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MAT 326 Project 1

Zombie Outbreak Statistics

**Problem**:

The issue at hand is a statistical representation of a zombie outbreak. The outbreak relies on several assumptions. First that babies are being born in the non-infected population at a set percentage. Secondly that infected mothers do not give birth to infected children but rather there is a set chance that a non-infected will become infected through some assumed interaction. There is also an assumption that the zombies die over time of some unknown brain injury. Lastly as stated in the specifications we assume that the creatures show up new or die off right at the end of the month based on the numbers from the previous month.

**Model:**

Ln = Ln-1 + deltaLn

Zn = Zn-1 + deltaZn

deltaLn = b\*L – a \*L \* Z (change in human population)

deltaZn = a\*L\*Z – d \* Z (change in zombie population)

a = 0.00001 (zombie interaction rate) b =0.02 (human birth rate)

d = 0.05 (zombie deathrate)

initial model starting Human Pop = 1000

initial model zombie starting pop = 100

Model uses delta L and Z to find change in the populations using above formula’s

The current L and Z are found by adding previous L and Z with delta version

Most models were done with from as little as 400 rows and some as large as 1000

**Data and results**:

For the base model the living population steadily grew to a point where it exponentially increases along with the zombies spiking in population shortly after. The living population then plummets to near zero and the zombie population slowly falls back to near zero. Then the model appears to cycle the same process several times over and will likely continue forever. So the base model appears to show an example of the fourth scenario. The model acts this way because the as long as there is a growing human population and the interaction between humans and zombies is not zero the zombies will always return when the human population gets large enough. The size required for the zombie population to spike is dependent on that interaction. The zombie death just changes how quickly the population declines.

For the all is lost scenario the larger the a value is the quicker it ends. For most cases apart from the base scenario the entire population is zombified immediately and then the entire zombie population slowly fades away.

The zombies are defeated one was the most difficult as any amount of a zombie interaction ensures that the zombie population will return when the humans grow large enough. changing d to a large number like 1 and a to a very small number allows it to stabilize eventually and the human population to grow unhindered.

**Conclusion:**

This project was predicting a zombie outbreak with certain circumstances such as set human growth and zombie interaction/growth along with zombie death. A somewhat unrealistic part of the model was the human growth model does not take into account carry capacity or lack of resources in the apocalypse. I don’t think a set growth rate is appropriate for the scenario, but it makes the math easier. Like many of the other models we have done there are many small variables that could be accounted for but would make it overly complicated. An example would be infected pregnant mothers. Or possibly that the humans were killing the zombies, that could be implemented as a number of zombies killed based of human population size.