Course: ECE 4730
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<u>OpenMP Matrix Multiplication</u>

In this laboratory we were required to write four programs regarding matrix multiplication with the purpose of teaching the student about the speedup with parallel programming when compared with sequential programming.

The first program required the student to create a program which created a square matrix or vector of size **n** and of user desired range in which the numbers in matrix/vector were of type **double** and output the matrix/vector as a binary file.

The second program consisted on developing a program which would print the binary file created from the first program and printed it in ASCII.

The third program was to develop a program which took 2 inputs, a matrix and a vector, with the purpose of outputting a binary file which contained the result of the matrix multiplication.

The fourth program was to create a parallel program which took two input files, a matrix and a vector with the purpose of outputting a binary file which contained the result of the matrix multiplication. To create this parallel program, the student used the OpenMP library and modified the third program.

As a result, the student was to time the matrix multiplication of both sequential and parallel matrix multiplication programs. The parallel program was also tested with four matrix sizes and different number of threads to show the speedup between the parallel and sequential programs. The result be seen below:

RESULTS

<u>Tests:</u>

Problem Size [n]	Serial [s]	Parallel [s]	Threads	Speedup
1024	0.01	0.007306054001674	2	1.36872790670705
2048	0.02	0.028500724118203	2	0.701736556483713
4096	0.1	0.114451163914055	2	0.873735107448039
8192	0.44	0.45862964191474	2	0.9593797769181593
1024	0.01	0.012005697004497	4	0.832937895755173
2048	0.02	0.028506522998214	4	0.701593807187681
4096	0.1	0.095996179850772	4	1.04170811958822
8192	0.44	0.277067017043009	4	1.5880634392931
1024	0.01	0.016676211962476	6	0.599656566041573
2048	0.02	0.027231010142714	6	0.734456779061184
4096	0.1	0.091926581924781	6	1.0878246303319
8192	0.44	0.23415429610759	6	1.8791028279824
1024	0.01	0.024185227986891	8	0.413475531651814
2048	0.02	0.034056936157867	8	0.587251886291008
4096	0.1	0.086278147995472	8	1.15904203234924
8192	0.44	0.176552852150053	8	2.49217157718892

SpeedUp vs Threads