

RobotChallenge – RoboGolf

Synopsis: There are four green areas with a golf ball. The robot is to autonomously find each green area, locate a golf ball, stop, and putt the ball into a hole by using a specific piece of wood (wooden putter). The center hole, “a” in Figure 1, has the highest points.



Figure 1

Group: Junior and senior

Changelog

10.29.2024

1 Rules

1.1 Rules

- A. 4 standard golf balls with numbers 1 ~ 4 marked by permanent marker will be used. Modification of the balls is not allowed.
- B. 2 minutes are given per game round.
- C. Starting location and robot orientation are unveiled before the work-time for each round.
- D. The robot can putt only one ball at a time. The ball may only be struck/hit once and at the original location on the green.
- E. Teams cannot touch the robot during the round.
- F. There is no Home Base. The robot does not need to return to where it started.
- G. Only Judge can end the round.

1.2 Violations

If any of the following violations occur, this round will end and the score for this round will be 0.

- A. During the competition, without the permission of the referee, team members touch any part of the field.
- B. During the competition, team members touched the robot without the permission of the referee.

1.3 Termination of Competition

If the following situations occur, this round will end and the score will be retained. The remaining game time will be 0.

- A. The robot touches the ball hole device.
- B. The robot falls off the desktop (any part of the robot touches the ground).

1.4 Invalid Push Rod

- A. The golf ball entered the hole and was hit by a part of the robot's body instead of a wooden push rod.
- B. When a golf ball goes into a hole, it's not just one hit, but multiple hits.
- If the above situation occurs, the referee must immediately declare it "invalid" and record it. The referee does not need to take any action on the ball, whether it is in the hole or anywhere else.

2 Venue Settings

2.1 Competition venue

The actual size of the stage is approximately 80CM wide, 180CM long, and 10CM high. The surface is light colored. The four corners of the desktop are right angles. The table is placed on a dark tabletop. Figure 2 is a schematic diagram of the site dimensions, and Table 1 describes the corresponding values.

	Min	Max	Unveiled?
d	35CM	50CM	The team leader will announce the values.
x	35CM	50CM	Announce before the start of the junior group debugging.
y	5CM	10CM	
n/m	1/7	7	Junior group is 1 (4/4) , and the advanced group will be announced after isolation.

Figure 2

2.2 Golf balls

Using standard golf balls, the color may be white.

2.3 Green Zone

The size is 15CM * 22CM. The RGB value is green (0,120,0), and the position line of the golf ball is printed in the area. As part of the challenge, the robot must be designed so that you can smoothly pass through the green zone, as the green zone may be uneven due to being an unknown paper surface. PDF files can be downloaded from the website. As shown in Figure 3.

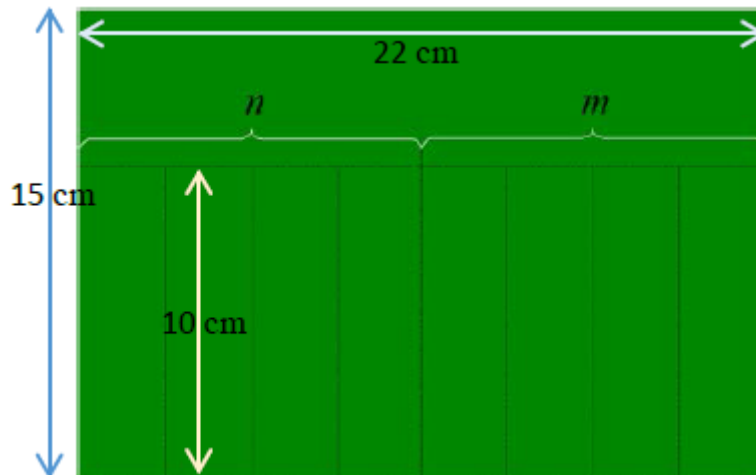


Figure 3

Green paper can be downloaded from the official website. It is recommended to open and download it using Google Chrome or print it directly, which is more standard.

2.4 Wooden push rod

The actual size of the wooden push rod is 1.9cm x 3.8cm x 28cm. Pine wood material is sufficient. The wooden push rod can be slightly modified (such as drilling) as long as the above dimensions remain unchanged. Wooden push rods can only be designed to hit the

RobotChallenge – RoboGolf

ball, and a robot can only be equipped with one wooden push rod. Refer to Figure 4. The golf club needs to use a unified wooden push rod, which can be purchased through the registration system for first-time participation.

