Assignment 3

Take the second general problem, which have been discussed in the lab classes and for which you have developed both a multithread and a multiprocess solution. The aim now is to convert it into a CUDA program to be run in a GPU under Linux in the department computer `banana.ua.pt`.

The kernels to be written should sort the contents of the file `datSeq1M.bin` in 10 iteration steps. In iteration 1, 1024 subsequences of 1024 integer values are to be sorted in parallel. In iteration 2, 512 subsequences of 2048 integer values are to be sorted in parallel based on the merging of the previously sorted halves. And so on and so forth, until iteration 10 is reached, where 2 previously sorted subsequences of 512K values are merged, yielding the whole sorted sequence.

Assume that the values of the whole sequence, when stored in memory, are organized as the elements of 1024 X 1024 matrix. Two approaches are to be tried

i) the threads in a block thread process successive matrix rows

ii) the threads in a block thread process successive matrix columns.

In both approaches, the best running configuration for each iteration is to be sought, the execution time should be compared with running the previously obtained multithread and multiprocess solutions and the following question is to be answered "*Is it worthwhile to use the GPU to solve this kind of problem*?".

GRADING

- development and validation of a CUDA application based on either approach – 13 points
- development and validation of a CUDA application based on both approaches – 20 points.

DELIVERABLES

- an archive, named `CLE3_T$G#.zip` (where `$`, equal to 1, ... , 3, means the lab number, and `#`, equal to 1, ... , 10, means the group number) containing both the source files of your solution to the two problems and a pdf file, named `present.pdf`, up to 6 pages (power point like), where the main ideas of the design of the solutions to the two problems and the timing results that were obtained are discussed and the answer to the above mentioned question is given
- the archive should result from the compression of a directory, named `CLE3_T$G#`, containing two subdirectories, named `prog1` and `prog2`, and the file `present.pdf`
- the archive is to be sent to me by email.

DEADLINE

June, 7, at midnight.