Test Document

Project: LIBERTY
Task: Dismounting Test

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1.0 TEST

Test: Dismounting from the Zip-line

Date: 18/11/2017
Tester: Claire Liu
Author: Claire Liu

1) The purpose of this test is to determine whether the robot can dismount from the zip-line successfully.
2) One objective of this test is to determine whether the robot can dismount from the zip-line.
3) First, place the robot on the start-side of the zip-line. Then, run the test code. After the robot finish traversing, record the final result.
4) The expected result is that the robot should be able to dismount from the zip-line successfully.
5) Results:

	starting point (60.96cm, 152.40cm)		
Trial	Successful or not		
1	yes		
2	yes		
3	yes		
4	yes		
5	yes		
6	yes		
7	yes		
8	yes		
9	yes		
10	yes		

Figure 1: Testing Result of dismounting from the zip-line

6) From **Figure 1**, it can be observed that all of the trials can dismount from the zip-line successfully, which is perfectly under estimation.
7) As the actual results meet with the estimated results, should not make changes.

Test: Localization after Dismounting from the Zip-line

Date: 19/11/2017

Tester: Claire Liu

Author: Claire Liu

1) The purpose of this test is to determine whether the robot can localize itself accurately after dismounting from the zip-line.
2) One objective of this test is to determine whether the robot can localize successfully can travel to point (182.88cm, 152.40cm) with final direction angle 90 degrees.
3) First, place the robot on the start-side of the zip-line. Then, run the zip-line code. After the robot finish traversing, record the final result. Next, run the localization code. Record the final position of the robot and calculate the differences between x-position, y-position and angle theta with 182.88cm, 152.40 cm and 90 degrees respectively.
4) The absolute value of the differences between the actual results and the estimated results of x-axis, y-axis and theta should be within 3cm, 3cm and 5 degrees, respectively.
5) Results:

	starting point (60.96cm, 152.40cm)			
Trial	Successful or not	x(+/-1cm)	y(+/-1cm)	theta(+/-1deg)
1	yes	183.58	153.40	94.80
2	yes	183.18	152.60	93.4
3	yes	182.78	152.80	96.5
4	yes	183.88	153.60	94.2
5	yes	184.98	152.80	87.1
6	yes	183.78	153.70	93.8
7	yes	184.38	153.10	94.7
8	yes	182.48	152.90	94.4
9	yes	183.58	152.80	93.9
10	yes	183.48	153.2	87.4

Figure 2: Testing Result of localization after Dismounting from the Zip-line

Trial	Offset		
	x(+/-1cm)	y(+/-1cm)	theta(+/-1deg)
1	0.7	1	4.8
2	0.3	0.2	3.4
3	0.1	0.4	6.5
4	1.0	1.2	4.2
5	2.1	0.4	2.9
6	0.9	0.3	3.8
7	1.5	0.7	4.7
8	0.4	0.5	4.4
9	0.7	0.4	3.9
10	0.6	0.8	2.6
average	0.83	0.59	4.12
standard deviation	0.596	0.325	1.106

Figure 3: Position and Theta differences between Actual Position and (182.88cm, 152.40cm)

6) The data in **Figure 2** shows the final position and the angle theta of the robot after localization. Meanwhile the differences between the actual position and the expected position are shown in **Figure 3**. It can be obtained that the averages of the differences of x-position, y-position and theta are all within the tolerance.
7) The overall results are ideal. However, if one of the color sensor detects the robot immediately after dismounting off the zip-line, the localization might fail.

The average (AM) was calculated by using the following formula

$$Average = \frac{1}{n}\sum_{i=1}^{n} a_i = \frac{1}{n}(a_1 + a_2 + \cdots + a_n)$$

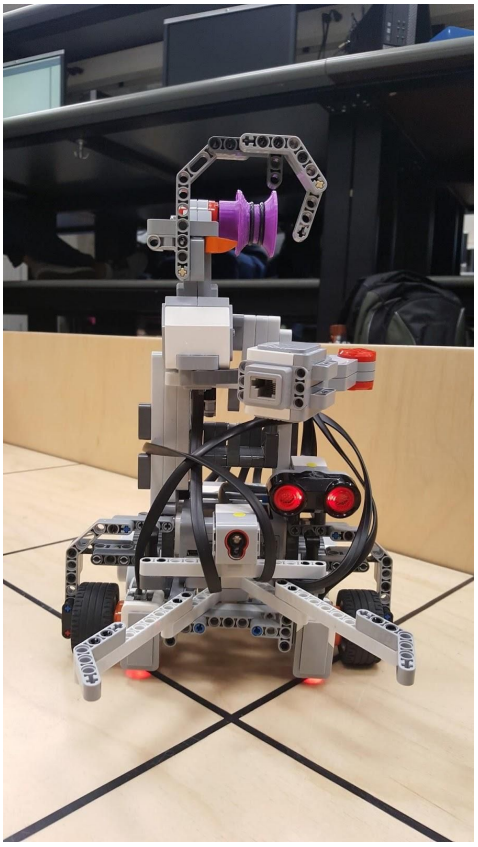
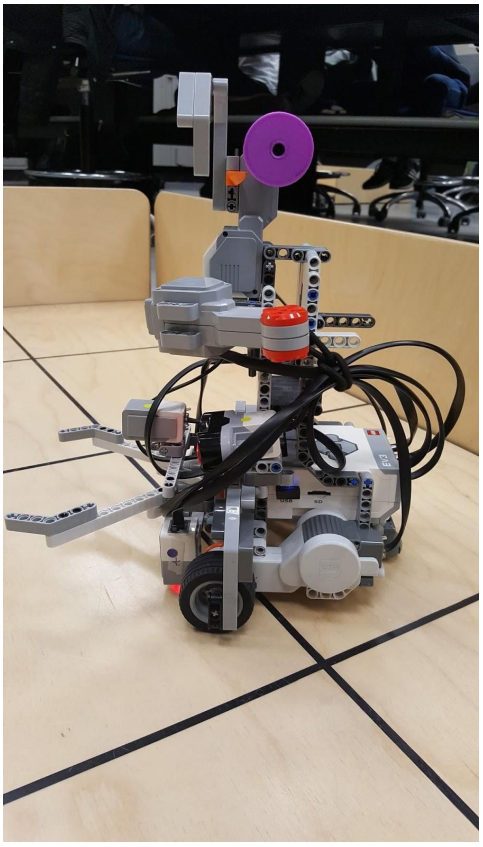
We use the sample standard deviation formula (see below) to calculate the sample standard deviation.

$$s = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \overline{x})^2}$$

$\overline{x}$ = *Mean*
N = *Sample size*

x_i = *Sample at i*

2.0 HARDWARE

See ***HARDWARE - 2.0***

3. Source Code used

See github group repository at commit: 941f1c2c2ba3f6c1ed7a9073f08fd72fd2747e2e