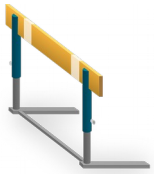
AIRC 2016

1st Annual Augustana Invitational Robotics Challenge

1. Objective:



The 2016 challenge is to build a track & field robot to compete in the *hurdles* event!

Specifically, your robot must (somehow) locomote over 3 "hurdle" barriers, change direction, and cross those same 3 hurdles again on the return trip. (Well, that's the ultimate goal – but really, your robot only has to outperform the other robots that are *trying* this task!)

Each barrier will be a 2 foot long section of 2x4 (lumber) lying on its widest flat side. (Note that a standard 2x4 board is actually 1.5 inches tall by 3.5 inches wide.)

The robot should only turn around after it has crossed the 3rd hurdle. A robot counts as having "crossed" a hurdle if EVERY physical piece of the robot has moved beyond the plane that extends upward from the far side of that hurdle. *(You should probably make it move a few extra inches past thuogh, just so there's no question for the judges).* A robot counts as having "half-crossed" a hurdle (for a half-point – see scoring below) if the robot manages to get ANY physical piece of the robot across the plane that extends upward from the far side of that hurdle.

The race is finished (and time is recorded) once the robot completely crosses the *final hurdle on the return trip*. (After this point, your robot should feel free to celebrate with song and/or dance).

2. Trials:

Each robot will be given an <u>individual</u> time trial on the course (not simultaneous with other robots).

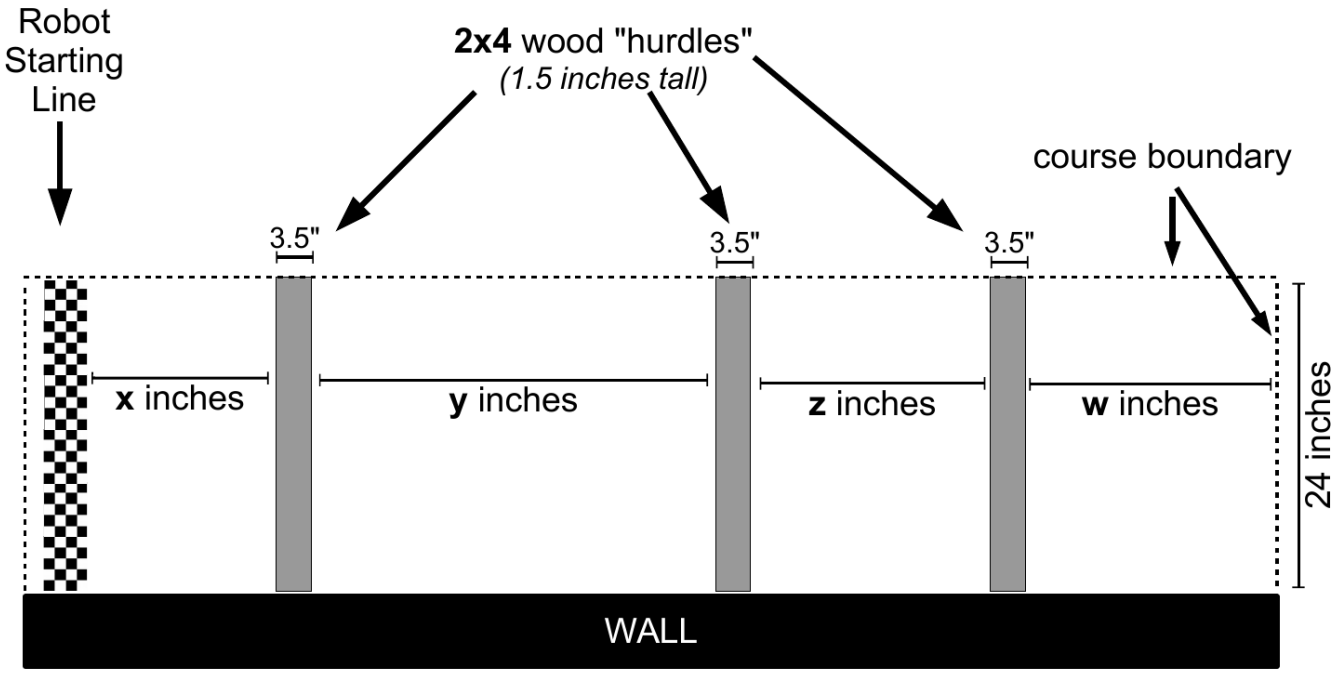
Each race trial will have a 3 minute time limit, and end early if the robot leaves the course boundaries.

