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CS415

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PA4 - Matrix Multiplication

Overview

This project focuses on the multiplication of square matrices. The program will be implemented and timed in a sequential method as well as a parallelized method, and their times compared. An example of a square matrix multiplication can be seen below, in Figure 1.

$$\begin{pmatrix} A & B \\ C & D \end{pmatrix} \times \begin{pmatrix} E & F \\ G & H \end{pmatrix} = \begin{pmatrix} AE+BG & AF+BH \\ CE+DG & CF+DH \end{pmatrix}$$

Figure 1, Example of square matrix multiplication. (Source: StackExchange.com)

Sequential

The sequential implementation of matrix multiplication shows a superlinear execution time, that is, as the square size of the matrices increase, the execution time increases faster and faster. The execution time vs. time graph should indeed look very similar to a graph of n^2, because essentially, the sequential implementation is doing size^2 calculations. The execution time vs. size graph can be seen below, in Figure 2.
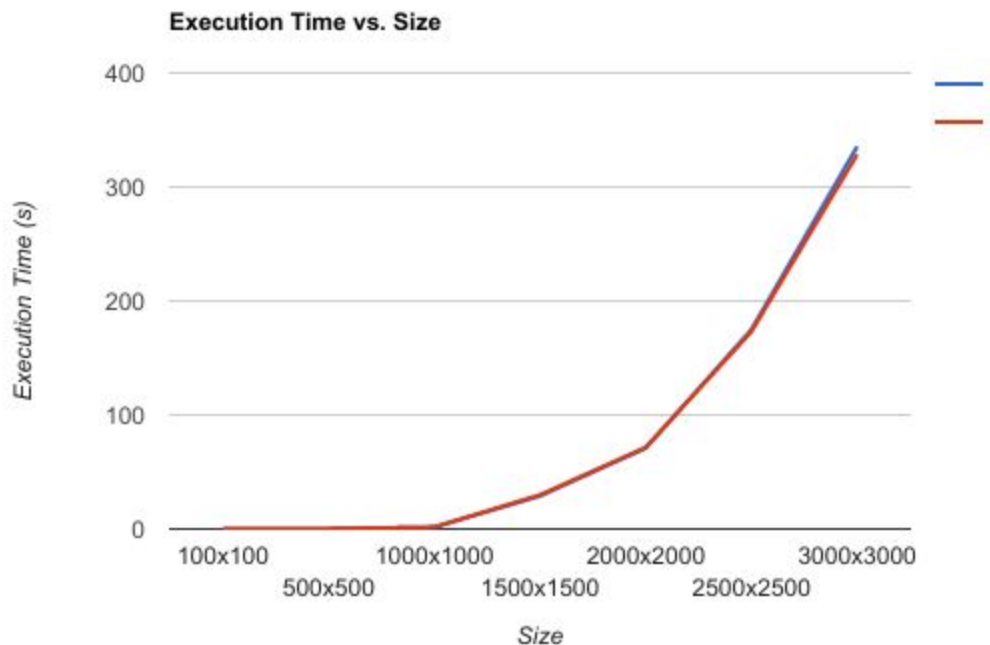

Figure 2: Figure 2, above, shows the relationship between two matrices of size <size>^2 being multiplied together, and the execution time in seconds..

	100x100	500x500	1000x1000	1500x1500	2000x2000	2500x2500	3000x3000
Time 1 (s)	0.001023	0.187337	1.59314	28.9215	70.8782	174.88	335.39
Time 2 (s)	0.001035	0.182211	1.59539	29.8491	71.5264	173.092	328.41
Time 3 (s)							

Table 1: Table 1, above, shows data for various tests logging the execution time of sequential matrix multiplication given different size square matrices.