

IEEE SoutheastCon 2010

Student Hardware Competition Rules

Version 1.1 - 9/15/09

I. Introduction

Renewable energy is critical to the well being of our planet and civilization. In the spirit of renewable energy, Southeast Conference 2010 will focus on the use of green energy in autonomous vehicles. In this competition no batteries or fuel will be used as a source of energy. A combination of solar power and capacitors is one anticipated solution.

II. Objective

The primary objective of this competition will be to drive around a track as many times as possible within the given time limit. The track will contain several different types of obstacles and terrains. In order to successfully complete the challenge, a vehicle needs to travel around the track, passing through/over obstacles. Points will be awarded for every lap successfully completed, however, bonus points will also be awarded to vehicles that successfully navigate one or all of the obstacles on a given lap.

It is the hope that student teams will learn and apply several key Electrical and Computer Engineering technologies in their vehicle, including:

- Solar panel analysis and power harvesting
- Very-low power computing
- Efficient electrical to mechanical conversion and propulsion
- Problem solving, algorithm development, and course strategy

III. Playing Field

The playing field will consist of a 10x10 foot square of AstroTurf (Lowe's #234774) that is ringed by wooden 2x4s. There will be a 4x4 foot wooden 2x4 square in the center of the track to create the inside wall of the track. This will allow a 3 foot wide track. Adjacent to three of the walls, obstacles will be placed (see Figure 1):

- **Height Obstacle:** Consists of a 2x4 structure with the inside dimensions of 16" wide by 8" tall.
- **Width Obstacle:** Consists of a 2x4 structure with the inside dimensions of 8" wide by 16" tall.
- **Ramp Obstacle:** Consists of a 16" wide Plexiglas ramp with 3 faces, each 12" long, with the front and back faces at an angle of 30 degrees between the floor and the top surface.

The starting line will consist of a strip of 1/2" masking tape that will run the width of the track. In the center of each side of the track at a level of 18" above the astroturf, a "basking light" will be hung for energy harvesting (see Figures 2 and 3). These lights will be intense and can charge your vehicle's solar-cells. Each basking light will be a 250 Watt Halogen Worklight with the metal screen and UV filter removed. Item # 246900, Model: WL250CL4-L sold on www.lowes.com for \$12.98

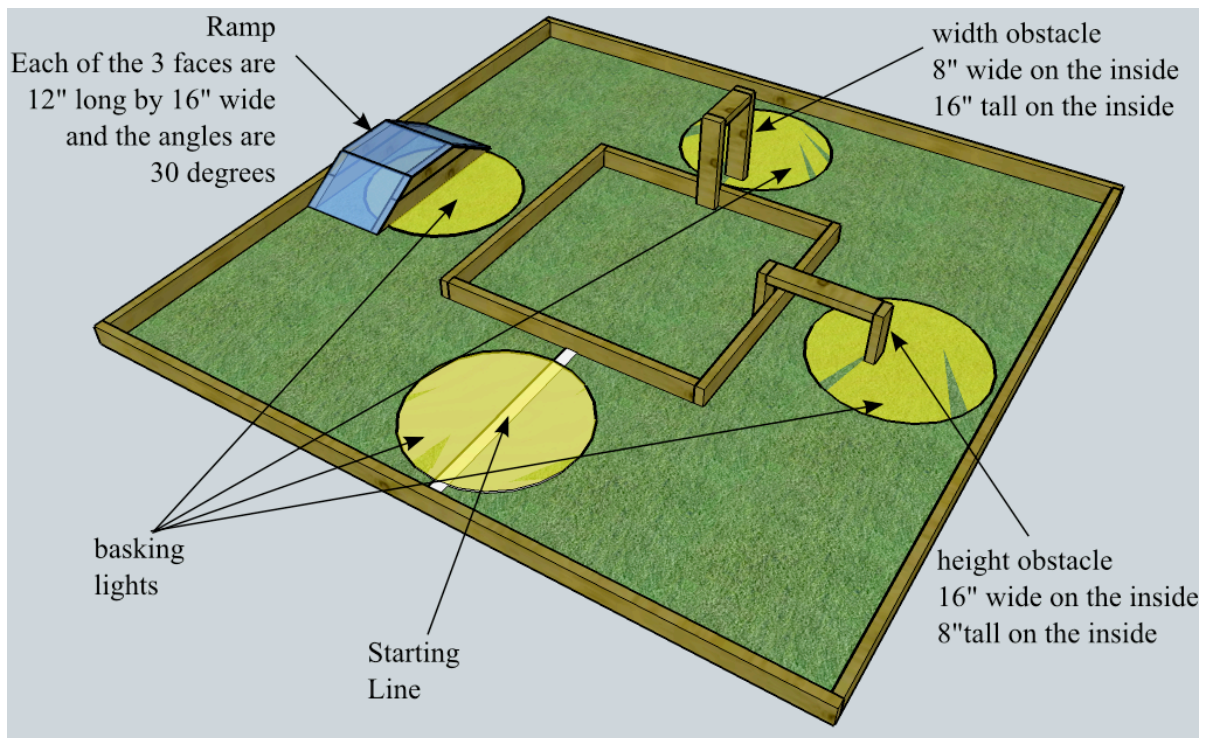


Figure 1: Playing field with expected placement of obstacles (Note the yellow circles represent approximate light coverage)

