THE UNIVERSITY OF ALABAMA® | College of Engineering Computer Science

2025 Alabama Robotics Competition

Dorothy's Big Adventure!

This year's contest requires each team to help Dorothy find her way to the Wizard, melt the Wicked Witch, and then assist Dorothy in tapping her shoes together to return home. You must complete three tasks that require programming your robot to be controlled autonomously.

Competition Rules and Problems

The following pages describe each problem and give an overview of how points are scored. The total of all three problem scores determines the overall ranking for awards. A tie-breaker is determined by the earliest clock time that the last set of points was earned. Each problem 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 problem is worth a maximum of 100 points.
3. The overall team score is the sum of all three problem scores (for a total possible score of 300). Ranking will be based on the overall combined score from the individual problems.
4. Teams may work on any problem in any order. Teams do not have to start with problem #1.
5. Each problem must be completed within a 60-second time limit.
6. All problems will have a designated starting area.
   - A contestant must start their robot with the robot completely within the starting area.
   - The robot may face any direction when starting (problem #2 must face east).
7. Students may not touch or remotely control the robot, except to place and start it initially.
8. After a robot is started, the contestant's turn begins. Once the turn has commenced, there is no redo, and a team must resubmit a new scorecard if they want to try again.
9. For each turn, the team must bring their scorecard for the problem that they want to attempt, in addition to the blue "token" that they were assigned. Each scorecard will be placed in a queue and students will be called to the waiting area when they are 3 positions away from their turn.
   - At the end of a turn, the scorecard will be turned in to the scorekeepers, and the blue token will be returned to the team to be used for their next submission.
10. A team may try each problem multiple times, but there is a maximum of three (3) tries per problem.
    - Each team may only submit one scorecard for one event at a time. It is not permissible to spread scorecards across multiple lines at any specific time (hence the need for the blue "token").
    - Each team may attempt each problem only three times; the best of the top three scores will be used in computing a team's score for each problem. A practice round is also provided. Measurements are allowed for 60 seconds per turn in line. Students may only measure during this time and then submit a scorecard or return to their desk when done. However, we have provided all measurements in the following pages such that measuring should not be needed.
    - 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).

Find the Yellow Brick Road

Can you find the road that leads to the Wizard, who will provide Dorothy with the solution to get back home?

Goal: Navigate your robot through the forest to find your three friends: Scarecrow, Tin Man, and Lion. Your goal is to find your friends and navigate the path to the Yellow Brick Road that leads to the Wizard without straying off the path.

Problem: The field contains the following features:

