Drexel University

Electrical and Computer Engineering Dept.

ECEC-413

Assignment 4:

PthrGaussian Elimination OpenMP

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Gaussian Elimination OpenMP:

For this assignment, the introduction of OpenMP was used to extend the serial or single thread component into a multithreaded parallelism for the Gaussian Elimination. Pragma omp parallel is used to make sure that the elimination and division steps run in parallel and the algorithm is split up just like pthread. Each thread has to wait for the other thread to finish in order to proceed to the next step. First you have to initialize the barriers to be used in the algorithm; in this assignment two are intialized: division step and elimination step. After initializing it, each thread is given a thread ID and will be pointed to the matrix structure. This would let each thread take turn to choose which column to start with and then increment the counter to the total number of threads assigned. The code goes through a striding method for the division step for dividing its parallel elements for the rows. During the elimination step, the chunking method was used for each thread to tell which row to begin with to start the elimination of and for it to do it for each following row until it reaches the starting row of another row.

Results:Speed Up:

Matrix Size	Single Thread	4 Threads	8 Threads	16 Threads	32 Threads
512x512	0.062	0.03	0.039	0.045	0.119
1024x1024	0.384	0.137	0.139	0.177	0.246
2048x2048	2.532	0.748	0.49	0.539	0.681
4096x4096	21.171	5.906	4.282	4.815	5.771

Table 1: Gaussian Elimination Data on Xunil-05

Matrix Size	Single Thread	4 Threads	8 Threads	16 Threads	32 Threads
512x512		206.67%	158.97%	137.78%	52.10%
1024x1024		280.29%	276.26%	216.95%	156.10%
2048x2048		338.50%	516.73%	469.76%	371.81%
4096x4096		358.47%	494.42%	439.69%	366.85%

Table 1: Speedup of Gaussian Elimination