Light Sensor

**Test Description**

This test focuses on examining whether the robot can recognize black color of the line. We are using light localization to help reduce error during the navigation. The capability of detecting a black line is significant as it will affect the accuracy of localizing the robot to a waypoint. Similar to ultrasonic sensors’ readings, there are large fluctuation readings in light sensors’ readings and we also apply the same filter methods to make them more stable and trustable.

The procedure for this test is placing the robot on the center of a tile with different colors(Red,Green,Yellow) as a starting point. After that, the robot will move straight. If it detects a black color successfully, it will stop. We will record the readings of the light sensors and whether it is able to detect the lines.

**Test 1**

**Date :** 2021/3/15

**Tester:** Shichang Zhang

**Author:** Shichang Zhang

**Hardware version:** 1.0 (in Part 2.5 of [Hardware Document](https://docs.google.com/document/d/11jkA_S_xBqyCbcn2NyMuM-OMDEybDfRy/edit#))

**Software version:** 1.0 (in Part 7.0 of [Software Document](https://docs.google.com/document/d/19JaY5629aUu4Y4rjoQJ-jWyeQLqNSAcr/edit))

**Test Purpose:**

Determine whether the filtered feedback of the light is acceptable after applying the medium filter on datas.

**Test Procedure:**

We will place the robot stationary at the center of the colored tile and let the robot detect the color of the tile. We want the robot to correctly detect the tile color. After a short period, we will let the robot move forward. We want the robot to stop when light sensors detect the black grid line.

1. The robot is placed at the center of a tile. The exact position will be determined by the input coordinate.
2. Depending on the input coordinate, tile is expected to be red, or green, or yellow.
3. The robot is oriented to 90°. The starting angle is 90°.
4. Run the light sensors at a sample rate of 25Hz and use the filter methods to deal with samples. .
5. Print the three filtered feedback on the console.
6. Let the robot move forward.
7. Let both light sensors successfully detect the black grid line.
8. Stop the robot.
9. Print the three filtered feedback on the console.
10. Record the printed data.

**Test Data:**

|  |  |  |
| --- | --- | --- |
| Trial# | Coordinate (ft, ft) | Color |
| 1 | (0.5, 0.5) | yellow |
| 2 | (0.5, 0.5) | yellow |
| 3 | (0.5, 0.5) | yellow |
| 4 | (0.5, 8.5) | red |
| 5 | (0.5, 8.5) | red |
| 6 | (0.5, 8.5) | red |
| 7 | (13.5, 8.5) | green |
| 8 | (13.5, 8.5) | green |
| 9 | (13.5, 8.5) | green |

**Expected Result:**

|  |  |  |
| --- | --- | --- |
| Trial# | Start Point Tile Color Reading | Black Line reading |
| 1 | 240 | 70 |
| 2 | 240 | 70 |
| 3 | 240 | 70 |
| 4 | 255 | 70 |
| 5 | 255 | 70 |
| 6 | 255 | 70 |
| 7 | 200 | 70 |
| 8 | 200 | 70 |
| 9 | 200 | 70 |

**Test Results:**

|  |  |  |
| --- | --- | --- |
| Trial# | Left Sensor Start Point Tile Color Reading | Left Sensor Black Line reading |
| 1 | 243, 243, 244 | 72, 71, 72 |
| 2 | 242, 242, 243 | 70, 70, 74 |
| 3 | 243, 243, 244 | 72, 72, 76 |
| 4 | 251, 251, 252 | 71, 71, 71 |
| 5 | 248, 251, 252 | 71, 71, 76 |
| 6 | 248, 252, 253 | 74, 73, 72 |
| 7 | 196, 196, 197 | 70, 67, 70 |
| 8 | 193, 193, 197 | 74, 73, 74 |
| 9 | 193, 198, 198 | 68, 70, 70 |

|  |  |  |
| --- | --- | --- |
| Trial# | Right Sensor Start Point Tile Color Reading | Right Sensor Black Line reading |
| 1 | 240, 243, 244 | 72, 72, 76 |
| 2 | 243, 243, 244 | 71, 71, 71 |
| 3 | 240, 243, 244 | 71, 71, 71 |
| 4 | 248, 251, 252 | 71, 70, 70 |
| 5 | 248, 251, 252 | 70, 67, 70 |
| 6 | 249, 252, 252 | 73, 73, 73 |
| 7 | 193, 196, 197 | 77, 74, 77 |
| 8 | 194, 195, 196 | 70, 67, 70 |
| 9 | 194, 194, 197 | 77, 73, 71 |

**Test Report:**

The test is performed 9 times for different input distances. We expect the robot to detect the tile color and black grid line successfully. From the tested output, we can see that for color yellow, red, green we get very little error and for the black line we get relatively large error but are tolerable. So we can conclude that the medium filter helps the light sensor return accurate data so that the robot can clearly know the color of the area detected by the light sensors.

**Conclusion:** Pass

**Action:** None

**Distribution:** software development, hardware development