Problem set 6, Part 2

TDT4200, Fall 2016

Deadline: 16.09.2016 at 20.00 Contact course staff if you cannot meet the deadline.

Evaluation: Graded, counts 10 % towards final grade.

Delivery: Use It's Learning. Deliver exactly two files:

- *yourusername_ps6.*{*zip* |*tar.gz* |*tar*} containing your solution to the programming tasks.
- *yourusername_ps6.pdf* containing your performance measurements.

Cooperation: This problem set is to be done **INDIVIDUALLY, no cooperation of any kind is allowed**. Cooperation will be regarded as cheating on an exam, for details see `https://innsida.ntnu.no/wiki/-/wiki/English/Cheating+on+exams`

General notes: Code must compile and run on the course servers. Do not add third-party code or libraries.

Problem 1, 45%

In this problem, you should implement a CUDA version of the heat equation solver, using only global memory, by implementing the following functions in *heat_cuda.cu*:

- `device_allocation()`
- `transfer_to_gpu()`
- `transfer_from_gpu()`
- `external_heat_gpu()`
- `external_heat_kernel()`
- `ftcs_solver_gpu()`
- `ftcs_kernel()`

Problem 2, 25%

Implement a version of the heat equation solver, using shared memory, by implementing:

- `ftcs_solver_gpu_shared()`
- `ftcs_kernel_shared()`

Problem 3, 20%

Implement a version of the heat equation solver, using texture memory, by implementing:

- `ftcs_solver_gpu_texture()`
- `ftcs_kernel_texture()`

Problem 4, 10%

Measure the execution time of just the kernel in each of the cases above, for several different block sizes. Present your measurements in a table, and briefly comment them. In particular, try to explain any unexpected results.

This problem will require you to add timing functionality to the code written in the previous problems.

Do not include results if you know your code is wrong. You can get partial credit for only reporting results for 1 or 2 of the versions above.

Further details can be found in the recitation slides for this problem set.