School of Computing

Year 4 Project Proposal Form

SECTION A

Project Title __Artificial Life___

Student Name __David Craig_____

Student ID __14506617_____ Stream _CASE4____

Project Supervisor Name __Alistair Sutherland_____

[Note: It is the student's responsibility to ensure that the Supervisor accepts your project and this is only recognised once the Supervisor assigns herself/himself via the project dashboard. Project proposals without an assigned Supervisor will not be accepted for presentation to the Approval Panel.]

SECTION B

Proposal Description

The aim of this project is to utilise Genetic Algorithms and Evolutionary Game Theory to create a simulation of simple single-celled organisms. Organisms will be able to exhibit different traits which will be passed from generation to generation depending on the fitness of the organisms carrying them which will mimic Darwinian Evolution. Ultimately I would like to use Game Theory to allow organisms to join and create multi-cellular organisms to observe what kinds of multicellular organisms emerge from unions of single celled organisms and in what conditions in which it is beneficial for an organism to cooperate with its population, and which conditions it is beneficial to compete with them.
In order to represent this simulation I would like to create a 2D visual representation of the population and allow the user to tweak variables in the Genetic Algorithm to allow them to find out and demonstrate how it affects the outcome of the simulation.

Background

The idea of the simulation is by Alistair Sutherland; I was interested in it due to my interest in learning about simulations, game theory, algorithms and statistics. There are reports already on how to use Genetic Algorithms to train players of (usually competitive) game theory though I could not find any examples of populations of Genetic Algorithms exhibiting cooperative or competitive traits based on their Genotypes with a root in Game Theory, nor a simulation in which the individuals form a symbiotic relationship through game theory and evolution.

Achievements

My project will be a sound practice in Genetic Algorithms and Game Theory that others can use as a tool to learn the concepts themselves, as well as demonstrate it to others. I expect the user base will be college students, lecturers and other academics interested in Genetic Algorithms.

Justification

I hope that providing the users with the ability to manipulate variables in the simulation makes it a valuable tool for demonstration, particularly for lecturers teaching Genetic Algorithms. I also think that enthusiasts might find this variation of Genetic Algorithms and Game Theory interesting. I hope that Game Theorists will be able to apply my work to other scenarios and produce new results that weren't generated with other methods.

Programming language(s)

- Javascript
- HTML5 & CSS
- Node.js

Programming tools / Tech stack

No special programming tools required except and IDE and git for version control as well as a browser capable of reading HTML, CSS and Javascript. I may use a web server to host my project.

Learning Challenges

Learning challenges involve implementing a genetic algorithm from scratch, learning Javascript and HTML5 canvas, learning and implementing Game Theory and creating a graphical element that takes the results of the simulation as input and displays it.

Hardware / software platform

I will be writing this project in a Linux environment but because i am writing it in Javascript it will be available on all mainstream PC Operating Systems. There are no special hardware/software requirements; nothing that will not already be available on lab PC's.