

Midterm - CS671

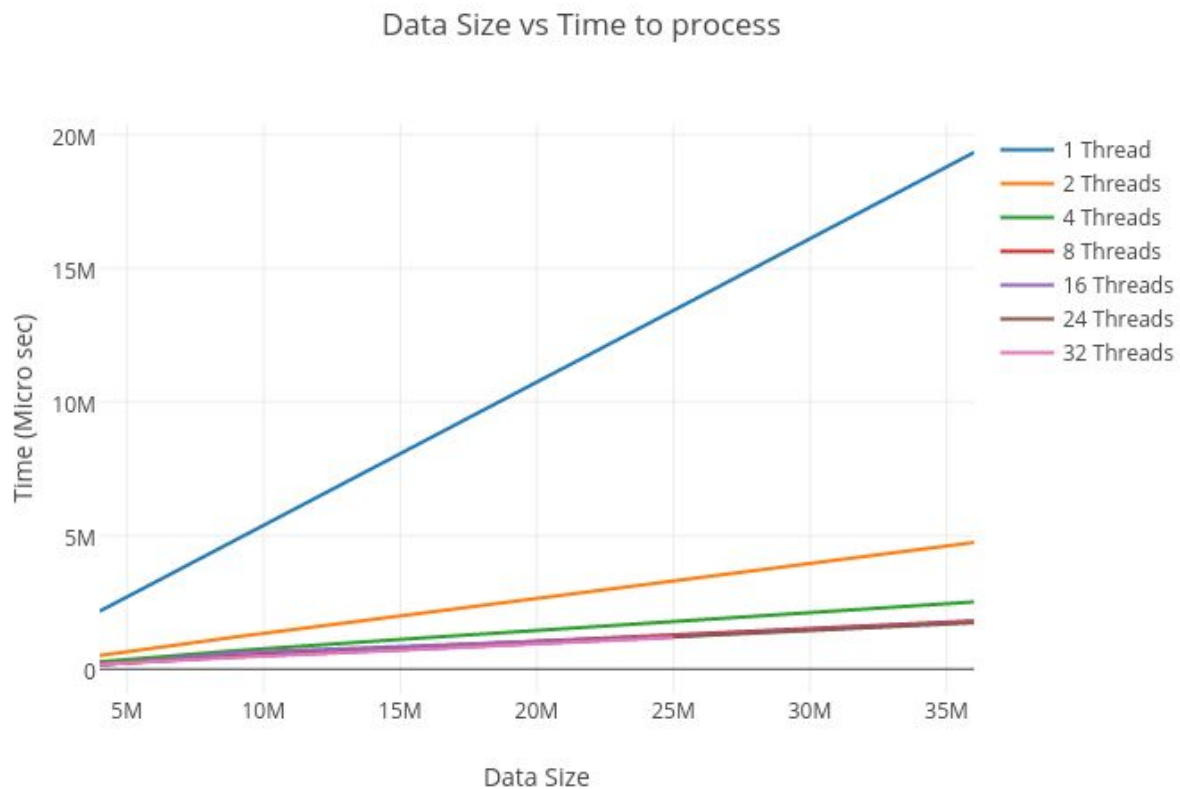
Midterm

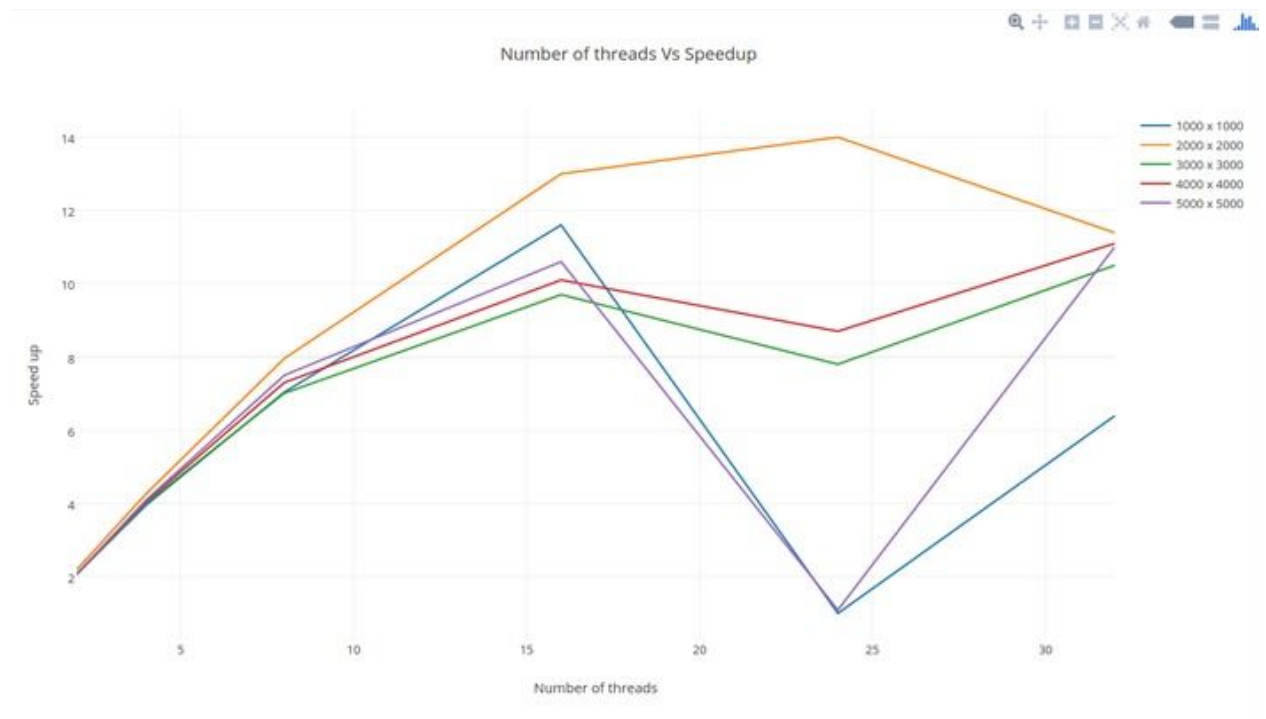
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Q 1 -

