Augustana Invitational Robotics Challenge 2018

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AIRC 2018

3rd Annual Augustana Invitational Robotics Challenge

1. Objective:

The 2018 challenge is to build an automated *recycling-collector* robot. Specifically, your robot must find and move empty soda pop cans (standard 12 oz size & shape, aluminum) from the collection zone (BLACK) back to the drop-off zone (RED).

2. Course layout and construction

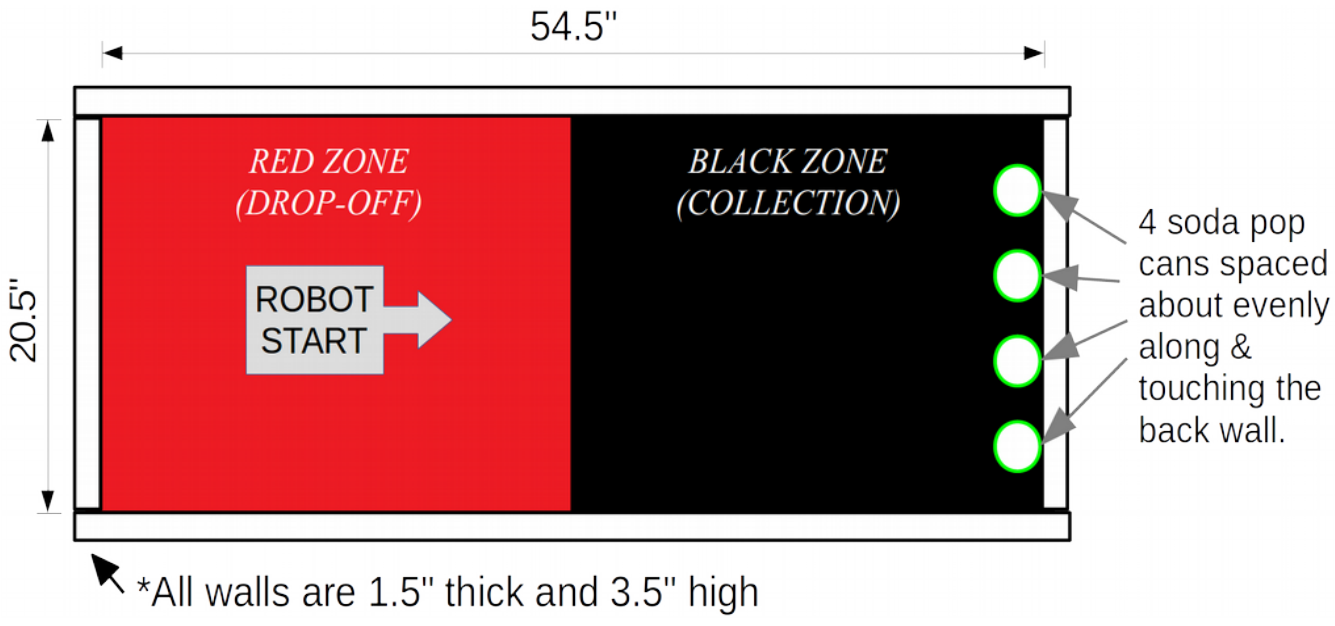
Raw Materials:

- Two sheets of standard 22"x28" posterboard – one red and one black (~ $1 each @ Walmart)
- Two 7-foot 2x4 boards (~ $3 each @ Home Depot), each cut twice to get 57.5" and 20.5" pieces. *(Note: Home Depot & Lowes will even cut the boards for you if you ask.)*
- Masking Tape (~ $3 @ Home Depot)
- Optional: An electric drill and a few screws (to hold the boundary together sturdily)
- *Total cost of materials: ~ $11* *Total Time for Assembly: 15-30 mins?*

The course floor is made by taping the red and the black posterboard sheets together along their short edges on the underside using masking tape.

