not possible to determine the winner and the loser.
- If a winner cannot be determined after a Torinaoshi, the referee may place the robots personally and continue the match within the time allotted to it.

5.6. Break between matches

- During the breaks between matches within a single subgroup, the robots must be placed on a designated table. They may be taken from the table only for the duration of the match. It is forbidden to leave the competition area with the robot during the breaks between matches, except when appropriate permission has been received to do so (if the robot needs to be repaired). This condition is necessary for a smooth and fair running of the competition.

> **NB!** If the robot is not found on the previously indicated table on time, or the team is not present, the match will result in a **loss**.

5.7. Scoring - Yuko (awarded) points, Shinitai and Yusei (advantage)

- Yuko (awarded) points - the winner is announced in the following situations.
  - If the opponent has been pushed out of the Dohyo ring (the robot touches the area around the Dohyo ring).
  - If the opponent falls off the Dohyo ring and touches the area around the Dohyo ring.
  - If, as a result of a collision, a robot is partially on the Dohyo ring and is the first to touch the area around the Dohyo ring, but the other robot, as a result of the collision, has fallen completely off the Dohyo ring later (for example, having been pushed out and thrown into the air), the point is awarded to the robot that is partially on the Dohyo ring and has clearly pushed the opponent out.
  - In a “Shinitai” situation.
  - In a “Yusei” (advantage) situation.
  - If a “Keikoku” (warning) is given to the opponent twice.
  - If a “Hansoku” (violation) is established.
  - If the winner is announced without a match, the winner receives 2 Yuko points (if the winner already has 1 Yuko point, the winner receives only one more point). The opponent's existing Yuko point(s) remain counted in the event of a loss.
- A Shinitai situation means that one or more of the robot's wheels end up outside the Dohyo ring and the robot is unable to return to the ring. In this case, the opponent receives 1 Yuko point.
- In a Yusei (advantage) situation, the referee may award a Yuko point to a team, based on strategy, movements and the robot's skills.

5.8. Keikoku (warning)

A participant who commits any of the following actions receives a “Keikoku” (warning). If a participant receives 2 warnings, the opponent gets 1 Yuko point.

- If the robot operator or any item belonging to them (e.g. a remote control) ends up in the Dohyo Jyonai area before the referee's signal to end the round.
- If the robot makes a movement before the start of the round (a movement or a change of shape).
- If the participant violates the rules for using the remote control.
- If the robot is replaced after it has already been placed on the Dohyo.
- If the participant does not comply with safety requirements.
- If any other conduct that does not comply with the rules is established.

5.9. Hansoku (violation)

In the situations listed below, the opponents each receive 1 Yuko point.

- If a part detaches from the robot.
- If the robot does not move.
- If both robots are moving but do not make contact.
- If the robot catches fire, or there is a suspicion that the robot may be on fire.
- If the participant wishes to end the round.

5.10. Hansokumake (loss due to violation)

A participant who commits any of the violations listed below loses the match due to the violation.

- If at the start of the match the participant is not in the previously indicated Dohyo ring area, or the participant arbitrarily extends the time for putting the robot in order (see “Match principles”).
- If the participant knowingly disrupts the course of the match (for example, by deliberately breaking or deforming the Dohyo ring).
- If the participant violates the rules of Section 3 “Robot”.
- If the robot does not make autonomous movements.
- If the participant fails to comply with the conditions, even if the participant has already been given a “Keikoku” (warning).

5.11. Sikkaku (disqualification)

In the cases listed below, the participant will be excluded from the competition and will not be added to the lists of competition participants and results.

- If the participant's robot does not meet the requirements stated in the competition rules.
- If the participant behaves in a way that does not meet elementary standards of courtesy (insults the opponent or referees, uses obscene language)
- If the participant deliberately injures the opponent.

