Programming Assignment 2: Multi-Process & Multi-Threaded Computation of Statistics
Operating Systems–1: CS3510
Autumn 2018

Submission Date: ~~24th November 2018, 9:00 pm~~ 26th November 2018, 9:00 pm

Goal: The goal of this assignment is to compute some statistics over a sequence of input numbers using multiple threads, processes and compare the times taken by each of them.

Details: This assignment is based on the problem 4.22 given in the book. Develop multiprocess (proc-stat.cpp) & multithreaded (th-stat.cpp) programs that calculates various statistical values for a list of numbers. These program will be passed a large sequence of numbers in a file. They should then create three separate worker processes/threads to compute the following: (a) the average of the numbers (b) the standard deviation of these numbers (c) the median value of these numbers.

After computing these statistics, the program will output these values. The variables representing the average, standard deviation, and the median values will be stored globally or in the shared memory. The worker processes/threads will set these values, and the parent thread will output the values once the workers have exited.

Input & Output Details: The input to your program will be a file containing the sequence of numbers. The first line of the file will be ***N*** which is the size of the input given. The second line will be list of input numbers. The following line shows an example:

5
45 3445 423 854 2

The output of your program will be another file that contains the statistics mentioned above in the following format:

The average value is 953.8
The standard deviation value is 1434.37
The median value is 423

Report Details: As a part of this assignment you have to prepare a report which will describe the low-level design of your program and give an analysis of its output.

It should explain the design of both programs: proc-stat.cpp and th-stat.cpp. In addition to this, the report should contain a graph showing the performance comparison of both these programs which is described below.

***Performance Comparison*:** Compare the time taken by the proc-stat.cpp and th-stat.cpp to compute the above statistics for different values of N. Prepare a graph showing the time taken by these programs for different values of N. The x-axis will consist of the following values of N: 1 * 10^6, 2 * 10^6, ….., 5 * 10^6. The y-axis will consist of time taken by both these programs to complete (possibly in micro-seconds).

The report should contain this graph and explain these results.

Submission Format

You have to upload: (1) The source code of both the programs in the following format: Assgn2-ProcStat-<RollNo>.cpp and Assgn2-ThStat-<RollNo>.cpp (2) Readme: Assgn2Readme-<RollNo>.txt, which contains the instructions for executing the program. (3) Report: Assgn2Report-<RollNo>.pdf. Name the zipped document as: Assgn2-<RollNo>.zip Upload all this on the drive by **~~24th November 2018, 9:00 pm~~ 26th November 2018, 9:00 pm**.

Please follow this naming convention. Otherwise, your assignment will not be graded.

Grading Policy: The policy for grading this assignment will be -
(1) Design as described in report and analysis of the results: 50%; (2) Execution of the tasks based on description in readme: 40% (3) Code documentation and indentation: 10%.