Nicholas Paz

Kelly Pang

**4.2.3 Simulation Project**

**Brainstorm:**

We chose the **Virus** simulation in the NetLogo Biology library as our template.

* Add a death rate to the simulation.
* Add in a scroller to modify the death rate.
* Rename “immune” percentage to “wearing a mask”.
* Add small percentage that a person may become infected with a mask on.
* Add ability to sneeze or cough and input a scroller to modify the chance someone may sneeze or cough.
* Try to add a visualization when a person sneezes or coughs.
* Create a slider that allows the lifespan of the turtles to be changed.
* Create a slider that allows the user to modify the the carrying capacity of the world, which is currently set to 300.

**Research & Rules:**

Our article is called “1918 Flu Pandemic” <http://www.history.com/topics/1918-flu-pandemic>

* There were no effective drugs or vaccines to treat this killer flu strain .
* Citizens at the time were ordered to wear masks at schools, theaters and other public places.
* The Spanish Flu is highly contagious when an infected person coughs, sneezes or talks.
* Someone who touches something with the virus on it and then touches his or her mouth, eyes or nose can become infected.
* People infected with the Spanish Flu died within hours or days of their symptoms appearing, their skin turning blue and their lungs filling with fluid that caused them to suffocate.
* There were not any effective vaccines or antivirals, drugs that treated the flu.

**Presentation (3-5 Minutes):**

a. Which model you chose to work with, and why

We chose to work with the Virus model because it was an interesting simulation that we could link to a variety of diseases that currently afflict the human population today or ones that have affected the human population in the past. In addition, it was a more simple simulation, as compared to the convoluted AIDS one we earlier considered, which allowed our group to make changes in the code that we desired.

b. Summary of any parameters you changed using the AI and/or any modifications that you made to your model's code in order to accurately represent the new assumptions

Our group created a toggle switch that has two options: mask on and mask off. We made the assumption that when infected people wear masks, the spread of their illness, or their infectiousness, is decreased. Thus, when the wear-mask variable is turned on, the infectiousness is lowered by 20%, and the shape of the turtles becomes smiley faces to indicate that the masks are worn. To contrast, when the masks are off, the turtles are in the shape of sad faces.

In addition, because the lifespan was previously hard coded into the program as 50 years, a scroller has been added so that the user can modify the lifespan of the turtles. This allows the code to simulate a variety of different countries and a variety of different time periods wherein the lifespan of humans was nonuniform.

c. Summary of your observation of the results of the simulation as viewed through the viewport

When the wear-mask switch is on, the turtle shape becomes a smiley face, and when the wear-mask switch is off, the turtle shape becomes a sad face. Furthermore, the wear-mask switch also affects the infectiousness of the disease, which manifests itself as changes in the color of the turtles. If the switch is on and lowers the spread of the disease, we can expect a greater percentage of green turtles. The lifespan slider has the effect of changing the amounts of turtles/people in the total population, which can also be visible through the viewport.

d. Summary of your observation of the results of the simulation as indicated by data produced using BehaviorSpace as well as any appropriate visual representations

When the masks are on, people are 20% less likely to become infected, which is reflected as a change in the infectiousness slider value as well as a change in the graph. The amount of healthy people will rise, while the amount of sick people will decrease. The opposite occurs when the masks are off since the people are more likely to become infected.

Additionally, the creation of the lifespan slider causes the new plot to show differences in the total number of people in the population. When the lifespan of a turtle is increased and the simulation is allowed to run, the total population grows larger. If the lifespan is decreased, the total population count will fall.

e. Explanation of how the modified assumptions have changed the predictive power of the simulation, including under what circumstances the model could be used to make reliable predictions about real world systems

With the creation of the lifespan slider, the model can now predict disease infection in many different regions of the world and in many different time periods since the average lifespan of humans can be modified accordingly. As a result, the model is now more reliable in making predictions about real world systems.

With the addition of a switch that signifies sick people wearing masks, the masks’ ability to prevent the spread of disease is demonstrated. Thus, a comparison can be made between a simulated population that wears masks in the wake of disease and a simulated population that doesn’t take these preventative measures.

**Create Prompt:** “Describe how each smaller algorithm within your simulation functions independently, as well as in combination with others, to form a new algorithm that helps to achieve the intended purpose of the program. (Approximately 200 words)”

One of the first algorithms in the simulation is the setup-turtles. This algorithm creates the specific turtles and a random age for the turtles. This algorithm decides whether or not a turtle is going to be healthy or sick . It also allows the turtles to wear a mask and if they do, it lowers the infectiousness rate and turns the shapes of the turtles into smiley faces to indicate that the masks are on. If the turtle is not wearing a mask, then the shape of the turtle is a sad face. The get-sick, get-healthy, and the become-immune all control whether or not a turtle will be infected, healthy, or immune to the disease for a limited time. The go algorithm keeps the turtles moving and is a crossroads that leads to other algorithms depending on the state of the specific turtle. The next algorithm is the get-older and this controls the lifespan of the turtle, which can be modified in the lifespan slider. If the turtle gets to a certain age, it dies. A move algorithm allows the turtles to randomly move. An algorithm called infect checks to see if another turtle is not sick and not immune and then gets the turtle sick. The recover-or-die algorithm decides whether or not a turtle will survive the virus or die from it. If the turtle has survived past the virus’s duration then the turtle will survive. The last algorithm called reproduce allows the turtles to create another turtle based on a random chance. All of these algorithms function together so that the simulation works as a model for populations that are affected by a series of factors in relation to the infectiousness, duration , and prevention of a disease.