THE UNIVERSITY OF ALABAMA® | College of Engineering Computer Science

2019 Alabama Robotics Competition

April Madness!

You may have heard of March Madness, but in this contest you will get to participate in April Madness by programming your robot to get ready for the Alabama Robotics Basketball Championship!

Competition Rules and Problems

The following pages describe each event and an overview of how points are scored. The overall ranking for the awards ceremony is determined by the total of all three events. A tie-breaker is determined by the earliest clock time that the last set of points were earned. Each event will have two separate playing field instances to improve waiting time.

General Scorekeeping Rules

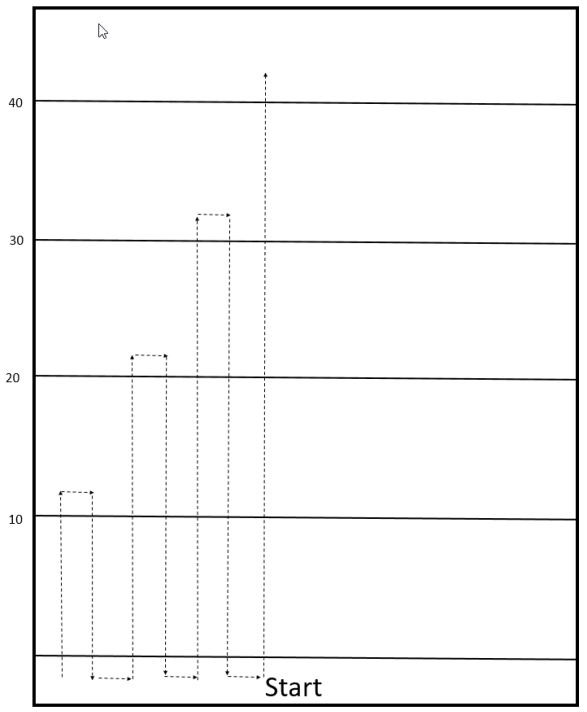
These rules are in addition to the rules available at http://outreach.cs.ua.edu/robotics-contest/rules.html.

1. The contest consists of 3 obstacle course problems that students can attempt through 2:30pm.
2. Each challenge is worth a maximum of 100 points.
3. The overall team score is the sum of all three scores (for a total possible score of 300). Ranking will be based on the overall combined score from the individual challenges.
4. The contest courses and associated problems will not be revealed until the beginning of the contest.
5. Teams may work on any problem in any order.
6. Some problems have disqualification measures (*e.g.,* going off the playing field, pushing an obstacle).
7. Each event must be completed within 60 seconds to receive points.
8. All courses will have a designated starting area (Three Point Competition allows player to start from any location on the playing surface).
    1. A contestant must start their robot with the robot completely within the starting area.
    2. The robot may face any direction when starting.
9. Students may not touch or remotely control the robot other than to initially place and start the robot.
10. After a robot is started, the contestant's turn begins. There is no redo once the start has commenced and a team must get back in line if they want to try again.
11. A team may try each course multiple times (maximum of 5 tries per problem).
    1. Teams must start at the back of the line for each new attempt.
    2. Each team may only be in line for one event at a time. It is not permissible to spread team members across multiple lines at any specific time.
    3. When multiple attempts are made for a specific obstacle course, the best score and earliest time of all attempts will be used in computing the overall score.
    4. Each team may attempt each problem only five times; the best of the top five scores will be used in computing a team's score for each problem.
    5. Teams may modify their programs and robot before making additional attempts to improve their score. Robots may not be altered such that there is a size violation (13in x 13in x 13in).
    6. Measurements on each field is allowed for 60 seconds per turn in line (students may only measure during this time, and then go back to the end of the line or their desk when done).

Practice Makes Perfect: Wind Sprints

You need to be in great condition to make it to the top! This problem gets your robot in shape for the future contests that you will face over the day.

Goal: Your robot will start at one end of the basketball court and sprint up and down the court.



Problem: The field contains the following features:

1. Starting area in the bottom-center.
2. A series of lines marking different locations on the basketball court that your robot must pass over to earn points.

Robot Movement:

- Your robot must move past each line up the court, do a 180, return and completely pass over the starting line, and then do a 180 and move to the next line further down the court, until reaching and passing the final line. See simulated robot movement in the figure to the right.
- After reaching the final 40 point line, the round is over (your robot may move off the surface after passing all completed lines).
- The round is over if your robot goes completely off the playing surface and onto the carpet.

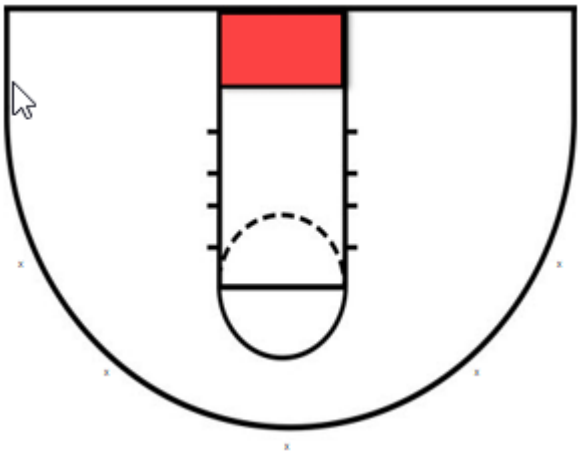
Scoring:

