THE UNIVERSITY OF ALABAMA
COMPUTER SCIENCE

2015 Alabama Robotics Competition

Scaring Company: Working your way to the top!

Pretend that you and your robot friend are working your way up through the "Scaring Company." You will be presented with three levels of advancement (mail room delivery, janitorial cleanup, and Scare Room tryouts). Your goal is to impress your employer at each level and become the next legend of the Scaring Company.

Now put on your scariest face and get in there!

Competition Rules and Problems

The following pages provide a description of each contest problem 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 will occur at the end of the contest, if needed. 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 challenges that students can attempt over a 3-hour period.
2. The set of obstacles will span various levels of difficulty. Each challenge is worth 100 points. The overall team score is the sum of all three scores (for a total possible score of 300 across all three problems).
3. The obstacle courses and associated problems will not be revealed until the beginning of the contest.
4. Teams may work on any problem in any order.
5. Each team may only use one computer at a time during the competition.
6. Ranking will be based on the overall combined score from the individual challenges.
7. All courses have a 90 second time limit per round. If the team has not completed the course after 90 seconds they will receive those points earned before the 90 second limit expired.
8. All courses will have a designated starting area.
    1. The robot must start completely within the starting area.
    2. The robot may face in any direction when starting.
9. Students may not touch or remotely control the robot other than to initially place and start the robot.
10. For all taped boundary lines, the tape is considered to be within the boundary. For example, the robots may start with a portion of the robot on the taped boundary of the starting area, but not extending beyond the taped boundary. Cords do not count as part of a robot body, only the main frame of the robot.
11. A team may try each course multiple times.
    1. Teams must start at the back of the line for each new round.
    2. Each team may only be in line for one course 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 course, the best score of all attempts will be used in computing the overall score.
    4. Teams may modify their programs and robot before each round to improve their score. Robots may not be altered such that there is a size violation (13in x 13in x 13in).
    5. Only one team member may be in line with their robot at any one time.

***Special thanks to Jonathan Corley, Dustin Heaton, and Brian Eddy for the problem theme and course design!

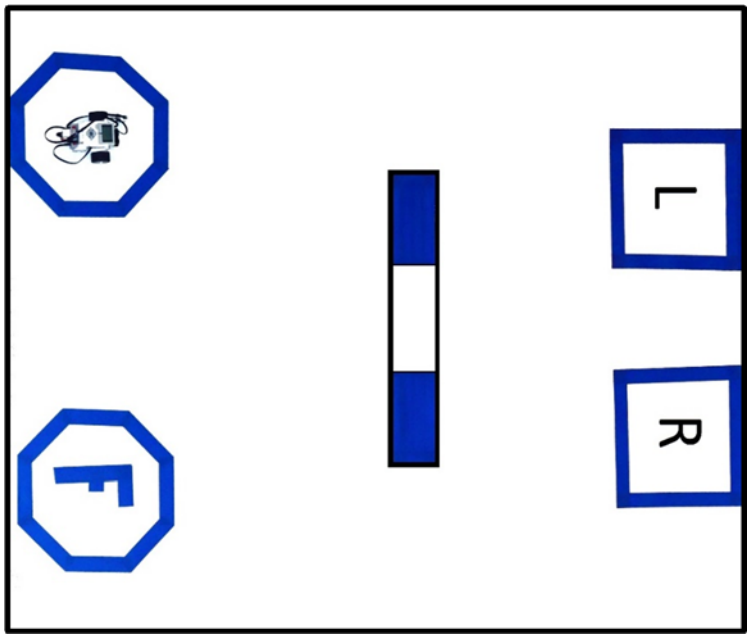
Mail Room Delivery

In this problem, you have been hired by the Scaring Company as a member of the mail room staff. To impress your boss and move up in the company, you must sort all of the incoming mail both quickly and accurately.

Goal: Your goal is to have your robot "pick-up" each of three letters and deliver them to the appropriate delivery bin within 90 seconds.

Problem: The field contains the following features:

1. Starting and Finish areas (left side of the field)area
2. Letters (middle of the field, designated by blue or white rectangles)
3. Delivery bins (right side of the field)



Your robot must begin in the Start location and "pick-up" each letter and move it to the appropriate delivery bin. Each letter will be blue or white. There will be three letters placed randomly side by side in the middle of the playing field (the figure above shows a Blue/White/Blue configuration, but the configuration will vary with each round). Blue letters must be delivered to the left mail bin (marked as L above) and white letters must be delivered to the right mail bin (marked R above). The robot must pick up one letter at a time. In this problem, a letter is picked up simply by rolling the robot over a part of a letter. If the robot moves to a new letter before delivering a letter already picked up, the previous letter is assumed to have been returned to its starting square. To deliver a letter that has been picked up, the robot must enter the appropriate delivery bin. After all letters have been delivered, the robot should move to the finish area and stop.

