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INSTITUTE OF COMPUTER SCIENCE

CMSC 180: Introduction to Parallel Computing
Second Semester 2022-2023

Laboratory Exercise 02 PART 02
Runtime-efficient Threaded Interpolating elevation

Research Activity 1: Using the programming exercise from the previous week, do the following tasks and answer the following questions.

Tasks Specifications

A. Fill in the following table with your time reading:

n *(size of matrix)*	**t** *(number of processors)*	**Time Elapsed (seconds)**			**Average Runtime (seconds)**
		Run 1	**Run 2**	**Run 3**	
8,000	1				
8,000	2				
8,000	4				
8,000	8				
8,000	16				
8,000	32				
8,000	64				

B. Using a graphing software for each n, graph t versus **Average** obtained from the Table above. Describe in detail what you have observed.

Research Question 1: What do you think is the complexity of estimating the point elevation of a $n \times n$ square matrix with given/randomized values at grid points divisible by 10 when using n concurrent processors? The obvious processor assignment is one column of M for each processor.

Research Question 2: What do you think is the complexity of estimating the point elevation of a $n \times n$ square matrix with given/randomized values at grid points divisible by 10 when using $n/2$ concurrent processors (*what is the obvious processor assignment here*)? What about with $n/4$ concurrent processors (*i.e. processor assignment*)? What about with $n/8$ concurrent processors?

Research Question 3: Why do you think the running time of *t=1* will be higher than the average that was obtained in Exercise 01?

Research Question 4: Do you think you can go as far as *t = n*? If not, what about *t = n/2* ? Or, *t= n/4* ? Or, *t = n/8* ?

<u>Research Activity 2</u>: Repeat research activity 1 for *n = 16,000* and *n = 20,000*. Do you think you can achieve *n=50,000* and even *n = 100,000*? **Try to see if you can**. If you were able to do so, why do you think you can now do it? If not yet, why do you still can not?

Lab Report Guidelines

Submit a report on your answers to the research questions posted in this exercise. All laboratory reports and term projects must be written in a technical way. That means each must have the following sections:

1. Introduction,
2. Objectives,
3. Methodology,
4. Results and Discussion,
5. Conclusion,
6. List of Collaborators, *(Yes, you can collaborate with other students but make sure that you can explain your work)*
7. References, and
8. Appendices.

Submit your report through the Google Classroom Laboratory Exercise 02 Part 02 portal.