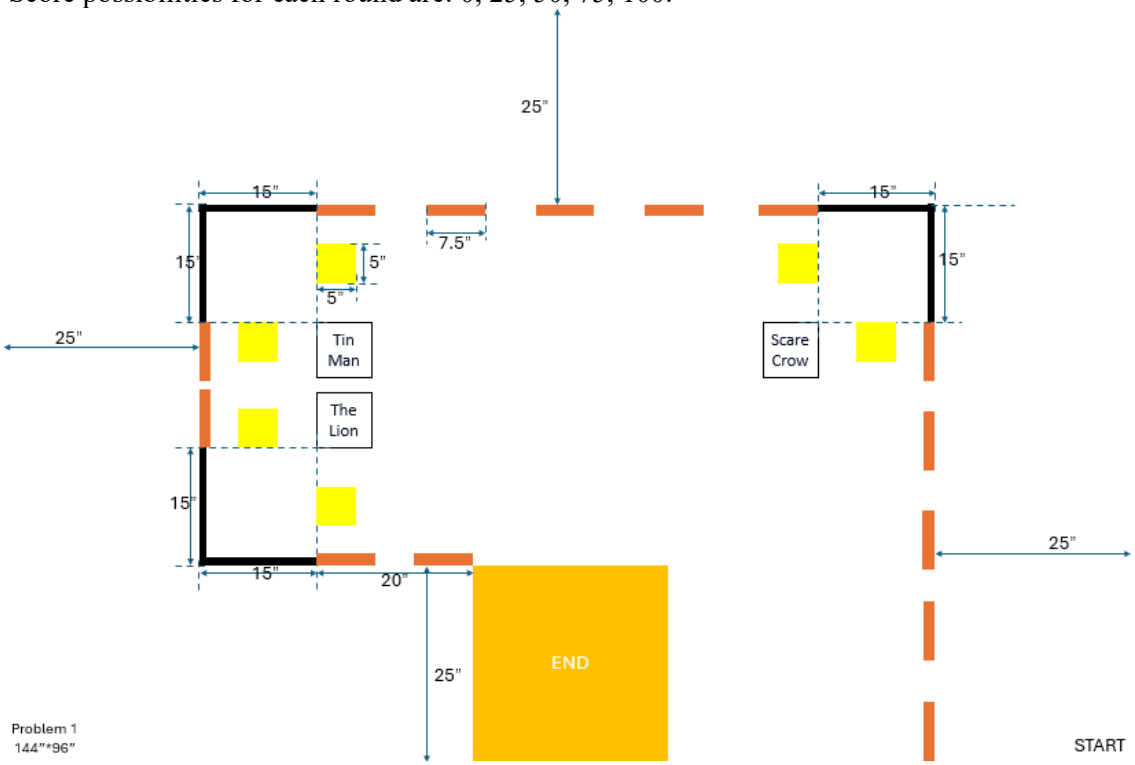
1. The starting point is at the bottom-right side of the field.
2. A narrow path of obstacles (bricks) and the deadly forest (the area off of the playing field).
3. An area in the bottom-middle of the playing field that represents the Yellow Brick Road.

Robot Movement:

- Your robot should navigate to the yellow brick road without moving any obstacles or going off the field.
- Your robot must begin at the starting location and touch the Yellow Brick Road (just touching is sufficient).

Scoring:

- Points are awarded as follows:
    - You will receive 25 points for each of your friends that you pass on the path (passing means to clear the corner turn and pass the location of the friend).
    - When your robot touches the Yellow Brick Road, you receive the full 100 points for the problem.
- The attempt is over if:
    - Your robot goes off the field or moves any of the bricks (bricks may be touched but not moved). In such a case, the score is the total achieved so far (e.g., leaving the field or moving a brick after passing the Tin Man, your score would be 50).
    - Before 60 seconds, your robot follows the path and touches the Yellow Brick Road without going off-field or moving bricks, you receive the full 100 points, and the turn ends.
    - 60 seconds have expired before reaching the Yellow Brick Road. In such a case, the score is the total achieved so far (e.g., if time expires after passing the Tin Man, your score would be 50).
- Score possibilities for each round are: 0, 25, 50, 75, 100.



Melt the Witch

Can you get past the Witch's guards and melt her with a bucket of water?

Goal: Navigate your robot through the corridors (horizontal) and hallways (vertical) of the Witch's castle to avoid the guards and melt the witch. Your goal is to move through hallways when a guard is discovered in each corridor and then make your way to the Witch.

Problem: The field contains the following features:

