TJHSST Computer Systems Lab Senior Research Project
Study on the outputs and design of an Abstract Evolution Simulator
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Abstract

Create an Abstract Evolution Simulator that accurately and effectively simulates the mutation of organisms and the transition from single celled organisms to multicellular complex organisms and organ systems with theoretical applications in the study of evolution and population dynamics.

Keywords: World Simulation, Simulated Evolution

1 Introduction - Elaboration on the problem statement, purpose, and project scope

1.1 Scope of Study

A given simulation will begin with a selection of low complexity organisms that through a combination of virus interaction, random mutation, and environmental effects will mutate into more complex organisms and eventually join into complex organisms with multiple organ systems.

This will potentially involve complex algorithms to model aspects of the individual cells and their development. One of the primary challenges is

letting the interactions and other aspects develop on their own instead of simply hard coding them in.

1.2 Expected results

I am hoping to have an effective model of how cells and more complex organisms mutate and evolve based on preexisting areas of research by the end of the year.

I hope to learn how different factors in a creature's environment affect it's evolution and how macroscopic, multicellular organisms evolve.

1.3 Type of research

Pure applied research

2 Background and review of current literature and research

Most of the research in organism and evolution simulation uses clearly defined organisms that do not combine together and mutate in a fairly organized fashion. I am basing mutation on a small internal mutation rate and on external conditions that are not constant or predictable. I am also not clearly defining what the organisms look like. They are simply defined by their important characteristics and cellular make up.

3 Procedures and Methodology

First Quarter- I am defining what characteristics I am going to define and how. I am also brainstorming ideas based on previous knowledge and my own informal research into characteristics of life. The brainstormed material is sorted into groups based on what data structure would be best to define it in the program.

Second Quarter- I will write the program and get a working textual output to files for each type of organism. Once this is done I will begin debugging the program and optimizing it to run faster and more efficiently.

Third Quarter- I will finish the debugging stage and begin analyzing the outputs. I may create a simple program to do this. I may need to expand the program as necessary at this point.

Fourth Quarter-I will write up the analysis of my results and fill in any holes in the program documentation.

I can create graphs based on the mutation and progression of a specific organism type using the text file output from my program.

Check if the program is not generating any errors and that complex organisms are forming. Errors will take the form of coding mistakes and stagnant organism development interaction. Both are fixed by modifying the program.

Analyze the output for a number of organism's development and look at the starting and final organism populations, average complexity, and maximum and minimum complexity.

Organisms should mutate and combined into a large variety of single and multi cellular organisms.

4 Expected Results

Textual and Graphical outputs detailing the evolution, divergence, and combination of the starting population of organisms.

Demonstrate the advantages to an environmentally based evolutionary simulation as opposed to an algorithmically based one.