- You will receive a score of 0 if your robot goes off of the playing surface.
- If the full body of the robot (not including cables hanging off the side) passes over a line, you will receive the points indicated on the figure (10 points for the first line, 20 points for the second, 30 points for the third, and 40 points for the finish line). However, after passing each line, you must return back to the starting area and completely pass the starting line in order to get to the next point level (that is, you must completely turn around at each line location, back to the starting location).
- The attempt is over if:
    - Your robot violates the movement rules mentioned above.
    - You passed all lines and made it to the finish (100 points).
    - 60 seconds have expired before all locations are passed over. In such cases, the score for the round is the sum of the points for each line passed over.
- Score possibilities for each round are: 0, 10, 30, 60, 100.

Three Point Contest

As one of the top shooters in your league, you have been invited to participate in a three point contest!

Goal: Move five plastic balls, each placed initially at fixed locations outside the three point range, through the hoop/goal (red area). The ball locations are marked according to the figure below.



Problem: The field contains the following features:

1. A half-court basketball playing area with three point line and red scoring area as indicated.
2. Five balls placed outside of the three point line.

Robot Movement:

- You may select your own starting location. You may start from any location on the playing surface.
- If your robot completely goes off the playing surface, the round is over, but any accumulated points prior to going out of bounds still counts toward the current round's score.
- Your robot must remain within the 13 x 13 x 13 size limit.

Scoring:

- The initial score for each round is reset to zero. There is no memory of past attempts or scores.
- Each ball that passes through the scoring area counts as 20 points for the current round.
- A ball does not need to stay in the scoring area, but only pass through it (even if just for a split second on just a small part of the red surface – as long as it makes it into the red area, it counts as a score).
- Each ball may only count once toward points (you cannot hit the same ball back into the scoring area for additional points – only 20 points per ball, per round).
- A ball is allowed to go off of the playing surface after a score. However, a ball that goes off the surface, but misses the hoop, is out of bounds and cannot be used for the rest of the current round.
- A ball that was previously moved, but did not reach the scoring area while still in the playing surface, may be bumped by another ball and count as a score if the bump pushes it into the red hoop area.
- If a ball is touched before time ends, but the clock ends while the ball is still movement, the final ending location of the ball may be counted if the ball passes the red scoring area (i.e., you can "beat the buzzer" if your robot touches a ball and makes it move before the clock ends).
- If your robot touches a ball and causes it to move, and then your robot goes out of bounds, the ball in movement can still count for a score if it passes the red scoring area.
- The score for each round is computed at the end of 60 seconds. Only the balls that make it through the scoring area count for the total points per round. Possible scoring range is 0 to 100 (20 points for each of 5 balls).
- Score possibilities for each round are 0, 20, 40, 60 , 80, 100.

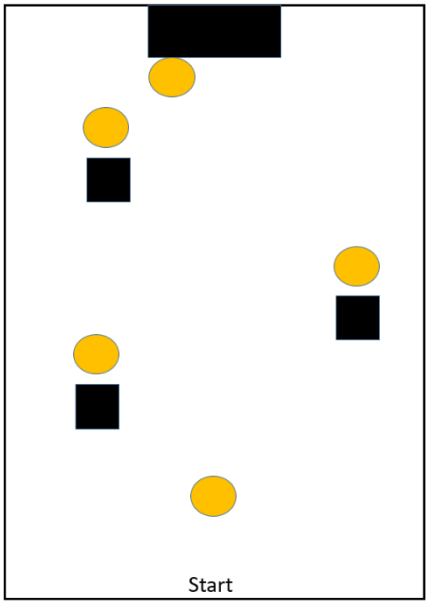
Fast Break to Win the Game!

There is less than a minute left in the game, and you need one more score to win! Can you handle the pressure and drive through all of the defenders to score the game winner?

Goal: Drive past the defenders and pass over each key location of the court, without moving the defenders (offensive charging), and slam dunk the winning score by touching the larger black area at other end of the court.

Problem: The field contains the following features:

1. Starting area in the bottom-center.
2. Three locations that must be touched in order (from bottom to top)
3. Five defenders who may be touched, but cannot be moved.
4. The final scoring location at top-center of court.



Robot Movement:

- An attempt is over and you receive 0 total points if:
  - Your robot pushes a defender (orange pylon) more than one inch, based on judge's estimation.
  - Your robot moves completely off the playing surface and onto the carpet.
  - You touch any of the score locations out of order (from top to bottom).

Scoring:

- A score is made by "passing" over a black location. This is satisfied by having any part of the robot body (except a long cable that might be sticking out).
- Points accumulate based on the number of locations passed over by your robot
  - 10 points for passing over the first location (bottom-left), 20 points for passing over the second location (right-middle), 30 points for passing over the third location (left-top), and a final 40 points for passing over the top-center area.
- The attempt is over if:
  - Your robot violates the movement rules mentioned above.
  - All four locations have been passed over (100 points).
  - 60 seconds have expired before all locations are passed over. In such cases, the score for the round is the sum of the points for each location passed over.
- Score possibilities for each round are: 0, 10, 30, 60, 100.