

## Research Track2(Assignment3)

### Statistical Analysis

Arghavan Dalvand  
S5606362

#### **I. Introduction**

The goal of this assignment is to carry out a thorough statistical evaluation, with an emphasis on contrasting two different algorithms that were created for the second assignment Research Track 1. The two algorithms being thought about are:

The successive actions taken to conduct the statistical analysis are described in the paragraphs that follow. A test is specifically developed to support a hypothesis with a predetermined level of significance. Several experiments are carried out to get the necessary data for the test.

#### **II. Hypotheses formula**

The hypotheses formulated for this analysis can be summarized as follows:

$H_0$ : There is no significant difference in the performance of the two programs.

$H_1$ : There is a significant difference in the performance of the two programs.

The specific hypothesis made is that, when the position and quantity of tokens on the map change, the algorithm I created (1) performs better than the algorithm my colleague created (2).

#### **III. The experiments process**

In the experiments, both algorithms are run with varying token distributions and token counts, number of paired tokens divided by total number of tokens. Let's examine the many configurations that were taken into consideration. Three distinct

maps have been selected to account for how the placement of tokens affects how well the algorithms work.

The inner circle's radius in the second is half.

In the last one, the placement of the silver and gold tokens is reversed, with the gold token on the inside and the silver token on the outside of the circle.

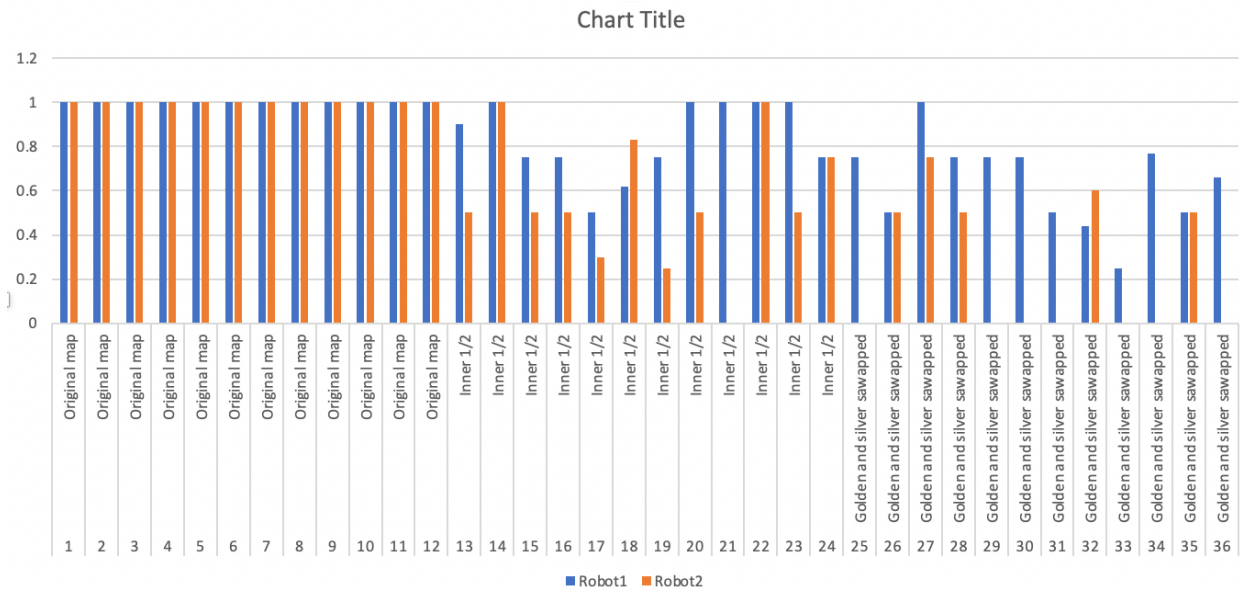
Here there is the data:

Experiment.N	Position	Robot1	Robot2	Token.N	Difference
1	Original map	1	1	8	0
2	Original map	1	1	8	0
3	Original map	1	1	8	0
4	Original map	1	1	8	0
5	Original map	1	1	5	0
6	Original map	1	1	5	0
7	Original map	1	1	5	0
8	Original map	1	1	5	0
9	Original map	1	1	3	0
10	Original map	1	1	3	0
11	Original map	1	1	3	0
12	Original map	1	1	3	0
13	Inner 1/2	0.9	0.5	8	-0.4
14	Inner 1/2	1	1	8	0
15	Inner 1/2	0.75	0.5	8	-0.25
16	Inner 1/2	0.75	0.5	8	-0.25
17	Inner 1/2	0.5	0.3	5	-0.2
18	Inner 1/2	0.62	0.83	5	0.21
19	Inner 1/2	0.75	0.25	5	-0.5
20	Inner 1/2	1	0.5	5	-0.5
21	Inner 1/2	1	0	3	-1
22	Inner 1/2	1	1	3	0
23	Inner 1/2	1	0.5	3	-0.5
24	Inner 1/2	0.75	0.75	3	0
25	Golden and silver sawapped	0.75	0	8	-0.75
26	Golden and silver sawapped	0.5	0.5	8	0
27	Golden and silver sawapped	1	0.75	8	-0.25
28	Golden and silver sawapped	0.75	0.5	8	-0.25
29	Golden and silver sawapped	0.75	0	5	-0.75
30	Golden and silver sawapped	0.75	0	5	-0.75
31	Golden and silver sawapped	0.5	0	5	-0.5
32	Golden and silver sawapped	0.44	0.6	5	0.16
33	Golden and silver sawapped	0.25	0	3	-0.25
34	Golden and silver sawapped	0.77	0	3	-0.77
35	Golden and silver sawapped	0.5	0.5	3	0
36	Golden and silver sawapped	0.66	0	3	-0.66

## IV. Result

- The difference  $D = X1 - X2$  measurement of the gap between the two observations.
- The standard deviation of difference = 0.3138972
- The standard error of the difference = 0.0523162
- T-value = -4.332629

average		
-0.226667		
standard deviation_Sd		
0.3138972		
standard error_SE		
0.0523162		
T		
-4.332629		



## V. Conclusion

Based on the experiments conducted thus far, the hypothesis has not been supported. To enhance the robustness of the test and ensure that the null hypothesis cannot be rejected, it is advisable to increase the sample size and

conduct additional experiments. By doing so, the power of the test in detecting false null hypotheses can be amplified.

Growing the sample size has a number of benefits. First of all, as sample size grows, the mean and standard error stabilize and begin to move closer to the real value. This lessens the possibility of sampling errors and leads to a more precise assessment of the population parameters. Second, a bigger sample size offers a more representative and varied dataset, which can help the results be more generally applicable.

Generally, the results show that changing the token count and radius considerably affects how well the algorithms operate. This suggests that the quantity of tokens and their spatial distribution within the arena have an impact on how well the programs match silver and golden tokens.