Pacific Northwest Engineering Student Design Conference
Hosted by TCC ASME Engineering Club – April 2016

Autonomous Mini-SumoBot Competition

Introduction

A mini-SumoBot is a relatively small, self-propelled, electromechanical robotic device, designed to compete in Sumo-style Matches by forcing an opponent's similar device out of a designated competition zone.

Autonomous SumoBots, once placed in Starting Position and activated, operate under their own internal logic and programming, without any human guidance or control. SumoBots do not use any form of weapons. Points, penalties, and victories are determined in the style of classic Sumo.

The ASME Mechanical Engineering Club is pleased to offer a mini-SumoBot Competition at our Engineering Design Weekend.

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AUTONOMOUS MINI SUMOBOT RULES

Sumo Match

1 - DEFINITION

A sumo match involves two teams, each team having one or more contestants. Only one member is allowed to approach the sumo ring (Dohyo). Each team competes with mini sumo robots that they have made themselves. The individual contest continues until two Yuko points are scored by one of the contestants.

The competition is structured using a double elimination tournament format, where each robot must lose two matches to be eliminated from the tournament.

Requirements for the Dohyo (Sumo Ring)

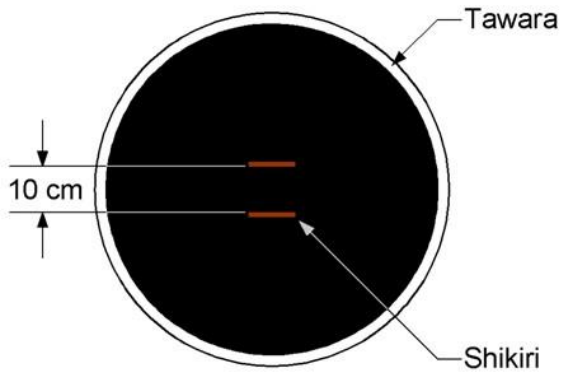
2- DEFINITION OF THE DOHYO INTERIOR

The dohyo interior is defined as the dohyo area surrounded by and including the border line.

3- DOHYO

A dohyo is a flat cylinder which is illustrated in the image below. The geometrical dimensions of the doyho are listed in the table below.

Shikiri lines (starting lines) consist of two painted parallel brown (or equivalent for absorption of IR light) lines centered in the ring with appropriate width and spacing for the given class. The separation distance between the lines is measured to their outside edges.



Division	Diameter	Height	Border Width (Tawara)	Starting Line Length	Starting Line Width
Mini Sumo	77 cm	2.5 cm	2.5 cm	10 cm	1 cm

4 - DOHYO EXTERIOR

The exterior area of a dohyo extends at least 100 cm from the border line. The color of the exterior can be any color except white. There are no restrictions on the type of material that can be used or the shape of the exterior, as long as they do not violate the spirit of the rules.

AUTONOMOUS MINI SUMOBOT RULES

Requirements for Mini Sumo Robot

5 – SPECIFICATIONS

Division	Length	Width	Height	Max-weight	Type
Mini Sumo	10 cm	10 cm	Unlimited	500 g	Autonomous

- The robot must be able to fit inside a square box with a length and width as described in the table above.
- The robot's weight (including accessories) must not exceed the maximum weight for its weight division.
- There are no restrictions on the type of control method used with autonomous robots.
- There are no restrictions on the type of microprocessor or the amount of memory used in the robot.
- An autonomous robot should be designed to begin action no earlier than five seconds after the contestant presses the robot's start button

6 – RESTRICTIONS

- The robot will not include a device that obstructs the control of the opponent's operation, such as a jamming device or strobe light.
- The robot will not include any parts that might damage or deface the dohyo.
- The robot will not include a device that insufflates (pour, spill, drop, ooze, eject, fire, shoot, squirt, etc) any liquid, powder, or gas.
- The robot will not include an inflaming device.
- The robot will not include a throwing device.
- The robot will not include any part that fixes the robot to the dohyo surface and prevents it from moving (such as suckers, glue, and so on). The robot must always be able to move.

Game Principles

7- HOW TO CARRY SUMO SUMO MATCHES

- One match shall consist of 3 rounds, within a total time of 3 minutes, unless extended by the judges.
- The team who wins two rounds or receives two "Yuhkoh" points first, within the time limit, shall win the match. A team receives a "Yuhkoh" point when they win a round. If the time limit is reached before one team can get two "Yuhkoh" points, and one of the teams has received one Yuhkoh point, the team with one Yuhkoh point shall win.

