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Getting Started: Expanded Predator-Prey Model GUI

This GUI displays an expansion of the *Volterra-Lotka* predator prey model.

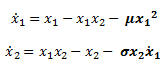
The *Volterra-Lotka* predator prey model is the standard model of ecosystem dynamics that assumes:  
1. logarithmic population growth rate   
2. linear predator growth and prey decline proportional due to predation to the opposing population

**Our expansion adds two additional terms:**

**3. Disease and overcrowding in prey (represented by parameter μ)**

**4. First order time delay for predator growth (represented by parameter σ)**

The terms we add to the *Volterra-Lotka* predator prey model are bolded below:

https://lh5.googleusercontent.com/BTjF9xobSynbbOYiG9Z8bG7eFLjWyPumo-rbX7hJbQtfFIHNUBOD0k1YNDOS_FNkeHzFLxXWHf9wh5iTdUyCfGQMfBl_W9wKxGc9SW65rgXSX-5ebeH7bNmtXBkV_367uw

To understand this expanded model, the provided GUI plots phase portraits and time plots of predator-prey populations with various initial conditions and parameter values.

**Parameter Inputs**

Parameters **μ** and **σ** can be input in three ways:

1. Clicking directly on the parameter space plot

2. Using the provided sliders

3. Entering the parameters directly

**Initial populations** and **time spans** can be input by clicking the appropriate *Edit* buttons. These can be reset to default by clicking their respective *Default* buttons. The **Input populations** can also be input by clicking directly on the phase portrait plot.

**Outputs**

All outputs will automatically update upon any change to the input parameters.

The **Phase Portrait** and **Time Evolution** plots reflect the ecosystem developments from the given initial conditions for a duration given by the time span input.

The **Results Table** in the lower left corner of the GUI will display the stable point of the system and its stability classification (Stable node, Stable focus, Limit cycle). If a limit cycle is predicted, the GUI will tabulate a predicted approximate limit cycle period based on the parameters, and tabulate the measured limit cycle period.

**Other Features**

The “Hold Current Axis Limits” box can be checked to stop autosizing the output graphs.