LVBots Challenge 3.5 Dead-Reckoning Contest

Objective:

The purpose of this contest is to develop our robots' dead-reckoning capabilities. To demonstrate their dead-reckoning abilities, robots must follow a line away from their starting position and, after reaching the end of the line, return to their starting location. The purpose of the line is to function as a user interface that will direct the robot through a sequence of moves for which it is not pre-programmed.

Because the focus of this contest is dead reckoning, apart from the line sensors, entries must rely solely on internal sensors to determine their positions. Internal sensor is defined as a sensor that only responds to phenomena or properties that originate within the smallest rectangular prism that can enclose the robot when it is on the ground.

Examples of allowed sensors:

- encoders on wheels
- timers
- gyroscopes
- accelerometers not measuring gravity
- current sensors
- cameras viewing something within the volume of the rectangular prism (e.g. optical mouse)

Examples of prohibited sensors:

- compass
- GPS
- rangefinders
- accelerometers measuring gravity
- cameras viewing out from the robot

Restrictions on Robots:

Robots must remain in one piece and may not intentionally alter or mark the course in any way. Each robot must be small enough to fit through standard doorways and be light enough that the robot's builder can carry it up stairs. (We expect entries to be less than one foot cubed and less than 5 pounds.)

Disqualifications:

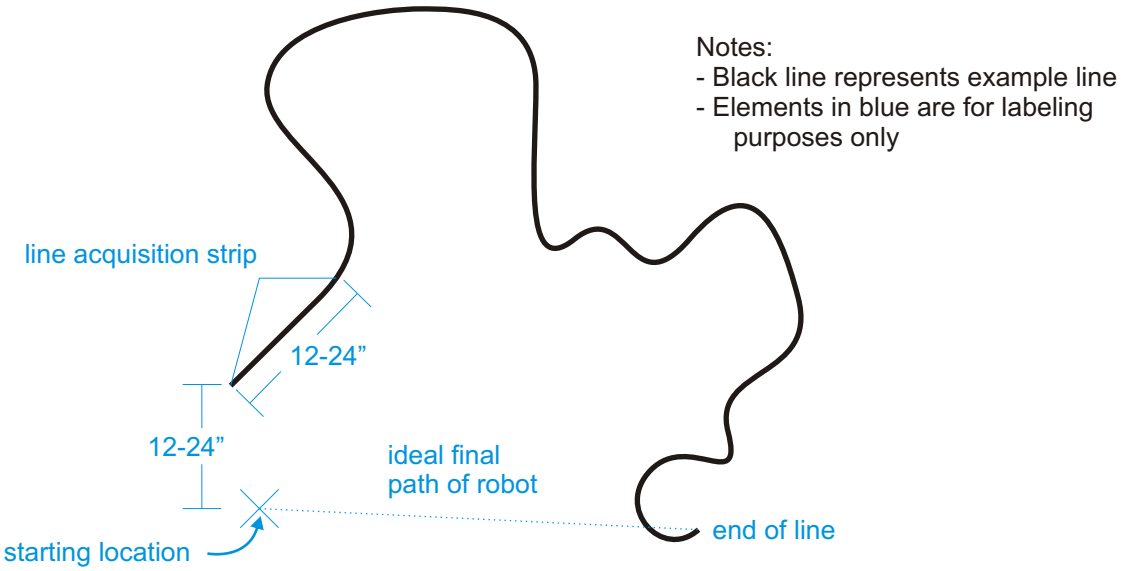
A robot will be disqualified if:

- it fails to follow the line after acquiring it (some part of the robot must stay above the line, and the direction of the robot must be the same as the "direction" of the line (from start point to end point)
- it does not get to the end of the line
- the robot builder interacts with the robot after it has begun its run and before it comes to its final stop
- its run time exceeds 5 minutes
- the robot is deemed dangerous to bystanders.

Course:

The course will consist of a starting point and a black line on a background that is not black. The starting point will be lightly marked for initial robot placement and final distance measurement, but it is not intended to be detectable by robots. The line will begin within 12-24" of the starting point, and the first 12-24" of the line will be straight. A robot may begin facing any way you wish; the suggested direction is somewhere toward the middle of the straight line portion. The robot must acquire the line, follow it to the end, and drive back to the starting point, as shown in the dotted line in the figure. The goal for the robot is to stop as close to the starting point as possible.

The line will be arranged such that a robot driving straight from the starting point should turn right to follow the line, but entries will not be disqualified for turning the wrong way, determining that they reached the end of the line too soon, and turning around to follow the line to the other end. The line will be between ½"and 1" wide (probably 3/4" electrical tape), it will not intersect itself, and the minimum radius of any curves will be 3". Note that the final path of the robot might cross the line, as shown in the figure. The line length will be between 3 and 50 feet.



Scoring:

A robot's score is based on its run time and on its distance from the starting point, both of which we wish to minimize. The part of the robot that is above the start point will be used to measure distance at the end of the run. The score is time (in seconds) multiplied by the quantity one plus the error (in inches) squared:

score = time * (error^2 + 1)

A lower score is a better score, and a smaller error is valued more than a smaller time. Each robot is allowed up to three runs, and the lowest of its scores is its final score.

score = time * (error^2 + 1)

Error(in.)	Time (s)	Score
0	t	t
1	60	120
1.73	30	120
10	60	6060
14.2	30	6060
36	60	77820
50.09	30	77820