EXODIA '19

A LINE FOLLOWING ROBOT

EVENT COORDINATORS :

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DELIVERY-BOT

Introduction

Our friend Ryuzaki is very enthusiastic about robots. Recently he won a lottery of 1000 Nerdcoins. He decided to start up a logistics company in Nerdland with that money. Since he loves robots so much, he does not want any human delivery persons, he wants robots to do the deliveries instead. He invites you to compete in a contest whose winner gets to build those delivery robots for him.
You have been instructed to build robots which take the orders from the warehouse and deliver them to the houses.
The roads of Nerdland are white in color and have black lines painted on them for the numerous robots in the city to follow as shown in the sample city layout.

Ryuzaki wants that your robot should be able to:

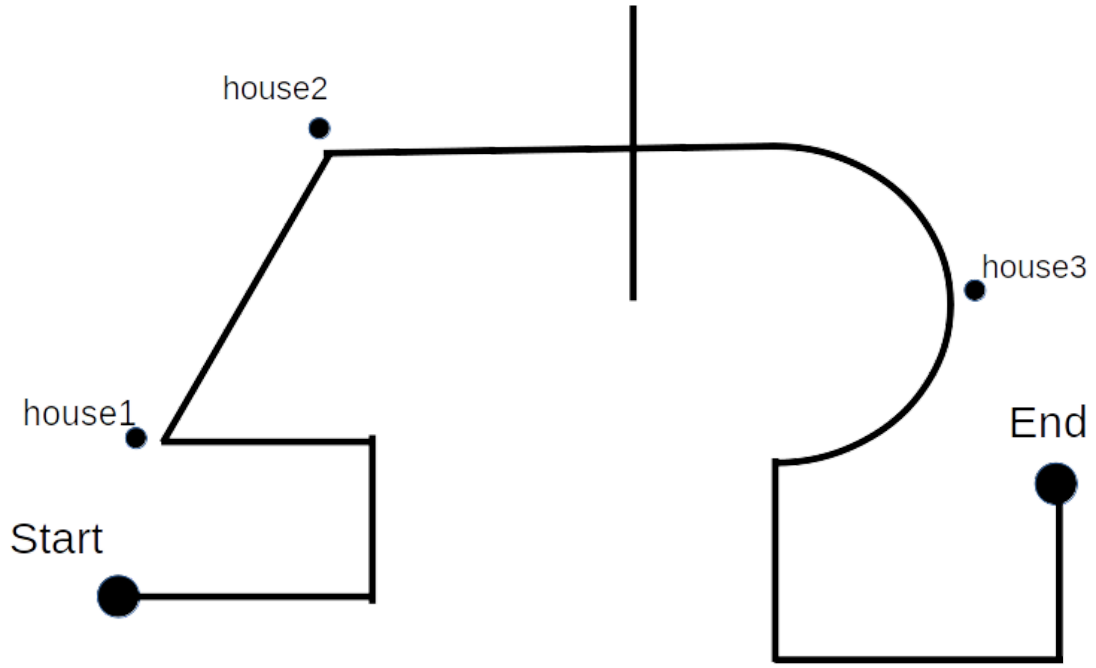
1. Follow the line to traverse the city
2. Visit all addresses to deliver the order
3. Return to the end point following the line

* An order is said to be delivered at a house if the robot passes by that house. Then it may continue to deliver further orders.

Ryuzaki asks all contenders to present their robots in two phases as described :

LEVEL 1

Ryuzaki has asked all contenders to present their robots to him after it can follow the black line to do the deliveries and reach the finish point.
A Sample city Layout :



Ryuzaki sets this as an elimination round. Only robots remain in the race which could successfully complete this level. These contenders can now go on to complete their robots for the final test: Level 2

Arena Specifications for level 1

1. The arena will be 3m X 3m in size.
2. The road will be uniformly 3 cm wide and black in colour.
3. The floor will be white in color.
4. The path will be having smooth curves, U – turns and also sharp turns (angles between the edges will be in the range of 45-180 degrees).
5. The number of turns will not be more than 100.
6. There shall have exactly one correct path from start point to end.
7. There may be open ends as shown in image.
8. There will be no closed loop in the path.

LEVEL 2

After a successful run in Nerdland, Ryuzaki wants to expand his business into Muggleland. But the condition of Muggleland is pathetic. This will be a bit difficult compared to the first round. The track will have more number of turns including sharp turns (Angle will be between 45-180 degrees). There may be some points where 2 roads can intersect . There might be ditches on the roads, the black line for the robots is damaged at some places. At some places the road is broken so the Muggles may use inclined planes to cross the ditches.