8 – BEGINNING OF THE GAME

Before the match, the contestants greet each other outside the dohyo following the referee's instructions, then enter the dohyo area. After that, the contestants put their robots on or behind their starting lines. No part of the robot can be placed in front of the starting line before the match begins.

At the referee's signal, the contestant can press the start button on the robot. The match begins five seconds after the referee's signal. The contestant must exit the dohyo area when the match begins.

9 – END OF THE GAME

The match ends when the referee calls the winner.

10 – GAME CANCELLATION AND REMATCHES

A match will be stopped and a rematch will be started under the following conditions:

- The robots are locked together in such a way that no more action appears to be possible or they rotate in circles several times.
- Both the robots are moving, but they don't appear they will ever contact each other.
- Both robots touch the exterior of the dohyo at the same time.
- Any other conditions under which the referee judges that no winner can be decided.
- In case of a rematch, maintenance of competing robots is prohibited until a Yuko is observed, and the robots must be immediately put back to the location specified in Part 8 (Beginning of the Game).
- If neither of the competing robots win nor lose after a rematch, the referee may reposition both robots to a specified location and restart. If even that does not yield a winner, the match may continue at any location decided by the referee, until the time limit is reached.

Yuhkoh Points

11 – YUHKOH POINTS

Yuko points are awarded when:

1. A team legally forces the body of the opposing robot to touch the space outside the ring, which includes the side of the ring its self.
2. A Yuhkoh point is also given in the following cases:
    - The opposing robot has touched the space outside the ring on its own.
    - Either of the above takes place at the same time that the end of the Match is announced.
    - In the case of humanoid sumo, any part of the opposing robot other than the bottoms of its feet (hands, knees, back, chest, etc.) touches the dohyo or when it is pushed or thrown outside of the ring.
3. When a wheeled mini sumo has fallen over on the ring or in similar conditions, Yuhkoh will not be counted and the match continues.
4. When judges' decision is called for to decide the winner, the following points will be taken into considerations:
    - Technical merits in movement and operation of a robot
    - Penalty points during the match
    - Attitude of the players during the match

Violations, Penalties, and Objections

12 – WARNINGS

A contestant who takes any of the following actions will receive a warning:

- Preparation for the restart of a match takes more than 30 seconds.
- An autonomous robot begins action (physical expansion or moving) within five seconds after the chief referee's start signal.
- Any other actions that may be deemed unfair occur.
- When a contestant continues to complain (verbally or non-verbally) about a referee's decision, condition of the dohyo, or environment, after the officials have made an attempt to correct the problem.

When a contestant receives two warnings, the contestant's opponent will be awarded one Yuko point.

13 – VIOLATIONS

Any of the following actions is determined as a violation, and the offender's opponent, or both robots, will get a Yuko point:

- A part (or parts) of the robot that exceeds a weight of 10 grams is separated and dropped from the robot.
- The robot stops moving on the dohyo for more than 10 seconds.
- The robot emits smoke or any kind of liquid.

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

- A contestant does not attend the appointed dohyo when called at the beginning of the game.
- A contestant ruins the game, such as by intentionally breaking, damaging, or defacing the dohyo.

14 – DISQUALIFICATIONS

A contestant who takes any of the following actions will be disqualified and forced to leave the game:

- A contestant's robot does not meet the robot specifications stated in Part 5. A contestant makes a robot using a method restricted in Part 6.
- A contestant displays unsportsmanlike behavior. For example, using violent language or slandering an opponent or a referee.
- A contestant intentionally injures their opponent's operator.

15 – OBJECTIONS

- A contestant who has an objection to the operating rules must express dissent to the Tournament Committee before the end of the game.
- No objections to the judgment of the referee can be raised.

Sources used

The rules presented here follow the rules taken from these following webpages:

http://www.robothon.org/robothon/sumo.php http://robogames.net/rules/all-sumo.php

Some of the rules have been modified with minor changes and these rules have been put together only for the autonomous mini sumobot competition at Pacific Northwest Engineering Student Design Conference which is hosted by TCC ASME Engineering Club.

http://learn.parallax.com/sites/default/files/Files/Images/Contests/2013-Robotics

http://learn.parallax.com/sites/default/files/Files/Images/Contests/2013-Robotics-Expo-Contests/2013-Expo-Sumobot/SumoRing.pngExpo-Contests/2013-Expo-Sumobot/SumoRing.png