Microprocessors-2

Spring 2023

CaiRobOlympics

Guidelines

N.B: Use of any device that causes malfunction of other robots (تشويش) is not allowed. And the team that does this will be forbidden from joining any of the games.

- All teams must be allowed to test their robots before the final competition in the specified environment and with the specified objects. For example, the goal must be completed before the competitions so that teams could test their robots on it.
- Using removable extensions on the robots is acceptable but the team that uses an extension in a game will have it score multiplied but 0.8 in that game. (This is not related to the Doctor's final evaluation)
- All the games are to be videotaped in order to settle any disagreements.
- The robot cannot exceed 50 cm in width or length without the removable extensions.
- At the end of the Olympics, the robot with the highest score of all the games combined wins.
- The final score of the robots will be calculated as follows:
    - Based on the ranking of each robot in each game (the method for determining the ranking for each game is specified below) they get a specific number of points.
    - The number of points they get for each game is as follows:
        - 1st:100
        - 2nd:80
        - 3rd:70
        - 4th:60
        - 5th:50
        - 6th:40
        - 7th:30
        - 8th:20
        - 9th:10
        - 10th: **ZERO**
        - In case of multiple robot failures in a single game, all failed robots get **ZERO** in this game.

    - In case of a tie, both robots get the score of their place.
    - A robot's rank is based on how many robots have better scores than it. So, if two robots are tied for first, then the robot after them will be third not second.
- The final score of each robot is the sum of all the points that it got based on its ranking in all the games.

Football (Penalties):

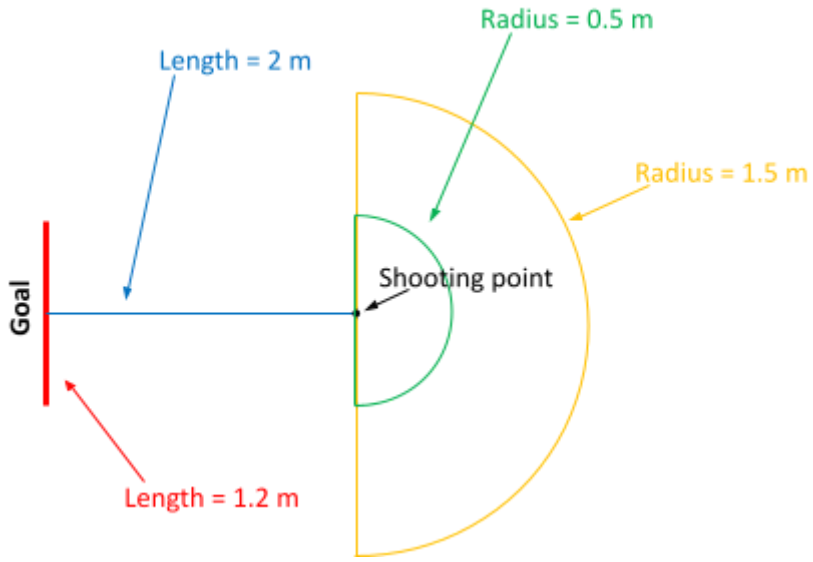
This game is divided into two: Shooting and Goalkeeping and will be held as a tournament between all the robots.

Shooting: the robot is required to shoot the ball through the goal.

Goalkeeping: the robot is required to stop the ball from going through the goal.

Football Rules:

- The ball will be placed at the "shooting point," a point ~~1.8 m~~ 2 m away from the middle of the goal.
- The goal keeping team will choose where to place the shooting team's robot given that the shooting team's robot:
  - Is not between the ball and the goal and is facing the ball..
  - Is within 1.5 m from the ball.
  - Is not within 0.5 m from the ball.
  - Basically, the shooting team's robot has to be placed so that some part of it has to be inside the yellow semicircle while no part of it is in the green semicircle shown in the figure below.
- The circles, semicircles, and shooting point drawn in the figure are to be drawn on the ground with chalk to make it easier to place everything in the right place after each shot and verify that all the rules are followed.



- Some part of the goal keeping team's robot must be on the goal line at all times. The first time this rule is broken, the trial gets repeated. If the rule is broken any other time, the trial is considered a win for the shooting robot. The count is reset for each opponent. Which means that the robot of each team can break this rule once with each opponent with no consequence.
- The goal keeping team's robot must not exceed 70 cm in width or length with any attachments.
- The shooting team's robot must shoot the ball within 2 minutes of being placed.

