

# **Rules for Lego Robotic Line Follower Competition 8/11/2012**

## **Description:**

In this line following contest, robots attempt to complete a specified race course by following a black line on a white background. The robot completing three laps of the course in the shortest time is the winner.

## **Location and Date/Time:**

Georgetown Texas Public Library, 402 West 8th St., Georgetown, TX 78626  
Saturday, August 11, 2012, 12:30pm to 5:30pm

**To Enter:** Contact Diana Heinig <[moonlit-hunt@earthlink.net](mailto:moonlit-hunt@earthlink.net)> before 8/4/2012. \$5 per robot entry to cover expenses. (One \$5 fee covers all contests held that day.)

## **Robot Specifications:**

Robots must be constructed only out of 1) LEGO-manufactured parts, or 2) third-party sensors sold through LEGO-sanctioned channels (e.g. HiTechnic sensors).

### **Size and Weight:**

The maximum size and weight specifications are:

- **Maximum Width:** 9 1/2 inches, or 24cm
- **Maximum Length:** 15 1/4 inches, or 38cm

Height and weight are unconstrained.

All robots must comply with the size limitations at the beginning of a run, but can expand beyond them after a run has begun.

## **Allowed Parts:**

Robots may be constructed only out of 1) LEGO-manufactured parts, or 2) third-party sensors sold through LEGO-sanctioned channels (e.g. HiTechnic sensors). Only stock, unaltered parts may be used. No part may be altered or modified.

The allowed parts are:

- **CPU:** one LEGO-manufactured CPU brick, selected among: 1) NXT 2) RCX 3) Cybermaster 4) Scout 5) Micro Scout, or 6) Spybotic brick.
- **Sensors:** Any number of sensors may be used.
- **Motors:** Up to three motors of any type may be used.
- **Additional 9V battery box:** In addition to the batteries in the CPU (or a rechargeable battery pack in a NXT CPU), no more than one additional 9V battery box containing six AA batteries.
- **Other electrical components:** Unrestricted passive electrical components (wires, polarity switches, lights, sound elements, etc.).
- **Non-electrical parts:** Unrestricted non-electrical parts.

Entries are not required to use all of the allowed parts.

## **Programming / Software:**

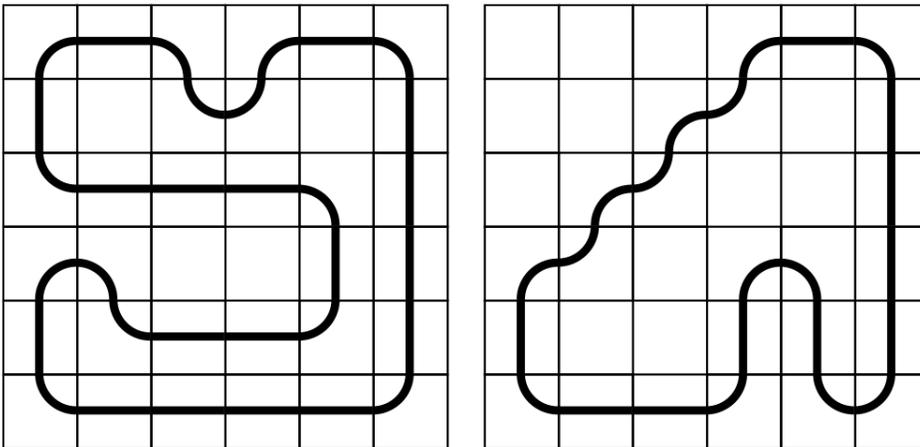
Any CPU firmware may be used. Any programming language may be used, including, but not limited to, RCX Code, NXT code, NQC, Robolab, ROBOTC, and Visual Basic.

Multiple programs on the CPU are allowed. If, during the event, any contestant deems it necessary to change or update program(s), he or she may do so, as long as the contestant's robot is not currently competing.

Robot entries must operate completely autonomously, acting independently of humans or external host controllers.

## **Race Course Specifications:**

The race course will be a closed loop, of a length and shape to be revealed on the day of the contest. Two possible courses are shown below:



### **Surface specifications:**

The race course surface will consist of an array of square tiles of painted hardboard.

