

Parallel and SIMD Programming – Assignment #1 (Multi-threaded hello world)

Due on 07/30/2008

For this assignment you will implement the classic “Hello, world!” using multiple threads. Each thread will be pass an integer on the range $[0, N-1]$, where N is the number of threads. Using some sort of synchronization mechanism, the threads must coordinate to print the integers in order. That is, the thread that is passed the value 3 must wait to print “Hello, world #3!” until after the thread that was passed 2 prints “Hello, world #2!”

To ensure that the synchronization is working correctly, the integers should be passed to threads in random order. Passing 0 to the first thread, 1 to the second, 2 to the third, etc. way function correct without any synchronization. Such is the nature of race conditions. I suggest filling any array with sequential integers from 0 to $N-1$. Then scramble the array using, for example, Knuth’s shuffle algorithm. Values from the shuffled array can be passed to threads in array order.

Use a define to set the number of threads, and test different values. When the assignment is submitted, please set the define to 10.

Criteria	Excellent	Good	Satisfactory	Unacceptable
Completion	Program correctly implements all required elements in a manner that is readily apparent when the program is executed. User interface is complete and responsive to input. Program documents user interface functionality.	Program implements all required elements, but some elements may not function correctly. User interface is complete and responsive to input.	Program implements most required elements. Some of the implemented elements may not function correctly. User interface is complete and responsive to input.	Many required elements are missing. User interface is incomplete or is not responsive to input.
Correctness	Program executes without errors. Program handles all special cases. Program contains error checking code.	Program executes without errors. Program handles most special cases.	Program executes without errors. Program handles some special cases.	Program does not execute due to errors. Little or no error checking code included.
Efficiency	Program uses solution that is easy to understand and maintain. Programmer has analysed many alternate solutions and has chosen the most efficient. Programmer has included the reasons for the solution chosen.	Program uses an efficient and easy to follow solution (i.e., no confusing tricks). Programmer has considered alternate solution and has chosen the most efficient.	Program uses a logical solution that is easy to follow, but it is not the most efficient. Programmer has considered alternate solutions.	Program uses a difficult and inefficient solution. Programmer has not considered alternate solutions.
Presentation & Organization	Program code is formatted in a consistent manner. Variables, functions, and data structures are named in a logical, consistent manner. Use of white space improves code readability.	Program code is formatted in mostly consistent with occasional inconsistencies. Variables, functions, and data structures are named in a logical, mostly consistent manner. Use of white space neither helps or hurts code readability.	Program code is formatted with multiple styles. Variables, functions, and data structures are named in a logical but inconsistent manner. Use of white space neither helps or hurts code readability.	Program code is formatted in an inconsistent manner. Variables, functions, and data structures are poorly named. Use of white space hurts code readability.
Documentation	Code clearly and effectively documented including descriptions of all global variables and all non-obvious local variables. The specific purpose of each data type is noted. The specific purpose of each function is noted, as are the input requirements and output results.	Code documented including descriptions of most global variables and most non-obvious local variables. The specific purpose of each data type is noted. The specific purpose of each function is noted, as are the input requirements and output results.	Code documented including descriptions of the most important global variables and the most important local variables. The specific purpose of each data type is noted. The specific purpose of each function is noted.	No useful documentation exists.

This rubric is based loosely on the “Rubric for the Assessment of Computer Programming” used by Queens University (<http://educ.queensu.ca/compsci/assessment/Bauman.html>).