ASABE 2008 Robotics Competition Rules

The 2008 AIM competition will consist of a two part format: a robotic trial demonstrating the capabilities of small robots designed and built by university students and a presentation outlining the details of their design.

Theme Description
The theme for the trial portion of the competition will emulate the operation of a tree harvester. One or two robots developed by the team will be placed in the competition area and run autonomously to harvest, gather and transport as many trees as possible during the time allotted. Trees will be simulated by dowel rods and marked as “harvestable” and “un-harvestable”. The trees will be placed in holes drill in the floor of the competition area. Teams will pull the tree out to “harvest” it. Points will be awarded for each harvested tree that is placed in a holding portion of the competition area. Points will also be deducted for harvesting or knocking over un-harvestable trees. The configuration of the trees will be randomized before each run to avoid teams from pre-mapping the location of the harvestable trees. Each team will be allowed two runs of five minutes each and the best run will be used as that teams score.

Restrictions on Robots
The size and weight of the robots are up to the team’s discretion, though the teams should take care to notice the dimensions and layout of the competition area. A compromise should be made between a large robot for increased harvesting capabilities and a small robot for maneuverability in between the trees. Students will be allowed to purchase robotic kits from which to build their robot or build their own from scratch. Students may not purchase or use pre-built robots, nor may they use designs other than their own. Though it is often useful to study the designs of other engineers, the theme behind the competition is to design and build your own robots. Also, changes to code on the robot will not be allowed after 10 minutes before the beginning of the competition. No coding changes will be allowed between runs either.

Costs
Costs to compete in the competition including travel to and from the competition and the cost of parts and materials will be paid by the university teams. Students are expected to fundraise in order to raise the money they need.
Modification Rule:
A team is not allowed to intentionally modify the course. Teams may not affix anything to, move, remove, or color the floor, walls, guidance path, or gathering area. Nothing can be affixed to the trees and they cannot be marked.

Forest:
The mock forest will be made up of a combination of ½” (un-harvestable) and 1” (harvestable) dowel rods 24 cm in length to serve as the trees for the robotic harvester to gather. The spacing between the centers of the trees will be 25 cm in both the horizontal and vertical directions. The trees will be 12.5 cm from the walls. To assist with the identification of the trees that are harvestable, the 1 in. dowels will be painted red. The trees will be recessed in holes that have been drilled into the wood to provide a sturdy yet removable fit. The 1” dowel rod will have a ½” dia. base (2 cm high) so that the holes for the tree positions can all be the same size and a random configuration of the forest for harvestable and un-harvestable trees can be obtained.
**Gathering Area:**
The gathering area will consist of three 15 cm walls, 50 cm wide, 25 cm deep and an open entrance side. The harvester is responsible for returning the harvested trees to the guidance area in order to receive full points. Any trees that are crossing the entrance line will not be counted towards the teams point total.

**Guidance Road:**
The guidance road will consist of two lines that run the length of the course as seen in the diagram on the prior page. The lines will start at the entrance line of the gathering area and run to the back wall. The two lines will be spaced roughly 30 cm apart and will allow the teams to have an option to “line follow” when navigating to or from the gathering area.

**Walls:**
The entire 2.5 m x 2.5 m course will be surrounded by a 3 cm high wall that will serve two purposes. The wall will ensure robots will not fall outside of the course along with serving as an easily identifiable navigational tool while the robots are performing the challenge.

**Presentation**
Each team will be required to give a 15 minute presentation discussing the details and effectiveness of their design, including mechanical, electrical, and software components. Students will be given a score on their presentation skills as well as a score on the elegance of their design. This presentation will be at a separate time from the main event.

**Points**
Points will be awarded based on three categories: competition performance, elegance of design, written report, and presentation. The point breakdown is as follows:

- **Performance:** 750 points for 1\textsuperscript{st} place. Others will be awarded points based on the percentage of logs harvested when compared to the first place team.
  
  \textbf{Example:} if the 1\textsuperscript{st} place team gathers 24 logs and the 2\textsuperscript{nd} place team gathers 20 logs then the 1\textsuperscript{st} place team will get 750 points and the 2\textsuperscript{nd} place team will get $20/24 \times 750 = 625$ points. Points will be rounded to the nearest whole number. Points will be reduced by 20 points per un-harvestable tree that is harvested and 10 points per un-harvestable tree that is knocked over.

- **Elegance of Design:** 50 points. These points will be awarded by the judge’s discretion, with an emphasis on the quality of the system built by the students.
• **Written Report:** 100 points. Points will be awarded based on general writing ability and effectiveness of presenting the team’s design in a written format. The report should include all major design decisions and the algorithms used to complete the challenge. Also include pictures, diagrams, and equations to assist your descriptions.

• **Presentation:** 100 points. Points will be awarded on speaking ability and effectiveness of presenting the team’s design in a presentation format. A computer and projector will be available to present and slides, diagrams, or pictures you may have.

**Rules arbitration**

Though the rules presented here have been developed to be as encompassing and unambiguous as possible, it is of course possible that questions and concerns regarding the rules can occur up to and during the competition. Rules have been made by the P-127 Rules subcommittee and they will make the final decisions regarding any and all concerns as well as ruling when a team violates any of the rules. Unless otherwise specified, any rules violation or attempt to violate the rules will result in immediate disqualification from the competition. There will be no exceptions. As such, teams should take extra care to follow them to the best of their ability.