The precise area of the race course path will be revealed at the contest, but it will not exceed 6 tiles wide by 6 tiles high. The race course may or may not traverse all sections of the array.

The tiles will be 10 1/8 inches square (256mm), with a tolerance of 1/8 inch.

Gaps between tiles will not exceed 1/10 inch.

The tiles will have a white background.

The array of tiles will be arranged on a square platform measuring six tiles on a side (approximately 1536mm by 1536mm). Outer edge tiles will be secured to the edge of the platform with white tape. The platform will be approximately 3 inches high. Robots must account for the edge of the platform with their design.

### **Line specifications:**

The race course will be drawn in black ink on the surface tiles in either quarter-circle segments or straight line segments.

The segments will be drawn in black ink, 1 inch wide, with a tolerance of 1/8 inch.

Quarter-circle segments will have a turn radius of 5 1/8 inches, with an inner radius of 4 5/8 inches and an outer radius of 5 5/8 inches.

Straight line segments will join center points on opposite sides of a square tile, and will be 10 1/8 inches long.

**Starting position:**

The start/finish position for the closed loop will be revealed at the start of the competition.

**The Competition:**

Each robot will be scored based on its time to complete three (3) laps of the race course. The robot that completes three laps of the race course in the shortest time will be declared the winner.

Each robot will be given up to three attempts to achieve its lowest time. The shortest time among the attempts will be the robot's official entry time.

A five-second penalty will be assessed each time a robot needs to be touched to restore it to the race course or to correct an unintentional shortcut. This includes the time taken to reposition the robot. After a touch, the robot must be placed at or before the point it left the course.

Times will be measured by an electronic gate system or by a judge with a stopwatch, based on the availability of equipment. In either case the recorded time shall be final.

A contestant may perform a short calibration (e.g. measuring black and white) before starting a run. The contestant starts a run by pressing a start button. The time of a run is measured from the time the robot crosses the start/finish line until the time it crosses the start/finish line after three (3) laps. A robot may start a run up to 10 1/8 inches (256mm) behind the start/finish line. A robot is deemed to have crossed the line when the forward-most part the robot crosses the line.

Before the contest starts, all contestants will be invited to inspect the course. Any issues the contestants have with the course (smudges, uneven surfaces, etc.) must be brought to the attention of the judges at this time.

A sample track will be available for "test drives" prior to the competition, to perform testing and calibration.

The order of running will be randomly assigned.

**Age Groups:**

There will be two age groups for this competition. Contestants under 13 years old will compete in one group, while contestants 13 years old or older will compete in a second group. The length and/or complexity of the race courses may vary between age groups.

**Safety and Fair Play:**

In the interest of safety and fair play:

- **Intentional damage to or marking of the race course surface is prohibited.**
- **Shortcuts are prohibited.** Robots must make a fair attempt to follow the line provided. Intentional deviations from the provided path will be disallowed.
- **Custom electronics are prohibited.** Only unmodified parts manufactured by LEGO, or third-party sensors sold through LEGO-sanctioned channels, are allowed.

**Prizes:** No prizes are awarded except the feeling of having completed a well-designed entry and competed honorably against worthy opponents. (Bragging rights are beyond the scope of these rules.)

### **Judging:**

A primary and secondary judge will be appointed at the contest. A single judge will oversee each race attempt. If the primary judge is participating in a race attempt, the secondary judge will be the active judge for that attempt.

The judge will have sole discretion and in any dispute the judge's decision is final.

The judge has the authority to remove a participant at any time. This can be due to harmful actions, disregard for the rules, poor sportsmanship, or any other reason that the judge declares.

### **Entry Limits:**

There is a limit of one robot per team allowed for this contest. A team may consist of one or more robot designers, but no robot designer may be a part of more than one team.

### **References:**

Some concepts and rules were taken from various rule sets for other robotics contests, including line-following contests at ChiBots, sumo contests held at BrickFest in 2004 and 2005, and other contests held by rtlToronto.