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Territory Takedown	Division	Team	How to Create
	Junior	2 people, team	Pre-production

1. Description

Territory Takedown is a competitive game in which two players on a team compete against an opponent to collect as many resources as possible. It requires autonomous judgment through coding and problem-solving through radio control to acquire targets, load, move, navigate, and complete missions.

2. Robots

2.1 Type of robot wheeled robot with the ability to acquire, load, and move targets.

2.2 The robot's configuration

2.2.1 Manufacture: Robots must be entered as pre-built and there will be no time to assemble or modify the robot at the competition site.

2.3 The size of the robot Within 25cm x 25cm x 25cm (length x width x height) (The robot must still fit within these dimensions after deformation.)

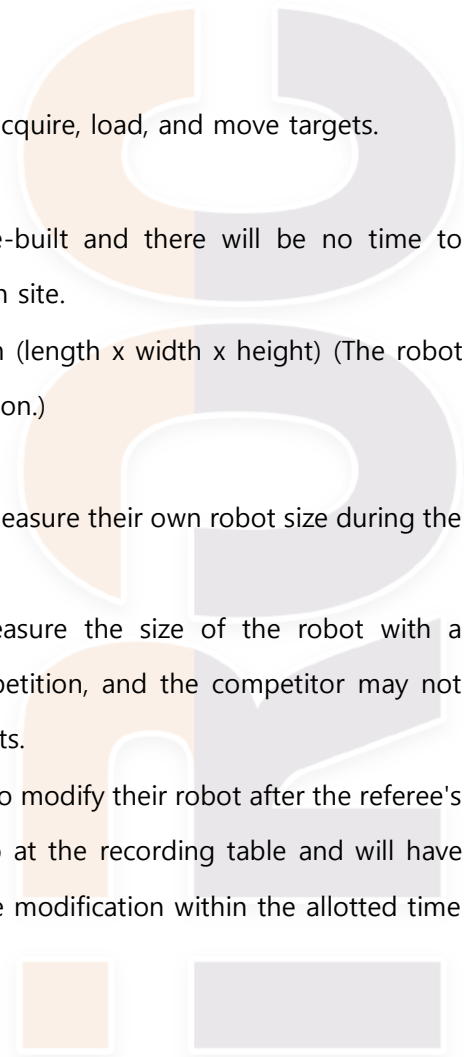
2.3.1 Measurement of size

- 1) Autonomous measurement: Participants can measure their own robot size during the test.
- 2) Official Measurement: The referee must measure the size of the robot with a measuring tool before the start of the competition, and the competitor may not challenge the measurement process and results.

2.3.2 Robot Modification Competitors who need to modify their robot after the referee's official measurement is complete may do so at the recording table and will have one minute to do so. Failure to complete the modification within the allotted time will result in disqualification.

2.4 Sensors on a robot: Unlimited

2.5 Parts of a robot: Unlimited



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2.6 Team Robot Configuration Each team of two players shall compete in the competition using their own robot, and for convenience, the robot in Zone A shall be referred to as Robot A and the robot in Zone B shall be referred to as Robot B.

2.7 Power source and capacity of the robot The robot must use an autonomous, mobile, off-grid power source and cannot use a combustion engine. There are no usage restrictions on the current and voltage of the robot's power source.

2.8 Programs and controls

2.8.1 Control mode: To complete the mission, the mission is performed through the coding program (autonomous driving) and then the control mission is performed through unwired control.

2.8.2 Communication standards

2.8.2.1 Communication standards Allow only Zigbee, Bluetooth, and 2.4GHz wireless communication.

2.8.2.2 You can control the robot via smartphone, but it must be set to flight mode while in the arena.

2.8.2.3 Wired piloting is not authorized.

2.8.2.4 In case of communication interference, if it is not possible to change the communication channel, the participant will not be able to participate in the competition and will be disqualified.

2.9 Spare robot Competitors may bring a spare robot, which must be verified by the referee prior to the match.

2.9.1 Use of Spare Robots Robots are not allowed to be switched during a match. A spare robot may be substituted prior to the start of a match after confirmation from the referee.

2.9.2 Substitutions Before the start of each match, substitutions can be made after referee verification.

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3. Stadiums

3.1 Authorized venue: Use an authorized venue as defined by the International Robotics Olympiad Committee.

3.2 Stadium dimensions and configuration 160 cm x 120 cm ($\pm 10\%$ tolerance) with two pitches connected to form 160 cm x 240 cm.