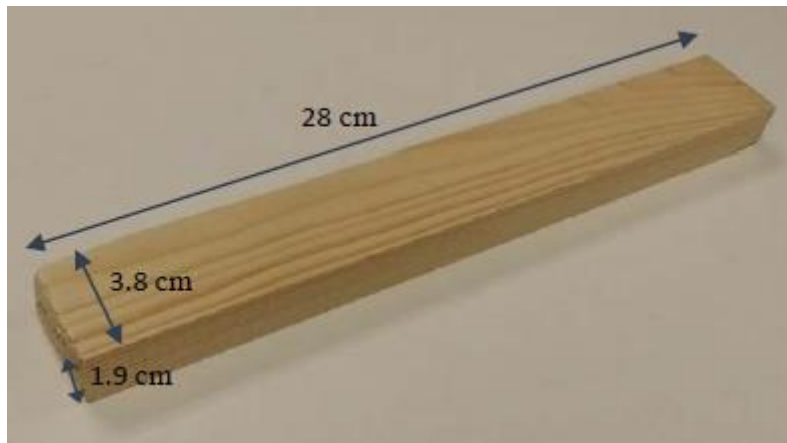


Figure 4

2.5 Ball Hole

The ball hole device is made of foam plate or acrylic, with a thickness of 0.8CM. The size of the hole is 11cm * 13cm. As shown in Figure 5.

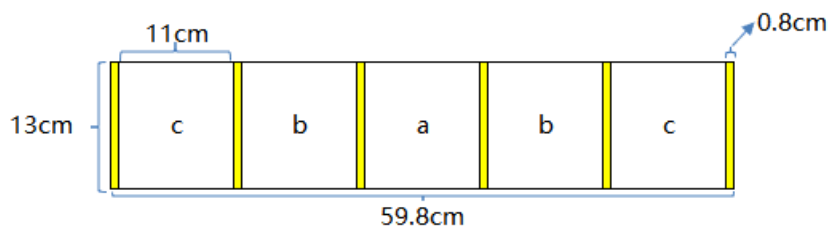


Figure 5

3 Robot Specifications

- Your robot may expand to putt the ball. However, it still must fit within a box with a 50 x 50 x 50 cm base when fully expanded.
- Weight limitation: none.
- Any number of sensors/sensor types (unless it is harmful to humans).
- Any number/type of motors/servo motors (multiplexor is OK to use).
- Any material/robot kit may.
- The team ID tag must be placed on top of the robot.

4 Precautions for Competition

- The venue configuration may vary from round to round.
- After the announcement of unknown factors, the team has 30-60 minutes to debug.
- After the debugging time, all participating teams must submit their robots to the quarantine area.
- During the quarantine period, the referee will check the size of the robot and the wooden push rod.
- It is strictly prohibited to use any communication device to remotely control robots or communicate with team members on the competition field. If anyone sees any suspicious activity, please notify the nearest staff immediately.
- During the competition, each team is only allowed to have on-site participants on the field.

5 Points Ranking Explanation

The winner of each group will be determined by the average score of 2 rounds. If the scores are the same, the following criteria will be used: (1) the best score from 2 rounds, (2) the highest score corresponds to the most remaining time, and (3) if necessary, a new competition will be held. Please refer to Table 1 for examples.

team	Score 1	remaining time	Score 2	remaining time	average	highest score	remaining time	ranking
A	80		100	15	90	100	15	1
B	100	10	80		90	100	10	2
C	90		90		90	90		3

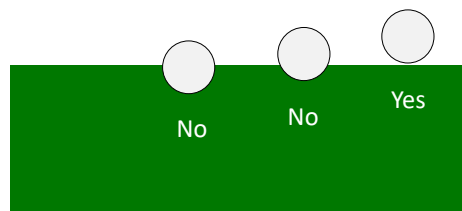
Table 1

6 Special Tips

- Although every effort is made to ensure consistency and accuracy, the dimensions of all competition venues and parts are subject to a tolerance of ± 0.3 centimeters.
- If there are multiple venues for certain events, the referee will conduct consistency checks between the venues.
- When the robot is searching for a hole using a distance sensor, the referee should maintain a distance of at least 0.5M from the table.
- The final decision-making power is granted to the presiding judge.

7 FAQs

- What happens if the ball is putted before the 2 minutes end and enters into the hole after the 2 minutes end? It is valid.
- What happens if a ball hits another ball? The game round continues and scoring is done at the end of the round.
- What happens if a ball bounces out of the hole-slot after hitting another ball in the slot? Game continues and scoring is done at the end of the game. The slot has enough room for more than 4 balls.
- The ball was putted and landed on another green area. Can the team get 5 points? Yes.
- How to decide whether a ball is outside the green? It must be completely outside. See Figure below.



- Are the greens #1, #2, and #3 parallel to each other? The Green Areas will be setup as parallel as possible. But there will be some error margin.
- Can teams use pool stick style or baseball batting style putting? Yes.
- Can you add more weight to the putter? We will check only the dimension of the wood.
- Can holes be drilled in the wood? Yes. We encourage students to use screws or nuts and bolts rather than glue, since we will require teams to detach the wood from the robot to start the competition at the World Championship.
- How will the starting location be determined by the center of the robot or by the edge? By the edge. Team should select what is considered the "front" of their robot and label it. Once it is chosen and labeled, it cannot be changed.
- Is there a chance to restart? No. Once started, there will be no restarting.



