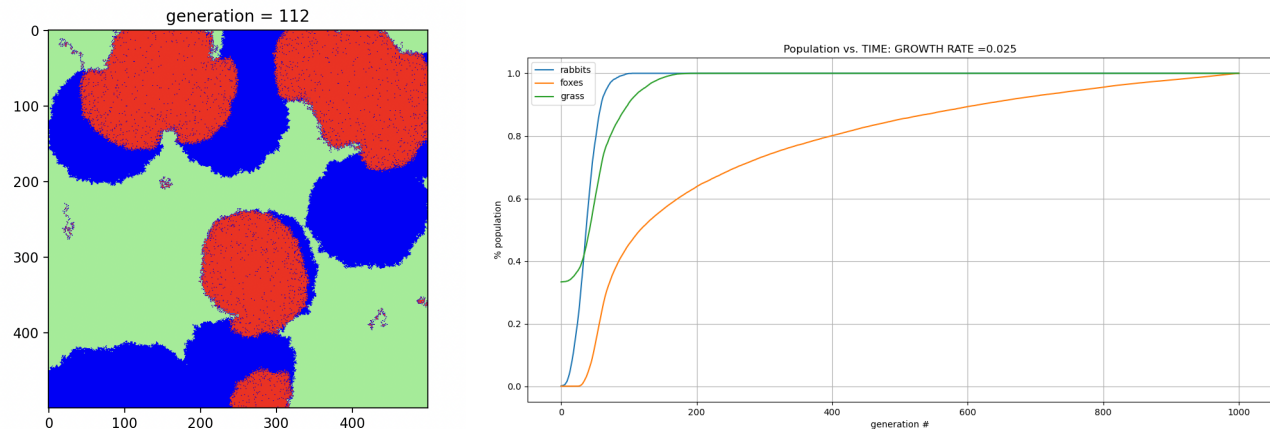


Rabbits vs Foxes: Modeling Ecosystems

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Github: https://github.khoury.northeastern.edu/kdonn/HW5_AM_KD



INSIGHTS & CONCLUSIONS

In our simulation, we investigated the dynamics of a population of rabbits and foxes living in a field, where the rabbits feed on grass and the foxes feed on rabbits. To begin, we randomly placed a user-specified number of rabbits and foxes in the grass field. Each cycle, the rabbits feed on the grass and reproduce, while the foxes hunt the rabbits and reproduce. The amount of grass grows at a user-chosen rate, and both rabbit and fox populations are limited by their food availability and movement speed.

After 1000 cycles, we plotted the population of rabbits, foxes, and grass as a function of time, which gave us an idea of how the populations evolved and interacted over the course of the simulation. We predicted that we would see cycles of boom and bust, where the rabbit population grows, followed by a corresponding increase in the fox population, which in turn leads to a decline in the rabbit population, and so on. However, our results presented otherwise.

From the plot showing population records over time, we can see which species survived and thrived. In the beginning, the rabbits seemed to have the upper hand and acted as an invasive species. They reproduced at an astonishing rate with grass consumption at an all time high. The foxes reproduce a lot slower and because of the lack of food and nourishment and will eventually die out due to lack of food. However, this all changes if the foxes and the rabbit species meet each other as the foxes eat the rabbits and reproduce at an increasing rate. As you can see in our resulting graph plotting the population of rabbits, foxes, and grass over time, the rabbit species grows somewhat linearly while the foxes grow exponentially. The rabbit species eventually goes extinct due to overhunting.

To investigate the effect of the parameters, we repeated the simulation with different values and observed how the outcomes change. For example, increasing the field size allowed for more rabbits to survive, as there is more space and food available. Similarly, increasing the rate at which grass grows allowed the rabbit population to grow faster, leading to more food for the foxes. Finally, increasing the fox k value (i.e., making them better hunters) led to more successful hunts and a faster decline in the rabbit population. By varying the parameters of the simulation and observing the outcomes, we were able to see how a variable of factors affect the survival and coexistence of different species in a complex ecosystem as well as analyze predator prey interactions.