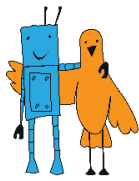


“SUMO” General requirements

Version 4.0 dated July 20, 2017.

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1. General provisions

1.1. Task description

Match is played between two teams. Each team has one or more participants. Each team puts the robot on the ring. Match starts with the referee command and continues until the team gains two points. The referee determines the winner of the match.

1.2. Contest categorie

Competitions "Sumo" are held in the following classes:

- „Mechanical sumo";
- „Mega Sumo";
- „Intellectual sumo 15x15 ";
- „Intellectual sumo 15x15. Educational kits";
- „Mini-sumo 10x10";
- „Micro-sumo 5x5";
- „Humanoid Sumo robots".

2. Requirements for the robots

Before the competition, all robots declared for participation should meet the qualification criterias to take part in the selected class.

The total weight of the robot at the start of the match should be less than the weight limit for its class. The measurement error of the total weight of the robot may be 3 g.

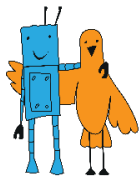
The robot can grow in size after the start of the match, but should not be physically divided into parts, and must be one whole robot. Robots that violate these prohibitions, loses the match. Screws, nuts, and other parts of the robot with a total mass of not more than 5 g, that fall out of the robot does not lead to the loose of the match.

All robots must be autonomous. Any control mechanisms are allowed if all their components are on the robot and the mechanism do not interact with an external control system (man, machine etc.).

Each robot gets a number at registration. Participants should display this number on the robot in order for spectators and organizers recognize their robot.

In the design of the robot it is prohibited to use:

- sources of interference, such as IR-LEDs, designed to blind the infrared sensors of the opponent;
- devices that can store liquid, powder, gas or other substances in order to blow off them toward the opponent;
- devices, throwing objects at the opponent;
- sticky substances to improve adhesion;



devices increasing down force such as vacuum pumps or magnets.

Tires and other robot features that come in contact with the ring, should not be able to raise and retain a standard A4 sheet (density of 80 g/m²) for more than 2 seconds.

No edges of the robot including front bucket must be sharp enough to scratch or damage the ring, other robots or players. In general, the edges with a radius of more than 0.1 mm can be made of blunt 0.2 mm thick metal strip are satisfactory. The referees and organizers may demand that edges that are, in their opinion, too sharp, be covered with adhesive tape.

Participants have the right to prompt meaningful robot modification between rounds and matches (including repair, replacement batteries, etc.), if the changes do not conflict with the design requirements of the robot and do not violate the competition rules.

3. Ring characteristics

The ring should be of round shape and of sizes corresponding to the class.

The border is marked by a white line around the edge of the playing surface with the width of the corresponding class. Inner ring area extends to the outer edge of that line. The ring is made of wooden material.

Inner ring area is defined as the playing surface, surrounded by a white line, including it. Everything outside is considered the outer area of the ring. There are ring settings for each classes.

Around the ring it should be free space defined for each class. It can be of any color, shape and material, if basics of these rules are not violated. This space with the ring in the center is hereafter referred to as "the ring area". Any markings or parts of the platform with the ring beyond the minimum sizes will also be considered to be in the ring area.

4. Procedure of the competition

4.1. Placement of the robots

With the referee's command two teams come to the ring to place their robots on it.

The ring is divided into 4 quadrants (see fig. 1). Robots should be always placed in two opposing quadrants. Each robot should be located on the border of the field within the correspondent quadrant. The robot has to cover the border, at least partially. Robots are not to be moved after the placement is completed.