RobotChallenge – RoboGolf

12. Can student verbally say when they want the round to be ended? No. Team members cannot terminate the game or approach the table to grab the robot. The game will end only if one of the following occurs:
 - 1) The 2-minute time limit expires.
 - 2) All 4 balls have been hit and have come to rest AND the robot stops on the table.
 - 3) The robot leaves the table (the table will be on the floor, so it would not fall).
 - 4) The Judge asks the team members if they would like to end the round if the robot malfunctions or stops moving.
13. Can a robot use a touch sensor to start? Yes.
14. Balls moved since Robot was heavy or it struck the table. Do we reset the balls? No. Game continues. Robots should be constructed to move without disrupting the balls on the table. Disrupted balls will not get any points. See item E on scoresheet.
15. Does it matter which ball/green the robot goes to first? No. Robots may go ball/green area in any order.
16. How do we print/prepare the green areas? When printing Green Area PDF, be sure to select "Actual Size" under Page Sizing & Handling to ensure proper dimensions. Please trim around the green area and discard the white.
17. Green area is not in pure green color? Since over 30% teams are using robot kits without color sensors, we made the green color as dark green (in RGB color space, R: 0, G: 120, B: 0).
18. Can we add another wooden putter that will not be used for putting? No, since it will be difficult to Judge.
19. Rule B.5 says that the robot body must be at rest (stopped) while putting. How long the robot needs to be at rest? The Judge must observe the robot to come to a complete stop.
20. Can the putter be pulled back in a locked position by the actuator and then use rubber bands to propel it forward? Yes. However, the actuator needs to be used to trigger the putter.
21. Can we use gravity to provide the force to move the putter and strike the ball? Yes. The actuator also needs to be used to set/release the putter.
22. Can sensors or other miscellaneous parts/objects be attached to the putter, as long as the wood portion of the putter maintains the proper dimensions? YES. But the contact area to hit the ball must be wood. See section H.
23. Can robot's starting location be between fourth green area and end of table (towards opposite to flag pole side)? Yes.
24. Will robot orientation be parallel to edge/side of table? As in the rules, the starting location and the orientation of the robot is unknown. At Michigan Championship and World Championship, it may or may not be parallel to the edge/side of the table.
25. The ball was moved not intentionally, because the table was shaking from robot motion or gravity. Is it a disruption? Yes. Teams must design the robot to move softly and gently.
26. Can we intentionally blow air to move balls? No. Balls should be moved by putting only.
27. If a ball is hit legally, then the moving ball hits another ball on the table before it comes to rest in one of the holes, will the first ball be counted as valid or invalid? Will the second ball at rest that was hit be considered valid or invalid? If the second ball moves and falls into the hole, will it be counted as a valid ball in the hole? Judges are concerned only when the ball goes into a hole. See the following cases:
 - 1) A ball is putted legally and hits another ball. If either or both balls go into the hole, they are valid/legal.
 - 2) A ball is putted illegally and hits another ball. If the first ball goes into the hole, it is not valid. If the second ball goes into the hole, it is valid/legal.
28. If a ball is legally hit (or touched) by the putter and then it touches another part of the robot or putter, is it valid? No, the ball may only be hit/struck/touched once by the putter (even if the ball is not moved by the initial contact).
29. How do we determine the starting location of the robot? The edges of the robot are defined as the widest points of the robot as viewed from above including any



RobotChallenge – RoboGolf

overhanging parts. The dimension “Z” will be measured from the edge of the table to the edge of the robot. No part of the robot (or putter) is allowed to overhang the table edge or the specified location dimension at the start of the round.

30. What is a “push” as opposed to a “hit” or a “strike”? Anytime a ball is “hit” or “struck” by the motor-actuated movement of the putter, it is legal as long as it is only a single “strike” - no double hits allowed. A “push” is defined as any movement of the ball which is a result of physical contact with the robot body or the non-actuated putter.

8 Additional notes

- A. During robot isolation, it is not allowed to modify the robot.
- B. A failed ball enters the hole and does not score.
- C. The effective balls outside the green area are defined as those that leave the green area due to one strike by the robot or another strike by another ball.
- D. The starting position and orientation of the robot will be announced after isolation.

RoboGolf Scoring Sheet

Division: Junior / Senior
Team Number: _____

Team Name: _____
Round: First Second Track No.: _____

Judging Items	Count					Point Value(per count)	Score Earned
	0	1	2	3	4		
1. A Number of legal balls in the center hole	0	1	2	3	4	22	
2. B Number of legal balls in the center hole	0	1	2	3	4	15	
3. C Number of legal balls in the center hole	0	1	2	3	4	10	
4. Number of undisrupted balls outside their own green (not in the hole-slots)	0	1	2	3	4	5	
5. The robot remained intact from start until end	0		1			6	
6. The robot remained on the table from start until end (if touched by human hand, score =0)	0		1			6	
	Total Score						
	remaining time						

Team player:

Judge: