

Line Follower Simulator Competition

(rule version 20200830.00)

Objective: The competition objective is for user supplied robot models to compete against each other by successfully completing one lap around a virtual line following course. The competition uses a modified version of the Line Following Simulator (LFS) authored by Ron Grant. The competitors provide robot controller and initialization files for use on LFS. A judge inserts the files into the simulator and runs the robot.

Competition: The competition will be live streamed at a date and time published on DPRG's website and Meetup page.

Robot: The "robot" consists of a robot controller file and an initialization file. The robot controller file contains the robot's algorithms and representation in the simulator. The initialization file contains the robot's sensor definitions and other configurable parameters. The controller file must be named <competitor's first name><initial of last name><course #>_UserController. The initialization file must be named <competitor's first name><initial of last name><course #>_UserInit. For example, if the competitor's name were "Bob Smith" and he is attempting the advanced course, the files would be named "BobS2_UserController" and "BobS2 _UserInit". A skeleton version of these two files is included in the competition LFS download.

Sensors: Two types of sensors are allowed: spot and line.

A spot sensor is a rectangular array of pixels. Maximum size of a spot sensor is 225 pixels (i.e, 15 x 15, if square). Smaller size spot sensors are allowed. Multiple spot sensors can be configured.

A line sensor samples a linear array of cells which are adjacent with no space between them or overlap. The cell size in a line sensor is required to be 5 x 5 pixels (i.e., 25 pixels per cell). The maximum length of line sensor is 64 cells or 320 pixels. For the competition, a maximum of 4 line sensors can be used. The line sensors are placed in an array named "lineSensorArray[]".

Simulator: The competition uses a specific version of the LFS. The competition version of the LFS has been parried down to make insertion of new user robots easier. It also has a few interface changes. It is available on the DPRG GitHub at <https://github.com/dprg/Contests/tree/master/Line%20Following%20Simulation>. Additional instructions are also available at the link above.

The LFS is written in Processing, which must be downloaded from <https://processing.org/download/> to run the simulator.

The original LFS created by Ron Grant with collaboration by Will Kuhne is available on DPRG's GitHub at <https://github.com/dprg/LineFollowerSimulation>. It includes example robots by both Ron and Will. A user guide is also available at the link above.

Run Definition: A run starts when the robot is placed in the simulator and moves. If the robot fails to move, the competitor can remove the robot and try again at the end of the round. If the robot doesn't move when given this 2nd chance, its run is forfeited. The run ends whenever the robot completes the objectives, or malfunctions after moving, or stops advancing for a period of 15 seconds, or the time limit has elapsed, or the user's robot files crash the simulator. Each robot is allowed 1 run per contest round.

Run Time Limit: The run time limit is 5 minutes for the Beginning and Advanced levels. The run time limit for the Sub-challenge level is 6 minutes. The run time limit for the Challenge-2011 course is 15 minutes.

Round Definition: A round consists of a single run by each competing robot. The competition consists of 2 rounds.

Play: At the start of the competition, the robot's UserControllerRobot and UserInit files will be loaded into the simulator. A judge will place the robot on the course and start the simulator. The robot's objective is to complete one lap of the course. The starting location of the robot is selected by the judge and will be the same for all robots.

Courses: There are 3 levels of courses available in the competition: beginner, advanced, sub-challenge, and the Challenge-2011 course. The courses are in the simulator's data directory.

<i>Level</i>	<i>Course Name</i>
Beginner (1)	Novice_LF_course-Fall_2018_64DPI.jpg
Advanced (2)	Advanced_LF_course_Fall-2018_64DPI.jpg
Challenge-2011 (3)	carfLF_64DPI.jpg

Scoring: A robot's run score is the number of successful **quarter** lap segments (i.e., 0.25 of lap) that the robot travels within the run time limit or when the run is terminated.

A perfect score is **4**. If multiple robots have the same score than they are ranked by speed. The robot's best run is used for ranking.

No place or prize will be awarded to a robot that does not at least have a score of 1 in a run during the competition (i.e., travel 1/4 of a lap around the course).

An example scoring: Four robots run the course. Two successful complete a full lap with times of 90 secs and 280 secs. The next robot travels 0.5 lap before running out of time, however, is still on course. The last robot goes off course at 0.75 lap within the time limit. The rankings are 1st place goes to the robot with the 90 sec time, 2nd place goes to the robot with the 280 sec time, 3rd place goes to the robot which travelled 0.75 laps.

Judging: One or more judges will referee the contest. They will ensure the rules are followed. The decisions of the judges are final.