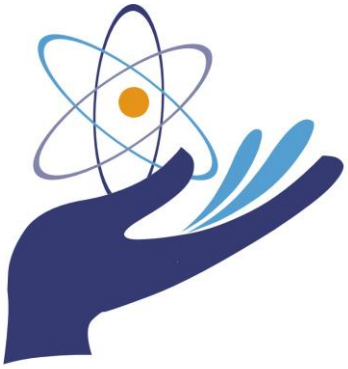

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NJRC COMPETITION GUIDELINES AND RULES

NJRC 2018

ABSTRACT

This document specifies the details of the competitions to be held in the National Junior Robotics Competition (NJRC). It is essential reading for all entrants.

1 Contents

2 Overview

The NJRC 2018 will be held on **19 May 2018**, in Johannesburg, South Africa (venue details to be confirmed).

A total of 16 competitions will be held, as follows:

		Competitions		
Competitor Classes		**Sumo**	**Battlebots**	**Capture the Flag**
Non-Lego	Antweight	Y	Y	Y
	Featherweight	Y	Y	Y
	Middleweight	Y	Y	Y
Lego	WeDo	Y	N	N
	EV3	Y	Y	Y
	Open	Y	Y	Y

The competitions will be conducted in leagues, as follows:

- **School Students** – open to all school-going children attending any school in South Africa
- **Universities** and **Professionals** – open to all students attending a South African University (regardless of nationality), as well as organisations with Operations in South Africa, and individuals currently living in South Africa.

Leagues are *based on skill-level* and entrants will be allocated to a league based on the complexity of their robot. Entrants of **all ages and skill levels** may enter any of the competition classes.

Entry for all participants is **free**.

Any given team may **only enter one robot** to the NJRC, except Lego contenders, who may enter 2 robots.

Any given Robot may **enter any number of competitions** for which it is eligible.

All robots must be presented to the competition adjudicators for **inspection** at least 1 week prior to the competition. Any changes to the robot after the inspection must be brought to the attention of the competition adjudicators at least 2 days before the competition. Inspection days will be announced closer to the time, but competitors may make alternative arrangements with the organisers.

3 Specific Build Rules

3.1 Non-Lego Classes

3.1.1 Dimensions

No dimensional restrictions apply.

3.1.2 Weight Classes

- Antweight: Maximum 150g
- Featherweight: Maximum 13.6kgs
- Middleweight: Maximum 55kgs

3.1.3 Build Rules

The following restrictions apply:

- Jamming devices, such as IR LEDs intended to saturate the opponents IR sensors, are not allowed.
- Parts that could break or damage the arena are not allowed. Do not use parts that are intended to damage the opponents robot or it's operator. Normal pushes and bangs are not considered intent to damage.
- Devices that can store liquid, powder, gas or other substances for throwing at the opponent are not allowed.
- Any flaming devices are not allowed.
- Devices that throw things at your opponent are not allowed.
- Sticky substances to improve traction are not allowed. Tires and other components of the robot in contact with the arena must not be able to pick up and hold a standard 3"x5" index card for more than two seconds.
- Devices to increase down force, such as a vacuum pump or magnets, are only allowed for robots that weight greater than 3kg. They are not allowed in all other classes.
- All edges, including but not limited to the front scoop, must not be sharp enough to scratch or damage the arena, other robots, or players. In general, edges with a radius of greater than .005", as would be obtained with an unsharpened .010" thick metal strip, should be ok. Judges or competition officials may require edges that they deem too sharp to be covered with a piece of tape.

3.2 Lego Classes

3.2.1 Dimensions

No dimensional restrictions apply.

3.2.2 Weight Classes

No weight restrictions apply.

3.2.3 Build Rules

- WeDo: Competitors are restricted to the use of one standard WeDo 2.0 set. No other parts are allowed.
- EV3: Competitors are limited to the use of one standard MindStorms set. This may be either a Retail set, or an Education set. No other parts are allowed.
- Open: This category permits the use of any Lego part. The only limitation is that only Lego parts are allowed.

4 Competition Rules

4.1 Battlebots

In general, these competitions are conducted in line with the guidelines set out by the Fighting Robots Association (FRA) - http://www.fightingrobots.co.uk

4.1.1 Format

These competitions are conducted in a Knockout Tournament format: A knockout competition normally takes the form of a double-elimination tournament. Early rounds may consist of qualifiers where melees are scored 4 points for a knockout, 3 points for a judge’s decision, 2 points for coming second and 1 point for entering the arena. The top-ranking robots then continue through to the

main competition. In the event that the main competition is oversubscribed the bottom ranking robots will compete in one or more melees to determine who goes through.