3.2.1 Stadium tolerance Stadiums can have a tilt of no more than 2° ($\pm 10\%$ tolerance) and bumps or gaps of no more than 0.3 cm ($\pm 10\%$ tolerance).

3.2.2 Robot falls There will not be a separate arena perimeter wall to prevent bot falls.

3.3 Playfield field The floor is made of padded paper, has a white color, and may be partially covered with advertising or the organizer's logo.

3.3.1 Mission Map mission map with destinations is used and is secured to the playing field with pads and tape. Various accessories and obstacles are also placed in various locations.

3.4 Arena Accessories

3.4.1. Golden Balls Golden Balls used in missions are gold cubes, one for each team faction.

3.4.1.1. Weight: 15-20 grams or less ($\pm 10\%$ tolerance)

3.4.1.2. Size: 3cm x 3cm x 3cm (W x D x H, $\pm 10\%$ tolerance)

3.4.1.3. Location: One of four locations at Destination C, to be revealed on the day of the competition.

3.4.2. Objective: 10 red cubes in the common area and 8 blue cubes for each team faction.

3.4.2.1. Weight: 15-20 grams or less ($\pm 10\%$ tolerance)

3.4.2.2. Size: 3cm x 3cm x 3cm (W x D x H, $\pm 10\%$ tolerance)

3.4.2.3. Location: Red cubes can be placed anywhere in the common area, blue cubes can be placed anywhere in each team's faction, with specific locations revealed on the day of the event.

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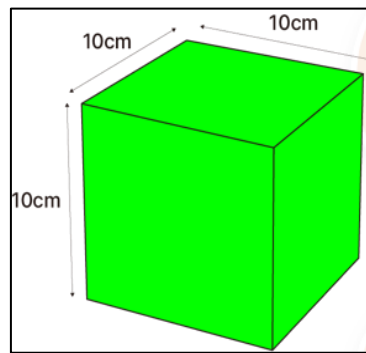
<Figure 1> Golden ball and target example

3.4.3. Obstacle 1 for each team faction.

3.4.3.1. **Weight:** 200 grams or less ($\pm 10\%$ tolerance)

3.4.3.2. **Size:** 10 cm x 10 cm x 10 cm (W x D x H, $\pm 10\%$ tolerance)

3.4.3.3. **Location:** Can be placed anywhere within each team's faction and will be revealed on the day of the tournament.



<Figure 2> Example of an obstacle

3.5. Destinations

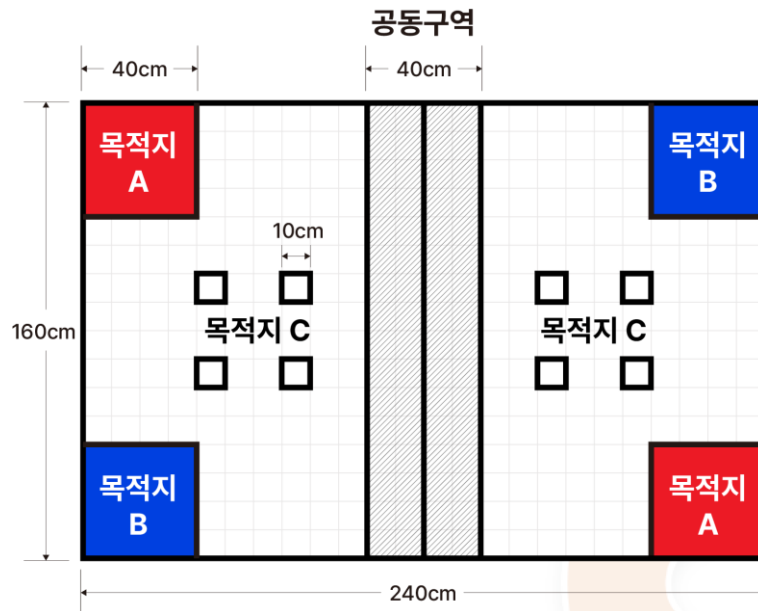
3.5.1. **Starting Points A, B** These are the starting points for Robot A and Robot B. They are 40 cm x 40 cm in size, the same color as the target, and are fixed at each corner of the arena.

3.5.2. **Destination C:** The dimensions are 10 cm x 10 cm. There will be four Destination C locations, one of which will be the location of the Golden Ball and one of which will be the destination of the other three balls. The exact location will be revealed on the day of the match.

