William Conley

Ryan DeSousa

Simulation Project Proposal

For this project, we will be creating a disease spread simulation based on the COVID-19 pandemic. This will be based off a research paper attempting to achieve the same goal. In this paper, the simulation is implemented numerically, with differential equations defining the behavior of how the population changes, and the state of the simulation being the percentage of the population that is part of each stage of infection. In this simulation, we will instead be taking a graphical approach, choosing a smaller population, and representing each person as a dot on the screen that can move around.

We will be using the same values chosen in the paper for the rates of change between states of infection, but rather than computing changes numerically, we will introduce a random chance for each individual person to change states.

Simulation states:

- Susceptible: Individual is not infected with the disease
- Infected: Individual is infected; they have not been identified and have no symptoms
- Diagnosed: Individual is infected; they have been identified and have no symptoms
- Ailing: Individual is infected; they have not been identified and are showing symptoms
- Recognized: Individual is infected; they have been identified and are showing symptoms
- Threatened: Individual infected and very symptomatic; they are at risk of becoming extinct
- Extinct: Individual is deceased
- Cured: Individual has been cured of disease

Initial Setup

When the simulation begins, each person will be put in a random position on the map. Most will be susceptible, and a small number will be chosen to become infected.

Infection

When a susceptible individual is within range of infection, they have a chance to become infected as well.

Detection

When an undetected infected individual is within range of another individual, they have a chance to become detected.

Symptom Progression

When an individual is infected, they have a chance to progress their symptoms. Progression follows the order: Infected/diagnosed, ailing/recognized, threatened, extinct.

Curing

A "clinic" will be placed randomly somewhere on the map. After an individual visits the clinic, they will have a chance to become cured.

The people will be given logic to move around the map, and the progression of the infection will be observed. We may add random behaviours to individuals (e.g., a "recluse" class of person that is more cautious of other people, an "antivaxxer" class of person that does not try to become cured, etc.)

Sources:

https://www.nature.com/articles/s41591-020-0883-7#Fig2