

Collegiate ROBOFEST 2009

Mini Urban Challenge

Using a Vision-centered Robot, L2Bot

V1.1 4-25-09 Official Version (changes after the v1.0 are in green)
Please go to www.robofest.net to register teams.

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) Low power consumption (compared to laser scanners), (3) Richness of information, (4) Possibility of 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-centered Robot Competition - Mini Urban Challenge, 2009.

When & Where:

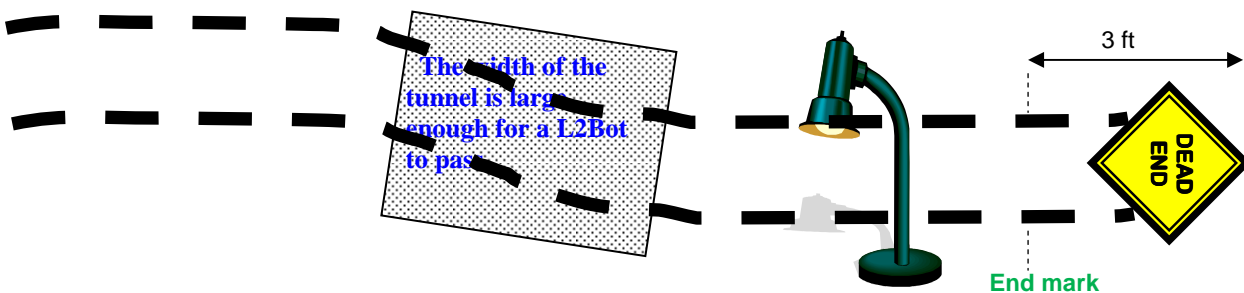
- Qualifying Competitions: COBO Hall MI on March 19, Cypress TX April 4, and LTU on May 8. Check out details on www.robofest.net
- Final: Saturday, May 9, 2009, Lawrence Tech, 21000 West 10 Mile Rd., Southfield, MI

Team Divisions

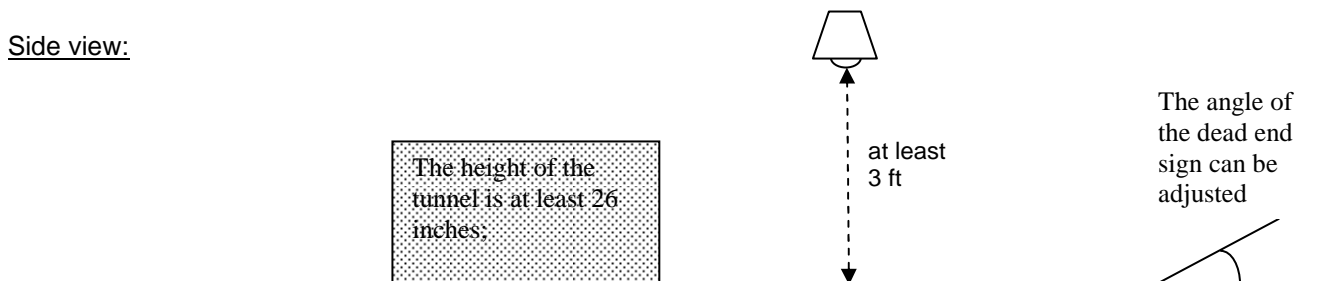
- Advanced High School: max. 3 team members
- College: One member per team, harder problem will be given

Challenge Synopsis

Follow a dashed lane until the robot reaches the yellow dead end sign. The shape of the lane is unknown. The robot must turn around after passing the end-mark at the dead-end and come back home. The light condition on the course is unknown and dynamic. There will be an unknown size/shape tunnel of which the light condition inside must be dark. The tunnel will be located anywhere between the start point and the dead end. A bright light on the lane may be turned on and off during the mission at unknown location. The robot does not need to stop at the home when it comes back. See a sample road below.



Side view:



The size of the lane width is between 2 and 3 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 least 7 inches. 90 degrees will be the sharpest angle to turn.

The floor color is a sort of (dark) gray. The dead end sign on a letter size paper can be downloaded from (www.robofest.net/collegiate). **There are two types of dead end sign. The team can choose the one they like. The sign should be placed on the gray color carpet. The orientation of the sign can be either portrait or landscape.** The angle of the sign from the floor can be between 0 to 90 degrees and the team can adjust before each run. We plan to use tables with 4 legs to create the tunnel. The robot must not touch any part of the tunnel. The size is unknown. It is encouraged for college students to use new techniques such as artificial neural network architecture to train the robot or other computing algorithms inspired by nature for the challenge.

Competition Rules

- A robot has 2 chances to run. For each run, each robot has a maximum of 4 minutes. The winner will be decided by the **best** time of the two runs. If failed during a run, the robot's distance traveled will be recorded.
- **For the successful lane following, the L2Bot must maintain at least one wheel inside the lane, that is, if both two front wheels are off the lane, the robot is in failure. Rear caster wheel does not count.**
- **College teams only:** unknown number of orange safety cones will be located inside the lane. The robot must navigate the road without touching it. Here is the cone info on the web at <http://www.homedepot.com/webapp/wcs/stores/servlet/ProductDisplay?storeId=10051&langId=-1&catalogId=10053&productId=100063670>
- The robot must restart from the start point if any failure such as failing to follow the road occurs.

Robot Requirements

- Must be autonomous (no remote control by human driver is allowed)
- Only the L2Bot provided by LTU is allowed to enter the competition. Must use the motors, width, length, battery of the original L2Bot.
- 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.
- Only 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. Using sound sensor on the laptop is NOT allowed.
- The method to mount a camera depends on the team. However the height of the robot should be less than **26** inches (due to the height of the tunnel).
- Weight: no limit
- Any programming language can be used.

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

Questions or Need to purchase or lease an L2Bot?

- Send an email to CJ Chung at chung@LTU.edu

Misc. Info

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