



2013 Alabama Robotics Competition Challenge Descriptions

General Introduction

The following pages provide a description of each event and an overview of how points are scored for each event. 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. Two of the problems will have two separate playing field instances to improve waiting time.

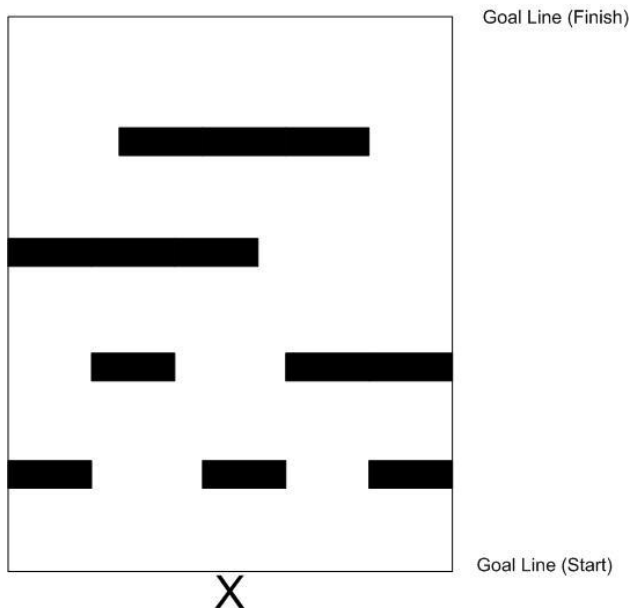
General Scorekeeping Rules

1. The contest will consist of 3 obstacle courses and challenges that the students must consider over a 3-hour period.
2. The set of obstacles will span various levels of difficulty.
3. The obstacle courses and project challenges will not be revealed until the beginning of the contest.
4. Teams may work on any problem in any order. It should be noted that a line may form for specific obstacle courses and challenges, such that the wait time to get onto the playing field is a factor that should be considered as a strategy.
5. Ranking will be based on the overall combined score from the individual challenges.
6. Some obstacle courses or challenges may have disqualification measures (e.g., going off the playing surface or past a boundary). Other problems may have a penalty (e.g., navigating in the wrong order).
7. A team may try each obstacle and challenge multiple times, but must start at the back of the line for each new attempt.
8. When multiple attempts are made for a specific obstacle course, the best score of all attempts will be used in computing the overall score. It is possible for teams to go back to their computers and modify their programs and make additional attempts at a specific obstacle course to improve their score. Robots may be slightly modified to incorporate new sensors, but may not be significantly altered such that there is a size violation (13in x 13in x 13in).

Kickoff Returner

Imagine the day when the NFL is dominated by robots. In this game, you need to design a robot program that can return kickoffs. Your robot will start at one goal line and then pass through four rows of defenders (three defenders per row) to score a touchdown. The distance between the defensive coverage area is not specified as part of the problem, but you can assume all defenders are the size of a standard brick and each row is equidistant. This event has one playing field. For each play, the location of the defenders will be randomized on each line. The image below shows just one possible configuration.

- Time:** There is a 90 second time limit on this event.
- Scoring:** For each row of defenders, 20 points will be awarded whenever the main body of the robot completely passes the row. An additional 20 points will be awarded if the robot completely passes the opposing goal line for a touchdown. The maximum score for this event is 100 points, by passing all four rows of defenders and going over the opposing goal line within the time limit.
- Penalty:** If the robot goes out of bounds (marked by black tape; out of bounds is when any part of the robot main body goes over the sideline tape) or 90 seconds have passed, the play is over and the point total represents the number of lines that were passed (e.g., going past three lines of defenders would give a score of 60). If a robot goes backward, and passes a row of defenders that it previously crossed, the points will be decreased (e.g., if a robot passes the second line of defenders to get 40 points, and then goes backwards past those same defenders, the score will go back to 20). A robot will be disqualified if it moves in such a way as to plow through the bricks intentionally (slight movement of the bricks, and even an occasional knock down, are permitted during a navigational path that appears to be trying to bounce off of the defenders, rather than plowing through them).



