Objectives: To experience the efficiency of the memory hierarchy.

Activity 1: Utilize a benchmark program in C containing loops to time and print out the MFLOP rating for the following “daxpy” computation:

\[ y[k] = a * x[k] + y[k], \]

- \( x[ ] \) and \( y[ ] \) are double precision static arrays,
- \( a \) is a double precision constant, and
- \( k \) is an integer index arranged for unit strided memory access: \( k = i \) where \( i \) is the loop counter.

I want you to repeat the Assignment 1 exercise described at:

http://users.wmin.ac.uk/~lancasd/CST605/assignment.html

on the Wright hall lab computers under Linux. You can use the program provided, but you will probably need to increase the size the loop ranges. Use the compiler optimization flags: `gcc -O3 daxpy.c`

Model your analysis of the Wright hall computers after the “results” described at

(http://users.wmin.ac.uk/~lancasd/CST605/Assignments/A1/Conclusions.html) for the data they were provided.

Thus, the steps I want you to perform:
1) Read the Assignment 1 description and results on the web
2) Use the code provided in the results section to do timings on the Wright hall lab machines
3) Perform a similar analysis of the times for the Wright hall lab machines as was done for their machines. Include in your analysis:
   - A printout of the code high-lighting any chances that you made.
   - A printout of the output of your code as columns of size (bytes), time (sec), performance (MFLOPS).
   - A graph displaying the measurement results for the Wright Hall lab machines. The graph should follow the same rules as theirs:
     - The graph should have a logarithmic horizontal axis in “Bytes”.
     - The vertical axis should be in “MFLOPS”.
     - There should be one graph, showing both the unit strided and random sets of measurements.
4) Answers to the following questions:
   a) Estimate (specify the parameters you look up or guess) the peak performance for daxpy on the Wright hall lab machines. How does it compare with the best performance you measure?
   b) Estimate the size(s) of the cache(s)? Explain your method.

Submit your report by Monday, April 28, 2008.