Predator – Prey Explorationa

Your goal is to explore the origins, historical development, and behavior of simple computational models of PREDATOR-PREY systems. The assignment will be "generic" in the sense that you may choose to make the model(s) as specific as you have interest, perhaps finding a specific pair of entities with which you can compare your models to reality (wolves and rabbits, lynx and hares, sharks and minnows, etc.)

The assessment of this week of work will be your rather complete lab report due October 17.

I. Background reading. You should download and read –then re-read– the following document by Prof. Holly Hirst of Appalachian State University:

   http://www.shodor.org/wofford/panoffrm/COSC150/Labs/popnewnew.pdf

   You should be able to describe the rationale behind each of the models discussed.

II. All Classmates: Lotka-Volterra: Download a starting template for your studies:

   http://www.shodor.org/wofford/panoffrm/COSC150/Labs/Predator-Prey-LV.mdl

   Make a copy of this file before you start so you can use the same file as the starting point for all the scientific investigations.

   Decide how best to use the resources of all of you to help each of you accomplish the following explorations. You may work alone, in small groups, or larger groups, as long as you declare your workmates and ***the final lab report must be your own work.***

   Devise a plan for a systematic examination of these models to uncover facts about them:

    a. For what combination(s) of parameters will this model display periodic, oscillatory behavior?
    b. For what combination(s) of parameters will this oscillatory behavior produce almost equal populations of predator and prey?
      •What combinations produce large oscillations?
      •What combinations produce small oscillations?
    c. For what combination(s) of parameters will this oscillatory behavior produce populations of predator greater than populations of prey?
    d. For what combination(s) of parameters will this oscillatory behavior produce populations of prey greater than populations of predator?

      For c. and d. above, what natural systems might correspond to each?

    e. How do the initial populations of predator and prey affect your answers?

    f. Modify the model to also remove a fraction of the predators each time period due to hunting. (add another rate OUT OF the predator box, introduce a new parameter for hunting fraction, and remove a fraction of the predators.)

What is the most obvious impact on the model from hunting (vary the hunting fraction between 0 and 1)?

g. Modify the model to add a carrying capacity (competition) and explore the parameter space to identify patterns of behavior.

Your lab report should read as a coherent and concise 4-6 page lab report with models and graphs, starting with an introduction summarizing the background reading and how it shaped your expectations, what explorations you performed individually or with your labmates (including any conjectures or hypotheses) and a clear summary of what you learned.