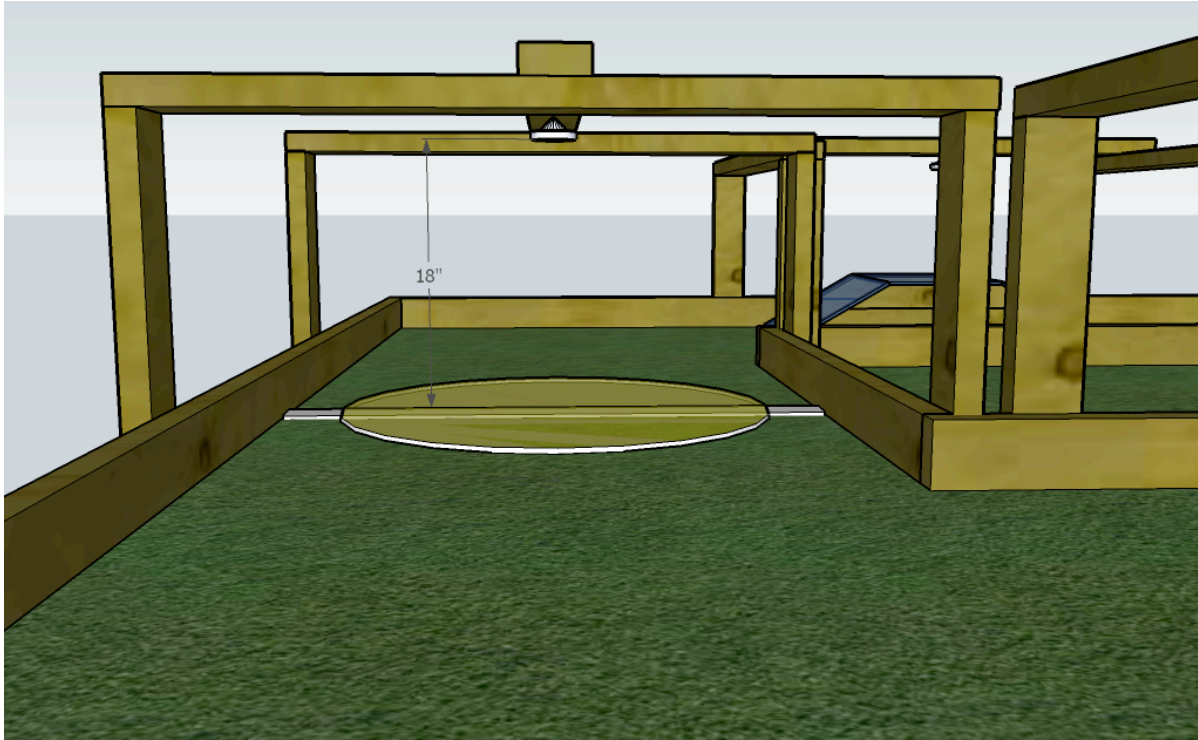


Figure 2: Example of light locations (Note the yellow circle represents approximate light coverage)

