2018 Alabama Robotics Competition
An Incredible Adventure!

Your 2018 Robotics Competition T-shirt suggests you are a Computer Science Superhero. You will help your next door neighbors, The Incredibles, solve various problems as you encounter several new adventures!

Competition Rules and Problems

The following pages provide a description of 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 will be 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 obstacle 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 forward a specific number of inches).
7. Each event must be completed within 60 seconds to receive points. Event 1 points will be based on the fastest robot to make it to the teleportal.
8. All courses will have a designated starting area.
   1. The robot must start 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. A team may try each course multiple times.
    1. Teams must start at the back of the line for each new attempt.
    2. <u>Each team may only be in line for one event at a time</u>. 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. 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).
    5. 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).
11. There are clear boundary lines for the starting position. A robot may start with a portion of its body on the boundary of the starting area, but not extending beyond the boundary.

Dash's Escape

Dash is being chased by the notorious villain Syndrome. Help him reach the special teleportal that will transport him to a safe location.

Goal: Your robot has 60 seconds to navigate through a maze and pass through a teleportal, while avoiding the high voltage walls that surround the maze.

**Problem**: The field contains the following features:
1. Starting area in the bottom-right.
2. A maze (surrounded by high voltage walls) with a pathway that leads to the teleportal that will transform you to the safe zone.

Robot Movement:
- Your robot must start outside of the maze, behind the start line.
- Your robot should move through the fixed pathway of the maze.
- The attempt is over, with a score of 0, if your robot touches any part of a wall.

Scoring:
- If your robot passes the teleportal line in under 60 seconds, your time will be recorded.
- At the end of the contest, rankings will be determined by completion times of each team's best attempt.
- The scores for each division will be assigned as follows:
  o First Place: 100 points
  o Second Place: 80 points
  o Third Place: 60 points
  o Fourth Place: 40 points
  o Fifth Place: 20 points
- If two or more teams have the same completion time (a tie), they each will receive the same points.
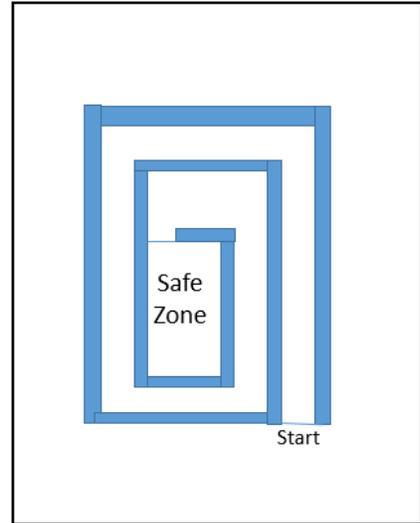
Mr. Incredible's Train Mess

Mr. Incredible's weightlifting sessions involve picking up trains on the track and moving them around. However, he does not pick up after himself and often leaves the trains out of order. Your job is to help arrange the train cars back in order after one of his workouts.

Goal: Move the four cars back onto the track in the correct order. The track location is marked in each cell in the figure below (but not written on the actual field). The proper location of each train is written under the train (but not written on the actual field).

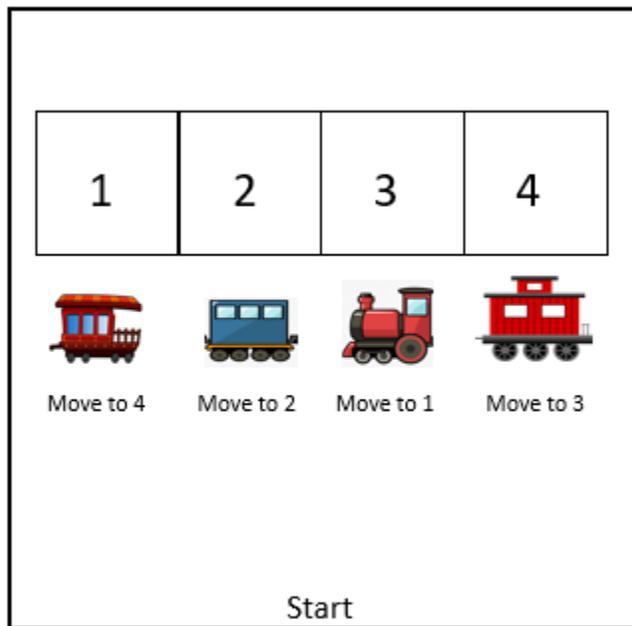**Problem**: The field contains the following features:
1. Starting area in the bottom-center.
2. Four train cars (cups that are marked in the same fixed location each time, as shown in the figure).
3. A train track that has four equally-sized squares.

Robot Movement:
- Your robot may touch any part of the playing field without penalty.
- Your robot <u>may not</u> go off the playing surface and onto the carpet. A robot going into the carpet will receive 0 points and the attempt is stopped.

Scoring:
- Each cup must be placed in the proper train track location. Points are not awarded to cups that are placed in incorrect locations (e.g., the cup on the far-left must only be placed in the far-right, designating the caboose of the train).
- For a correct placement, the entire cup must be fully enclosed within the train track location (i.e., no parts of the cup are allowed to touch the boundary of the track location). It is ok for cups to fall down if they are still fully in the square.
- Each cup placed successfully within the correct train location receives 25 points, for a total of 100 points. The total score is computed by how many cups are placed after 60 seconds.
- The score is only computed at the end of 60 seconds. Only the cups correctly placed at the end of 60 seconds will be added to the total score (a cup properly placed and then knocked out later does not count toward the score).

Violet's Forcefield

There is a set of dangerous explosives on a playground. Violet must detonate the explosives using her forcefield.

Goal: Search over the playground to identify each of the four explosives. Detonate each explosive by doing a full 360-degree turn (to invoke your forcefield) at the location where an explosive is identified.

Problem: The field contains the following features:
1. Starting area in the bottom-center.
2. Four explosives that are randomly placed during each attempt (black rectangles).
3. Two fixed playground objects (never changed, the same location on each attempt) that can be touched, but not moved more than 3 inches.

Robot Movement:
- An attempt is over and you receive 0 total points if:
  - Your robot pushes a playground object more than <u>three inches</u>, based on judge's estimation.
  - Your robot moves completely off the playing surface and onto the carpet.

Scoring:
- 25 points will be awarded for each explosive that is identified and detonated. To detonate an explosive, a full-360 must be performed by your robot at the identification site.
- Points will be awarded once per explosive (once detonated, additional points cannot be awarded for the same explosive on the same attempt). The overall score is the sum of the uniquely detonated explosives during each attempt (full 100 points for detonating all 4 explosives within 60 seconds).
- The attempt is over if:
  - Your robot violates the movement rules mentioned above.
  - All four explosives have been detonated (100 points).
  - 60 seconds have expired before all explosives have been detonated.