Only one start attempt per 90 second round is allowed. If a robot leaves the playing surface, the attempt is over and points are awarded based on the cumulative score for that round. Another attempt is not allowed, even if time remains, and a team must go back to the end of the line to try again.

Scoring:

- 10 points will be earned for each letter picked up, but you will lose the 10 points if a second letter is picked up before the first letter is delivered.
- 20 points will be earned for each letter successfully delivered to the appropriate delivery bin.
- 10 points will be earned for stopping with the robot completely inside the finish area.

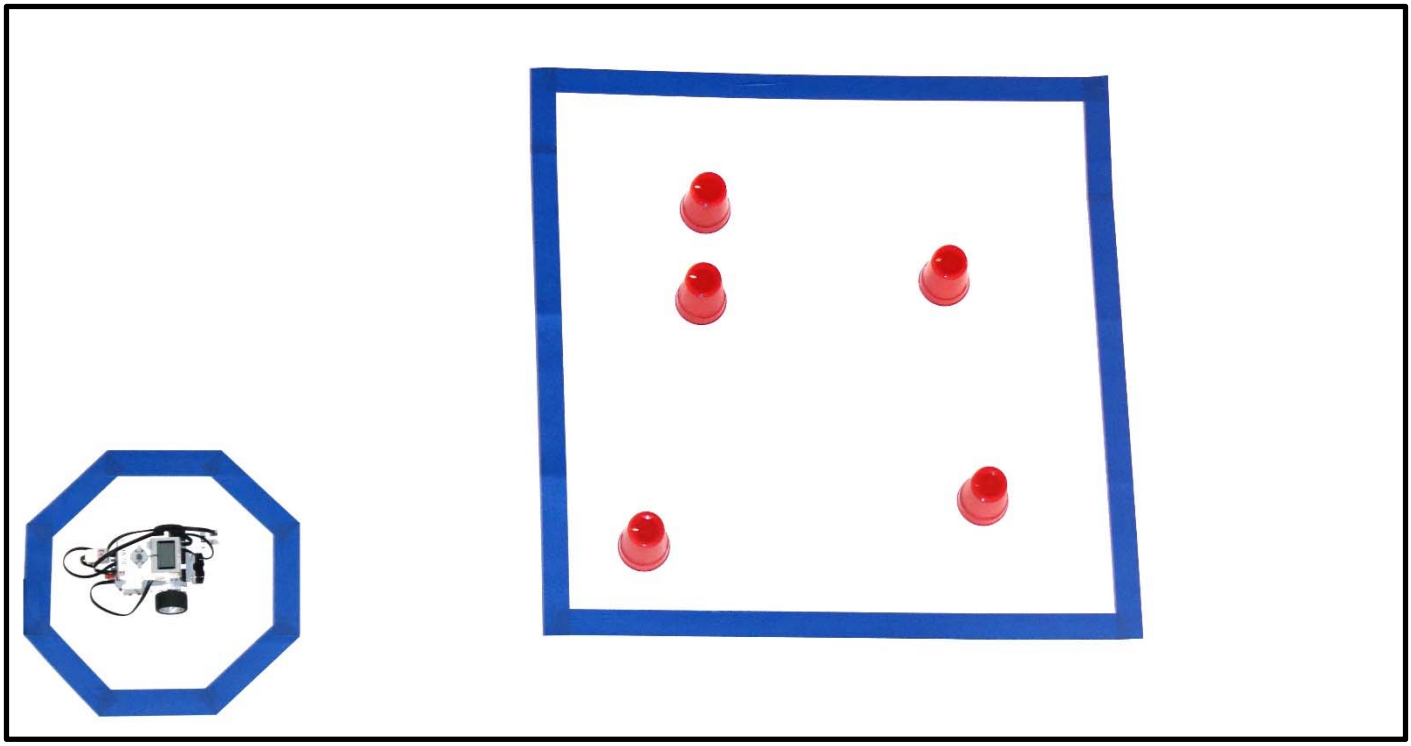
Janitorial Cleanup

In this problem, you are now working as a member of the janitorial staff. To impress your manager and move up in the company, you need to clean up the room as fast as possible!

