The food web of life

New Mexico

Supercomputing Challenge

Final report

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Executive Summary:

In this project I attempted to make a predator-prey program that could model both the eating habits of a variety of animal diets. Given the assumption that a completely lifelike program is impossible, I tried to add as many variables as possible to add the lifelike outputs.

Variables that were added were those like disease, energy, and grass density. Obviously if an animal is sick or hungry it cannot do quite as much as one that is in perfect condition and well fed. Therefore the speed of animals and the amount of energy they hold can be altered to fit this assumption. I felt that grass that had varying density would add some more realism into the picture.

By adding variables I hope to enhance the realism in the data given by my program.

Body of the Report:

Introduction:

Though there are many different predator-prey models that have been created, the accuracy and precision of the data is questionable. For instance, in wildlife populations species rarely if ever go extinct because they have a niche or place in the specific arias in which they live. However, when one runs a simplistic predator-prey program, the precision or repetibility of the data is horrible. Species go extinct, populations are out of proportion, etc. The accuracy of the data is largely wrong and the data is useless in studying actual environments. The purpose of this project is to narrow the widely incorrect data to a more realistic scale.

Description:

Through the miracle of StarLogo my program reaches a state of simplicity from the standpoint of a user. The buttons, sliders, and graphs are easy to read and understand. On the outside the program looks rather simplistic. However, the inner code of the program is complicated enough with just a predator-prey relationship. The epidemiology behind the project makes the outcomes seem like they ought to be different every time the program is run. The truth is not far from such an assumption, but not entirely true. The rates even out after a while and I have on a rare occasion killed off a species. The balance is kept in check however and is more lifelike.

My project is based off of previous simplifications of nature but then expanded to reach a largely different set of outcomes. Although the thought process behind the project is simplistic, the outcomes are different from the many different roots I drew information from.

Results:

The resulting data is dependent of the different factors in the program. The different ways in which species interact by preying off each other, how fast the specie metabolize the food, the ways in which a disease spreads, etc. make the data difficult to generalize.

When a species was edited to metabolize food at rates similar to that of a rodent and the food generated by eating that species creates a world of difference between the ways that they live, reproduce, and die. In general, smaller animals or animals that have less nutritional value are devoured by the larger animals because the larger carnivores needed to eat more to stay alive. The ways in which this was represented in the program mimicked real nature but on a smaller scale.

When a disease is introduced into the environment it does not last long. The population density is too small to spread and the disease dies out with those infected. This also is mimicked in real life. Major diseases are usually incapable of spreading in isolated environments because the densities are far too low to have an impact.

I learned that although my results did go in line with those in nature, they simply do not match up. No model can fully anticipate all variables. But models such as mine can add variables to try and strive for as near to perfection as possible. I also learned that programing pack hunts is near to impossible

Calculations:

Although no new calculations were made in the production of this project, revising old statistical data from known diseases such the as rate of disease spreading, the probability of catching the disease, and the ways in which they could be spread all needed to be scaled down to

a computer-screen size. The conversions from data to equations was simplistic enough with percentages and such. But adding in the drive to hunt with hunger or the want to mate when given enough energy made this program rather tedious.

Recommendations:

Although this project sounds and seems to be rather tedious to work through, all programs are built off one-another. Therefore, the use of existing projects as examples for the different functions of this program made the project far more simplistic than if done from scratch. The StarLogo program comes with a disease 'adventure project', a termites project, a predator-prey project, and other helpful tools for the completion of a project such as mine. Other help can come from the MIT headquarters who are sometimes more helpful than needed. Otherwise, the logic behind the project is rather easy to muster.

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