2016 Alabama Robotics Competition
Working for the Bananas!

You are the loyal minion of a powerful leader. As a minion you get all the perks (living in a trap infested evil lair) and the disadvantages (cleaning up after the master's pet and the occasional do-gooder blowing up the evil lair).

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 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 problems that students can attempt over a 3-hour period.
2. The set of obstacles will span various levels of difficulty. 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).
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. Ranking will be based on the overall combined score from the individual challenges.
7. Some problems have disqualification measures (*e.g.,* going off the playing field).
8. Event 1 and 3 must be completed within 90 seconds to receive points. For event 2, if a team has not completed the course after 90 seconds, they will receive points earned before the 90 second limit.
9. 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 (except problem 1, which must face up or right).
10. Students may not touch or remotely control the robot other than to initially place and start the robot.
11. A team may try each course multiple times.
    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 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. Only one team member may be in line with their robot at any one time.
12. 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.

In Search of Banana!

You are attempting to reach the break room to retrieve your most important snack of the day (and an excellent source of potassium!), your banana. However, the hallway leading to the break room is the location of a new trap being tested…on you…

Goal: Your goal is to safely traverse the trapped hallway and reach your precious banana. Your robot has to follow a strict set of instructions to avoid triggering the trap, and you must be out of the hallway in less than 90 seconds or the timer will set off the trap! Teams posting the best times will receive the highest score on their end of year evaluations.

Problem: The field contains the following features:
1. Starting area (S)
2. Finish area (F)
3. Black tiles
4. White tiles
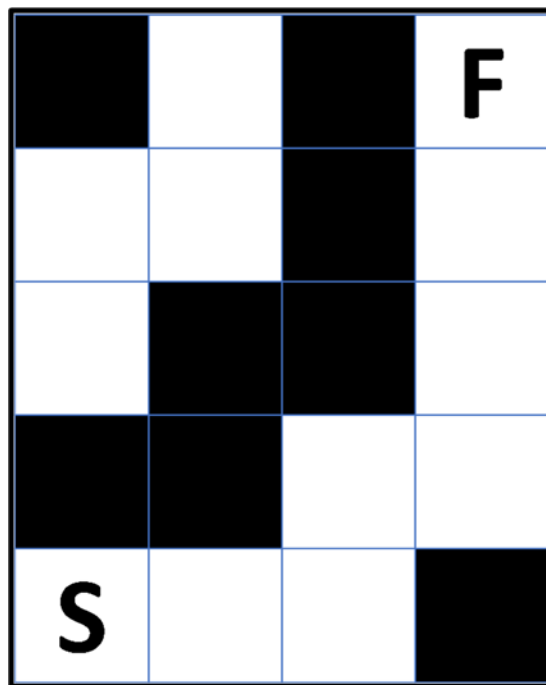
The robot must adhere to the following instructions to avoid setting off the trap:
1. After moving onto a white tile, the robot must turn left.
2. After moving onto a black tile, the robot must turn right.

Turning left or right is defined by the left or right of the front-facing part of the robot (discussed further during rules coverage).

For this problem only, the robot must start facing either up (toward the black square) or right (toward the white square).

Scoring:
- The team with the fastest time in each division will be awarded 100 points.
- All other teams in that division will start at 100 points, and lose 2 points for each second slower than the fastest time.
- Points will only be awarded to teams that successfully complete the problem.

Clean Up After Poochy!

You have been tasked with cleaning up after your leader's favorite pet. Poochy tends to dig holes and leave the occasional 'mess' that needs to be cleaned up. You must fill in each of the holes and clean the 'mess' spots off the courtyard before Poochy returns…

Goal: Fill in all of the holes and remove the 'mess' spots in 90 seconds or less.

