User Documentation

Gao Yuyang

Overview

The program simulates a population of characters which can be either Humans or Vampires. The characters are placed on a 2D map and have the ability to move and interact with each other. The program allows for a user to set the initial population of Humans and Vampires, and simulates their interactions for a specified number of steps. The program also includes a parameter sweep script, which allows for the user to run multiple simulations with different population settings and output the results to a CSV file. It is designed to answer the following questions:

- How does the initial vampire population affect the number of infections?
- Are there any situations where all humans don't become vampires?
- How does the initial human population affect the final population of humans and vampires?

Using the Program

1. Before running the program, ensure that Python3 and the necessary libraries are installed on your machine.

2. To run the program, open a terminal and navigate to the directory where the program files are located.

3. To start a simulation, run the command “python3 A2.py [number of humans] [number of vampires]”.

4. The program will simulate the interactions of the characters for a specified number of steps. The final population numbers of Humans and Vampires will be displayed in the terminal.

5. To run a parameter sweep, run the command “./popSweep.sh [low human population] [high human population] [low vampire population] [high vampire population]”.

6. The script will run multiple simulations with different population settings and output the results to a CSV file in a new directory.

Discussion of Code

The code for this program consists of three main files: A2.py, popSweep.py and characters.py.

A2.py is the main driver program for the simulation. It takes in two command line arguments, the initial number of the human population and the initial number of the vampire population. The program then creates instances of the Human and Vampire classes, as defined in characters.py, and simulates the interactions between them for a fixed number of time steps. The final population numbers are then output to the console.

popSweep.py is a script that allows for parameter sweeping of the initial human and vampire population numbers. It takes in four command line arguments, the lower and upper bounds for both human and vampire populations, and runs multiple instances of the A2.py program for different combinations of initial population numbers within these bounds. The output of each simulation is written to a CSV file for further analysis.

characters.py contains the class definitions for the Human and Vampire characters in the simulation. Both classes have a set of attributes, such as current health and attack strength, and methods, such as attack and flee, that determine their behavior in the simulation. The class definitions also include methods for updating the population of each character type based on the outcome of their interactions.

In terms of implementation, object-oriented programming concepts were used to encapsulate the data and behavior of the characters within their respective class definitions. This allows for easy modification and expansion of the simulation in the future. The use of parameter sweeping in popSweep.py allows for a more thorough exploration of the parameter space and generation of a large amount of data for analysis.

Overall, the design and implementation of this program allows for the simulation of a vampire takeover scenario and the analysis of the effects of different initial population numbers on the outcome of the simulation. This can provide valuable insights into strategies for containing and overcoming such a scenario in the real world.