

# Vision Centric Robot Challenge (VCRC) 2013

A Robofest ([www.robofest.net](http://www.robofest.net)) Challenge for Advanced High School and College Students  
Lawrence Technological University, Southfield, Michigan

V1.1 2-23-13 Official Version (Changes after the kick-off are in red)

Using computer vision as the main sensory modality of autonomous mobile robotics projects has the following advantages: (1) Low cost (compared to expensive laser scanners), (2) Richness of information (3) Low power consumption (compared to laser scanners), (4) Retrieving 3D information with stereo vision.

In order to promote research on computer vision and autonomous mobile robotics, we challenge college students (undergraduate and graduate students), as well as talented high school students with the following Vision based Robot Competitions during Robofest 2012-2013 academic year.

## Team Divisions

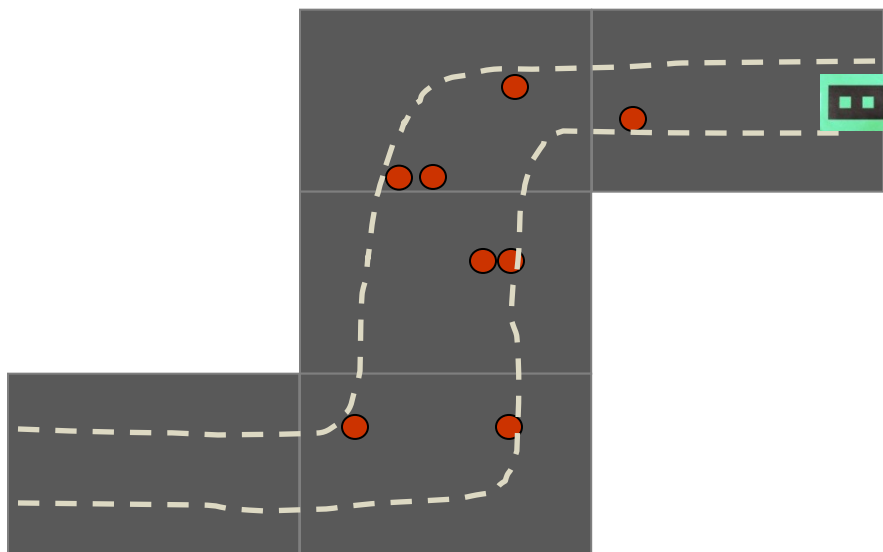
- Advanced High School: max. 3 team members, with simple obstacles (no switch back)
- College: max. 2 members per team, more complex obstacles (switch backs) to avoid

## Challenge Synopsis

Follow a dashed lane while avoiding orange safety cones. When a dead end sign with a digit on green paper is detected, read the number (college teams only), turn around and come back to the starting point. Report the read number (college teams only). 3 minutes are given for each run.

## Challenge Course Description

Unknown number of 5x8 carpets will be used for the course. The exact shape, color, and length of the course are unknown. Floor or ground color where carpets will be placed will be unknown, but should be different from the color of the dashed line. The light condition on the course is unknown and dynamic. A bright light on the course may be turned on and off during the mission at unknown location. See a sample course below.



(Figure 1) A sample course with a number 8 on green paper at the end

The minimum width of the lane is 2 feet. The line is made of bright masking tape of which the width is at least 2.5 inches. The gap between lines is at most 12 inches. 90 degrees will be the sharpest angle to turn. The dashed line must be at least a half foot away from the edge of the carpets.

The cone can be placed on the dashed line. There will be a minimum of 2 feet clearance, minimum passage width, between the dashed line and the cones or between cones. Some cones in the center area will be placed after the robot starts by a judge. But the difficulty level of the obstacle configuration should be similar to all the teams. Here is the 12 inch safety cone info on the web at:

<http://www.homedepot.com/webapp/wcs/stores/servlet/ProductDisplay?storeId=10051&langId=-1&catalogId=10053&productId=100063670>

The dead end one digit number on a green letter size (8.5"x11") paper can be downloaded from the VCRC home page at [www.robofest.net/collegiate](http://www.robofest.net/collegiate). The number should be placed on the carpet. The orientation of the sign must be portrait. The angle of the sign from the floor can be between 0 to 90 degrees and the team can adjust before each run. High school teams do not need to read the digit. The robot must completely pass the **last cone** before turning around.

### Competition Rules

- A robot has 2 chances to run. For each run, each robot has a maximum of 3 minutes. If failed during a run, the robot's distance traveled will be recorded.
- The winner will be decided by (1) number of successful perfect runs (The correct number must be reported) (2) the best time of the two runs. (3) best distance traveled of the two runs
- For successful lane following, the robot must maintain at least one wheel inside the lane.
- The robot must be **restarted** if any violation occurs. If you rerun, previous travel distance data will be reset. The timer does not stop while the robot is being returned to the start position by the player. Therefore it is discouraged to restart if the robot is far away from the home base.
- Human player cannot have any interaction with the robot. For example, giving sound or visual signals to the robot is not allowed.

### Robot Requirements

- Must be autonomous (No remote control by human driver or remote computer is allowed)
- Any robot platform with any vision system such as L2Bot or iCreate is allowed to enter the competition
- Any number of onboard cameras (webcam or camcorder) can be used. You may use any other sensors such as digital compass.
- Any programming language can be used.
- Width: must be less than 2ft, since minimum width of the lane is 2ft.
- Length: less than 3ft
- Height: maximum 6ft
- Weight: no limit

**Prize:** Winner Trophies; High school team members of the winning team receive \$2,000 LTU renewable scholarships.

### Competition Dates

- May 18, 2013 at LTU – World Championship 2013; (**Practice course will be open on May 17, 5pm~9pm**)
- June 9-10, 2012 at Oakland University (Tentative)

**Questions:** Contact Dr. Chung at chung@LTU.edu

- To purchase or lease an L2Bot
- To register (on-line or on-ground) classes to learn about vision centric robotics

### Misc. Info

- Go to [www.robofest.net/collegiate](http://www.robofest.net/collegiate) for more info and possible rule updates
- The event is open to the public. Admission is free. Parking is free