Kickoff Returner Event Challenge

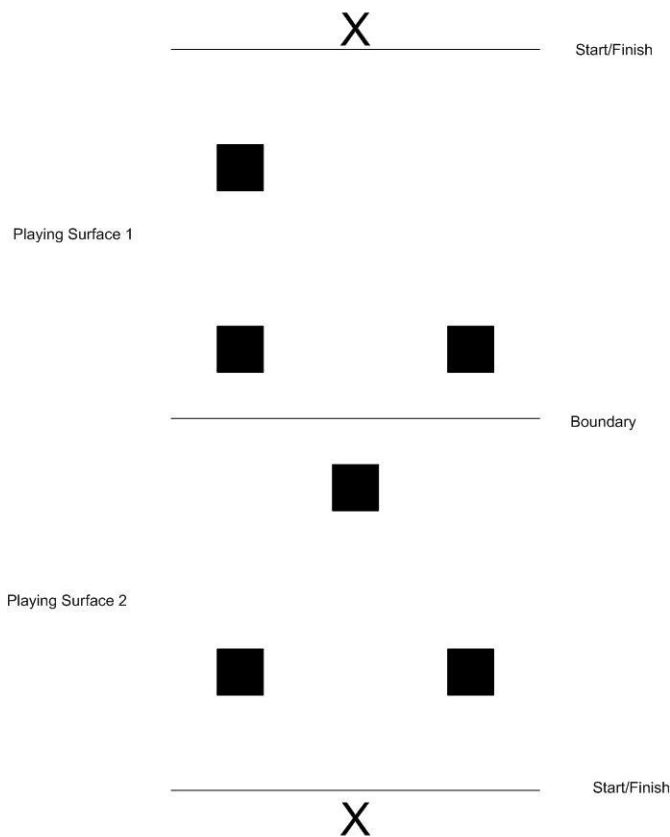
Search and Rescue

In this problem, your robot must perform a search and rescue mission by discovering missing survivors (represented as black squares on the playing surface) and then return back home. This event has two playing fields, which allows two teams to compete in this event simultaneously (robots are not racing each other, but each robot accumulates its own score in face of the time restriction). For each play, the location of the black squares will be randomized. The image below shows two possible configurations.

Time: There is a 90 second time limit on this event.

Scoring: For each new black square that the robot crosses over (any small part of the robot that eclipses the square will count as a crossover), 30 points will be awarded (points awarded only one time for each square). For any robot that crosses the finish line after touching all three squares, an additional 10 points will be awarded (only possible if all three squares were found before returning to the finish line). Each black square is 4in x 4in. The maximum score for this event is 100 points (from crossing over each of the 3 squares, and returning to the finish line). There is no particular order required for touching the squares.

Penalty: If the robot goes off the playing surface, or crosses the boundary between the two playing fields, the robot will be disqualified with no points awarded (the robot will be removed immediately if it crosses the boundary to avoid interference with the other robot).



Search and Rescue Event Challenge

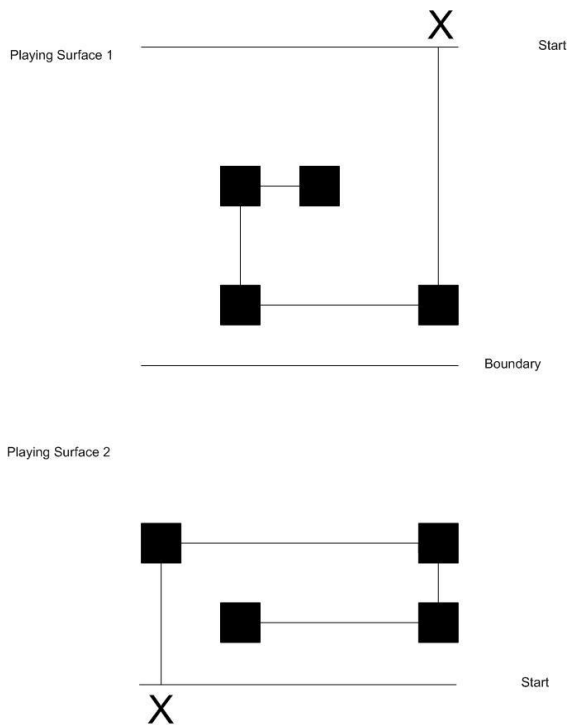
Shape Drawer

Your robot will draw a random shape based on the position of black squares that it must follow. Your robot will start on the far-left of the playing field. The robot should move forward until it finds a black square. For each black square that it finds, the robot needs to turn at a 90 degree angle and then search for the next square. The robot should stop when it has reached the fourth square. For each play, the squares will be moved to random positions, but each square will be directly in front of the preceding square after making the 90 degree turn. This problem will have two playing fields. The image below shows two possible scenarios (with the path traced by the line – the line is not on the playing surface, but shown here to indicate the path that the robot must take in each example).

Time: There is a 90 second time limit on this event.

Scoring: Any small part of the robot that eclipses the area of a square will count as a touch. The values for touching each square are as follows: 1st square: 10 points; 2nd square: 20 points, 3rd square: 30 points, final square: 40 points. The maximum score for this event is 100 points, by touching all squares in order within the time limit. Each square is 4in x 4in.

Penalty: If the robot goes off the playing surface, or crosses the boundary between the two playing fields, the robot will be disqualified with no points awarded (the robot will be removed immediately if it crosses the boundary to avoid interference with the other robot). If a robot touches the squares out of order, only the squares touched in order will count for the accumulated score (e.g., touching square 1, and then going off track to touch the third square, will only yield 10 points). If the robot fails to stop on the fourth square and continues moving, a 10 point reduction will be made (score reduced to 90 if the robot touches all squares in order but does not stop).



Shape Drawer Event Challenge