Problem: The field contains the following features:
1. Starting area (S)
2. Yard (Green Square)
3. 'Mess' spots (X)
4. Holes (black circles)
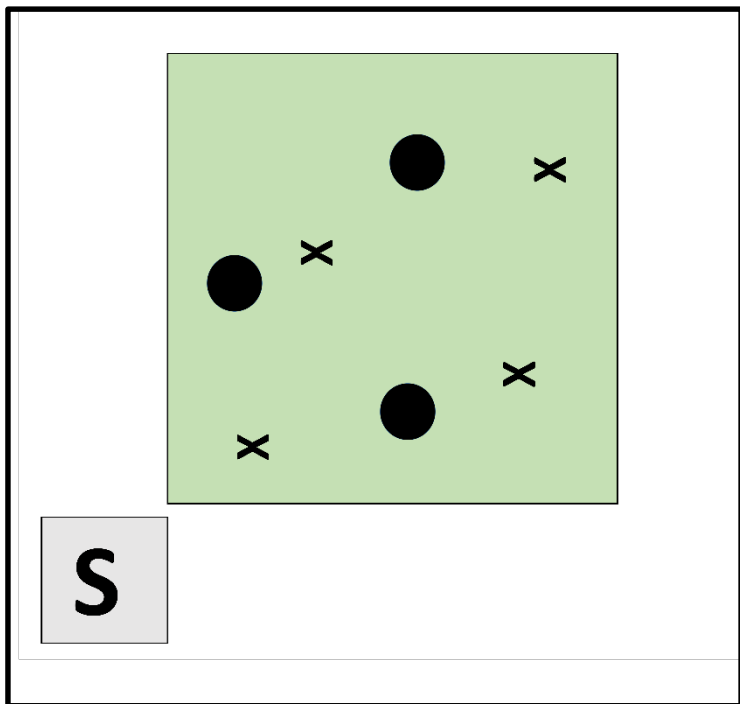
The team will be awarded 10 points for each cup ('mess' spot) pushed out of the green square (courtyard). The team will also be awarded 20 points for each hole filled in successfully. To fill in a hole, the robot must spin in a circle when the robot is over a black circle. Poochy always digs his holes in the same places (*i.e.,* black circles representing holes are always placed in the same location), but his 'mess' spots always seem to be in new places (*i.e.,* cups representing mess spots will be randomly placed for each attempt). After 90 seconds have elapsed, Poochy returns and chases you off or eats you!

Scoring:
- 10 points will be earned for each 'mess' moved out of the yard.
- 20 points will be earned for each hole filled.
- Only tasks completed before 90 seconds have elapsed will be counted.

Escape the Evil Lair!

It looks like the good guys have done it again! The self-destruct countdown has started. You are currently inside a volcano set to explode in 90 seconds, and you need to get outside quickly. However, all of the loot is still in the lair…

Goal: Your goal is to collect the most valuable loot possible and get out before the lair explodes. Unfortunately, the loot is located in the opposite direction of the exit. There are three rooms with loot. The loot in each room is not equally valuable, and you can only carry one room's loot (we will count the room the largest loot collected) as you escape through one of the three exits. However, only one of the exits will be clear (the others have collapsed).

Problem: The field contains the following features:
1. Start area (S)
2. Large loot pile
3. Medium loot pile
4. Small loot pile
5. Exits
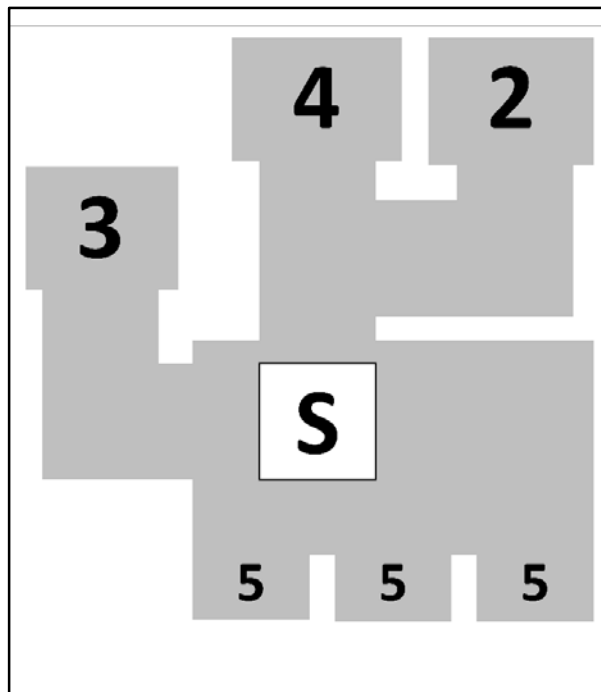
The robot must begin at the starting point, but can face any direction desired. The loot piles may be collected by moving any portion of the robot into the room containing the loot. The robot must be completely past one of the three exit lines before 90 seconds have elapsed. If the robot has not passed through one of the exits when time expires, the team will be awarded zero points overall for the attempt. Two of the exit hallways (determined randomly after placing the robot, but before beginning the attempt) will be blocked by bricks. The robot must pass through the unblocked exit to escape the lair successfully.

Additionally, the robot must remain within the maze area (representing the halls and rooms of the evil lair) during the attempt. If the robot strays outside of the boundaries, zero points will be awarded overall for the attempt.

Scoring:
- 50 points for escaping (area 5).
- 50 points for collecting the large loot pile (area 2).
- 30 points for collecting the medium loot pile (area 3).
- 15 points for collecting the small loot pile (area 4).