



Klaipėdos
universitetas

Robotikos klubas

MINI SUMO RULES

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1. INTRODUCTION

This document defines the Mini Sumo bot rules. The rules are based on the rules of the Baltic Robot Sumo.

2. ROBOT CLASSES

Mini sumo in the competition is divided in the following categories :

1. Mini Sumo (autonomous),
2. Mini Sumo RC (radio controlled)

3. COMPETITION

3.1. Definition

One operator and two assistants can be registered for each robot (3 team members in total). However, only the operator is allowed to control the robot. Both contestants are required to abide by the competition rules, defeat conditions and participate using only their hand-built autonomous robots in a pre-designated Dohyo area. The judges announce the winner.

3.2. Format

The format of the competition is determined by the tournament organizers, taking into account the number of participants. If the number of participants is high, subgroups will be used to determine who will advance to the final tournament. The finals are held in a double-elimination tournament format. If the number of participants is small, all participants compete at once in a final tournament format.

3.3. Subgroups

KURC Mini Sumo competitions can be divided into two age categories depending on the number of participants. If there is a high number of participants then the competition is divided into 2 age groups, beginners (under 18) and professional (over 18). A participant who is eligible to be a beginner can decide to participate in professional age group, but not the other way around

4. DOHYO JYONAI

Dohyo Jyonai (Competition Ring Area) consists of Dohyo (Competition Circle) and Yochi (Dohyo Outer Area). The rest of the space will be considered the Dohyo Jyogai area (outside the Dohyo). The Dohyo Jyogai area is surrounded by guards (see Appendix 1. Diagram of the competition area). Dohyo (competition circle) is a circle covered with a black coating.

Table 1. Sumo laukų parametrai.

Class	Height	Diameter	Arena material
Mini Sumo	2.5 cm	77 cm	Wood/plastic

4.1. Initial cross

The starting line is placed in the middle of the Sumo field and divides the field into four equal sectors. Robots must always be in two opposite sectors (see Figure 1). The robot must at least partially cover the Tawara (white line) area. The referee removes the starting line from the field when the robots are positioned. The robot cannot be moved after it has been placed on the field.

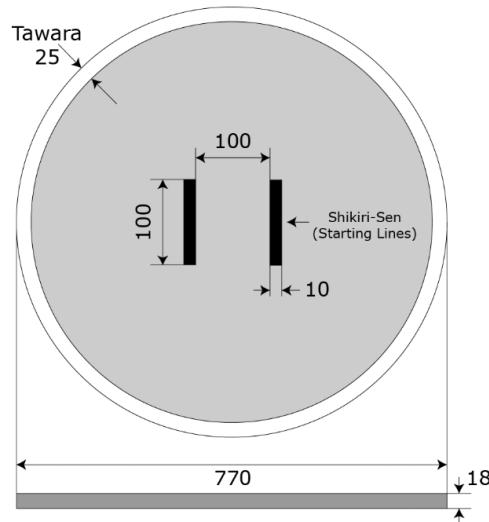


Figure 1. Starting lines

4.2. Tawara (white line)

Tawara is the white line around Dohyo. The Tawara line is part of Dohyo.

Table 2. Tawara dimensions according to competition classes.

Class	Tawara width
Mini Sumo	⁵ 2.5 cm

4.3. Yochi

Yochi is an area around the Dohyo that is at least 250cm in diameter for Mini Sumo competitions. Yochi color and material can be freely selected except white color.

5. ROBOT

5.1. Robot requirements

5.1.1. Dimension and weight restrictions

Table 3. Dimension and weight restrictions.

Class	Mass	Length*	Width*	Height
Mini Sumo	0.5 kg	10 cm	10 cm	Unlimited

- NB! For autonomous Mini sumo robots the starter module must be placed on top of the robot at the highest point, not on the side or under the robot.
- The robot may expand after the start of the match, but must remain intact.

5.1.2. Autonomous robots – the beginning of movements

Table 4. Movement initiation methods.

