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2/21/2018

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CSC 207 A-Life Simulation Writeup (All tests run with 100 updates)

*Test – Count: 10, Cooperators: 1, Defectors: 9*

Our prediction for this first test is that the cooperator will end up becoming a defector. The reason for this is that the defectors are much more likely to reproduce since they take energy from the cooperator.

The results from this test gave us an average cooperation probability of 0 each time we ran the test. This is consistent with our prediction above in showing that there were no cooperators at the end. **Overall average of 0**

*Test – Count: 100, Cooperators: 1, Defectors:99*

Our prediction for this test is similar to the first test in saying that the one cooperator will become a defector (for the same reasoning as above).

The results were an average cooperation probability of 0 each time like above. So again the results are consistent with our prediction. **Overall average of 0**

*Test – Count: 10, Cooperators: 9, Defectors: 1*

We predict for this test that the cooperation probability of each test will be either 0 or 1. The reason for this being that since there are so many cooperators to start out with, the defector may not be able to “gain traction” in any given test. But in some cases if it gets “lucky,” it will be able to reproduce and overcome the cooperators.

The results support the hypothesis, showing a seemingly random distribution of 1s and 0s in the cooperation probability. **Overall average of 0.5**

*Test – Count: 100, Cooperators: 99, Defectors: 1*

We predict that most of the time the average cooperation probability will be 1, but in some rare cases may be less than 1. Since the ratio of cooperators to defectors is so large, it is unlikely that the defector will be able to gain traction in reproduction. Even if it does, it may not be able to overcome the population of cooperators completely.

The results support the hypothesis as we had all average cooperation probabilities be 1 except one outlier with a value of 0.83. **Overall average of 0.983**

*Test – Count: 10, Cooperators: 3, Defectors: 3, Partial Cooperators: 4*

We predict that there will overall be a low average cooperation probability since there are an equal number of cooperators and defectors, and defectors seem to have the upper hand. It will mostly depend on which way the partial cooperators go (if all of them turn out to be cooperators most of the time, the cooperation probability will be higher at the end).

The results support the hypothesis with all except one value for our average cooperation probabilities being 0 (the exception being 0.5). **Overall average of 0.1**

*Test – Count: 100, Cooperators: 33, Defectors: 33, Partial Cooperators: 34*

Since there are more organisms in this test, the cooperators are more likely to succeed, especially with the addition of partial cooperators. It is hard to say exactly what our probabilities will be.

The results show a varying average but mostly staying between a 0 and 0.1 probability. This is probably since defectors can mostly dominate except for when the partial cooperators end up majorly being cooperators. **Average of 0.0755**

*Conclusion*

From these tests, we can conclude that the defectors are a much stronger class than the cooperators. The obvious reason for this is that defectors never give away energy and only receive it, so they can reproduce much more quickly. With a small population size, even with 1 defector it is likely that defectors will end up being the majority at the end. As the population size increases, the cooperators can survive better. The only effect the partial cooperators seem to have on the average is allowing it to fluctuate more. In general adding partial cooperators will decrease the average cooperation probability since they have an equal chance of becoming either cooperator or defector, but defectors are more powerful in general.