

Collegiate ~~ROBO~~FEST 2008

Mini Urban Challenge using Vision-based Robot, L2Bot

V1.21 March 23, 2008

Using computer vision as the main sensory modality of autonomous mobile robotics projects has the following advantages:

- Low cost (compared to expensive laser scanners)
- Low power consumption (compared to laser scanners)
- Richness of information
- Possibility of retrieving 3D information with stereo vision

In order to promote research on computer vision and autonomous mobile robotics, we challenge college students (community college, undergraduate, and graduate students), as well as talented high school students with the following Vision Robot Competition - Mini Urban Challenge, Fall 2007.

When: Saturday, April 26, 2008, 8:30 am ~ 4:30 pm (practice: Fri. April 25, 5:00 pm ~ 8 pm)

Where: Lawrence Tech Don Ridler Field House, 21000 West 10 Mile Rd., Southfield, MI

Team Divisions

- Advanced High School: using L2Bot 2007 edition, max. 3 team members
- College: L2Bot 2006 edition, one member per team, harder problem will be given

Challenge Synopsis

Follow a road made of 3' wide black paper (Art Street Bulletin Board Paper, 36"W x 1000'L, Black, staples.com). There will be unknown number of 12" orange safety cones (from HomeDepot.com) at the end of the road. The robot must **turn around after passing the end-marks** at the dead-end and come back home. The robot does not need to stop at the home when it comes back. See a sample road below. The actual road shape is unknown until the day of competition. 90 degrees will be the sharpest angle to turn. The gym floor color is a sort of bright yellow.



Additional Challenges for the College Division

The robot starts when the green traffic light on the floor is shown to the robot. In the beginning before the start, red traffic signal light is placed on the floor. During the road following the robot must stop whenever and wherever the red light is presented on the floor to the robot. The red and green traffic lights on a letter size paper can be downloaded from (www.robofest.net/collegiate). The light condition on the course is unknown and dynamic. It is encouraged for college students to use artificial neural network architecture to train the robot or other computing algorithms inspired by nature for the challenge. The following picture shows a sample course setup in the atrium at Lawrence Tech.

Competition Rules

- There will be no direct sun light during the competition.
- A team has 3 chances to run. For each run, each team has maximum 4 minutes. The winner will be decided by the average time of the three runs. If failed for a run, the travel distance is recorded.
- For the successful road following, all 3 wheels of the L2Bot must be on the road.
- The robot must restart from the start point if any failure such as failed road following.



The robot started after recognizing the green light and is about to stop at the red light.

Robot Requirements

- Must be autonomous (no remote control is allowed)
- Only the L2Bot provided by LTU is allowed to enter the competition. No modification is allowed. Must use the original motors, width, length, battery, etc.
- If battery voltage is greater than 12V, it will be replaced with the battery provided by the organizer
- Any laptop (notebook) with a serial port can be plugged to the L2Bot platform. You may use a USB-serial adaptor.
- One onboard camera (webcam or camcorder) can be used. The use of purchased vision system such as COGNEX is not allowed. No other sensors are permitted to use. Using sound sensor on the laptop is NOT allowed.
- The method to mount a camera depends on the team. However height of the robot should be less than 5 feet (You may use your own tripod).
- Weight: no limit
- Any programming language can be used.

Prize: a giant trophy as well as additional prize for each age division winner

How to decide the winner

A team with the shortest average travel time out of three runs will win the race.

Registration & Questions?

- Send an email to chung@LTU.edu, especially if you need to purchase or lease an L2Bot

How to practice?

- It is easy to create a test course at home using black papers.
- A practice course will be setup from Friday April 25 from 5 p.m. in the gym, tentatively.

Misc. Info

- Go to www.robofest.net for more info and possible rule updates
- The event is open to the public. Admission is free. Parking is free.