HW4 Report

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CSCI 364 - OpenMP Matrix Multiplication

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Description

The following shows the run data of an OpenMP parallelized program for multiplying two $n \times n$ matrices together. The data shown below are for 2000×2000 matrices. Eighteen different configurations were used, including Static and Dynamic scheduling, and using chunk sizes and team sizes of 1, 4, and 8.

Scheduling:Static, Chunk Size:1, Team Size:1

Run 1: 88.1901 seconds

Run 2: 87.0854 seconds

Run 3: 88.8929 seconds

Run 4: 86.9093 seconds

Run 5: 138.799 seconds

Average elapsed time: 97.9753 seconds

Speedup: 1

Scheduling:Static, Chunk Size:4, Team Size:1

Run 1: 86.8373 seconds

Run 2: 87.5939 seconds

Run 3: 87.7143 seconds

Run 4: 87.3752 seconds

Run 5: 86.6165 seconds

Average elapsed time: 87.2274 seconds

Speedup: 1.12

Scheduling:Static, Chunk Size:8, Team Size:1

Run 1: 89.1535 seconds

Run 2: 102.41 seconds

Run 3: 94.4233 seconds

Run 4: 86.8227 seconds

Run 5: 88.5903 seconds

Average elapsed time: 92.278 seconds

Speedup: 1.06

Scheduling:Dynamic, Chunk Size:1, Team Size:1

Run 1: 88.5653 seconds

Run 2: 88.9177 seconds

Run 3: 87.9376 seconds

Run 4: 87.5654 seconds

Run 5: 86.975 seconds

Average elapsed time: 87.9922 seconds

Speedup: 1.11

Scheduling:Dynamic, Chunk Size:4, Team Size:1

Run 1: 89.9229 seconds

Run 2: 93.721 seconds

Run 3: 94.0359 seconds

Run 4: 88.8708 seconds

Run 5: 87.629 seconds

Average elapsed time: 90.8359 seconds

Speedup: 1.08

Scheduling:Dynamic, Chunk Size:8, Team Size:1

Run 1: 88.5237 seconds

Run 2: 88.9685 seconds

Run 3: 88.5519 seconds

Run 4: 87.0922 seconds

Run 5: 88.8846 seconds

Average elapsed time: 88.4042 seconds

Speedup: 1.11

Scheduling:Static, Chunk Size:1, Team Size:4

Run 1: 26.6721 seconds

Run 2: 27.3044 seconds

Run 3: 27.1891 seconds

Run 4: 27.6116 seconds

Run 5: 27.5737 seconds

Average elapsed time: 27.2702 seconds

Speedup: 3.59

Scheduling:Static, Chunk Size:4, Team Size:4

Run 1: 26.9023 seconds

Run 2: 26.8702 seconds

Run 3: 27.3821 seconds

Run 4: 27.1064 seconds

Run 5: 27.5443 seconds

Average elapsed time: 27.1611 seconds

Speedup: 3.61

Scheduling:Static, Chunk Size:8, Team Size:4

Run 1: 27.0594 seconds

Run 2: 27.2086 seconds

Run 3: 27.7421 seconds

Run 4: 27.2295 seconds

Run 5: 27.6185 seconds

Average elapsed time: 27.3716 seconds

Speedup: 3.58

Scheduling:Dynamic, Chunk Size:1, Team Size:4

Run 1: 26.17 seconds

Run 2: 26.4927 seconds

Run 3: 27.6041 seconds

Run 4: 27.1603 seconds

Run 5: 27.2193 seconds

Average elapsed time: 26.9293 seconds

Speedup: 3.64

Scheduling:Dynamic, Chunk Size:4, Team Size:4

Run 1: 26.5737 seconds

Run 2: 27.7621 seconds

Run 3: 27.3605 seconds

Run 4: 26.5973 seconds

Run 5: 25.8695 seconds

Average elapsed time: 26.8326 seconds

Speedup: 3.65

Scheduling:Dynamic, Chunk Size:8, Team Size:4

Run 1: 28.3137 seconds

Run 2: 26.6567 seconds

Run 3: 27.8857 seconds

Run 4: 28.4509 seconds

Run 5: 26.9688 seconds

Average elapsed time: 27.6552 seconds

Speedup: 3.54

Scheduling:Static, Chunk Size:1, Team Size:8

Run 1: 14.1272 seconds

Run 2: 14.3696 seconds

Run 3: 14.1569 seconds

Run 4: 14.1627 seconds

Run 5: 13.802 seconds

Average elapsed time: 14.1237 seconds

Speedup: 6.94

Scheduling:Static, Chunk Size:4, Team Size:8

Run 1: 14.5307 seconds

Run 2: 13.9193 seconds

Run 3: 14.3753 seconds

Run 4: 14.5659 seconds

Run 5: 14.5521 seconds

Average elapsed time: 14.3887 seconds

Speedup: 6.81

Scheduling:Static, Chunk Size:8, Team Size:8

Run 1: 13.5029 seconds

Run 2: 15.2307 seconds

Run 3: 14.6471 seconds

Run 4: 15.2336 seconds

Run 5: 14.1863 seconds

Average elapsed time: 14.5601 seconds

Speedup: 6.73

Scheduling:Dynamic, Chunk Size:1, Team Size:8

Run 1: 13.9087 seconds

Run 2: 13.8918 seconds

Run 3: 14.2826 seconds

Run 4: 14.222 seconds

Run 5: 13.7833 seconds

Average elapsed time: 14.0177 seconds

Speedup: 6.99

Scheduling:Dynamic, Chunk Size:4, Team Size:8

Run 1: 14.739 seconds

Run 2: 14.7756 seconds

Run 3: 14.3474 seconds

Run 4: 14.0943 seconds

Run 5: 14.1246 seconds

Average elapsed time: 14.4162 seconds

Speedup: 6.80

Scheduling:Dynamic, Chunk Size:8, Team Size:8

Run 1: 14.4275 seconds

Run 2: 15.008 seconds

Run 3: 14.5709 seconds

Run 4: 15.0285 seconds

Run 5: 14.7103 seconds

Average elapsed time: 14.749 seconds

Speedup: 6.64

Conclusion

By far the most significant factor for decreasing runtime was the number of threads used. In general, using dynamic scheduling seemed to improve performance more than chunk size. The configuration with the best runtime was dynamic scheduling, chunk size of 1, and using 8 threads, due to the use of dynamic over static scheduling, highest number of threads used in this analysis, and a chunk size of 1. The runtime for the slowest configuration on a 1200×1200 matrix was approximately equivalent to the runtime of the fastest configuration on a 2000×2000 matrix.