UT’s student organized engineering festival, Tech Carnivol, is proud to host the Autonomous Robotics Challenge: Line Vollower. The purpose of this competition is to promote excitement for robotics and technology, and allow students to show off their robotics skills and creativity. We hope that this competition will be a celebration of hobbyist robotics and encourage interest in technological growth.

For a robot to function autonomously, both hardware and software should be developed to sense the local environment and respond to the changes as needed for a task. This competition allow teams to gain hands-on experience in these areas and investigate the techniques required to build a working autonomous robot. Teams are challenged to design and build a fast yet accurate line following robot in a creative and ingenious way.

This competition is open to all high school and undergraduate students. The Autonomous Robotics Challenge is made possible by the student organizations at UT and student volunteers.
I. Important Rules

1. To be eligible to compete, each team must fill out and submit the Official Registration Form by TBA deadline (please visit our website for updates).
2. All robots must be fully autonomous. Competing robots must be the result of work by the officially registered members of that team.
3. This competition is open to high school and undergraduate students only.
4. No individual may participate on more than one team.
5. Prizes will be split equally among the registered members of that team.

II. The Course

Robots must navigate by following a white line through six gates. The white line will be 1.5 inches in width, and each gate will be approximately square with inside dimensions of 10 inches wide and 10 inches in height. Sections of the course may consist of both straight as well as curved sections. Curved sections will have a minimum turn radius of 6 inches (note: a larger radius means a larger turn). Each section will be tangent to the sections before and after it. One location along the course will have a split in the path, with one path continuing along the course while the other path stopping at a dead end (as shown below). The course will also include one straight section that will have a 3-4 inch gap in the line. Each gate will be built such that it stands up on its own, but knocking it down is a possibility. The line will pass as close as possible through the center of each gate. A square 12 inch x 12 inch ‘parking’ area will be marked with white tape at the end of the course. After completing the course, the robot should come to a complete stop for at least 5 seconds within this square parking area. The course will be located indoors, and will be constructed using black foam, poster board, and white tape. The location is to be announced. The following figure is an example of what the course could look like on the day of competition. Orange lines signify how gates could potentially be located.

A calibration area will be available to all teams before the start of the course. This will consist of a 12 inch by 12 inch square board made of the same material as the course. A single, straight white line
will be on this calibration block to allow teams to calibrate their robot before the start of the competition. Each team will have a maximum of three minutes to do any necessary calibration.

By the judges’ discretion, if a robot will or is damaging the arena, it cannot continue to compete.

III. The Race

Each team will be allowed three runs down the course. The best of these three runs will be used for scoring. Scores will not be combined, only one run will be used best of three. One official will time each run using a stopwatch. The time after each gate is passed will also be recorded. The track will be subject to video recording to definitively determine a winner in the event that two robots finish less than three seconds apart and are otherwise tied.

When called to the starting line, each team will have three minutes to setup and start their robot or their run will be forfeit. The run officially begins when the front of the robot crosses the starting line. The robot cannot be touched, and no communication of any kind may occur between the team and their robot once the run has begun. A run will be stopped once any team member touches the robot or the course. Each run is limited to a maximum of four minutes. A run will also be stopped if a robot moves outside the outside boundaries of the course area.

IV. The Robots

Each team is responsible for the design, construction, and programming of their robot. Any robot that complies with the following guidelines will be accepted to the competition.

1. Vehicles must be completely self-contained and fully autonomous.
2. Any motors used must be electric.
3. No hazardous components including but not limited to projectiles, flammables, sharp edges, or explosives can be used.
4. There is no size or weight requirement, but robots must be able to pass through the 10x10 inch gates.
5. All code must be written by team members.
6. Robots must be assembled by the team; fully assembled off-the-shelf robots will not be accepted. Competition organizers will not provide any component/code to build robots.

A list of all hardware components used in the robot assembly must be presented to judges. A printout of the code must also be presented. Each team will be asked a few basic questions on their design decisions, regarding both coding and hardware design. Each robot will be inspected by competition officials prior to the race, and any robot that does not follow these guidelines will be disqualified. The judges can also ask for clarification about the safety of the robots as required anytime during the event. Participating robots will be checked and tested according to the above mentioned rules and regulations.
V. Scoring

Scoring Points:
Completely passing through a gate: +10 points
Coming to a complete stop in the parking area: +20 points

Penalties:
Knocking a gate over: -5 points
Failing to present a list of hardware used: -10 points
Failing to present printout of code: -10 points

Teams will be ranked based on the number of points awarded, and then by their times. The robot must completely pass through the gate to be awarded points. Completely knocking a gate over will result in a five-point penalty. To receive bonus points for parking, the robot must come to a complete stop within the parking area. First, second, and third place prizes will be awarded to the teams with the highest number of points awarded during a single run of the course. If there is a tie, the team with the fastest time will place higher.

A “Judges Choice” award will be given to one team for ingenuity and creativity in their design.

VI. Awards
Will be announced on Tech Carnival Website.

VII. Contact Us
Any questions related to game rules, field specifications, or other clarifications can be directed to John Till (jtill@vols.utk.edu). Please include “Tech Carnival – Line Vollower” in the subject line.

Visit us at Website for team registration and Q&A updates.