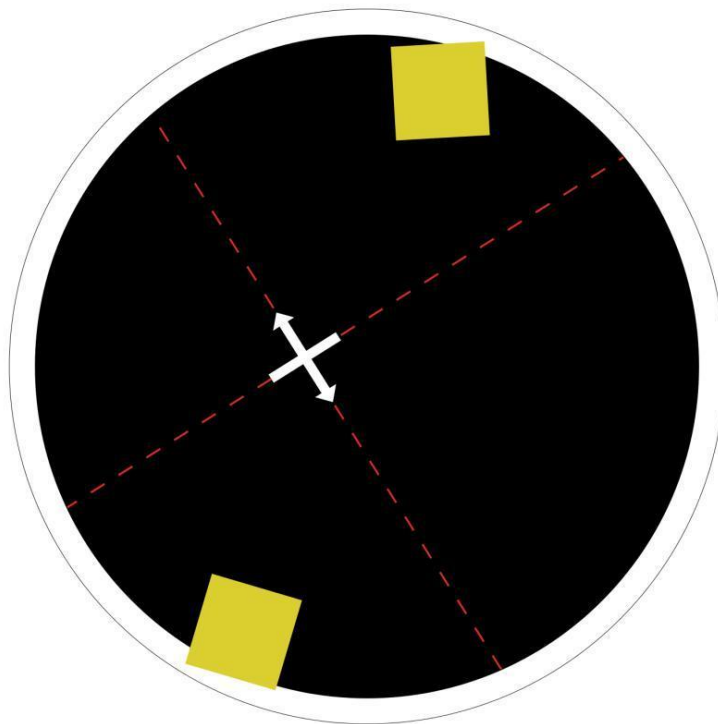
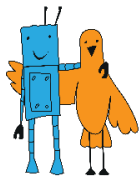


Fig. 1.Placement of the robots

4.2. Start

When using an IR receiver, the referee begins each round by sending a start signal from an IR transmitter. Technical parameters of the IR-receiver are given in the annex. Participants may use their own or ready modules offered by the organizers.

Without the use of an IR receiver, the referee announces the start of the round. During these five seconds the players must start robots and leave the ring area. Robots can act after a five-second pause from the start of the match.

4.3. Stop and resume of the match

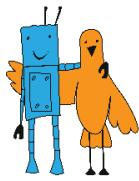
Match is stopped and resumed with the referee's announcement. The round should be stopped and assigned to a replay in the following cases:

- robots come into mesh or circle around each other without any noticeable results within 5 seconds;

- both robots move without any result or stop (simultaneously) for 5 seconds, without touching each other;

- if it is unclear whether there is a result, the referee may extend the observation time up to 30 seconds;

- if both robots touch the space outside the ring at the same time, and it is impossible to determine who touched it first.



Round may not be replayed more than three times. If it is still impossible to determine the result of the round the draw is scored as result of the round, i.e. none of the robots is awarded by the point.

Player may request to stop the match if he/she is injured, or robot got damage and the game cannot continue.

The participant gets 2 points when the match cannot continue due to injury or damage to the player or the player's robot, the player who caused the injury or damage, loses the match. If such situation takes a place when the match is replayed, the participant who is injured, or whose robot got damage gets 1 point.

When it is unclear which team is the reason of the injury or damage the player, who cannot continue playing, or requests to stop the game, loses the match.

If the game will continue in case of injury or accident shall be decided by the referees and the members of the Committee.

4.4. Sumo matches procedure

One 3 rounds is up to 3 rounds, each round lasts up to 90 seconds. By the referee's decision, time of the match may be prolonged.

The team which receive the maximum number of points within 3 rounds of the match, wins the match.

When neither team can win a match in the specified time period, an additional match can be held where wins the team the first awarded the point.

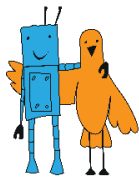
Otherwise, the winner/loser of the match can be determined through voting by the referees.

Match ends when the referee announces it. Teams take robots out of the ring area. If the referee announce an additional round, that round lasts 90 seconds maximum.

5. Violations

Two violations bring one point to the opponent during the match. Violation is declared if:

- a player demands to stop the match without any valid reasons;
- a player spends more than 30 seconds to prepare before resuming the match unless the referee extends the time;
- a robot starts to act before the end of the five seconds after the main referee announced the start of the match;
- a player does or says something that concerns the honesty of the match;
- a player puts any mechanical device in the ring;
- a player touches the robot or the ring during the match without the referee's permission and that violate these rules.



6. Awarding of points

Below are the rules of awarding points for the following classes of robots:

„Intellectual sumo 15x15 ";

„Mini-sumo 10x10";

„Micro-sumo 5x5";

The rules of awarding points for the classes „Mechanical sumo" and „Humanoid Sumo robots" are described in the regulations of the corresponding contests.

