Blobs on a Plane

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Project Description

The software is an evolutionary simulator, dealing with observations of mimicked natural evolutions. The scope of the project is to produce a system that can be used to study evolution in an environment where the user can intervene and change the parameters. Particular interest is placed on creature and group behaviour, and population dynamics.

The project involves building a tool which allows visualisation of an environment and enables users to interact with various parameters in the environment. It is intended as an educational tool to allow users to better understand evolutionary dynamics. Creatures called “blobs” evolve in this simulated environment by having techniques used in Genetic Algorithms applied to their DNA. This DNA described their characteristics and behaviour.

An alpha version of the project is deployed online at http://unityblob.azurewebsites.net/. This is still in development, therefore prone to bugs and sudden changes.

Progress

The system was build using the Unity development platform. The choice was made due to familiarity of the language used (C#) and the portability of Unity (from Windows, to iOS, to browser). The simulator was built from a top-down perspective, first starting with the general layout, then moving on to implement the details.

At the time of writing, the system is capable of simulating a species of virtual creatures with variable DNA, in an environment with user-defined parameters. The aforementioned creatures implement a simple food finding behaviour, reproducing if they have eaten enough, and dying otherwise. The parameters involved in the search and reproduce decisions are encoded in a “blob’s” DNA.

The system also shows statistics about the current simulation, such as: population size, number of food sources, etc. In order to analyse the characteristics of each “blob”, its genotype and traits are displayed, should the user click on a particular “blob”. A histogram of traits is also available for the whole population. The system also logs changes in the population, such as deaths, user clicks, and reproduction.

In order to provide better feedback, the system outputs sounds when food is eaten, or when “blobs” reproduce.

Plan

Future work on the project includes: changes to the behaviour of the "blobs", sexual reproduction, and active food searching. Another change to be taken into consideration is allowing the user to also tweak the parameters of the evolution itself, along with those of the simulation.

A change in the direction of the project would be to change the behaviour of the "blobs" to better simulate bacterial behaviour. This could be done by modifying the way creatures search for food. Certain bacterial genome operations could also be included. The biological similarities were added to the project plan after a discussion with Simon Hickinbotham, a researcher in Evolving Systems https://www-users.cs.york.ac.uk/sjh/

Sprint	End Date	Features
Sprint 3	12 January 2016	Simulate bacterial movement
Sprint 4	2 February 2016	Modularise internal evolution
Sprint 5	23 February 2016	User Evaluation Report Draft
Sprint 6	15 March 2016	Presentation Report

Problems

Initially, there were problems with the choice of platform for the system. Multiple attempts were made on different platforms, including WinForms, Mono, and .NET. Problems arose either in performance, portability, or the implementation of the user interface.

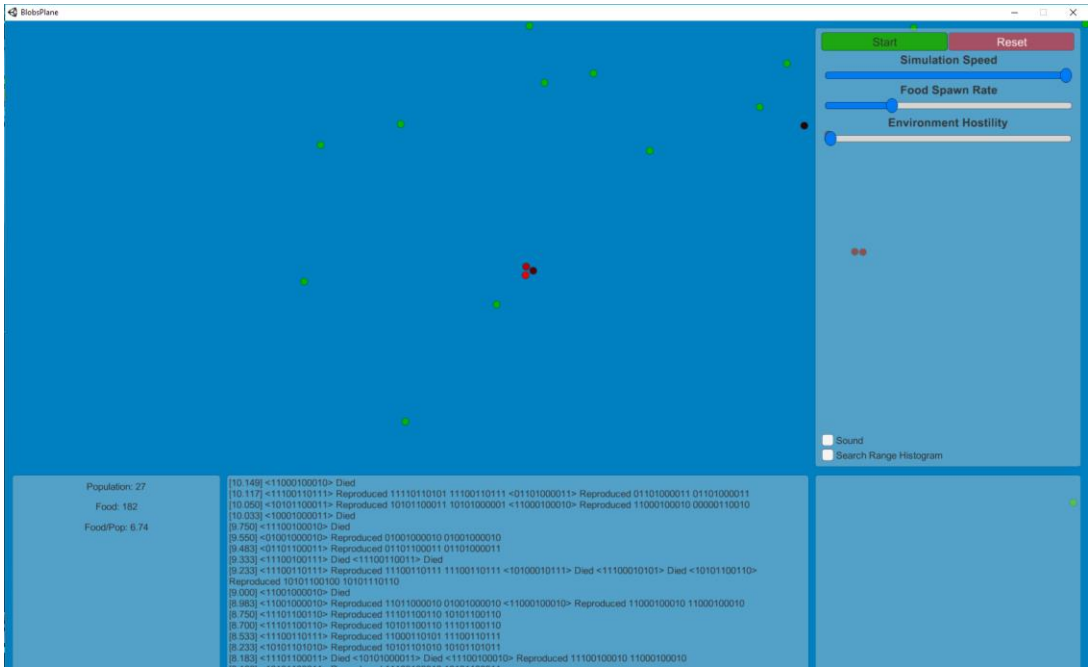
After the transition to Unity, the main problems faced were, at first, familiarisation with the new platform. This, however, has been made easy by a series of comprehensive tutorials on the official Unity website.

Another rising difficulty is the need to avoid clutter in the user interface. As more and more information needs to be displayed, this needs to be done in an efficient manner.

Through the lifespan of the project, there is also constant difficulty in the design of the system; mainly in deciding the discrete parameters of the environment and the evolution. Since even a small change in parameters can greatly influence the evolution (killing the population, or stagnation), finding values for these parameters is a difficult process.

Screenshots

In the right-hand side of the user interface the controls of the simulation can be found. Here, users can change the parameters of the environment. In The bottom part of the screen, the user is presented with statistical information about the current population, an event log, and information about the recently clicked “blob”.



The screenshot below represents a simulation in which food is not as scarce. As seen in the histogram on the left-hand side, the population has evolved towards more fit individuals. However, since food is largely available, the population will average out over time, resulting in less fit individuals.