Robots may be autonomous or R/C. Matchups make no distinction between autonomous and R/C bots. Roboteers will be given a reasonable time period to repair and recharge batteries with at least 15 minutes notice that their fight is about to start. Roboteers who fail to make it to the arena in time shall be deemed have been knocked out. Should a robot be unable to compete in the next round then the robot is knocked out.

Teams participate in a draw to determine matchups. Competing robots will begin the fight at opposite ends of the arena. The fight will begin after a countdown and will be signalled by a bell. Robots are not permitted to activate their weapons systems prior to the start bell. Each fight will be limited to a duration of 3 minutes.

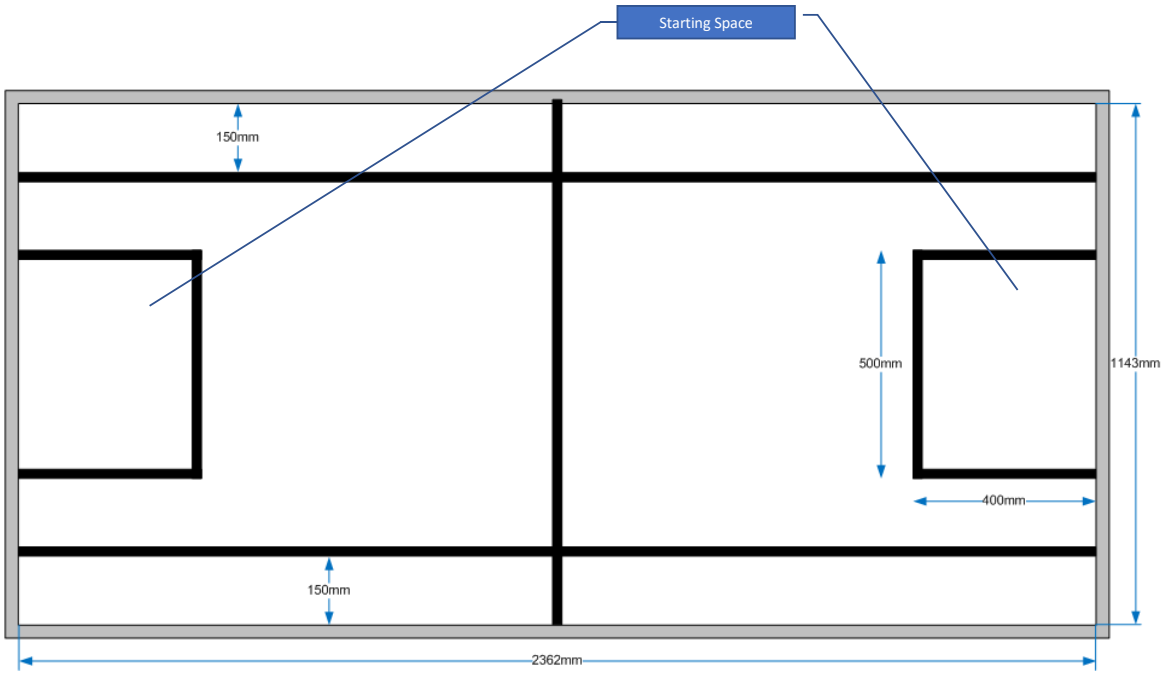
4.1.2 Rules and Judging

- All robots must comply with the Build Rules set forth in this document
- Team sizes of two to four members are allowed
- However, any given robot may be operated by up to 2 pilots
- Judging is performed by a Judging Panel, consisting of 4 Judges
- The Judges' decision is final
- Any robot that is unable to move or demonstrate control may be counted out by the judges. This may be due to mechanical failure or entanglement. When the judges identify a robot as immobile, a 10 second countdown will begin. During this time should the robot free themselves, the countdown will be stopped. Robots unable to move after the countdown reaches zero are knocked out
- When a robot is thrown out of the arena that robot will be deemed knocked out. The fight may be stopped while the robot is made safe should circumstances require this
- At the end of the fight cease is called and robots must stop fighting. Damage incurred after cease is called may not be counted and may result in disqualification
- Fights that last the entire duration are judged by the panel. Here each robot is subjected to a scoring (1 to 10) on the following parameters:
    - Damage: It is important that where a fight is judged on damage the judges need to be aware of any existing damage to a robot at the start of a fight. Cosmetic damage will not be taken into account, such as scratches to paint or other finishes (polycarbonate, etc.) and minor dents. Serious structural or mechanical damage will count against a robot. If a robot ceases to function during a fight due to loss of the removable link or any other internal component then it will be counted as damage
    - Aggression: Where a robot continually attacks their opponent, particularly where the attacker appears to be inferior technically to its opposite, for example a lightly armoured robot attacking a powerful spinning disc equipped robot
    - Control: Where a driver demonstrates a good level of precision in their driving, for instance an attack is started on an opponent who tries to veer away but the attack is taken to full contact, or conversely, an attack by a robot is attempted but due to good avoidance by the opponent the attack fails.

4.1.3 Arena Specification

- Lego and Antweight Classes:
    - Arena size: 2362 mm x 1143 mm
    - Arena Border Height: 70 ± 20 mm

- Arena colour is white (matte)
- All lines are of thickness: 20 ± 1 mm



- All Other Classes:
  - Competition will take place on a cement floor
  - The arena will have no markings, except for black border lines and black lines demarcating the Starting Spaces. Line thickness of all lines will be 50mm20 ± mm50mm ± 5mm
  - Overall internal dimensions of the arena will be as follows: 5000mmx5000mm

4.2 Sumo