Class	Start method
Mini Sumo	Mini Sumo Official infrared remote controlled by a referee. See the technical specifications of the mandatory reception device Appendix 2. Start and stop remote control system.

5.1.3. Autonomous robots – stop motion

Table 5. Methods of stopping movements.

Class	Stop method
Mini Sumo	The Mini Sumo Referee stops the robots using the official infrared remote control. See the technical specifications of the mandatory reception device Appendix 2. Start and stop remote control system. Additionally, robot operators can use their remote controls to stop the robot.

5.1.4. Requirements for the use of knives.

It is forbidden to use:

- any components that may detach from the robot when it moves or collides with another robot.

For Mini Sumo robots, all edges, including the front panel, must not be so sharp as to damage the ring (except in collisions), other robots or players. Sharp edges should be covered when the robot is being carried.

5.2. Movements of autonomous robots

The robot's movements must be designed to detect the opponent's movements and react/attack accordingly. If the robot's autonomy is in doubt, the judges have the right to check the robot's control logic.

5.3. Using remote control devices with autonomous robots

During the competition (match), the remote control devices must be placed in the previously designated place. The devices can only be used to stop the robot when the referee gives the appropriate command. The official infrared remote control device is held by the referee.

5.4. Using remote control devices with RC robots

Radio controlled robots should use remote control devices with a configured failsafe either on the transmitter or receiver that effectively stops all motion of the robot in case of lose of connection

5.5. Sensors with RC robots

No use of sensors are permitted.

5.6. Robot components that are prohibited

Any components that can jam an adversary (such as flashlights or jamming devices such as IR LEDs designed to flood an adversary's IR sensors.

It is forbidden to use:

- any components that may damage or scratch the surface of the Dohyo (the exception is collisions between robots),
- any components that are designed to damage an opponent,
- any liquid, powder or gas as a weapon against an opponent,
- any flammable materials,
- throwing devices (e.g. throwing a net at an opponent),
- parts that attach the robot to the Dohyo (eg glue, suction cups, etc.). It is allowed to use magnets that improve the grip of the wheels.
- Jamming devices, such as IR LEDs intended to saturate the opponents IR sensors

6. PRINCIPLES OF THE COMPETITION

Matches usually consist of three rounds and last up to three minutes. The first team to collect two Yuko points (effective points) during the match will be the winner. The match is timed during the rounds, not between them. If only one Yuko point is scored at the end of the match time, the team that scored it is the winner. If neither team wins a round during the match time, the winner will be declared according to the Yusei (dominance) situation (see clause 8.3). If Yusei cannot be determined or both

teams have the same number of rounds won, the match will be extended to three minutes. If one team scores one or more Yuko points during overtime, that team is the winner.

Competitors are given a maximum of 120 seconds between rounds to maintain their robot.

7. ORGANIZATION OF COMPETITION

7.1. Security requirements

For safety reasons, judges and participants must wear gloves and goggles according to the robot class.

Table 6. Safety requirements.

Class	Gloves	Glasses
Mini Sumo	Mandatory	Recommended

7.2. Start of the match

The match starts with the referee's signal. Participants bow to each other before entering the Dohyo Jyonai area. Before each round, at the referee's signal, the contestants place their robots on the Dohyo one at a time. The robots must be placed in opposite sectors, and at least part of the robot must be on the white line (see Figure 1 "Starting Cross"). Robots cannot move after being placed on Dohyo. A round starts with the method described for each robot class. Further is presented the scheme of robot placement possibilities:

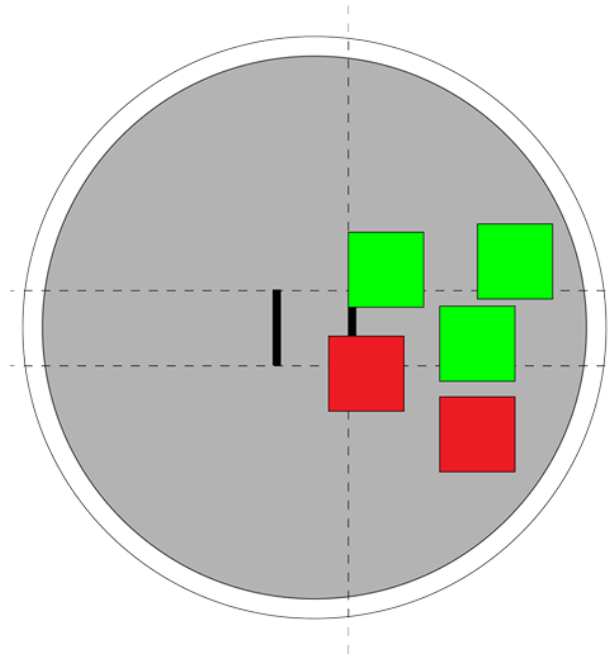


Table 7. Start method.

Class	Start method
Mini Sumo	Participants leave the Dohyo Jyonai area after placing their robots there. The referee starts the round by sending the start command via the official infrared remote control. Robots can start moving after receiving the start command.
Mini Sumo RC	The referee gives a signal to competitors to begin the match.

If the Dohyo area is scratched or becomes dirty, the judges decide whether to continue the match in the same Dohyo or change it to another.

7.3. End of match

The referee gives the signal that the match is over and stops the robots. The stop method is specified for each class separately.

Table 8. Stop method.

Class	Stop method
Mini Sumo (autonomous)	The referee stops the robots by sending a stop command via the official infrared remote control. Also, robot operators can use their own techniques to stop the robot.
Mini Sumo RC	The referee gives a signal to competitors to stop all motion of the robots at the end of the round.

The match is officially over after the appropriate referee's signal. Participants must take their robot from Dohyo, bow to each other, and leave Dohyo Jyonai's area.

7.4. Torinaoshi (round repeat)

The round is repeated in the following situations:

1. both robots are facing each other and their movement is hindered or they do not move at all,
2. both robots fall out of Dohyo at the same time,
3. other situations where it is impossible to determine who won or lost,
4. if it is not possible to declare a winner after Torinaoshi, the referee can help the robots himself or herself and continue the match within the allotted time.

7.5. Handling robots between matches

Between matches in the same sub-group, robots must be placed on the designated table and may only be picked up during the match. It is forbidden to leave the competition area with the robot between matches, unless the appropriate permission is obtained (for example, if the robot needs to be repaired). Robot changes are not allowed during the Subgroup Tournament. This requirement is

applied to ensure the smooth running of the competition. If the robot is not found on the designated table at the right time or if the team is not in place, the match will end in defeat.

8. YUKO (EFFECTIVE) POINT, SHINITAI AND YUSEI (DOMINATION)

8.1. Yuko (effective) point

The winner is announced in the following situations:

1. if the opponent is pushed out of the Dohyo (the robot touches the territory outside the Dohyo),
2. if the opponent falls out of the Dohyo and touches the area outside the Dohyo,
3. In the Shinitai situation,
4. In a "Yusei (Domination)" situation,
5. if the opponent is given two "Keikoku (Warning)",
6. if a "Hansoku (violation)" occurs,
7. if the winner is announced without a match, the winner receives two Yuko points (if the winner already has one Yuko point, he only receives one additional). The loser's Yuko points remain valid.

8.2. Shinitai

A "shinitai" situation means that one or more of the robot's wheels roll out of the Dohyo, and the robot cannot return to the Dohyo. In this case, the opponent receives one Yuko point.

8.3. Yusei (domination)

In a Yusei (dominance) situation, the referee can award a Yuko point to the team based on the robot's strategy, moves and skills.

9. HANSOKU (OFFENCE) AND PUNISHMENT

9.1. Keikoku (warning)

A participant who acts as follows receives a Keikoku (warning). If a contestant receives two Keikoku (warnings), the opponent receives one Yuko point.

