Simulation of the Spread of a Virus Using Agent Based Modeling
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Abstract

My goal is to make an agent based modeling simulation that shows the spread of a cold through a school. It will start with an amount of infected students and healthy students received as inputs and will show how much the virus spreads or possibly recedes over time. The program will answer the question as to how quickly and fully different types of sicknesses will be able to spread through the population of a school once introduced. This will show how likely it is for a disease to be spread by a set amount of sick people coming to school with the sickness. This will show if the danger of infecting others is actually a valid excuse not to come to school or if you should come to school unless you actually don't feel like you will be able to do work.

Procedures

My program has three main classes. An Agent class which defines what values an Agent will store and how to construct it. A class that creates the GUI. And the most complicated of the three, the Model class which is where all of the calculations occur. In the Model class there is an arraylist containing all of the Agents in the simulation. With these Agents the class has to define a step() function which moves the simulation forward. This function has to update the locations of all of the agents, check to see if any of them get infected, and check to see if any recover from being sick. First it goes through the list of Agents and moves them all to the next location in their schedule. In order to check for any new infections it goes through the entire list of Agents finding each sick Agent. Whenever it finds a sick Agent it finds any healthy Agents in the same location and checks a randomly generated number against the sick Agent's infectiousness value. If the random number is lower then the healthy Agent is switched to sick and the method continues on through the rest of the list. To check if any Agents recover from sickness it goes through the list checking the recoverytime value and if it equals zero the Agent is switched to healthy.

Expected Results

My program will answer the question as to how quickly and fully different types of sicknesses will be able to spread through the population of a school once introduced.

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My program shows how many people are infected with a virus after any amount of time given an input of how many people there are and how many are infected at the start. It displays the number of infected people and the period that the agents are in at the moment in the display window plus possibly some other information such as the ratio of infected to healthy people, the total number of people that have been infected (including those that have gotten healthy after being infected), and other similar results.

The program displays values for the number of agents are sick, healthy, total agents, total infections, and total recoveries. It also has a display showing the locations of all of the agents and their status (healthy or sick). Eventually it will be able to have different diseases which have different recovery times and infection rates. I will use research data for all of the stats relating to the different diseases such as the recovery time and the infection rates based on real values for different diseases.

Next I plan to change the display showing locations to a picture instead of words. I then plan on adding the ability to graph the number of sick and healthy Agents over time which would assist in analyzing the data. If I have extra time I could then explore different methods of contracting the diseases. At the moment viruses are all passed through close contact with a sick agent, but I could add diseases passed through contact with where a sick person had recently touched such as a door knob or a keyboard.