

Line Follower Simulator Competition

(rule version 20201120.05)

Objective: The competition objective is for robot models to compete against each other by successfully completing one lap around a virtual line following course.

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 several initialization files. Additional files may be added by the competitor. The robot controller file contains the robot's algorithms. For the competition, the robot's acceleration / deceleration rates, turn acceleration, maximum speed, and max turn rate in degrees are limited by the following settings.

```
lfs.setAccRate(64);      // acceleration rate (inches/sec^2)
lfs.setDecelRate(64);   // deceleration rate (inches/sec^2)
lfs.setTurnAcc(720);    // turn acceleration and deceleration rate (degrees/sec^2)
lfs.setMaxSpeed(36);    // inform LFS of your max speed (inches/sec)
lfs.setMaxTurnRate(720); // inform LFS of your max turn rate (degrees/sec)
```

These settings are maximum values. A competitor may reduce the values for their robot. The competitor may also adjust simulator time step within 0.01 and 0.1 second range (smaller values produce more accurate results, and do not slow Robot Run time).

All contests are run in Lap-Mode and require the setting 'lfs.lapTimer.lapCountMax=1;' which is located in the UserInit tab of the simulator. The Challenge-2011 contest also requires the setting in the UserInit tab.

```
lfs.defineLapCourse(3,"DPRG_Challenge_2011_64DPI.jpg"); // create Lap-Mode
```

The robot must be autonomous.

Sensors: Any combination of sensors supported by LFS is allowed. Currently, spot and line sensors are supported. The robot may use multiple sensors.

Simulator: The competition uses LFS Line Following Simulator (LFS) version 1.64 distribution lineFollowerSim-18. Below are the links necessary to setup the LFS simulator.

Processing (v3.5 or higher): <https://processing.org/>

LFS (V1.64 / distribution: lineFollowerSim-18): <https://github.com/ron-grant/LFS/distribution>

LFS documentation: <https://github.com/ron-grant/LFS/blob/master/LFS%20Users%20Guide%201.6.pdf>

Getting started video for LFS: <https://www.youtube.com/watch?v=taVdIYcWUxY>

Run Definition: A run starts when the competitor presses the Run Contest button while sharing their screen in presentation mode. The run ends whenever the robot completes 1 lap (note:

lfs.lapTimer.lapCountMax = 1;), or the user presses the End button, or the Robot Run time limit has elapsed, or the user's robot files crashes the simulator. The End button should be pressed if the robot leaves the line or stops advancing for a period of 10 seconds. Each robot is allowed 1 run per contest round.

After a run, the Report button should be pressed to record a screen shot and append data to the contest.cdf file.

Run Time Limit: Robot Run Time is measured by the LFS simulator. It is displayed in the top left corner. Robots must complete the course with an LFS measured Robot Run Time of less than 5 minutes. During the competition, the robots may be asked to use the "time warp" feature of the simulator. LFS is designed to provide a level playing field, and measure the same Robot Run Time for a given robot and course regardless of host computer speed and time-warp settings.

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

Play: The competitor will start presenting in Google Hangout Meeting, then position and set the heading of their robot. The competitor will create a marker (or click an existing marker) to set the start position of the robot. After positioning the robot, the Run Contest button is pushed. In Lap-Mode contests, the start marker serves as the lap marker. Make sure no other markers are present on the course path. The starting location of the robot for the Beginner and Advanced courses may be set by the competitor.

The robot starting location for the Challenge-2011 contest is 48.0,12.0.

Courses: There are 3 levels of courses available in the competition: beginner, advanced, and the Challenge-2011 course. The courses are located in the simulator's examples data directory (such as: [LFS/distribution/lineFollowerSim-18/examples/LFS_SimpleBot/data/](https://github.com/robotics/lineFollowerSim-18/tree/master/examples/LFS_SimpleBot/data/))

Level	Course Name
Beginner (1)	Novice_LF_course-Fall_2018_64DPI.jpg
Advanced (2)	Advanced_LF_course_Fall-2018_64DPI.jpg
Challenge-2011 (3)	DPRG_Challenge_2011_64DPI.jpg

Scoring: Robots are ranked first on distance that they travel successfully around the course. Where more than one robot has travelled the same distance (usually one full lap) the robots are ranked by speed.

A robot must "follow the line". This means that the robot must not take shortcuts or alternate paths from the line. The most common failures to "follow the line" are: not following the segmented S curves but rather going straight across the feature, following the outline of a stain instead of going across the stain,

leaving the line in one feature and picking up the line in another feature, not solving the gate and wrapping around the gate from the backside.

It is permissible for the robot to overshoot the line and recover. It is not required that the breadcrumb trail fall exactly on the line. The breadcrumb trail is the path of the center of the robot.

No place or prize will be awarded to a robot that does not successfully complete at least a quarter of a lap 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 Robot Run 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.

Competition Recording: A video of the competition will be recorded and posted on the DPRG YouTube channel. By joining the meeting, you are giving consent to be included in the recording.

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