

CEE 618 – Scientific Parallel Computing: Homework #4

Name: _____

Due Monday, February 8, 2013

1. (40 pts) In the π calculation program, change the number of processors from 1 to 16 and calculate speed up ratio and plot it vs. the number of processors. Speed-up is defined as

$$S_{N_{procs}} = \frac{T_1}{T_{N_{procs}}}$$

where T_1 and $T_{N_{procs}}$ are elapsed time to finish a program using 1 and N_{procs} processes, respectively.

- (a) Calculate $T_{N_{procs}}$ as “Elapsed time” from the code.
 - (b) Plot $S_{N_{procs}}$ vs. N_{procs} graph with a diagonal line of $y = x$ for visual comparison.
 - (c) Provide coefficients a and b of your linear regression: $S_{N_{procs}} = a N_{procs} + b$. Exclude $N_{procs} = 1$ case for the linear regression and explain a and b values and ranges.
2. (40 pts) [Volume calculation] Calculate the three-dimensional sphere volume of radius 1 using Monte Carlo method using 1, 4, 8, 12, and 16 processors. Compare your results of the serial code and the parallel code using 1 process. Use the number of total iterations, $n = 10^9$. Calculate the speed up ratio and plot it vs. the number of processors.
 3. (20 pts) Summarize “How to choose a good scientific problem” by Uri Alon, published in Molecular Cell 35, September 25, 2009, p. 726-728.