In general, these competitions are conducted in line with the guidelines set out in the Robogames Unified Sumo Rules - http://robogames.net/rules/all-sumo.php

4.2.1 Format

Two robots compete in a head-to-head match following the basic system of traditional human sumo matches. Robots are allowed no weapons, and are not allowed to flip each other. The sole purpose is a pushing match between the two robots to force the other from the arena. Multiple weight classes and control systems are allowed (autonomous compete against autonomous and R/C against R/C - they are separate classes and do not compete against each other).

4.2.2 Rules and Judging

- A match is fought between 2 teams, each team having up to 4 members. Only one team member may approach the ring; other team members must watch from the audience. In accordance with the game rules each team competes on a Dohyo (sumo ring) with a robot that they have constructed themselves. The match starts at the judge's command and continues until a contestant earns two points. The judge determines the winner of the match.
- 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 points first, within the time limit, shall win the match.
- A team receives a point when they win a round. If the time limit is reached before one team can get two points, and one of the teams has received one point, the team with one point shall win.
- When the match is not won by either team within the time limit, an extended match may be fought, during which the team who receives the first point shall win.
- One point shall be given when:
    - 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.
    - 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.
    - When a wheeled robot has fallen over on the ring or in similar conditions, point will not be counted and the match continues.
- When judges' decision is called for to decide the winner, the following points will be taken into consideration:
    - Technical merits in movement and operation of a robot
    - Attitude of the players during the match
- The match shall be stopped and a rematch started under the following conditions:
    - The robots are entangled or orbiting each other with no perceivable progress for five seconds. If it is unclear whether progress is being made or not, the judge can extend the time limit for observable progress for up to 30 seconds.
    - Both robots move, without making progress, or stop (at the exact same time) and stay stopped for five seconds without touching each other. However, if one robot stops it's movement first, after five seconds it will be declared as not having the will to fight. In this case the opponent shall receive a Yuhkoh, even if the opponent also stops. If both robots are moving and it isn't clear if progress is being made or not, the judge can extend the time limit up to 30 seconds.
    - If both robots touch the outside of the ring at about the same time, and it cannot be determined which touched first, a rematch is called.

4.2.3 Arena Specification

The dohyo interior is defined as the playing surface surrounded by and including the border line. Anywhere outside this area is called the dohyo exterior

The ring shall be circular in shape and of the appropriate dimensions for the given size class.

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.

The border line is marked as a white circular ring of a width appropriate for the given class on the outer edge of the playing surface. The ring area extends to the outside edge of this circular line.