The course boundary wall consists of a rectangular frame of 2x4s oriented so that the height of the wall is 3.5", and a wall thickness of 1.5". The inner dimensions of the rectangular course are 54.5"x20.5", and the outer dimensions are 57.5"x23.5". The frame is placed on top of the red & black floor such that the posterboard edge extends halfway (¾") underneath each of the wall boards.

Optional: for more stability/rigidity, the boundary wall frame can be screwed together, and the posterboard can be taped all the way around the bottom of the frame.



3. Rounds of Competition

Initially, the robot will be placed at the center of the RED (DROP-OFF) ZONE facing toward the BLACK (COLLECTION) zone.

Four (standard) soda pop cans will be placed roughly evenly spaced along the back wall of the BLACK ZONE, with the can touching the back wall. Your robot should not depend on the *exact* placement of these cans, but you may assume that the cans are not placed too close to the corners.

Your robot will be given 2 minutes to move as many of these cans as possible into the RED ZONE.

Each robot will be given three individual trials (no other robots simultaneously on the course).

4. Scoring

The score at the end of the trial is based on the number of cans in the RED ZONE. One point is earned for each can that is touching (or situated above – e.g. in the robot's grasp) the red posterboard when time runs out. One additional point is earned for each can that is "free standing" (standing tall/vertical, up on its end) and *entirely* on red posterboard (no part touching black), not touching the robot, and in mint condition (not significantly dented, etc). The maximum score for each trial round is 8 points.

Each robot's *contest score* is the sum of its **best two trials** (out of three). *Ties are broken as follows:*

If multiple robots tie in *contest score*, then the sum of all three trials will be considered.

If there is still a tie, then an *overtime* round will occur, where each potential champion gets another trial, and the highest score wins. During *overtime* rounds, the speed at which cans are successfully deposited may also be used to break ties. If necessary, additional overtime rounds may be held.

5. Robot construction and programming

- This year's contest will allow teams to use any robotics platform, but most teams will likely use LEGO-brand EV3 or NXT kits. *(Augustana teams may check out robots from the Math and CS Department. Other schools will need to provide their own robots – contact your local CS or engineering dept. to see if they have robots or are willing to purchase them for you.)*
- The robot must not exceed 18 inches in any dimension when placed on the course (although it is acceptable for it to unfold itself/become larger during operation.)
- Remote-controlled robots will NOT be allowed. Once the race trial begins, the robot must act autonomously! (Bluetooth/WiFi communication with the robots is prohibited during the race.)
- If a robot is physically damaged during a trial, the team may repair it after that trial is over. However, NO changes to the robot design or programming are allowed once the contest starts.
- Robots that are excessively destructive (to the course or the cans) may be penalized points, or could even banned from participating (in extreme cases – e.g., robots with flame throwers).
- Teams are free to program their robots using any tools/language that they choose. The free LeJOS platform (to program LEGO robots using Java with a convenient Eclipse plugin) is one possibility, but other choices (LEGO drag-n-drop, RobotC, LabVIEW, ev3dev) are also fine.

6. Team composition & registration

Teams must be composed of undergraduate students from an invited institution. Teams should generally consist of 3 members, and teamwork is highly encouraged. However, team sizes between 1 and 5 will be allowed to register. Each participant may only serve on ONE team, and each team is only allowed to enter one robot in the contest. Non-student (e.g. faculty) coaches may offer some assistance, but robot construction *and* programming should be done primarily by the students.

Teams should register no later than **April 24, 2018**. Register here: http://lovelace.augustana.edu/airc

At least one team member should be present at the actual contest, which will be held at **7:30 P.M. on the evening of Wednesday, May 2, 2018**.

If any adjustments/clarifications need to be made later regarding the robot challenge rules or logistics, these will be posted on the A.I.R.C. website http://lovelace.augustana.edu/airc, and ***all registered teams*** will receive email updates.

Questions? Contact the AIRC coordinator: Dr. Forrest Stonedahl, forreststonedahl@augustana.edu