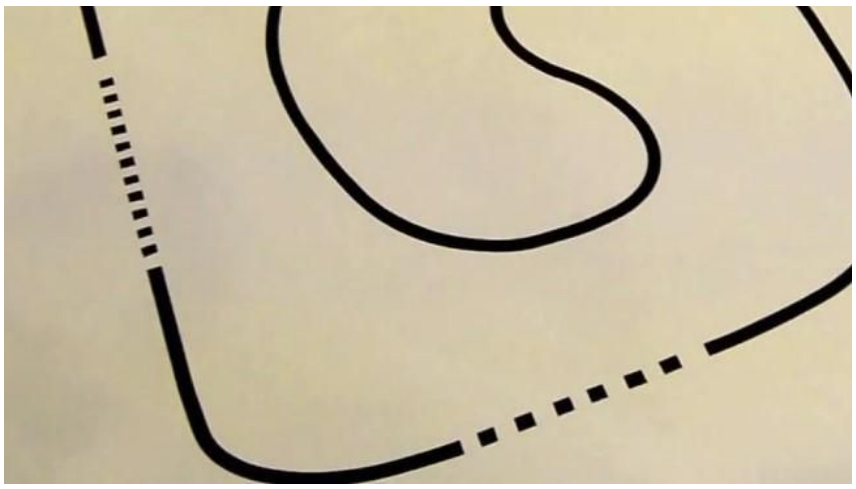
Those contenders who were able to satisfy Ryuzaki's requirements in Level 1 shall proceed to this round. In this round Ryuzaki expects the bots to be able to serve all the houses overcoming the pathetic Muggleland terrain and reach the finish point.

Your bot should start from the start point and reach the finish point after visiting all the delivery houses.

Arena Specifications for level 2

1. The arena will be 3m X 3m in size.
2. The road will be uniformly 3 cm wide and black in colour.
3. The floor will be white in color.
4. The path will be having smooth curves, U – turns and also sharp turns (angles between the edges will be in the range of 45-180 degrees).
5. The number of turns will not be more than 100.
6. The angle of the inclined planes used by Muggles is between 20-40 degrees [Both inclusive]
7. There may have loops in the path,therefore it can have multiple correct paths from start point to end point.

Example of damaged black line :



Rules of the Game

1. Reaching a delivery house will result in an addition of 100 points in the score.
2. Reaching the finish point will fetch additional points based on the number of orders delivered.
3. In case, the bot deviates from the line, you can keep the bot manually back on track, but it will result in a penalty of 50 points. Also, these chances will be given only **3** times.
4. The ranking of the teams will be done on the basis of scores. But in case, there is a tie, time taken by the bot to complete the track will serve as a tiebreaker.
5. But, if the time taken by the bots is also same, then design of bots will serve as a tool to decide the winner.
6. In case, no one or the required number of teams are able to reach the finish line, then teams will be sorted according to the average speed of the bot.
   (Average Speed = Total Distance Covered/Time Taken).
7. The task will be assumed to be completed when the rear most wheels crosses the finish line.
8. Every Run will be allotted a maximum of 7 minutes. If the bot fails to complete the path within the stipulated time, then the score at the end of 7 minutes will be the final score.

Bot Specifications

1. The robot must be able to fit inside a box with dimensions of 20 cm X 20 cm X 20 cm. Otherwise it shall be disqualified from the vent.
2. Only proper Line Follower algorithms should be used. Any unfair way will lead to disqualification.
3. Hard coded bots are strictly prohibited.
4. The external power supply is not included in the size constraint. However, in case of onboard power supply, the machine along with the power supply should fit in the above-mentioned dimension box.
5. Teams are allowed to use ready-made microcontroller boards, sensor kits etc. However, use of kits like Lego kits are not allowed.
6. The batteries used can be maximum of 18V. More than that will not be allowed for the contest.
7. If the bot damages the arena or any other bot, the team will be disqualified.
8. The organizers will provide a standard 230V/50 Hz AC power supply. Any eliminator, adaptor, etc. required will have to be arranged by participants themselves.
9. No manual control is allowed for the bot. It should be fully autonomous.
10. If the judges find any bot whose working mechanism or game strategy if faulty, they have the right to disqualify.

General Rules

1. The teams shall report for their slots on time.
2. Only two members will be allowed to handle and operate the bot.
3. Participants are not allowed to keep anything inside the arena except bot.
4. Only the points and the time recorded by the organizers will be considered.
5. The organizers reserve the right to change any or all of the above rules without the prior intimation, however any change shall be promptly communicated to all the registered participants.

Team Registration and Composition

1. A team can have a maximum of upto 6 members.
2. More than one team can register from same college but the robots should not be identical.
3. A team once registered cannot register again, even with a different name.
4. A participant cannot be a part of two different teams for the same event. If he/she registers as a part of two different teams in this event, he may be barred from the event.

Scoring

Reaching each house	+100 points
Reaching finish point 1) Less than 4 orders delivered 2) 4 to 8 orders delivered 3) More than 8 orders delivered	+0 points +75 points +150 points
Manually setting the bot back on track [Allowed a maximum of 3 times]	-50 points each time

The decision of the organizers shall be final and binding in case of any disputes. If you find any loophole in the rules, it's always better to have its legitimacy verified by us instead of being disappointed at the venue.