Appendix 1. Competition area

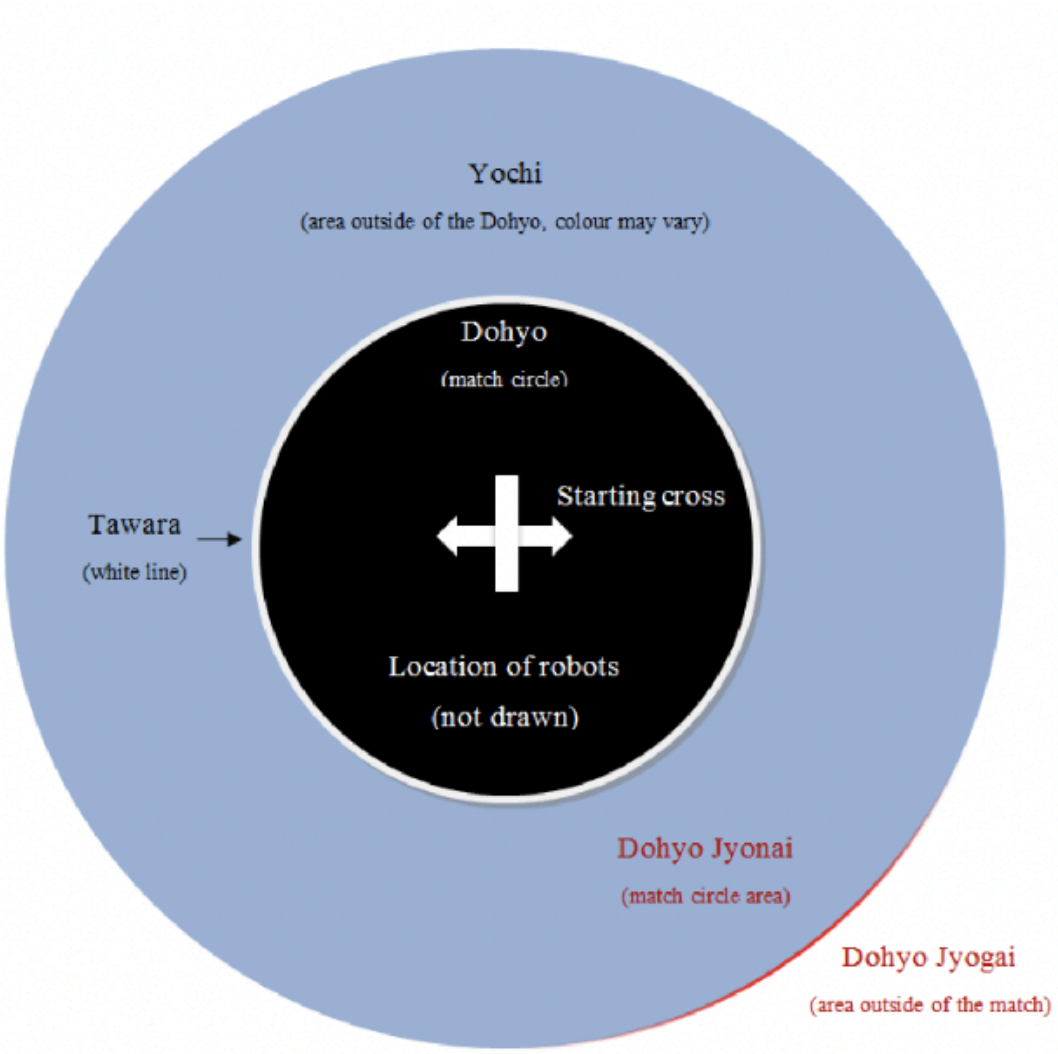


Figure 2. Competition area

Appendix 2. Start and stop system

The same start and stop system is used in the Baltic Robot Sumo as well as in the RobotSM and RobotChallenge competitions. The aim of the system is to ensure a fair and quick start of the round. For safety reasons, the system is equipped with a stop switch. Using one and the same control system in different competitions is convenient for participants.

The system is based on an infrared transmitter, operated by the referee, and an infrared receiver located on the robot. The infrared transmitter uses the RC-5 protocol. The RC-5 code is a Manchester-encoded bit stream modulated at 38 kHz. The message data consists of a 5-bit address and a 6-bit command, which contains remote control commands (programming, starting and stopping) and the Dohyo ID. The Dohyo ID is used to identify nearby matches that take place simultaneously.

Command	RC-5 message field
Programming	Address[4..0] = 0x0B, Command[5..1] = Dohyo ID
Starting	Address[4..0] = 0x07, Command[5..1] = Dohyo ID, Command[0] = 1
Stopping	Address[4..0] = 0x07, Command[5..1] = Dohyo ID, Command[0] = 0

Programming commands are used to send a new Dohyo ID to the infrared receiver located on the robot immediately before the match. The referees' infrared receivers are equipped with a separate low-power infrared LED to ensure that robots nearby can receive the specified commands. The programmed Dohyo ID is used in order to distinguish the start and stop commands.

The start and stop commands have one message address, but only the first bit of the command field determines the action. The robot's infrared receivers must confirm that the Dohyo ID in the message is the same as the one programmed in the robot, and must perform the corresponding action if they match.

The infrared receiver components must be placed on the robot so that the robot is able to pick up - receive messages from any side.

The robot's infrared receiver must be equipped with clearly visible LEDs, to confirm whether or not the robot has received the signal of the referee's infrared receiver. When a programming command is received, the robot's LED quickly flashes twice. If the robot receives a start command, the LED flashes continuously; if the robot receives a stop command, the LED starts to flash slowly.

More information about remote control systems can be found at: http://www.startmodule.com