OpenMP Homework (Due 2/24, before class)

1. Simple matrix multiplication (C[N] = A[N][N] x B[N]) (10points)

1.1 This was shared in class. Implement and run your code. Compare with the solution that was provided.

1.1 What is the speedup? Plot the strong scaling (as a function of number of threads) and the weak scaling (as a function of the number of points)

2 Compute π (10 points for code, 5 points for write-up)

2.1 In your previous homework, you computed PI using a Monte Carlo approach. Parallelize it using OpenMP. Compare the error with the value of $\pi = \cos^{-1}(-1.0)$.

2.2 What is the speedup? Plot the strong scaling (as a function of number of threads) and the weak scaling (as a function of the number of points).

3 Matrix Multiplication (20 points for code, 5 points for writeup)

3.1 Multiply two NxN matrices. Use the example that I circulated to initialize the matrices. As shown in the example, check your results by comparing the outputs of a serial and a parallel version.

3.2 Plot the strong scaling (as a function of number of threads) and the weak scaling (as a function of the number of points). Use any optimization strategy that you can find, to run your code faster.

3.3 You are free to use the full OpenMP API, adjust your matrix multiplication strategy, and use any optimization strategy you can find. **In other words, write the fastest matrix multiplier**.

4 Bonus Points

You can earn bonus points for problems 2 and 3. You will need to provide me with the following:

4.1 **For Problem #2**, plot the time to compute vs. computed error. If you are playing for Bonus points, then **you can use other approximation strategies to calculate PI**. The student who computes the most accurate PI in the least amount of time can earn **5 points.**

4.2 **For Problem #3**, plot N (size of matrix) vs. Time. On your plot, record the N that you were able to compute in 60s. The student who is able to compute the largest N in 60s can earn **10points.**