Point is awarded to the robot in the following cases:

a robot in accordance with rules forces the opponent robot to touch the space outside the ring inner area, including a side part of the ring;

an opposing robot touches the space out of the ring inner area by itself;

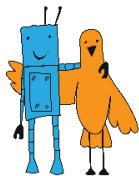
when a robot continues to move but an opposing robot stops function, then after 5 seconds the robot is awarded a point, and the opposing robot declared unwilling to fight.

When a wheeled robot turn over on the ring and in similar cases, the point is not counted, and the match continues. When the referee determines the winner, the following factors are taken into consideration:

robot motion and functioning technical peculiarities;

penalty points scored during the match; players behavior during the match

Robot with maximal score winning the match.



Appendix 1

IR receiver for robots participating in the Sumo competition

Every round is started by the referee sending a start signal with an IR transmitter. As soon as the robot receives the signal the round will start. (This method makes the matches fairer since it eliminates false starts and is also time saving since less restarts is needed)

Kill switch

The kill switch is used to cut power to the motors of the robot, which is used as a security precaution and is only mandatory in the «Mega Sumo» class. When the referee sends the stop command the power to the motors has to be cut.

Prebuilt module

The prebuilt module takes care of all communication and is very easy to implement. The robot only needs to wait for the start pin on the module to go high and then it should start. The module accepts supply voltage (VCC) 3.3-5V. The connectors have standard 2.54mm pitch.

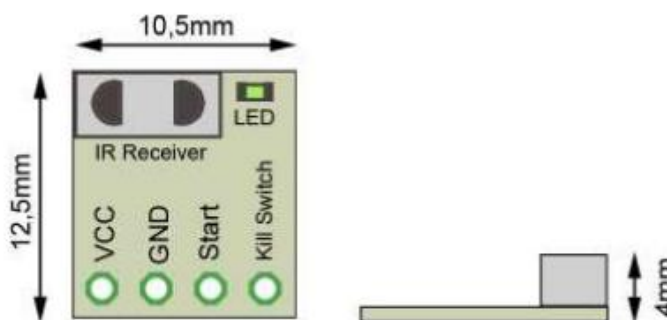
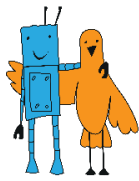


Fig. 2

Modes of operation

The figure below illustrates the modes of operation of the module. To be less sensitive to noise and disturbances the module will save its current state into a non-volatile memory and if it is resets it will return to the last known state. This means that each match will end with the referee sending the stop command.



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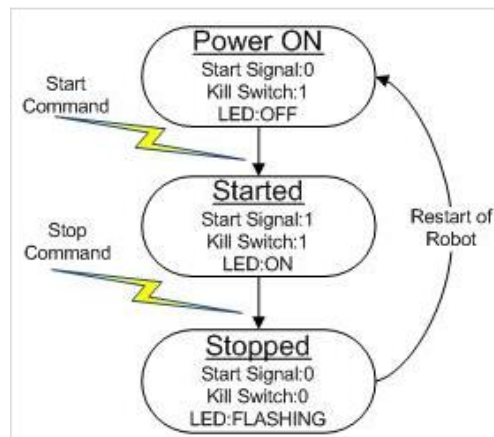
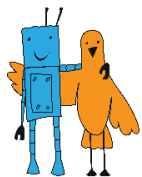


Fig. 3

If the LED on the module is on before the referee has sent the start command it means that the module is in the “Started” state. Then the stop command has to be sent and the robot needs to restart for the module to go back to the “Power ON” state.

To be able to run multiple matches next to each other rings each ring will have its own unique identifier. The prebuilt module can be re-programmed to listen for a new identifier. This is done by the referee by sending a special programming command which updates this identifier.



7. Revision History

№	Doc. No.	Date	Note	Previous version	Update version
1	2	3	4	5	6
1.	3.1		Section was changed	5.1.3	
2.	3.2		Text was changed	„Micro-sumo 5x5" class was added	
3.	3.3		Section was added		3.5
4.	3.4		Text was changed		
5.	3.5		Section was changed	2.1.2, 2.5.1, 4.2.2, 6.1.1.1, 6.1.1.2, 7.1.1, 8.1.1, 8.1.2	
6.			Section was added		6.1.5, 6.1.6
7.			Numeration was changed		
8.			Section was changed	2.1.3, 4.1.4, 6.1.1.4	
9.	3.6		Section was changed	4.1	
10.	4.0	20.07.17	All text was changed	Based on the version 3.7	