

16. Robot Penalty Shoot-out

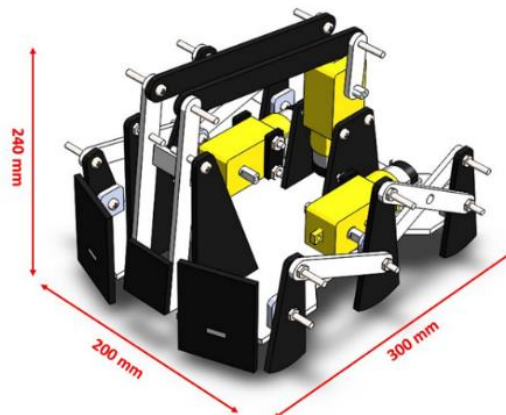
Level : Junior / Senior

Overview

Penalty kicks are one method of determining the winner in football. In this Robot Penalty Kick Competition, each team will be allowed 5 attempts. The team with the highest score after all attempts is declared the winner.

Robot Specifications

1. Each robot may use no more than **4 motors**.
2. The robot must not exceed the following dimensions: **Width: 200 mm, Length: 300 mm, Height: 240 mm**, and must weigh **No weight limit**.
3. The robot must move in a **walking-like motion**.
4. The robot must be controlled via a wired remote control only. Pressing a button once must cause the robot to perform only one action. The control cable must be elevated above the ground at all times. The cable must not touch the ground during the competition.
5. The **maximum battery voltage** allowed is **8.4 volts**.
6. Rechargeable batteries are permitted.
7. **Li-Po (Lithium Polymer) batteries are not allowed.**
8. The **front of the robot** must be equipped with slanted walls on both sides, sloping toward the rear, to prevent the walking legs from touching the ball.
9. The **kicking mechanism** must be designed to **swing**, not rotate. The direction of the kick must be **forward-facing**, relative to the robot.
10. **No modifications or adjustments** to the robot are allowed during the competition.



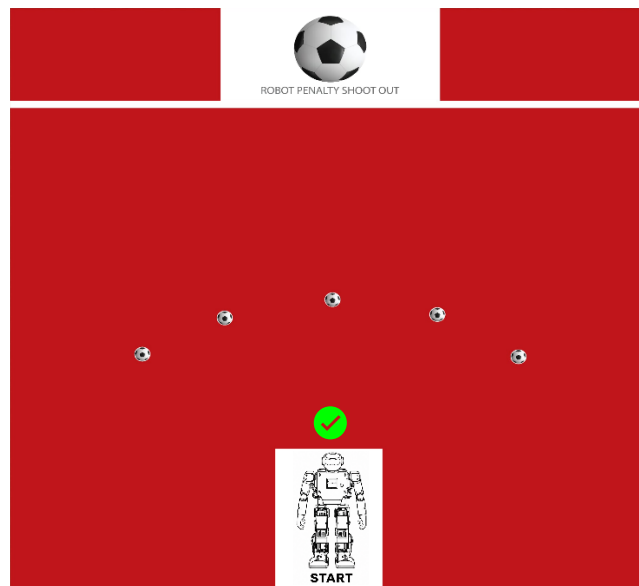
Competition Field Specifications

1. The competition field has dimensions of 1200 mm x 1200 mm. The goal is 400 mm wide and 150 mm high.
2. A tennis ball will be used as the football for this competition, with five ball-placement points arranged in an arc.

Competition Rules

1. The match duration is 2 minutes, with 2 rounds of competition.
2. After the contestants enter the competition area, no additional equipment or substances are allowed to be brought in.
3. After the robot has been submitted for inspection, the referees will place the robot at a designated location assigned by them. Contestants are not allowed to repair the robot until the first round of competition is completed (repairs can be made only during their own competition time). The repair time is at the discretion of the field referees (repairs must be performed strictly within the competition area).

Replacing the robot is prohibited.



4. Contestants place the robot at the starting point along with the remote control and turn it on. Upon hearing the signal from the referee:
 - Contestants start the timer themselves.
 - Control the robot to move and kick the footballs one by one out of a total of 5 balls.
 - Each football can only be touched or contacted once.

- During the competition, the remote control wire must not touch the field floor, nor pull, restrain, or drag the robot.
- When all 5 footballs have been kicked, the contestant must maneuver the mobile robot back to a complete stop at the Start point (with the robot entirely inside the boundary, with no parts extending outside the START area as shown in the image above) and place down the remote control. Only then can the timer be stopped to officially conclude the competition, after which the judges will record the actual score and time used by the contestant.

The referee will record the actual time used only when:

1. All 5 footballs have been kicked, regardless of the score calculation.
2. The robot is returned to the Start point and the remote control is placed down.