1. If the operator or any of his items (such as a remote control) is in the Dohyo Jyonai area before the referee signals the end of the round.
2. If the robot starts moving before the start of the round (move or change shape).
3. If the participant violates the requirements for the use of remote control (autonomous robots).
4. If the robot is replaced after it is placed on the Dohyo.
5. If the participant does not comply with security requirements.
6. In any other case which is considered to be an unfair act.

9.2. Hansoku (violation)

In the following situations, the opponent or both parties receive one Yuko point:

1. if parts with a total mass of more than 5 grams fall from the robot,
2. if the robot does not move,
3. if both robots move but do not collide,
4. if the robot is on fire or appears to be on fire,
5. if the participant wants to end the round.

9.3. Hansokumake (defeat due to infringement)

A competitor who violates these rules forfeits the match due to the violation.

1. If the participant fails to arrive on time for the Dohyo event or exceeds the time allotted for technical maintenance (see Clause 6 "Principles of the Event").
2. If a contestant sabotages the event, such as intentionally breaking or deforming the Dohyo.

3. If the participant violates the requirements specified in point 5 "Robots".
4. If the robot will not move autonomously (autonomous robots).
5. If the participant does not comply with clause 7.1 "Safety requirements", even after clause 9.1 "Keikoku" (warning).

9.4. Sikkaku (disqualification)

In these cases, the participant is disqualified - he has to leave the competition and is not included in the list of competition results.

1. If the participant's robot does not meet the requirements specified in point 5 "Robots".
2. If the participant behaves in an obscene manner, such as swearing or insulting the opponent or the judges.
3. If a participant intentionally injures an opponent.

10. SUSPENSION OF THE MATCH

The match is suspended:

1. if the participant is injured and it is no longer possible to continue the match, the participant can demand the stoppage of the match,
2. taking into account the situation described above, the referees take the necessary measures so that the match is resumed immediately,
3. if these measures do not allow the match to continue, the opponent wins the match without a match.

11. OBJECTIONS

Judges' decisions are not subject to appeal. Complaints must be made during or immediately after the match. If there is a disagreement with the judge, complaints must be submitted immediately to the senior judge. Any complaints submitted later will not be accepted. In the event of disputes or disagreements, the judges and/or organizers have the final say. Rude behavior is not tolerated, and a team that disobeys a referee, organizer or senior judge may be disqualified by the judge and/or event organizers.

12. MARKING OF ROBOTS

Robots must be marked with stickers with numbers (robot number). The stickers are provided by the competition organizers. The sticker cannot be placed on the robot's plow or any other part where it can interfere with the opponent's sensors.

13. MODIFICATION AND CANCELLATION OF RULES

Changes and cancellations of the rules are accepted by the main organizer of the competition in accordance with the regulations of the regulatory committee of the competition.

14. ANNEX

1 Appendix

Figure 2. Zone of competition.

2 Appendix

Start and stop remote control system

The same start and stop system is used in both the Baltic Robot Sumo, RobotSM, and RobotChallenge competitions. The aim of the system is to ensure a fair and quick round start. For safety reasons, the system is equipped with a stop switch. Using the same control system across 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 bitstream modulated at 38 kHz. The message data consists of a 5-bit address and a 6-bit command that includes remote control commands (programming, starting, and stopping) and the Dohyo ID. The Dohyo ID is used to identify nearby matches that take place simultaneously.

Komanda	RC-5 message field
Programming	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

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

Start and stop commands share the same message address, but only the first bit of the command field determines the action. The robot's infrared receiver must verify that the Dohyo ID in the message matches the robot's programmed ID and execute the appropriate action if they match.

The infrared receiver components must be placed on the robot in such a way that the robot can receive messages from any direction. The robot's infrared receiver must be equipped with clearly visible LEDs to confirm whether or not the robot has received the referee's infrared signal. Upon receiving a programming command, the robot's LED will blink twice quickly. If the robot receives a start command, the LED will turn on continuously; if the robot receives a stop command, the LED will blink slowly.

For more information on remote control systems, refer to the official website.
<http://www.startmodule.com>