2012 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).
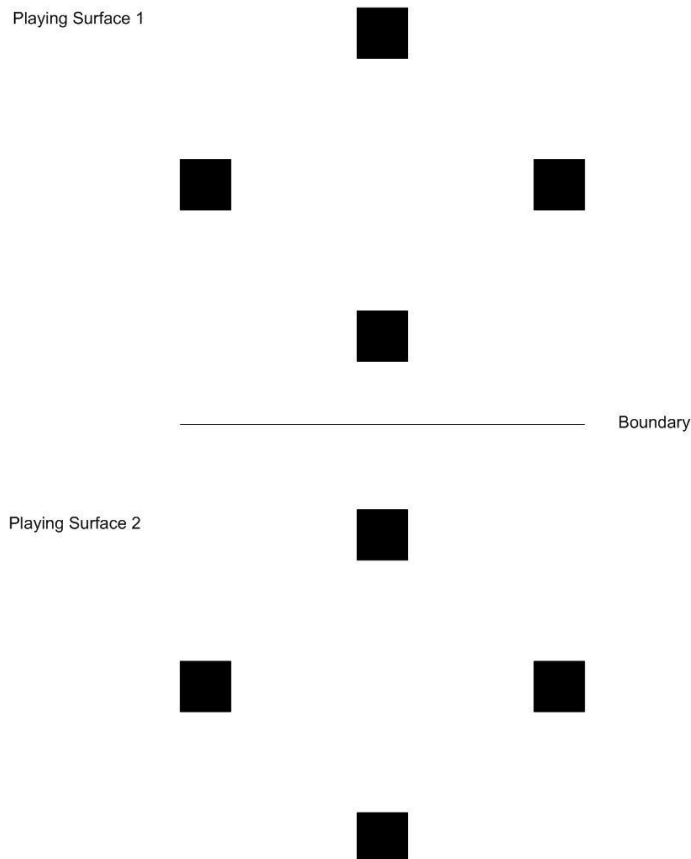
Running the Bases

In this challenge, your robot must touch all of the bases (in proper order) of a baseball diamond. The robot will be placed in the home base position with its front area facing first base, and it should touch each base in order (1st, 2nd, 3rd, and home). Each base is 4in x 4in. The distance between the bases is not specified as part of the problem. 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).

Time: There is a 60 second time limit on this event.

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

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 bases out of order, only the bases touched in order will count for the accumulated score (e.g., touching 1st, then 3rd and home will only yield 10 points).

Running the Bases Event Challenge

Maze Walker

This event tests your ability to write a program that navigates your robot through a maze, which has various corridors containing squares that much be crossed over to receive points. This event only has one playing field.

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

Scoring:　　　　For each black square that the robot crosses over (any small part of the robot that eclipses the square will count as a crossover), various points will be awarded, as indicated on the figure below. For any robot that crosses the finish line, an additional 10 points will be awarded. Each black square is 4in x 4in. The maximum score for this event is 100 points (from crossing over each of the 5 squares, and exiting the maze successfully).

Penalty:　　　　There are no penalty points for this event. A robot will be disqualified if it moves in such a way as to plow through the blocks intentionally (slight movement of the blocks, and even an occasional knock down, are permitted during a navigational path that appears to be following the boundaries of the walls).
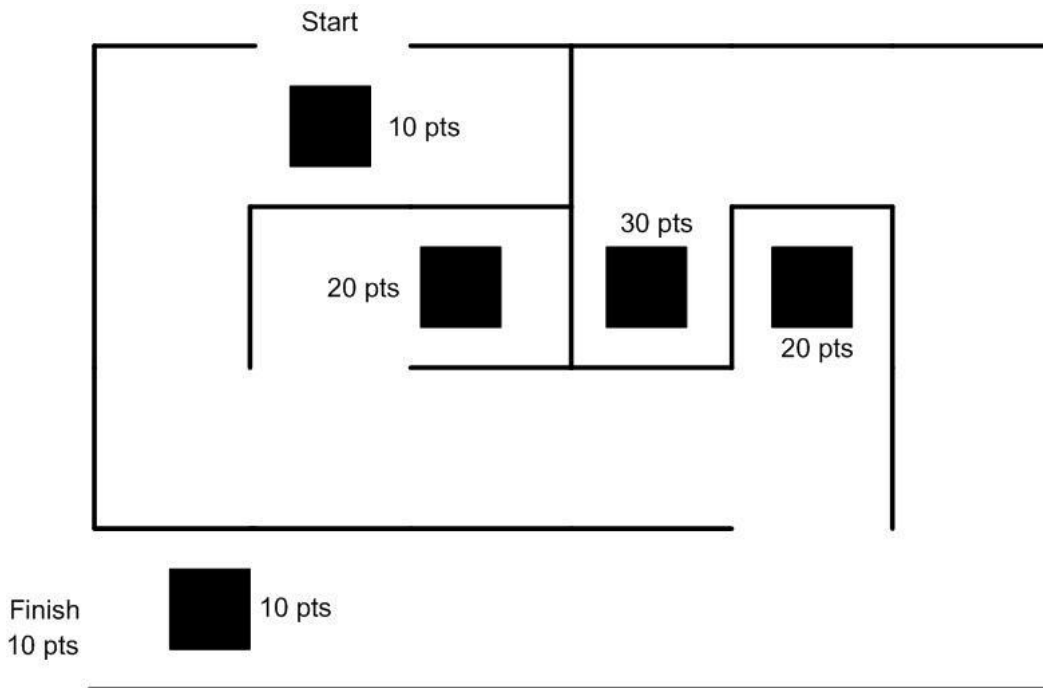
Maze Walker Event Challenge

Pheromone Tracker

According to Wikipedia, "A pheromone is a secreted or excreted chemical factor that triggers a social response in members of the same species. Pheromones are chemicals capable of acting outside the body of the secreting individual to impact the behavior of the receiving individual." There are many types of pheromones. Let's pretend that robots like to use "cookies" to serve as food trail pheromones.

In this problem, your robot must follow the trail of cookies left by some previous robot. Below are the innate behaviors of a robot that you must program:

1. A robot begins by knowing that the first cookie is always in front of it (see red starting position on the following page).
2. After finding a cookie, the robot knows that the next cookie is in either one of three positions: in front, to the left, or to the right (but never behind, which is where it just came from). However, the robot does not know in which direction the next cookie is located. Also, the pattern of the cookie placement varies.
3. The robot must search all directions to find the next cookie, and must do this for a series of 4 cookies.

Your robot will be placed in the starting position and must navigate through a randomly placed set of cookies. The cookie pattern will vary each time and is not fixed (you should not hardcode a solution, but rather develop a program that uses the light sensor to search for cookies appropriately). Each cookie pattern will be precise and not ambiguous (i.e., there is only one clear path to each cookie – there will not be a situation where two paths are possible). Each cookie will be 1 foot apart, in either direction.

The figure on the next page shows two separate cookie pattern examples, where two separate robots may independently search for cookies.

Time: There is a 60 second time limit on this event.

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

Penalty: Similar to "Running the Bases," 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 cookies out of order, only the cookies touched in order will count for the accumulated score (e.g., touching cookie 1, and then going off track to touch the third cookie, will only yield 10 points).

Playing Surface 1

Boundary

Playing Surface 2

Pheromone Tracker Event Challenge