Logistic

1. Author and Contact Info:

Dr. Robert A. Desharnais
Department of Biology
California State University, Los Angeles
Los Angeles, CA 90032-8201
Internet (NeXT Mail):   bob@biol1next.calstatela.edu
Phone: (213) 343-2056
Fax: (213) 343-2095

2. Category: Biology (Population Biology, Ecology) or Mathematics

3. Brief Description:

This application is used to show how a very simple ecological model can have very complicated dynamical behavior. This program implements a discrete generation version of the classical Logistic model where the *per capita* rate of population growth decreases linearly with increases in population density. The application plots the long term population density (y-axis) as a function of the population growth rate (x-axis). It shows how stable equilibrium points bifurcate to fixed point cycles which continue to bifurcate and eventually lead to chaos. The mouse can be used to zoom in and recalculate small portions of the graph.

4. How the Application Can be Used:

Logistic is one of those applications which combines elements of mathematics and biology. The application can be used to demonstrate the concepts of stable equilibria, fixed point cycles, bifurcation theory, chaos, self-similarity, and fractals. It could be used in an introductory biology course covering population biology or ecology, or a mathematics course on nonlinear dynamics.

5. Developed under NeXTSTEP 1.0

6. Detailed Instructions:

Parameter values are entered into the fields. New values for the graph minima and maxima can be selected by dragging a rectangle over the graph. For detailed instructions and a description of the model, click on the CSLA icon in the Info Panel.

7. Comments:

All the calculations are done using long double precision floating point numbers. If you consider the original dimensions as an area the size of a map of the world, you can zoom in until you reach an area the size of a postage stamp. However, the deeper you zoom, the larger the number of iterations you will need to obtain accurate results.

This is one of the first apps I developed while learning how to program on the NeXT. With hindsight, I see that there is much that I could add or improve (e.g. printing). If you have any suggestions or find any bugs, please let me know.