Alexandria University
Faculty of Engineering
Computer and Systems Engineering Dept.
3rd year

Subject: Operating Systems
Assignment 2
Assigned: N/A
Due: Saturday November 3rd,2018

Threads

Objectives:

1. Introducing threads concepts and POSIX threads library.
2. Implementing popular algorithms as multi-threaded ones.

Problem Statement:

It is required to implement two popular algorithms as multi-threaded ones. They are as follows:

1) Matrix Multiplication

It is required to implement two variations of this algorithm:

a. The computation of each element of the output matrix happens in a thread.
b. The computation of each row of the output matrix happens in a thread.

For both variations, you have to compute the elapsed time for each of them, compare them and justify your answer.

The program should read two input matrices in a certain format as mentioned in the "matrix-readme.txt" file associated with project (Output format is also mentioned).

2) Merge Sort

Merge sort is an O (n log n) comparison-based sorting algorithm. It is a divide and conquer algorithm.

Conceptually, a merge sort works as follows:

1) If the list is of length 0 or 1, then it is already sorted. Otherwise:
2) Divide the unsorted list into two sub-lists of about half the size.
3) Sort each sub-list recursively by re-applying the merge sort.
4) Merge the two sub-lists back into one sorted list.

So you are required to implement it using Pthreads. Each time the list is divided; two threads are created to do merge-sort on each half separately. This step is repeated recursively until each sub-list has only one element.

The program should read two input matrices in a certain format as mentioned in the "merge-sort-readme.txt" file associated with project. When the program finishes, it should print out the sorted array.

Hints:

- Check pthread_join function.

Deliverables:

- Complete source code, commented thoroughly and clearly.
- Object Code.
- A report that includes:
    - A description of the overall organization of your code and the major functions.
    - Sample runs and screen shots.

Notes:

- Languages used: C/C++. Operating System: Linux.
- Students will work individually.
- No cheating. It will be hardly penalized for both parties.

Acknowledgement:
Eng. Ahmed El-Eryan & Eng. Mahmoud Fouad