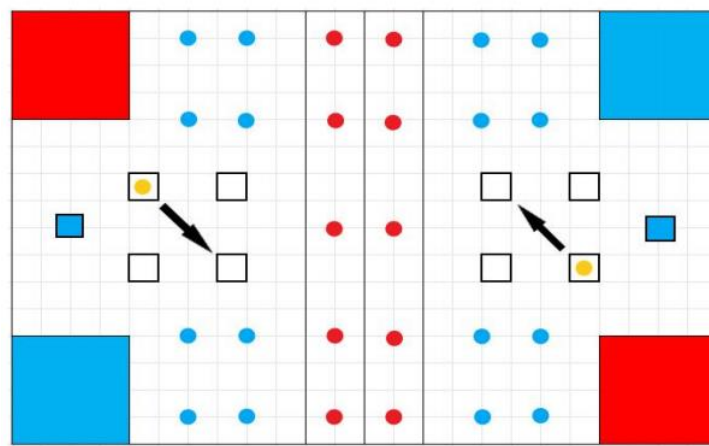
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3.5.3. Common Area: The 40 cm x 160 cm space in the center of the arena is the common area. 10 red cubes are placed symmetrically at random locations in the common area and only Robot A can enter.



<Figure 3> Mission paper example



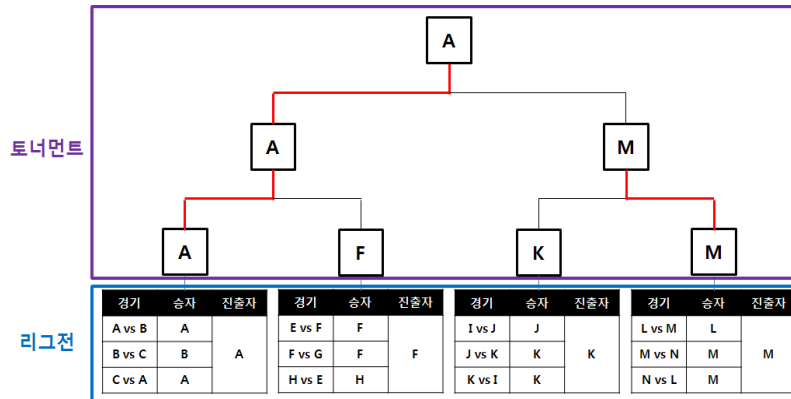
<Figure 4> Example of targets, obstacles, and mission locations

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4. Match progression

4.4. Gameplay: Matches are played between two teams in a 2v2 format, with league and tournament play.



<Figure 5> Example of how a match is played

4.1.1 Coding and Practice Time On-site coding and practice time will be no more than 2 hours and will be announced on the day of the match.

4.1.2 Arena Assignments Areas are assigned based on the number of participants and difficulty level of the competition, and participants may only practice within the allotted time within the assigned area. No practice is allowed in unassigned arenas.

4.1.3 End of Coding and Practice Time Competitors must stop operating their robots and follow the referee's instructions.

4.5. League matches (group draw): The groups are randomly assigned by the organizer's program. The draw will be announced on-site by the referee. The team with the highest number of points will advance to the tournament. (Winning points: 3 points for a win, 1 point for a draw, 0 points for a loss)

4.6. Tournament (Main Event)

- 1) Opponents are randomly determined by the organizer's program.
- 2) In the event of an odd number of teams advancing to the main draw, the remaining teams will be moved up to the consolation bracket.

4.7. Robotic Modification At the discretion of the referee after the match, all teams may be given the same amount of time to make corrections.

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5. Match

5.1 Start of the Match When the referee signals the start of the match, the competitors must activate their robots. Each of the two robots is located at the designated starting line. Robot A is tasked with the Golden Ball mission and Robot B is tasked with the Obstacle mission.

5.1.1 Restart A robot that does not work within five seconds of the referee's start signal can restart only that robot. It is given a total of three opportunities. The other robots in operation will continue to compete unaffected.

5.1.2 False Start If it is judged to be a false start when the robot is operated before the referee signals the start, the game is restarted. At this time, a total of two opportunities are given. The team that started illegally in both times will be disqualified and the opponent team automatically wins.