Dohyo Construction & Painting				Shikiri Lines			Border Width
Class	**Height**	**Diameter**		**Width**	**Length**	**Separation**	
Heavyweight	5.00 cm	154.0 cm		2 cm	20 cm	20 cm	5 cm
Featherweight and Lightweight	2.50 cm	77.0 cm		1 cm	10 cm	10 cm	2.5 cm
Antweight and Beetleweight	1.25 cm	38.5 cm		0.5 cm	5 cm	5 cm	1.25 cm

4.3 Capture the Flag

4.3.1 Format

- Two teams with 3 robots each (note: teams may join forces to jointly enter this competition) will compete in this competition.
- Each team starts the competition in its own base, marked on the arena floor.
- A flag is placed in a pre-determined location, marked by a red border square with the following specifications:
    - Square spec:
    - Flag spec
- One team must defend the flag and prevent its capture, while the other team endeavours to capture the flag and return it to its own base.
- The competition comprises 2 rounds of 3 minutes each, with teams switching between Defence and Offense
- In the case of a tie, a third round is conducted to determine the winner. In this case, a coin toss determines which team is on Defence and which on Offence.

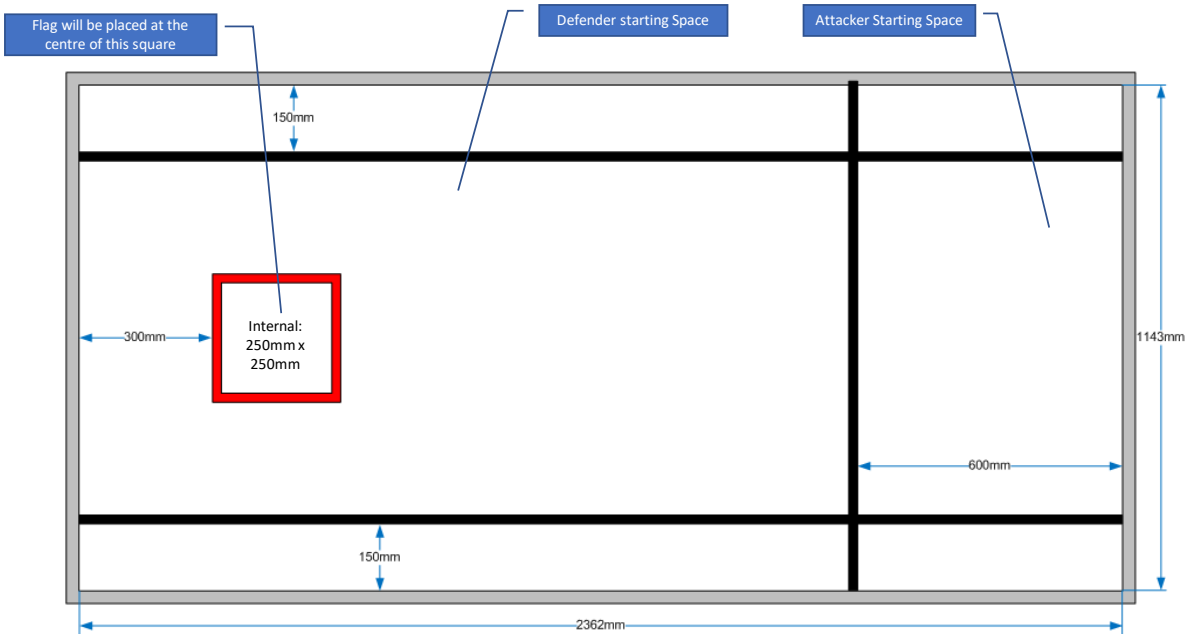
4.3.2 Rules and Judging

No rules apply, aside from the Build Rules specified herein.

If the attacking side does not capture the flag within the time limit, then the defending side will be declared the winner, and vice versa.

4.3.3 Arena Specification

- Lego and Antweight Classes:
    - Arena size: 2362 mm x 1143 mm
    - Arena Border Height: 70 ± 20 mm
    - Arena colour is white (matte)
    - All lines are of thickness: 20 ± 1 mm



- All Other Classes:
    - Competition will take place on a cement floor
    - The arena will have no markings, except for black border lines and a black line (Separator Line) separating the Attacker and Defender Sides
    - This line will run divide the arena into 2 sections, one of which (Defender side) will measure 5000mmx3500mm and the other (Attacker side), 5000mmx1500mm
    - The flag will be placed at the centre of a 500mmx500mm square defined by red lines
    - The square will be placed at random within the Defender side of the Arena, as determined by the judges, but such that the centre of the square will not be closer than 2500mm from the Separation Line
    - Line thickness of all lines will be 50mm ± 5mm
    - Overall internal dimensions of the arena will be as follows: 5000mmx5000mm.