Robot Athletics	Participation Category	Team	How to create
	Junior / Senior	1-2 person	On-site

1. Description

Robot Athletics is a record competition that uses wheeled robots to perform various sports, missions including curling, pushball, and more. The robots follow a black line to reach specific mission points, complete the assigned tasks, and then move to a destination in a timed race. The main objective is to assess participants' technical skills in sensor control, programming, and kinematic principles, as well as problem-solving skills for mission execution.

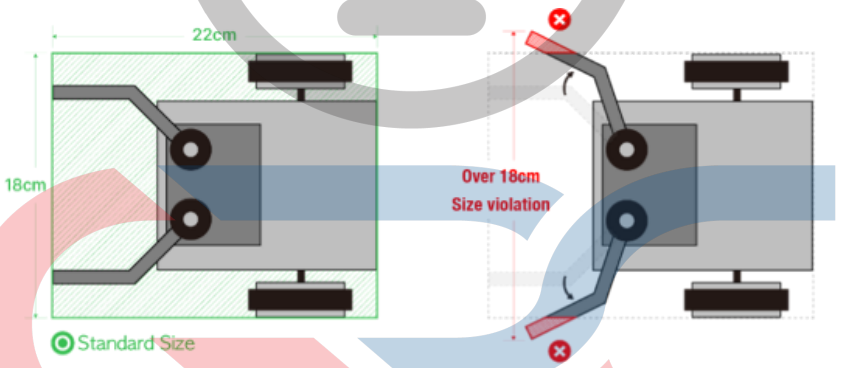
2. Robot

2.1. Type of Robot Wheeled robots that can play a variety of sports

2.2. Robot Manufacture All mechanical parts of the robot must be built on site and conform to the specifications.

2.2.1. Dimensions of the robot

2.2.1.1. The robot size is no larger than 18 cm x 22 cm (width x length)



<Figure 1> Standards and violations of robots

2.2.1.2. Measuring size

1) Participants can measure the size of their robot freely during build and practice time.

2) The referee will measure the size of the robot before the match starts.

2-1) Measuring Size: The participant can measure the size of the robot with a measuring tool after powering on the robot under the observation of the referee, and may not dispute the referee's judgment.

2-2) Modification time: If the size of the robot exceeds the standard, the robot will be given one minute to correct the problem and must be corrected under the referee's supervision. If the correction is not made within the allotted time, the record will not be recognized as a violation of the standard. Only hardware modifications are allowed (software modifications are not allowed).

3) If the size of the robot is different from the size at the time of measurement and the size changes before crossing the starting line during the competition, the participant will be disqualified for violation of the specifications.

2.2.2. Sensor No sensor limitations on the robot

2.2.3. Powering

2.2.3.1. Power source configuration The robot must use an autonomous, mobile, off-grid power source. No combustion engines are allowed.

2.2.3.2. Power Capacity There are no usage restrictions on the capacity current and voltage of the power source.

2.2.4. Robot Drive No drive restrictions for robots

2.3. The program and Control Robot must be capable of autonomous driving by the program and must not be externally manipulated except when departing (the robot may be held in the departure position).

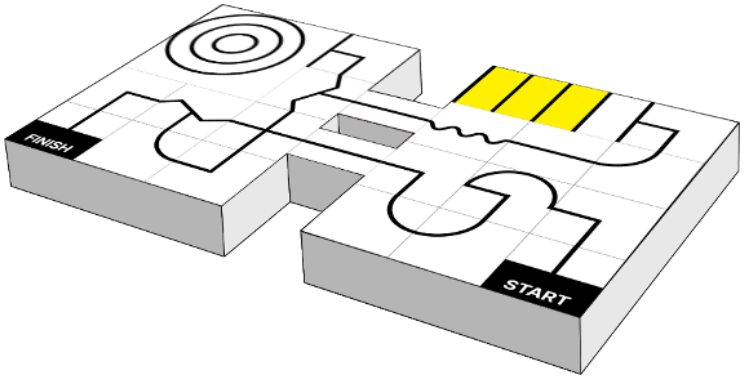
2.4. Disassembling the motor horn and wheels The wheels and tires do not need to be removed, and the wheels and motor horn cannot be pre-attached.

3. Playfield

3.1. Authorized Playfield A participant must use a playfield authorized by the International Robot Olympiad Committee.

3.2. Playfield A playfield has a dimension of 160cm x 120cm (±10% tolerance), and it consists of two or more pallets connected together. Mission maps are fixed to the pallets. The mission map will be revealed on the day of the match.