5.2 Performing Missions

5.2.1 Golden Ball Mission Robot A shall be the first to perform the Golden Ball Mission. The Golden Ball Mission shall be performed under the control of a coded program (autonomous driving) and shall transport the Golden Ball from the Destination C area to one of the three remaining locations announced on the day of the competition.

5.2.1.1 Mission Chance You will have 3 chances to complete the mission and the number of attempts will determine how many points you earn. The start of each opportunity is determined by the time the robot leaves the starting point A and leaves the destination C area.

5.2.1.2 Mission Complete After completing the Robot A mission, the competitor manually moves the robot to Area A and converts it to control model to continue. However, the three Golden Ball Mission opportunities must be used until successful, and the robot cannot be moved to the destination Area A after abandoning. If the contestant fails, the contestant must manually move the robot to Area A and try again. If all three attempts fail, the contestant must move Robot A to Zone A, convert to control mode, and continue to the next mission.

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5.2.1.3 Deductions Each time Robot A or Robot B hits the Golden Ball during control mode movement, it will be deducted one point. If either Robot A or Robot B causes the Golden Ball to deviate from its designated destination, the Golden Ball's score will be invalidated.

5.2.2 Obstacle Mission One obstacle will be randomly placed in each team's camp and Robot B will be the first to perform the obstacle mission. The location of the obstacle will be revealed on the day of the competition.

5.2.2.1. Mission Opportunities 3 total opportunities, no points awarded.

5.2.2.2. Robot B only needs to touch the obstacle to show the change in position of the obstacle through the control of the coding program (autonomous driving) to complete the mission. However, the three chances to touch the obstacle must be used until successful and cannot be abandoned to proceed to the next mission. If the contestant fails, the contestant must manually move the robot to Area B and try again. If the contestant fails all three times, the contestant must move Robot B to Area B, convert it to control mode, and continue to the next mission.

5.2.2.3. After the control mode conversion, either Robot A or Robot B can push the obstacle out of the playing field or move it into the opponent's camp.

5.2.2.4. Deductions

5.2.2.4.1. Deductions will be made if any obstacles remain in your arena area after the match is completed. (See Section 6, Method of Evaluation, for the number of points deducted.)

5.2.2.4.2. Per 1 touch While performing golden ball mission and obstacle mission, 1 point will be deducted

5.2.3 Blue Cube Mission 8 blue cubes will be at random points in both factions. After completing the program mission, Robot A and Robot B can move the blue cubes to Area B by control mode.

5.2.3.1 Number of moves There is no limit to the number of blue cubes that can be transported at once.

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5.2.4 Red Cube Mission: You need to place 10 red cubes in the common area and transport them to destination A.

5.2.4.1 The red cube in the common area can only be entered and carried by Robot A after it has completed the Golden Ball mission.

5.2.4.2 The red cube located inside each team's faction can be carried by both Robot A and Robot B.

5.2.4.3 Only one red co-target can be moved at a time. (Multiple moves are invalid)

5.3. Match time 2 minutes

5.4. Ending a match

5.4.2. Mission completion: The match ends when the mission is completed within the time limit. Mission completion means that there are no targets to move and no obstacles. At the end of the match, the score and time are recorded in the match history.

5.4.3. Technical Knock out (TKO): The referee may declare a TKO if the robot is deemed unable to perform a normal match.

- 1) If the robot hovers over a section repeatedly
- 2) If you get stuck between targets and obstacle points and stop moving
- 3) Leaving the arena, etc.

5.5. Robot Stop: If a robot stops during a match, the referee will count 10 seconds. If the robot is not functioning properly after 10 seconds, the referee will declare the robot stopped and the stopped robot and the competitor will leave the match. At this time, one robot from the same team and the opposing team may continue the match.

5.6. Ending a match by disqualification

5.6.2. Robot Touch: When Robot A and Robot B are performing a coding program mission, may not touch the robot without the permission of the referee before the end of the match is declared, except when the robot is moved to Area A or Area B.

5.6.3. Warning: The referee will issue a warning to a competitor if he/she disobeys the referee's instructions or is deemed to be disruptive to the match. After two warnings, the competitor will be disqualified regardless of the outcome of the match.

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- 5.6.4. **False Start:** A second false start will result in disqualification as per Section 5.1.2.

