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Period 6

COMPUTER SYSTEMS RESEARCH

Fall/Spring 2007-2008

Computer Systems Project Proposal - September 2007

1. Project definition:

This project will study artificial societies, especially the Sugarscape and the Schelling segregation model.

2. Purpose of project:

As of yet the Sugarscape society has not been implemented in Ruby and it would be valuable for this code to be available because of the scope of the Sugarscape research. Sugarscape has inspired further research concerning agent-based modeling and artificial societies. The Schelling segregation model was one of the first artificial societies to be implemented on a computer and has defined the area of study. The combination of these two models can provide valuable insight into human culture. Perhaps 3 different groups could be put into the Sugarscape instead of the usual two different groups.

3. Computer language and software:

Ruby will be used as the programming language for this project. Ruby's Tk toolkit library will be used for the GUI representation of this Sugarscape project.

4. Algorithms and methods:

First the environment will be built and then the environment will be set to update itself and redisplay over time. Next agents of one color will be added to the Sugarscape, harvesting and eating the sugar. Eventually multiple groups of different color agents will be added to the Sugarscape to see how they interact according to the principles of Schelling segregation. Lastly, combat between different groups will be implemented, as this has not yet been done by Tony Bigbee at George Mason. The project will be broken down into several files: a main file, an agent file, an environment file, a location file, a display file, and a simulation file. The main file will initialize aspects of the simulation, environment, and GUI by calling methods in other files. It will then run a while loop updating the display and running the simulation. The agent file will contain an agent object which will keep track of its location and its innate characteristics, such as vision and metabolism. Its act method will be called upon for it to move. The environment file will contain an object that has a matrix of locations and an array of agents. The location file will contain an object, which keeps track of its x- and y-coordinates in addition to its sugar capacity, sugar quantity, and whether or not it has an agent. The display file will contain methods to create the GUI and update the display of the environment and agents on a drawing canvas. The simulation file will have methods to pause, play, and step through the simulation, in addition to calling the act method of all the living agents.

5. Testing and analysis:

The program will be checked to see if it corresponds to the results obtained by Axtell and Epstein. Mathematical formulas are listed in the back of the book, and displays of charts and graphs showing the relationships between various variables are shown throughout the book. These can be used in conjunction with the version implemented in Ruby which will eventually display graphs that can be compared to said graphs and mathematical formulas. The program will meet as many of the specifications of Sugarscape as defined by Axtell and Epstein as possible. As there is a large amount of data on the results of certain variations of the Sugarscape in the book by Axtell and Epstein, versions of the project can be compared to the results in the book to see if it is running as it should.

6. Scope of research and expected results:

Growing Artificial Societies: Social Sciences from the Bottom Up written by Joshua M. Epstein and Robert Axtell and Micromotives and Macrobehavior by Thomas Schelling define Sugarscape and the Schelling segregation model. Tony Bigbee from George Mason University has written the Sugarscape in Java and his code will be used for reference along with the first book primarily. In the book by Axtell and Epstein Schelling's segregation model is mentioned and the Sugarscape is built with two separate groups (tribes) which combat against each other. The results should mirror those of the Sugarscape models in Growing Artificial Societies. However, once Schelling segregation is implemented with possibly more than two different colored populations the results will differ. In all likelihood only two groups will survive in the long run. The final results will be presented with screenshots of the running program along with graphs of relationships of variables. It will perform like previous Sugarscape models.