3.2.1. Playfield Connection Playfields are connected by straight or curved bridges with a width of 25 cm (±10% tolerance).



<Figure 2> Example Arena and Mission

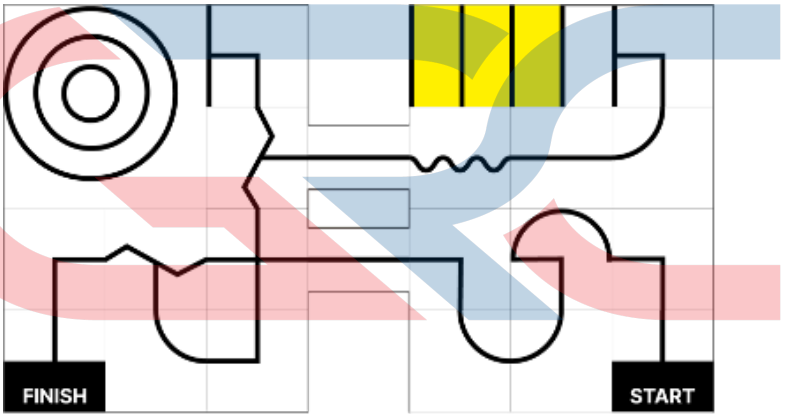
3.2.2. **Playfield tolerances** Playfields can have tilts of no more than 2° (±10% tolerance) and bumps or gaps of no more than 3 mm (±10% tolerance).

3.2.3. **Robot Fall Protection Structure** No separate structure is installed to prevent the robot from falling.

3.3. **Field Specifications** The field is made out of a white matte-coated padded paper and may have advertising or the organizer's logo.

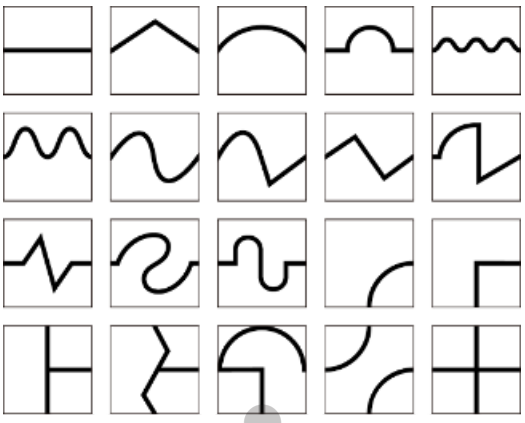
3.3.1. **Path** A path is created with a black line with a width of 20±3 mm.

3.3.2. **The mission map** consists of a combination of straight lines, curved lines, curved lines, curved lines, and intersecting blocks. The blocks measure 40 cm x 40 cm (±10% tolerance) and are fixed to the playing field with sheet paper and tape. The same blocks can be laid out multiple times, as shown in Figure 4.



<Figure 3> Mission map example

* These rules are not final and may be updated up until the day before the competition. Any unauthorized use and copying of these rules may result in legal liability for copyright infringement.



<Figure 4> Example of a mission map block

<Figure 5> MissionGate and missions included in the sample file

*A sample Mission Map block can be downloaded from the IROC official website documentation. (File name: R_Athletics_Block(2024).zip)

1.3.3. **Start and Finish Point** The start and finish point can vary in location and direction depending on the mission.

4. Match Progression

4.1. **The competition** is a record event where rankings are determined by comparing everyone's records(score). There will be a total of two rounds, with time to correct between each round. The final score is determined by summing "mission score" and "time record".

4.2. **Line Out** Robots must not leave the line while driving. If the robot leaves the line, the participant will be declared TKO and the match will end on the spot. However, line out rule does not apply when entering the curling and pushball mission areas. Line Out is defined as both axles (both wheels) navigating off the line, which will result in a TKO if it occurs.

4.3. **Robot building and practice time** will be a minimum of 2 hours and will be announced on the day of the competition.

4.4. **Match Points** Robot must pass through an " ⊦ " shaped mission gate to execute a curling or pushball mission. The target is located at the mission gate or in the empty space

in front of it. The robot must also pass through the mission gate when exiting. Targets can be positioned anywhere on the mission map except near the start or finish gates.

4.5. Playfield assignments The playfield assignments will be based on the number of participants and difficulty level of the competition.

4.6. Robot building and practice Participants may practice in their assigned playfields until the end of the announced building and practice time, and may not practice before their assignment.

4.7. Round 1 The first round will be held after the robot build and practice periods have ended. Lunch break may be adjusted depending on time.

4.7.1. Match Preparation All participants must come out with their robots and wait as directed by the referees and staff at each stadium.