- 5.6.5. **Trespassing:** If both of Robot A's rear wheels encroach on the opponent's side of the field, Robot A will be disqualified and Robot B will continue.
- 5.6.6. **Failure to honor playfield assignment:** Any participant caught practicing or competing in a venue other than their assigned playfield will be disqualified.
- 5.6.7. **Common Area Encroachment:** If both of Robot B's rear wheels are in the Common Area, Robot B will be disqualified and Robot A will continue.
- 5.6.8. **Collision in the Common Area:** If Participant Robot A intentionally obstructs the path of an opponent or collides with an opponent while moving the red cube, the chase will be disqualified.
 - 5.6.8.1. If two robots collide to get the same red cube, the behavior of each participant is not judged as intentional sabotage.
 - 5.6.8.2. In the case of Section 5.6.8.1, if a stalemate occurs due to confrontation or tangling of the robots, the Referee will instruct both competitors to pick up their robots and move them to the right corner of the common area on their side of the Faction. The referee will then give the start signal to resume play. If a false start occurs on the restart after the robot has been moved, Section 5.6.3 applies.
- 5.7. **Rematches:** In the event of a power outage or unforeseen circumstances, rematches may be held at the discretion of the referees and supervisors.
- 5.8. **Referee's Rulings:** The referee has the authority to preside over all situations and supervise the participants from the start to the end of the match. Deciding the outcome of a match is the sole authority of the referee and his/her declaration is final.

5. Evaluation

- 6.1 **Scoring method:** The team with the highest total score in both rounds wins.
 - 6.1.1 Move the golden ball to destination C. 1st trial: 10 points / 2nd trial: 8 points / 3rd trial: 5 points
 - 6.1.2 2 points for each successful red cube move (e.g., 20 points for moving all 10)
 - 6.1.3 1 point for each successful blue cube move (e.g., 8 points for moving all 8)

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6.1.4 Deductions

6.1.4.1 Obstacle Mission Penalties

6.1.4.1.1 No points are deducted for obstacles that fall out of playfield.

6.1.4.1.2 Deductions are awarded based on the number of obstacles remaining on the boundary of the arena or common area at the end of the match. (Go to section 5.2.2 as this is a demerit element of the mission)

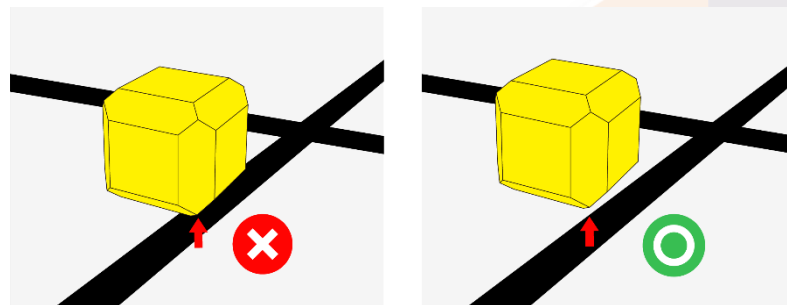
- 1) 1: 3 points penalty
- 2) 2: 6 points penalty

6.1.4.1.3 If 1 obstacle is in a common area, both sides lose 3 points

If 2 obstacles are in a common area, both sides lose 6 points

6.1.4.2 If either Robot A or Robot B hits the Golden Ball while on control mode, 1 point will be deducted for each hit (no limit to the number of hits) and no points will be awarded if the robot leaves the destination within the Destination C zone.

6.2 The final state of the target is used to determine the target score, and if the bottom of the target touches the boundary line, it is not scored.



<Figure 6> Example of a target and boundary line

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6.3 Tiebreakers

6.3.1 League round tiebreaker

6.3.1.1 If three teams are paired together and all three teams are tied with one win and one loss, the winner is determined by comparing the difference between their points and their opponents' points over the two matches. If the scores are equal, the team with the highest total score wins.

Ex) A:B 20:15 / B:C 18:15 / C:A 20:10

	Goal differential	Goal differential total
A Total points: 30	-3	-5
B Total points: 33	+3	+1
C Total points 35	+2	+7

C wins the goal differential total, +7, and advances to the next round.

6.3.2 Tournament tiebreaking criteria

6.3.2.1. Team with the highest combined Golden Ball score

6.3.2.2. 6.3.2.1. In the event of a tie, the team with the fewer deducted points

6.3.2.3. 6.3.2.3. In the event of a tie, the team with the lighter combined weight of Robot A and Robot B (including batteries) will be determined by weighing Robot A and Robot B.