- Each robot will play a game as a shooter against all other robots, and as a goal keeper against all other robots.
- Each game consists of 3 shots (trials).
- The shooting team's robot must not take the ball inside of it before shooting it.
- Ball specifications:
    - The ball will be a stress ball.
    - The ball will be 6 cm in diameter.
    - The ball will have a solid color.
    - The ball will be green.
    - Attach link here
- Goal specifications:
    - The goal will be 120 cm wide and 60 cm high.
    - The diameter (thickness from the inside) of the goal post must be 4 inches.
- Ranking specifications:
    - The score for the goal keeping robot is the total number of trials it wins against all the other robots.
    - The score for the shooting robot is the total number of trials it wins against all the other robots.
    - At the end, the ranking for each of the goal keeping and shooting is based on the total score of the robots in that category. The higher the score the higher the rank.
- If the ball does not go through the goal, then the trial is considered a win for the goal keeping team. That is even if the shooting robot shoots it away from the goal or does not manage to shoot it in time.

Maze (Line Following):

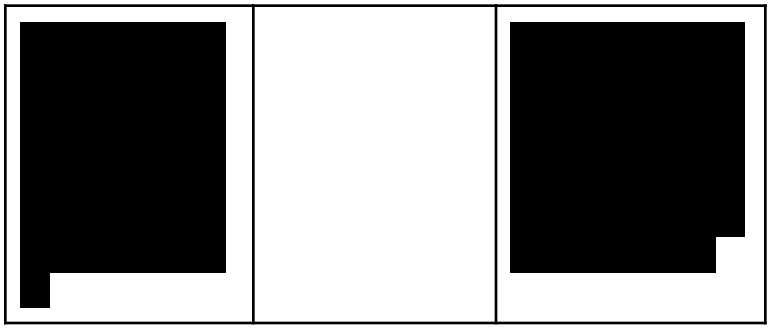
The robot of each team attempts to solve several mazes that are line following based.

Maze Rules:

- Each team will prepare 1 maze that has only one solution path.
- Each team's robot will enter all the mazes including the maze prepared by that team. This rule change is so that each team needs to make its maze with good quality since they will use it themselves.
- Each team enters each maze twice.
    - The first trial is for the robot to get a chance to memorize the maze and is not scored but is limited to 5 minutes. When the 5 minutes run out, the robot must end its first trial.
      // Omar Khaled: I can demand not to enter the second trial if I am satisfied by the time of my first
    - The second trial is the one that determines the score. The time of this trial is measured.
    - In the second trial, the robot will get a penalty of 5 extra seconds if it leaves the line or takes a wrong turn. Taking a wrong turn only gives a penalty after the first time that this wrong turn is taken. Also, if the robot takes a penalty for taking a wrong turn, it will no longer take any wrong turn penalties until it is back on the right path but it will still be penalized if it leaves the line.
    - If the robot leaves the line and gets penalized for doing so, the team members can place it back where it was last on the line, and facing the same direction that it was facing.
    - If the robot goes back to the line without any human interference no penalty is added. That is only the case if the robot manages to go back to the same edge (without skipping any nodes). Node: turn, intersection, dead end, start, or finish.
- Ranking specifications:
    - This rule change is so that a robot malfunctioning in 1 maze would not have that problem affect its score too much in all the mazes.
    - ~~The ranking in this event is based on the average time each robot takes to finish the second trial of all the mazes it enters.~~
    - For each maze, the time of the second trial for each robot is considered.
    - The robots are then ranked for that maze. The lower the time, the higher the rank.
    - For each maze, the robots get a score out of 10 based on their ranking as follows:
        - 1^{st}: 10
        - 2^{nd}: 8
        - 3^{rd}: 7
        - 4^{th}: 6
        - 5^{th}: 5
        - 6^{th}: 4
        - 7^{th}: 3
        - 8^{th}: 2
        - 9^{th}: 1
        - 10^{th}: 0

- The sum of the score of each robot in all the mazes will then determine its overall ranking in the entire maze game. The higher the score, the higher the rank.

- Maze specifications:
  - The Maze is made of black lines on a white background.
  - The width of the line is 5 cm
    // Omar Khaled: 5cm
  - All turns and intersections in the maze must be orthogonal.
  - The minimum distance between nodes is 35 cm.
  - At dead ends, the line ends without any special shapes.
  - At the start, the line begins without any special shapes.
  - At the finish, there is the shape of a white square between two black squares



  - …
  - The maze must not include closed loops. Only one correct solution path.
  - The total size of the maze must not exceed 3 m by 3 m.
  - The maze must be made of … (to be agreed upon).

Ball Collecting:

Each robot is required to collect as many balls as possible of a certain color in the allotted time.

