# CPE 412/512

# Fall Semester 2010

## Homework Assignment Number 5

1 )Write a multithreaded implementation of a matrix/matrix multiplication program using OpenMP where the first matrix is of size l x m and the second matrix is of size mxn. Assume that the quantities being multiplied are of type float. Write the program in a general manner to allow the number of threads to be independently varied between the numbers of 1 to 8. Your program should automatically adjust and achieve maximum parallelism when the workload is not evenly divisible between the threads (i.e. n/ [the number of threads] has a remainder that is not zero). Illustrate the correctness of this program for all values of threads from 2 to 8. Expand upon the reference program given at
*http://www.ece.uah.edu/~wells/cpe412_512_fl_10/material/hw/hw3/mm_mult_serial.cpp*.

2 )Using the altix batch queuing system (see separate handout), measure the runtime characteristics of the original serial program that was given to you for square matrices of with dimension of 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, and 2000. Then repeat these measurements for the 2, 4 and 8 thread implementation. Make sure to use the same subset set of processing cores for each of your experiments as discussed in the homework 3 solution. Graph the runtime characteristics. Create three separate graphs of the runtime characteristics. How do these implementations behave as the data size is increased? What is the order of these implementations?

3 Using the reference serial program as a base, on a single graph, show the speedup versus the data size for each of the 2, 4, and 8 threaded implementation. Also create a graph the shows the Efficiency versus the data size for each of the 2, 4 and 8 threaded implementations.

Follow the program turn-in procedure outline below. *Due date for In-class students is Tuesday October 19, 2010. Due date for DL students is Thursday October 21, 2010.*

Homework Assignment Turn in Procedure
You are to turn in an electronic copy of the homework assignment on or before its due date. This copy should contain a printout of all source code and the resulting output of the program or some form of a log of interactive activity captured in a text file. Acceptable file formats include pdf, doc, and ascii text. All files should be sent as standard E-mail attachments and should include all source level files and brief instructions as how to compile and execute your code. No object code files should be included. The subject line of the E-mail should contain the following; CPE x12, HW #num, where x is 4 or 5, representing which course you are taking (412 or 512) and num is the homework assignment number (Example CPE 412 student would put CPE 412, HW #1 for the first homework assignment. The E-mail is to be set to wellsbe@uah.edu.