

HOMEWORK 1: SEQUENTIAL ALGORITHMS

(30 POINTS)

Implement the following algorithms:

1. Matrix multiplication;
2. Gaussian elimination algorithm for solving a linear system of equations assuming that the pivot element cannot be zero: http://en.wikipedia.org/wiki/Gaussian_elimination;
3. Dijkstra's algorithm for computing the shortest path between nodes in a graph stored as an matrix: https://en.wikipedia.org/wiki/Dijkstra%27s_algorithm;
4. Sieve of Eratosthenes for finding all prime numbers to a given limit: https://en.wikipedia.org/wiki/Sieve_of_Eratosthenes;
5. The following sorting algorithms :
 - a. Bubble sort: http://en.wikipedia.org/wiki/Bubble_sort;
 - b. Bucket sort: http://en.wikipedia.org/wiki/Bucket_sort;
 - c. Counting sort: http://en.wikipedia.org/wiki/Counting_sort;
 - d. Insertion sort: http://en.wikipedia.org/wiki/Insertion_sort;
 - e. Selection sort: http://en.wikipedia.org/wiki/Selection_sort;
 - f. Quick sort: <https://en.wikipedia.org/wiki/Quicksort>.

Initialise algorithms' input with uniformly distributed random numbers. Choose for each algorithm one large problem size (i.e. array dimension) and execute it on the lcc cluster using the Sun Grid Engine batch queuing system. Use the profilers of the Intel or PGI compilers to measure the execution time of each algorithm. Explain the results.

Important: Measure only the execution time of each algorithm without random number generation, array/matrix initialisation, and any I/O operations.