OBSTACLE AVOIDANCE HARDWARE v3.03

GROUP 4

2nd December 2016
Verison 1

Abstract

This test is used to determine the optimal right wheel rotation speed to avoid obstacles. The most optimal rotation speed for this version is 150.

Contents

1 BACKGROUND

1.1 Edit History

Quentin Norris: 2016-11-25, Initial set up, Test Information and Procedure

Jake and Mamoun: 2016-11-25, Filled out table and Goal

Jake and Mamoun: 2016-11-26, Filled out conclusion

1.2 Test Information

Tester: Mamoun Benchekroun, Quentin Norris, Jake Zhu

Author: Mamoun Benchekroun, Quentin Norris, Jake Zhu

Hardware Version: 3.03

Software Version: ObstacleAvoidTest.java

2 GOAL

Identify as accurately as possible the rotation speed necessary to avoid the block as close as possible.

3 PROCEDURE

Setup:

1. Place the robot roughly 3 tiles away from the block. Ensure the larger side of the block is facing the robot. Record the orientation of the block.

Test:

1. Upload ObstacleAvoidTest.java
2. Note the DetectionDistance variable within ObstacleAvoid.java and then adjust it to make sure the block turns at the correct time.
3. Press the button to start the program
4. Watch the robot avoid the block.
5. Once the robot has avoided the block manually pause the code by hitting the back button and arrow down button.
6. Measure the distance from the left wheel to the block and record into the table.
7. If the recorded length is longer than one tile increase the rotation speed in the code.
8. Re-position the robot and recompile the code. Restart the previous steps and repeat until the length measured is within the distance of a tile.

4 EXPECTED RESULT

We expect to find the rotation speed so the robot is within one tile's length away, as the wooden blocks will most likely not be more than a tile apart. This will ensure that if our robot has to avoid one block with another block nearby it will successfully do so without hitting the other block.

5 TEST REPORT

Trial	Rotation Speed	Distance(Block)	Distance(Destination)	Detection Distance
1	150	7.5	4.9	10
2	150	17.1	3.6	10
3	150	N/A	N/A	10
4	150	5.5	10	20
5	150	5.2	7.0	20
6	150	19.0	7.5	20
7	150	27.0	7.0	20
8	150	N/A	N/A	20
9	150	20	6.5	20
10	150	16	7.5	20
11	150	19.5	11.0	20

Trial	Obstacle Position(Relative to Robot Path)	Avoidance?
1	Perpendicular	True
2	Perpendicular	True
3	Diagonal	False
4	Diagonal	True
5	Diagonal	True
6	Diagonal	True
7	Perpendicular	True
8	Diagonal	False
9	Diagonal	True
10	Diagonal	Hit
11	Diagonal	True

Average Error: 7.2

As shown by the table, the best wheel rotation value is 150. On trial number 10, the robot hit the obstacle but continued going to the destination with similar error to successful avoidance trials.

6 CONCLUSION

We were lucky in finding the best value fairly quickly. We ended up with a rotation speed of 150. The avoidance was not 100% successful because it would hit the block. In general, when the obstacle was positioned in a perpendicular position to the robot's path, the robot would avoid the block precisely. However, if it was placed at an angle, the light sensor, as described by the test results, would not detect the obstacle in time and the robot would collide with the obstacle. The error on the distance from destination was 7.2 cm on average.

7 ACTION

In general, the obstacle avoidance worked, but the error could be further corrected by odometry correction.

8 DISTRIBUTION

Software Team