ALL robots will attempt **T** trials on the course, where **T** is at least 2. *(Depending on the number of robot teams enrolled in the challenge and the time available,* **T** *could be larger.)*

3. Scoring/winning conditions:

Robots will score one point for each hurdle they successfully cross (and a half point for each half-crossed hurdle). While this adds up to a maximum possible score of 6 points for any trial, do not be discouraged if your robot only makes it over a few hurdles -- it could still win! The robot with the highest score on its **best trial** wins the challenge. ***Tie breakers:***

> If the tying robots each scored 6 points (i.e. they completed the full course), then the tie will be broken by completion TIME (with the fastest robot winning).
>
> Otherwise, ties will be broken by looking at the SUM of the robots' scores across ALL trials.
>
> If a tie cannot be broken with these methods, then multiple winners will be crowned.



Robot "Hurdle" Challenge Course: TOP-DOWN VIEW

4. Course layout:

The course layout (see diagram above) is "half-open" – one side of the course will have a wall (at least 12" tall) along it, and the other does not. When starting the course, the wall will be on the robot's right. On the return trip, the wall will be on the robot's left. The other side is *out of bounds*, and if a robot touches the ground outside the boundaries, its trial is over).

To start, a team may place its robot anywhere along the starting line, with no part of the robot extending in front of the starting line.

The spacing between hurdles (**x, y, z**) is purposefully left unspecified until the contest begins, but you may assume that **15 inches ≤ x, y, z ≤ 36 inches**. *The distance **w** between the last hurdle and the boundary will also be at least 15 inches (but note that the robots may turn around as soon as they have crossed the third hurdle – they do not need to reach the end boundary).*

The racetrack floor is expected to be firm institutional carpet (not long/shaggy).

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

5. 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. Teams should be registered by April 22, 2015.

5. Robot construction and programming

- To ensure a level playing field, teams must use a *LEGO Mindstorms* robot (i.e. EV3 or NXT) for this year's challenge. *(Augustana teams may check out robots from the Mathematics and Computer Science Department. Teams from other schools will need to provide their own robots – you should contact your local CS or engineering department to see if they already have LEGO robots available for you to use, or if they would be willing to purchase them for you.)*

- For the construction of the robot, any LEGO-brand parts are allowed. Beyond that, teams may only use common inexpensive household items (twist ties, paper clips, aluminum foil, scotch tape, etc – NO third-party motors/electronic equipment, etc.) If you need clarification about whether a specific construction material is permitted, contact the A.I.R.C. coordinator, forreststonedahl@augustana.edu

- 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 programming of the robots are allowed once the contest has started. *(Specifically, you are NOT allowed to program/specify the distances between hurdles into your robot in any way… your robot must figure out where the hurdles are for itself.)*

- Teams are free to program their robots using any tools/language that they choose. The free LeJOS platform (which allows you to program LEGO robots using Java with a convenient Eclipse plugin) is recommended, but other choices (LEGO drag-n-drop, RobotC , LabVIEW) are also fine.

- You might check YouTube for "climbing lego robot" videos to see some pretty cool creations others have made. Perhaps you can find ideas that you can mimic/adapt to this hurdles challenge...
  - https://www.youtube.com/watch?v=ukevZ17qN0U
  - https://www.youtube.com/watch?v=LjF6Fa-jowY

Once again, if you have any questions, please contact the A.I.R.C. coordinator:

Dr. Forrest Stonedahl
Assistant Professor of Computer Science
Augustana College
Email: forreststonedahl@augustana.edu