University of the Witwatersrand, Johannesburg
School of Computer Science and Applied Mathematics

Laboratory Assessment: Parallel Computing (COMS 3008)

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1 Assessment Details

This laboratory assessment is meant to serve as an introduction to parallel programming using OpenMP. In this laboratory three tasks are to be performed as outlined below.

Accessing multi-dimensional arrays: assess and comment on the performance difference observed when the access order is varied from column-wise to row-wise.[1] Access and set the array elements to programmatically generated random values.[2] Assessment question:

1.1. *Why are there differences in the access times?*[3]

Display output from threads: assess and comment on the observed differences in the output obtained from multiple runs. Implement a simple program that outputs the *id* of the thread that is executing the code block. The program should make use of more than one thread in performing this task.

Vector dot product: assess and comment on the performance difference observed when the number of threads and size of the vectors are varied.[4] Assessment questions:

1.1. *What is the effect of varying the number threads participating in the computation?*

1.2. *What is the effect of varying the size of the vectors?*

1.3. *Is there significant performance improvement when the random number generation is also parallelized?*[5]

2 Submission Rules

Graphs may be produced using any software with plotting capabilities. Ensure that the graphs are properly labeled.

Analysis results are to be presented in a document typeset in Latex.[6]

[1] Provide a graph depicting the results for different data sizes.

[2] Please start getting comfortable with random number generators, we will make extensive use of them in the course.

[3] The response should make explicit reference to the underlying hardware dependent concepts.

[4] Provide a graph depicting the results for different data sizes.

[5] You probably will notice sampling problems. If you don't notice them, then it's fine for now, we will return to this problem in due course.

[6] If you haven't used Latex before, then obtain a template for a report from the internet.

Submission is to be done via the Sakai system. Place all source code and the pdf file containing the analysis results in a single zip file in your dropbox. The file should have the following naming convention: <*name*>_lab_assessment_<*number*>. All submissions are to be made by 23:59 on the Monday following the laboratory assessment handout date. **Handout date:** July 18, 2016.