Ball Collecting Rules:

- One robot will be in the ball collecting field at a time.
- The field will be filled with balls of two colors.
- The two colors of the balls are chosen by each team for their robot.
- 15 and 10 each row and column must have a certain number.
- The team will arrange the balls randomly in the field.
  //Omar Khaled: The team specifies the color

- The team's robot has 4 minutes to collect as many balls as possible.
- Field specifications:
  - The field is 3 m by 3 m.
  - The border of the field is to be marked with a black line with a width of 2 cm.
  - The balls are going to be placed in a matrix with 50 cm between each ball.
  - A wall that is 30 cm high, will surround the black line. It will be 35 cm away from the line.
- Ball specifications:
  - The balls must be Ping-Pong balls.
  - The balls' diameter must be 40 mm (the standard size).
- Score calculation:
  - The score is equal to the number of balls that the robot has collected in the allotted time.
  - If the robot collects a ball of the wrong color, it will be counted as -1.
  - Any balls that are in the robot but not in the goal are counted as 0.75. That means that a wrong-colored ball will give a score of -0.75.
  - When the time runs out, if at least half the robot is inside the goal, all the balls in the robot will be counted as collected.
- If the robot wants to unload the balls to collect others, it can unload at the starting point which is inside the goal.
- The balls or the robot with the balls should pass the line drawn in front of the goal (20 cm away) to be counted.

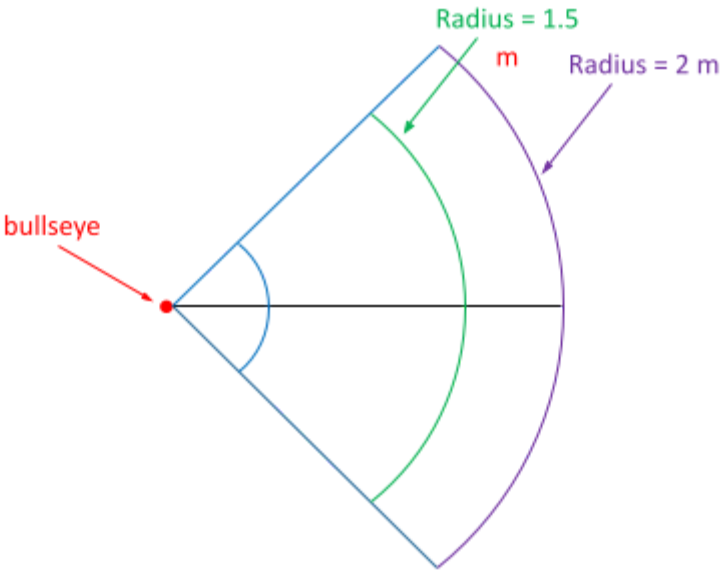
Gun Shooting (رماية بالخرز):

Similar to the actual sport, each robot has to aim at a target and shoot it as close to the bullseye as possible.

Accuracy is determined by how far the shot is close to the bullseye

Gun shooting Rules:

- The doctor places the robot anywhere given that:
    - The robot is at least 1.5 m away from the target.
    - The robot is at most 2 m away from the target.
    - The robot is within an angle of 45 degrees from the middle of the target.
    - Basically, the robot has to be placed so that some part of it is inside the purple curve while no part of it is in the green curve shown in the figure below. Also, the entire robot must be between the two blue lines in the figure.
- The curves drawn in the figure are to be drawn on the ground with chalk to make it easier to place everything in the right place after each shot and verify that all the rules are followed.
- Each robot gets 3 trials and the robot's score is the average score of the 3 trials.
- The doctor places the robot again anywhere within the valid region after every trial.
- Each team makes its own target for its robot to shoot at.
- The shot needs to leave a mark on the target to be counted. If it does not leave a mark, it will be counted as a miss.
- The team has the option to prepare more than one target so that they replace it after every shot.
- The robot needs to shoot within 2 minutes of being placed or the trial is counted as a miss.
- Target specifications:
    - The bullseye in the target (the center point) must be 1 m high measured from the ground.
      // Omar Khaled: minimum 60 cm
    - The style of the target is determined by each team.
- Ranking specifications:
    - The score of each trial is the distance from the center of the target to the mark left by the shot, measured in cm and rounded down to the nearest cm.
    - If the mark is more than 29 cm away from the bullseye, the robot cannot make a mark on the target, or the robot could not shoot in the allotted time, then the robot gets a score of 29.
    - The score of each team in this game is the total score of the three trials.
    - The ranking of this game is then decided based on the score of each team. The lower the score, the higher the rank.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m
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bullseye