4.7.2. Post-match All participants wait in a queue until they have finished their match and other participants have finished their matches, and then move to their seats after all participants have finished their matches.

4.8. Modification Time After the first round of competition, all participants will have the same amount of time to modify or practice their robot. The modification time will be announced on the day of the match.

4.9. Round 2 begins immediately after the correction time.

4.9.1. Match Preparation Same as in Section 4.6.1

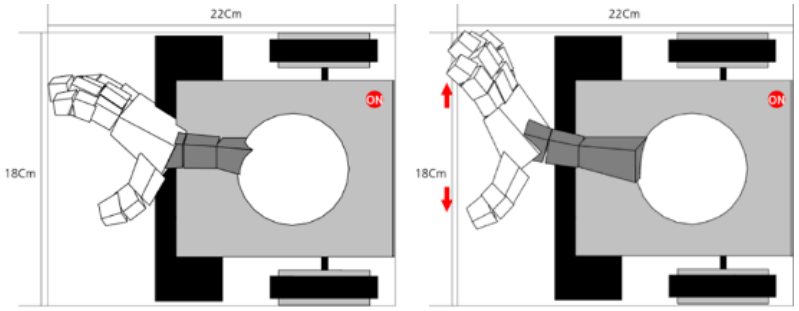
4.9.2. Post-match Same as section 4.6.2.

5. Match Progression

5.1. Mission Revelation The shape of the arena and bridges, the line structure, and the missions to be performed are revealed in the form of a mission map on site before the start of the match.

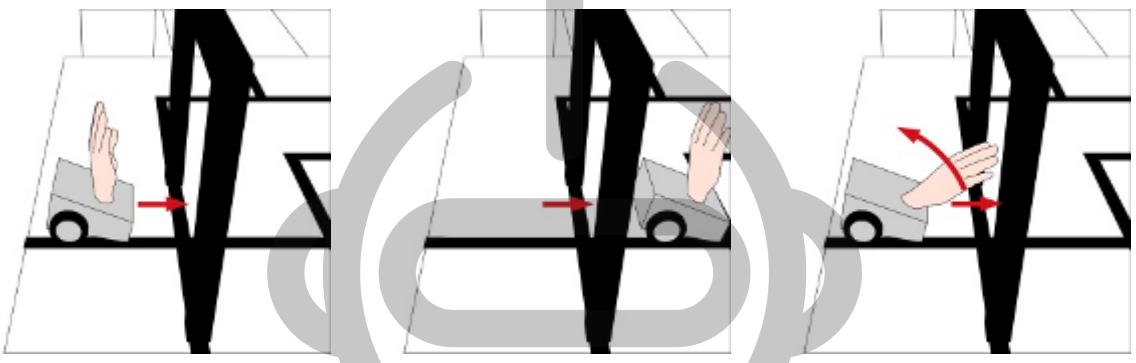
5.2. Time limit for starting a match is 2 minutes.

5.2.1 Start The robot will start on the signal of the referee and will be timed. If the shape of the robot when measuring the size of the robot is different from the shape before passing through the device and the size changes, the robot will be disqualified according to the rules.



인정 GOOD ⚠ 규격위반

*가로x세로가 바뀌는 경우에도 적용은 동일



Correct Shape **Proper Start** **Incorrect Start**

5.2.1.1 Start Point Robot must be partially placed in the black portion of the start point and must follow the straight line from it. Taking shortcuts or moving in the opposite direction will be recognized as a false start and will require a restart.

<Figure 6> Start point

5.2.1.2 Miss Start Failure to start within 5 counts of the start signal will be declared a failure to start and the participant will be given a maximum of 3 chances to restart (2 restarts).

5.2.1.3 False Start The following are recognized as false start:

1) If the robot was activated before the referee's start signal

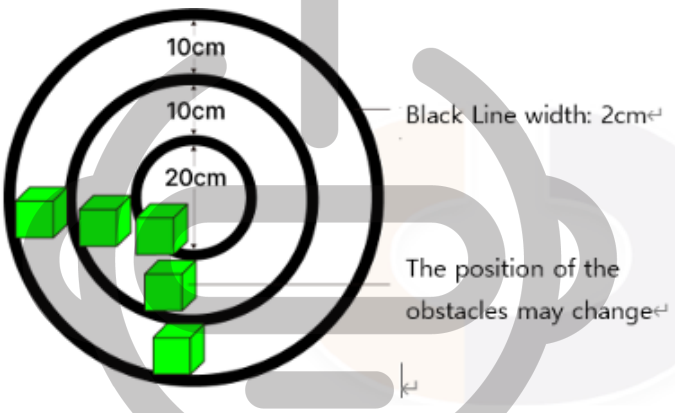
2) If a participant takes a shortcut from the start point

3) If a robot is moving in the opposite direction from the start point

5.2.1.4 Restarts Participants get a maximum of 2 restarts for a missed start and 1 restart for a false start.

However, only one restart is granted after a false start.

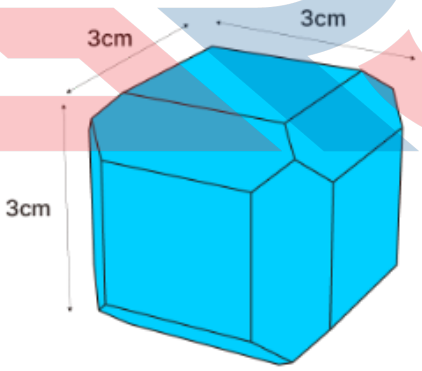
5.3. Curling Participants are given a circular target as shown below. They have to place the target between the obstacles. Each destination is worth a point. Points are only awarded if the target is in contact with the robot. The robot must move the block using part of its gripper or sensor. Striking, hitting, or launching actions are prohibited. Moving the block with wheels or other parts is allowed.



<Figure 7> Example of bull's-eye dimensions and obstacle placement

5.3.1. Size and shape of the target Polyhedron with dimensions 3 cm x 3 cm x 3 cm (width x length x height, ±10% tolerance)

5.3.2. Target weighs 30 grams or less (±10% error)



<Figure 8> Example of a target

5.3.3. **Movement of a Target** Targets must be placed at the final destination. However, during transportation, the robot may pass through non-destination areas.

5.3.4. **Movement of Targets** Only one target may be moved at a time. If the robot collides or comes into contact with another target while holding a target, the held target will not be awarded points even if it reaches the final destination.

Ex) If Target A is being carried and comes into contact with Target B → Target A's score is invalidated.

If Target B is temporarily placed on the line and moved later → Target B's score may be counted.

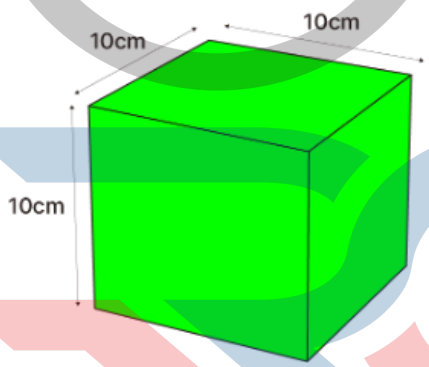
5.3.4.1. If a target is moved to a higher point space due to contact between the target and a target that is already at its destination during the movement of the target, this is counted as a point.

5.3.5. **Lost Targets** are targets that fall outside of the playfield cannot be brought back in.

5.3.6. **The color of the Target** can be any color.

5.3.7. **Target placement** will be on the mission map.

5.3.8. **Obstacle Dimension** 10 cm x 10 cm x 10 cm (width x length x height, with a tolerance of ±10%) for the obstacle.



<Figure 9> Example of an obstacle

5.3.9. **Obstacles** The number and location of obstacles placed in the arena will be revealed on the day of the match and will be fixed in the arena.

5.3.9.1. **Touching Obstacles** Even If a robot or target touches an obstacle, points will not be deducted while carrying out the mission.

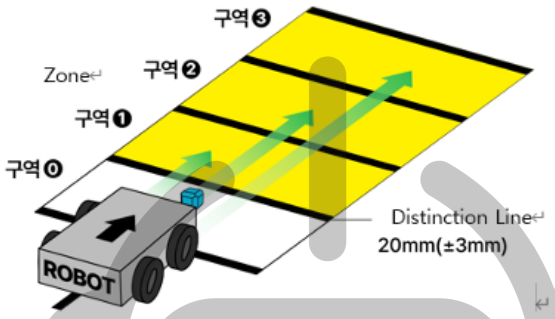
5.4. **Pushball** The objective is to move the target into the designated area. Points are only awarded if the target remains in contact with the robot. The robot must move the block using part of its gripper or sensor. Striking, hitting, or launching actions are prohibited. Moving the block with wheels or other parts is allowed.

5.4.1. **Size and shape of the target** is the same as in Section 5.3.1.

5.4.2. **The weight of the target** is the same as in Section 5.3.2.

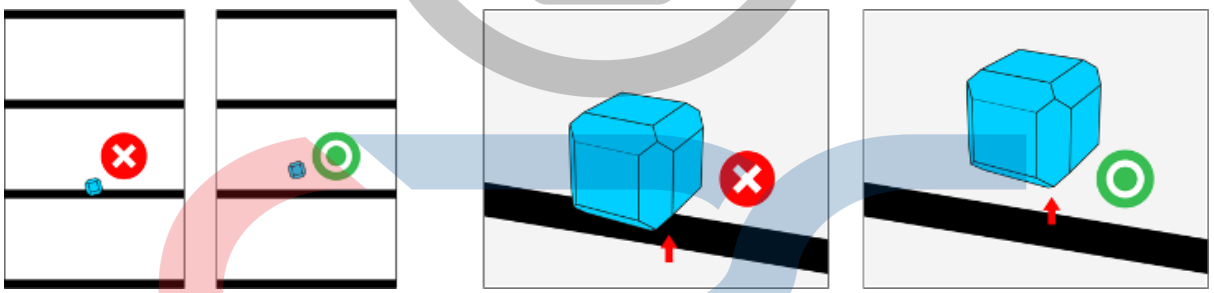
5.4.3. **Initial location of the target** The target is located on the horizontal line of the 'T' shaped mission gate, or Zone 0.

5.4.4. **Number of targets** Targets are located at specific locations on the map and can range from 1 to 10 in number.



<Figure 10> Initial location and zoning of the target

5.4.4.1. The target must cross the dividing line completely and no points are awarded if it touches the line.



<Figure 11> Correct position when moving the target

5.5. End of Match

5.5.1. **Finish Point** The robot must stop exactly at the Finish point and stay there for at least 3 counts to be considered successful.

<Figure 12> Finish Point

5.5.2. **Arrival** If the robot arrives at the arrival point before the time limit, the match is over and the mission score and time record at the end of the match will be recognized.

5.5.3. **Time Over** If a robot does not pass the finish point within the time limit, the time at the end of the time limit will be recognized as the record.

5.5.4. **Robot Stop** If the robot does not operate during the match, the referee will give a 10-second count, and if the robot does not operate normally within the count, the referee will declare the robot stop and only the mission score at the time of the stop will be awarded.

5.5.5. **Technical Knock Out (TKO)** If a robot cannot continue normal operation, the referee will issue a 10-second count. However, in certain cases or at the referee's discretion, a TKO may be declared immediately as a "robot stop." TKO conditions include the following:

1) Repeatedly moving a region

2) Robot has stopped progressing at a point due to being stuck or blocked by a structure, obstacle, etc.

3) Leaving the arena (falling robots), etc.

4) Line out

5.6. **Disqualification** In the event of any violation of the rules of the game or interference with the progress of the match, the match shall be terminated immediately, and all records of the match shall be disregarded and no remedy shall be granted. (However, Articles 5.5.4/5.5.5 shall apply only to the given match).

5.6.1. **Robot Repair** During the competition, no addition/removal/exchange/alteration of robot parts is allowed during the competition, and any robot found with spare parts, tools, batteries, etc. for the purpose of repairing the robot waiting for the competition will be disqualified.

5.6.2. **Sensor Tuning** Attempting or being caught tuning sensors in the arena before the start of a match will result in disqualification.

5.6.3. **Failure to comply with playfield assignment** Any participant found practicing or competing in a playfield other than the assigned playfield will be disqualified.

5.6.4. **False Start** Any participant with two or more false starts in a given match will be disqualified.

5.6.5. **Miss Start** If a participant fails to start three times in a given match, the participant will be disqualified.

5.7. Rematch In the event of an unforeseen event, such as a power outage, a rematch may be held at the discretion of the referee and organizers.

5.8. Referee's Decision The referee has the authority to preside over all situations and control the participants from the beginning to the end of the match. Deciding the outcome of a match is the sole authority of the referee and their declaration is final.

6. Match History

6.1. Scorekeeping Items Mission Performance Scores, Time Record, Finish Point Missions

6.2. Mission Record For each mission, the mission score is calculated after the end of the match is declared, and the status of the target is reported at the destination.

6.3. Time record is recognized when the robot passes the start and finish points. (Stops, falls, and TKOs will not be recognized.)

6.4. Final Score The better of the first and second match is recognized as the final score.

6.5. Priority in record The referee will first classify teams based on their mission performance scores. Then, among the classified teams, rankings will be determined by comparing their time records.

Mission Score > Presence of time record > Comparison in time records (Time Record)

6.5.1. Prioritization by time period If the driving results are equal between two or more participants in the same time period, the ranking is determined by comparing the records from the other round.

6.5.2. In event of a Tie When the final scores are equal between two or more participants, the better of the first and second rounds will be prioritized.