- Example of mission time recording:

Case 1: Successfully kicks 3 footballs into the goal and misses 2 footballs, then returns the robot to the Start point, places down the remote control, and stops the timer. **The referees will record the actual time used by the contestant.**

Case 2: Successfully kicks 3 footballs into the goal and misses 2 footballs, but fails to return the robot to the Start point and place down the remote control before stopping the timer. **The referees will record the maximum time of 2 minutes.**

Case 3: Successfully kicks all 5 footballs into the goal, but fails to return the robot to the Start point and place down the remote control before stopping the timer. **The referees will record the maximum time of 2 minutes.**

Case 4: Successfully kicks all 5 footballs into the goal, returns the robot to the Start point, places down the remote control, and stops the timer **The referees will record the actual time used by the contestant.**

5. The football must completely cross the goal line without any part touching or being in contact with the goal line to be awarded points.
6. Upon completing the kick of the final football, the robot must move to stop within the Start area, with the robot positioned entirely inside the frame, and the remote control must be placed down before the contestant can press stop on the timer.
7. In the event of a robot malfunction during the match, the referees permit it to be lifted out for repairs, which will be counted as 1 Retry. Once repaired, it must be placed back at the starting point to resume the competition, with the timer continuing to run during the repair. In the case of requesting to stop the

match, the score will be recorded immediately and the time will be considered fully used for the 2 minutes.

8. When all teams have finished competing in each round, the robots must be returned to the designated location until the committee announces that they may be retrieved.
9. Any situations or circumstances occurring during the competition that are not specified in the rules shall be at the discretion of the organizing committee.
10. **The decision of the committee is final.**

Retry: Every time a retry is performed, the robot must be placed at the START point only in order to resume the mission.

1. If the robot malfunctions or issues occur during the competition, contestants can request a retry at any time during the match to repair the robot strictly within the competition area. The match time will continue to run without stopping.
2. If the remote control wire touches the field floor or pulls, restrains, or drags the robot, receiving 2 warnings from the referees will count as 1 retry.
3. The contestant touches the robot during the mission, or the robot falls off the field.

Match Scoring

- Scoring (✓ Scored / ✗ Not Scored)

A football that completely crosses the goal line: 1 point ✓

A football that crosses the goal line and then rolls back out: 1 point ✓

A football that touches the goal line or fails to cross the goal line: 0 points ✗

In the event that any part of the robot touches/contacts the football:

B1 is defined as a football that is touched/contacted and fails to cross the goal line (considered an obstacle on the field).

B2 is defined as a football that is touched/contacted and successfully crosses the goal line.

In the case where both B1 and B2 footballs pass across the goal line:



In the case where both B1 and B2 footballs pass across the goal line, and then B2 rolls back out across the goal line:



- Each team will compete in 2 rounds. The scores from both rounds will be added together and ranked from highest to lowest. The team with the highest total score will be the winner of the competition, followed by the remaining teams in descending order of their scores.
- If the best total scores of Team A and Team B are equal, **the time from the round with the best score** of each team will be used to decide the winner, with the team that used the least time winning the competition.

Example	Team A		Team B	
	score	time/minute	score	time/minute
round 1	3	2.1	7	2.25
round 2	7	2.3	3	2.15

Team A's total score = 10, Team B's total score = 10.

From the above, it can be seen that:

Team B's time in the round where they achieved their best score, with Team B using the least time to complete the mission(2.25 minutes).

Therefore, Team B will be the winner of the competition.

- If the times from the round with the best score for both Team A and Team B are still equal, the total number of retries from both rounds for each team will be counted. The team with fewer total retries will be the winner of the competition.

Example	Team A			Team B		
	score	time/minute	Retry	score	time/minute	Retry
round 1	3	2.1	0	7	2.25	1
round 2	7	2.25	2	3	2.15	5

Team A's total score = 10 and Team B's total score = 10 (equal).

The best-round times for Team A (2.25 minutes) and Team B (2.25 minutes) are also equal.

From the above, it can be seen that the total retries across both rounds for each team are:

Team A retries = 2 and Team B retries = 6

Therefore, **Team A will be the winner of the competition** (having fewer total retries across both rounds compared to Team B).

- If the total number of retries for both teams is still equal, a tie-breaker match will be held specifically for the teams that cannot yet be resolved

Rule Violations and Penalties: Decisions are at the discretion of the committee and are final.

1. Changing the robot during the competition: Receive 1 warning, and the original robot must be brought back to compete. Failure to comply will result in immediate disqualification from the competition.
2. Contestants leave the competition area without notifying the referees or without staff accompanying them outside: Exceeding 1 warning (if a second instance occurs, it will result in an immediate forfeit for the round currently being entered or the round just completed).
3. Communication or guidance from external individuals who are not contestants, or external individuals disturbing the referees or contestants during the match: Exceeding 1 warning (if a second instance occurs, the team under the supervision of that individual will be immediately disqualified for the round currently being entered or the round just completed).
4. Contestants cause damage to the competition field: Result in immediate disqualification from the competition.
5. Contestants display inappropriate behavior regarding the awards received or cause physical, verbal, or mental harm to the referees: Result in immediate disqualification from the competition, and the next ranked team will be promoted to receive that award instead.
6. Team supervisors/coaches cause physical, verbal, or mental harm to the referees or disrupt the judging committee: All teams under their supervision will be immediately disqualified and forfeit the match, even if they have already won an award ranking.
7. Contestants take the robot out of the competition area during the match:
 - In case the robot is taken out of the area and an external person helps repair it or interacts with it: Result in immediate disqualification from the competition.
 - In case the robot is taken out of the area without any external person helping to repair it or any interaction, such as repairing the robot independently outside the area: Receive 1 warning (if a second instance occurs, it will result in an immediate forfeit for the round currently being entered or the round just completed).
8. Once the referees and contestants agree on the judging criteria before the start of the competition, it is considered a unanimous resolution.

9. When the competition is concluded, the decision of the referees is final.