PHY307, Science and Computers I
Waves Lab, Part II, December 3, 2002
(Parts I and II are due by end of lab Tuesday, December 3)

Waves: strings and stripes

Summary of what you will do [restated]: Waves are patterns that may vary in space or time. These patterns result from the interactions of neighboring pieces of physical objects: pieces of a string, parcels of moving water, or spreading chemicals, for example. These interactions lead to the formation and propagation of waves.

In the first part of this lab (Nov. 26), you will look at linear waves. The waves will be caused solely by the forces that are created when a piece of an elastic medium (such as a string or surface of a drum) is stretched. (The pieces of the medium also have inertia.) The forces act to bring the medium to an undistorted state. You will use both spatial displacements and colors to visualize waves.

In the second part of the lab, you will look at pattern formation in a more complex model. In this model, neighboring pieces of the substance communicate via chemical signals. As realized by Turing, models of such chemical waves can lead to patterns quite reminiscent of stripes and spots in living creatures.

LAB REPORT

1. Continue your lab report entitled "*MyLastName*Waves.doc".
2. In this part of your report, you want to explore the behaviors for different parameter values: describe what you see (take snapshots if possible, also) and try to map out the behavior as a function of parameters.
3. Download the program GrayScott1D.py from the codes page.
    a. Try running it, for various values of F and k.
    b. Record what you see: if you see waves, compute their wavelength (the string of boxes is 100 long, so if you see 2 wave crests, the wavelength is 100/2 = 50.)
    c. Summarize your results in a table or a list. What types of behavior do you see?
4. Run the simulation available from the web for the 2D version of the Gray-Scott equations (the link will be given in class.) Again, try different F and k values, and PLOT what you see. What types of behavior can you see, using some classification system (for the patterns and whether they change in time or not.)
    a. Tips: when you change parameters, press the restart key. Note that on the cluster computers, things will be slow to react (such as changes in parameters or clicking on reset.)
    b. Try parameters as suggested on the web page and vary beyond that range to see what happens.