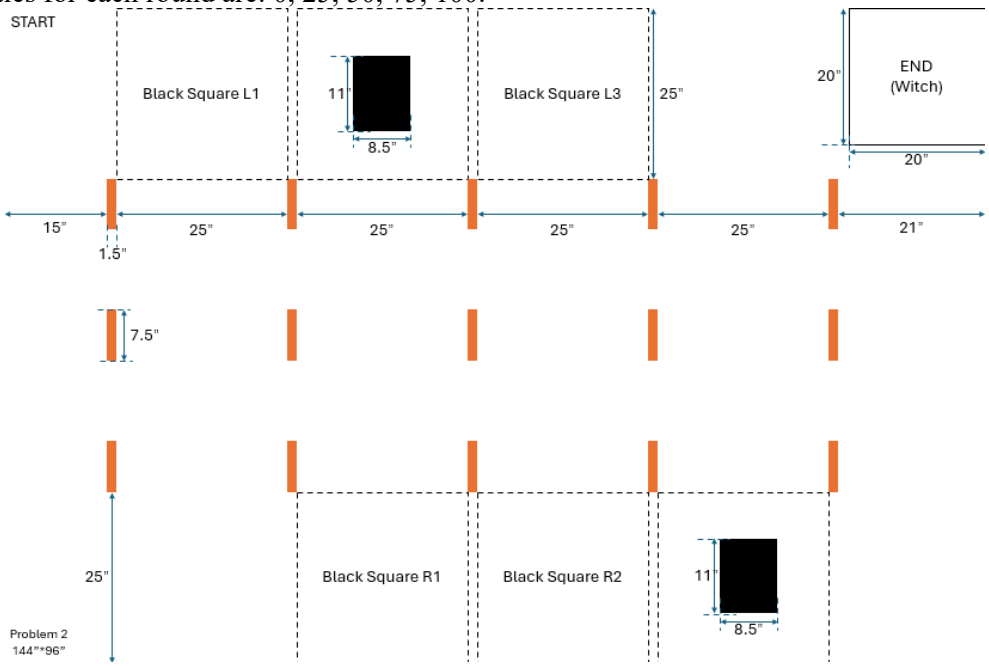
1. The starting point is at the upper-left side of the field.
2. Two **randomly placed** black rectangles– one in the top corridor and a second in the bottom corridor. Each rectangle represents the situation when a turn must be made to avoid a guard.
3. An area in the upper-right of the playing field that represents the Witch.

Robot Movement:

- Your robot will start at the upper-left of the field and face east (right).
- You must move your robot across the corridors and turn down a hallway whenever a guard is noticed (represented by the black rectangles).
- After avoiding both guards and moving through both hallways, your robot must touch the square of the Witch.

Scoring:

- Points are awarded as follows:
  - 25 points will be awarded for identifying the first guard and making the turn to move down a hallway.
  - 50 points will be awarded for identifying the second guard and making the turn to move up a hallway.
  - 25 points will be awarded when your robot touches the Witch's square
- The attempt is over if:
  - Your robot goes off the field or moves any of the hallway bricks (bricks may be touched but not moved). In such a case, the score is the total achieved so far (e.g., making the first correct hallway move is 25 points).
  - Your robot reaches the Witch's square. In such a case, the score is an additional 25 points to the total. It is possible to fight the guards, rather than avoiding them, and go straight to the Witch to end with 25 points.
  - 60 seconds have expired before reaching the Witch. In such a case, the score is the total achieved so far (e.g., if time expires after making the first correct hallway turn, your score would be 25).
- Score possibilities for each round are: 0, 25, 50, 75, 100.



There's No Place Like Home

Can you help Dorothy tap her magic ruby slippers to return home?

Goal: Move your robot to tap the ruby slippers together by pushing the upper part of the slippers outward and the lower part of the slippers inward.

Problem: The field contains the following features:

1. The starting area is at the top of the field.
2. Four red cubes represent the tops and bottoms of two slippers.
3. Four squares represent the locations where the four cubes must be moved horizontally.

Robot Movement:

- Your robot must move from the starting location and push the top two inner red cubes outward into the large squares, and the bottom two outer cubes inward into the large squares. The cubes may be pushed in any order.

Scoring:

- Points are awarded as follows:
  - Each cube that is completely pushed into its associated nearest square will receive 25 points. A cube must have all of its sides entirely within the larger square for it to be counted as 25 points.
- The attempt is over if:
  - Your robot goes off the field. In such a case, the score is the total achieved so far (e.g., if you leave the field after pushing two red cubes into their squares, the score would be 50 points).
  - Before 60 seconds, your robot pushes all cubes into their squares without going off-field, you receive the full 100 points, and the turn ends.
  - 60 seconds have expired before pushing all of the cubes into their squares. In such a case, the score is the total achieved so far (e.g., if time expires after pushing two red cubes into their squares, the score would be 50 points).
- Score possibilities for each round are: 0, 25, 50, 75, 100.