Bunnification Models for Population Studies

The basic Euler Model: HAVE = HAVE + CHANGE can be developed by looking at rates of change for any system, and in particular, single species populations as the prototypical system.

Differential Form: dP/dt = (change per unit time)

Difference Equation Form: $\Delta P/\Delta t$ = (change per unit time) →

$$P_{new} - P_{old} = (\text{change per unit time}) * \Delta t \rightarrow$$

$$P_{new} = P_{old} + (\text{change per unit time}) * \Delta t$$

http://webs.wofford.edu/panoffrm/COSC150/SimplePopulation.xls

Your tasks for this lab include designing and carrying out systematic examinations of the iteration of the Euler form of models of change to uncover the resulting behaviors that arise from these models of change. You should create a document you can use in writing your lab report that includes the graphs of the resulting behaviors up to Time = 25.

Name	**Change per unit time**
Zero	0
Constant birth fraction	any constant b
Linear birth fraction	b * time
Proportional birth fraction	b * population
Competition model	b * population – comp*population*(population-1)/2
Carrying Capacity model	b * population *(1 – population/MaxPopulation)

For each model, you should be able to address these driving questions *in your lab report*:

For questions 1-6, use dt=1 for each model

1. In words, how would you describe the model of change?
2. In words, if you iterate the model of change, how would you describe the shape of the resulting population growth curve?
3. How does each population growth curve change for different values of the parameter b, the birth fraction?
4. For what parameters would each model give a population of 1200 at Time=25?
5. How are the competition model and carrying capacity models related?
6. Do any of the models include "death"? How so?

7. For a given value of the birth fraction, how does each model change if you reduce "dt" to 0.5? to 0.125? What must you change in the model set up to extend the model to Time=25?