Goal: Remove all of the cups leftover from the last meeting within 90 seconds.

Problem: The field contains the following features:

1. Starting area
2. "Meeting Room"
3. 5 Leftover cups



Before each attempt, the judges will randomly place the five cups throughout the room. Your robot must move the five cups out of the meeting room (designated by a blue square). Once a cup is moved completely out of the room (i.e., all portions of the cup have passed the outer side of the blue line surrounding the meeting room area), it is picked up by the trash collector (in this case, a judge). The cups may not be touched by a contestant at any point during the attempt except by the robot (while moving under its own power). Thus, neither the judges nor players may remove a cup that is inside the room (judges may only remove a cup when it is pushed out of the room).

Only one start attempt per 90 second round is allowed. If a robot leaves the playing surface, then the round is over and points are awarded based on the number of cups that were moved out of the room. Another attempt is not allowed, even if time remains, and a team must go back to the end of the line to try again.

Scoring:

- 20 points will be earned for each cup moved out of the room during the 90 second period.

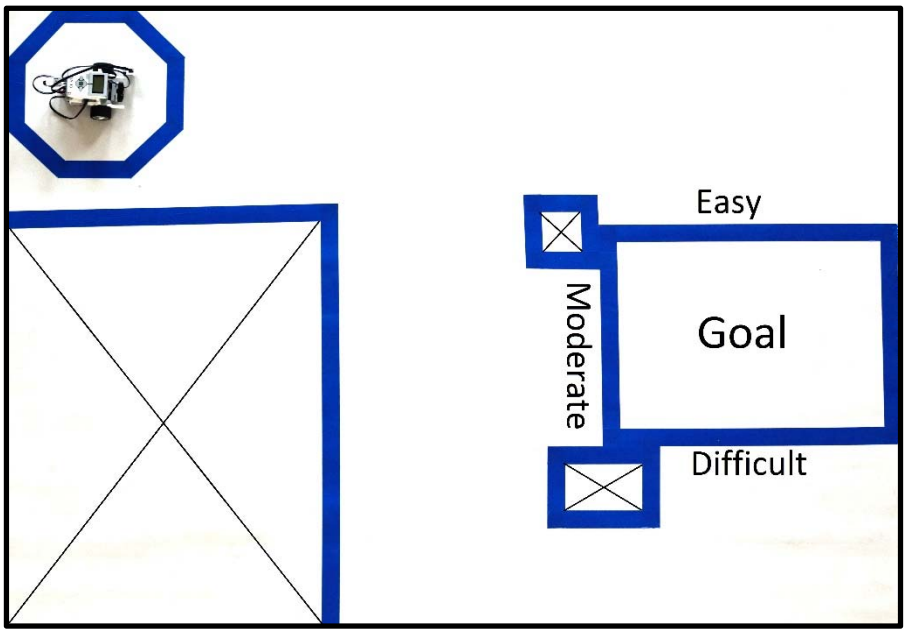
Scare Room Tryouts

You have finally earned your chance to prove yourself in the Scare Room! You must now successfully navigate the obstacles to reach the goal and prove your scaring prowess. However, the obstacles are deadly to touch. If you touch any obstacles, then your robot fails the tryout for that round.

Goal: Reach one of the goal areas within 90 seconds.

Problem: The field contains the following features:

1. Start area
2. Obstacles
3. Multiple goal areas



Your robot must navigate from the start area to one of three goal entry areas while avoiding any obstacles. If the robot touches any obstacle or leaves the playing area, the round is immediately over (even if the 90 seconds are not expired). It is ok for your robot to go into a blue obstacle box area, but it may not touch an obstacle. The goal has three sides that may be reached ("Easy," "Moderate," and "Difficult") with each requiring a different path. After a robot reaches the goal, the round is over and points are awarded (a team may not try another goal in that round, even if the 90 seconds are not expired).

Scoring:

Only 100 total points are awarded for this problem (e.g., reaching the Easy side in one attempt, and then the Difficult side in another, only results in 100 points that can be recorded for your final score on this problem). Points are also NOT cumulative (e.g., reaching Easy in one round and Moderate in another, results in a total score of 50, not 80). Points are awarded as follows:

- 30 points are awarded for successfully reaching the "Easy" side of the goal.
- 50 points are awarded for successfully reaching the "Moderate" side of the goal.
- 100 points are awarded for successfully reaching the "Difficult" side of the goal.