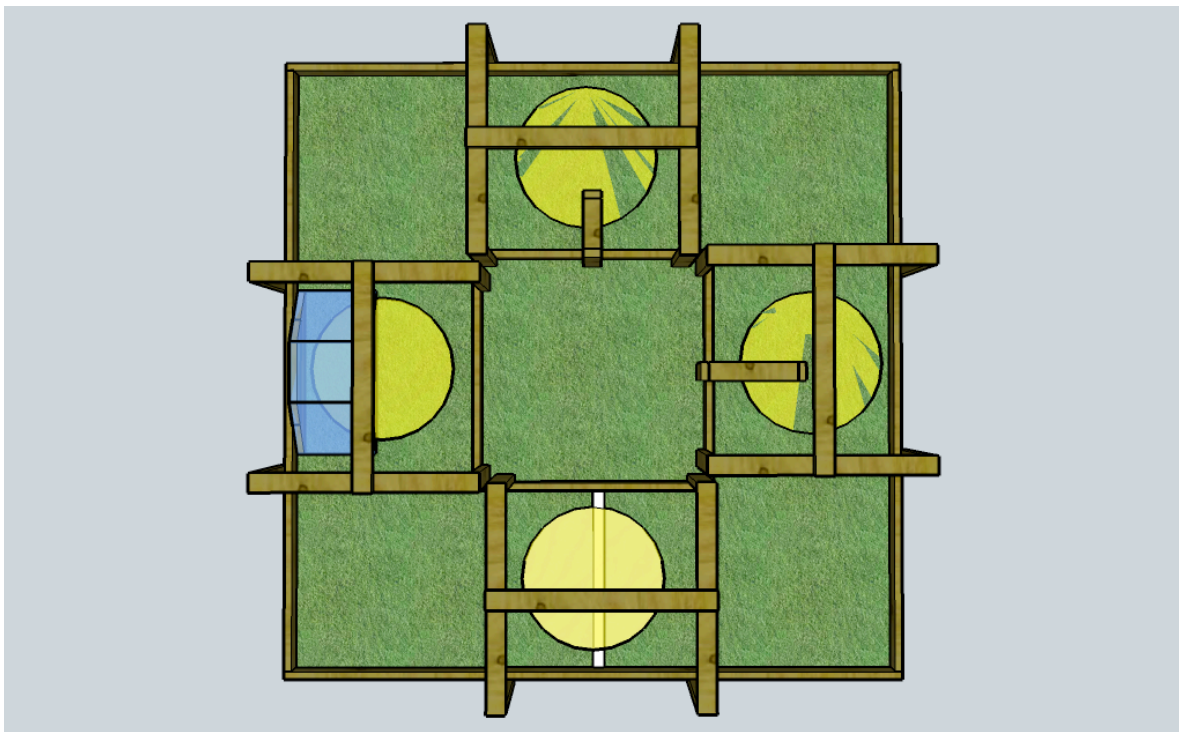


Figure 3: Top-down view of playing field with light locations (Note the yellow circles represent approximate light coverage)

IV. Vehicle

There are no regulations on the size of the vehicle, other than it must be shorter than 16" tall and must operate solely in the active playing field (i.e., no part of the vehicle can extend over the outer wall at any time during the race). Only commercially-available solar panels and storage devices that can be safely set to "zero energy stored" at the beginning of the contest are legal. Batteries are explicitly disallowed.

V. Rules of Play

At the start of each vehicle's trial run, the vehicle's energy storage devices must be completely discharged. The first part of each run will require the team to demonstrate that their vehicle has no energy stored, turning on the lights of the track will start the race.

A competitor will place their vehicle behind the starting line - at the time the lights are turned on, their three minute trial begins. The vehicle must drive around the track as many times as possible, attempting to acquire as many points along the way as possible. It must travel in the counter-clockwise direction.

VI. Competition Format

The competition will include three phases:

1. Qualifying round: A vehicle must earn at least one point to qualify for the main competition round of the contest. The points earned in the qualifying round are not used for future rounds.
2. Competition round: A vehicle will be given three trials. All vehicles will be ranked by their total score over their best two trials. The top three vehicles (that scored more than zero points during all three trials) will advance to the final round. A tiebreaking measurement (see Section VIII) will be used if the top three cannot be determined by points alone.
3. Final Round: The three top vehicles will compete head-to-head in a single race (on three separate tracks) and determine the first, second, and third place ranking. The points from the competition round are not used in this final race.

VII. Scoring

Points can be accumulated based on the number of laps made by the vehicle and obstacles successfully passed in the counter clockwise direction. Note that points will be deducted if the vehicle passes the obstacle in the wrong direction. Scoring will be counted when the vehicle passes the back-side of the obstacle. A vehicle must pass the starting line before it can earn points for the same obstacle again.

- 1 point - move the vehicle completely past the starting line
- 5 points - each lap completed
- 25 points - each height obstacle completed
- 25 points - each length obstacle completed
- 50 points - each ramp obstacle completed

Notes:

- 1) A lap is completed when every part of the vehicle crosses the finish line
- 2) An obstacle is completed when every part of the vehicle exits the obstacle

VIII. Tiebreakers

Should two or more vehicles have the same score and are ranked as tied for first, second, or third place at the end of the Competition Round, then the following tiebreaker will be used.

1. The distance covered (in degrees from the starting line, 0 to 359 degrees) of the center of the vehicle on the last incomplete lap of each Competition Round will be recorded.
2. The degrees measurements of the two highest point total rounds will be added together and these measurements will serve as a secondary ranking of the vehicles, should they have identical scores.

IX. Team Participants

The official university teams are to be made up of officially registered IEEE undergraduate members only. Each university is allowed one team for the main competition. While graduate students and professionals can be consulted on basic technologies, it is expected that only undergraduates participate in the design, fabrication, and testing of the university's official vehicle.

Each team member shall be officially registered for the IEEE SoutheastCon 2010 conference no later than January 31, 2010.

An open competition division will also be available for any other group that wishes to participate. The open competition will follow the same rules as the undergraduate competition, but teams can be made up of anyone including, but not limited to, graduate students, faculty, or practicing engineers.