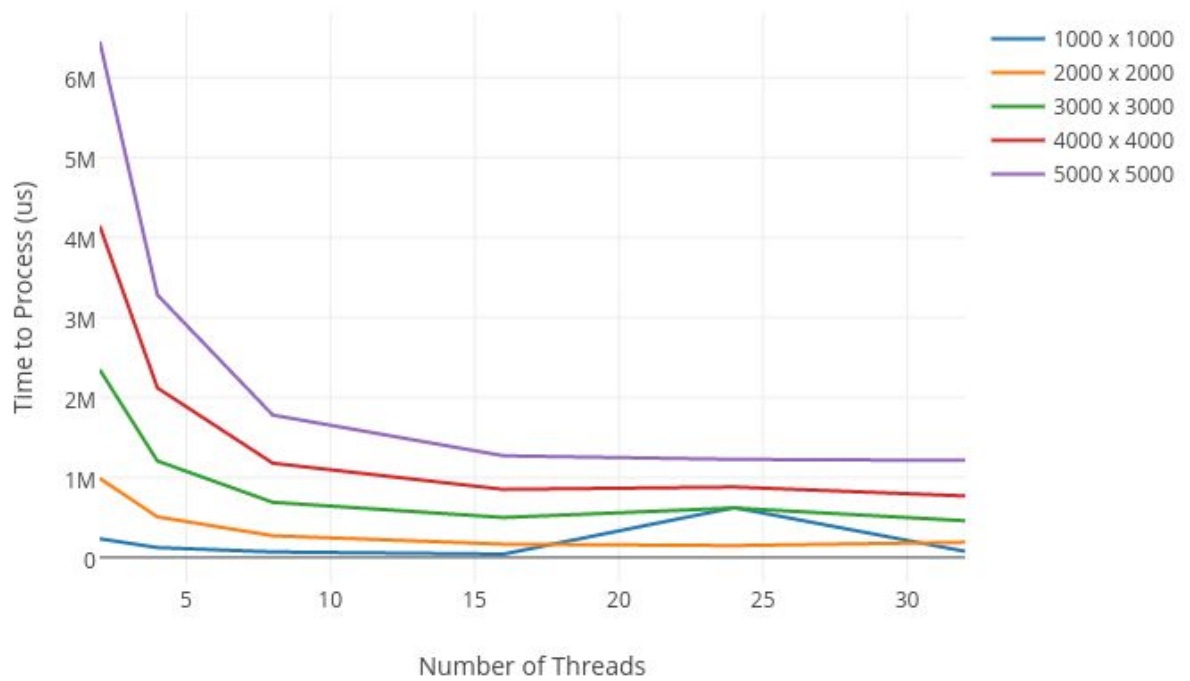
1. Code - `./main.c` - Serial implementation using OpenMP (Working and tested)
2. Code - `./cuda/solver.c` - Cuda stencil based implementation (Not tested)
3. Script to run on elf and generate stats - `./run.sh`
4. Data - `stats*.csv` (Check main.c for data interpretation)
5. Input format - `<serial - 0 vs openmp - 1> <iterations> <N><Num threads>`
6. Output Format - `<NxN><iterations><Time><Error if any><serial/openMP>`

Q 2 -





Number of threads vs Time to process



Q 3 -

The idea of algorithm is to determine convergence of the matrix after some N iterations. In the serial implementation we are updating the array value as soon as a new value is computed but this methodology doesn't sit in a good way with parallel implementation as it creates lots of dependencies among the cell values.

OpenMP Implementation -

- In my algorithms, I take an auxiliary array to support parallel reads without taking any locks.
- Before starting the computation we copy the value from original array to this auxiliary array, in parallel using openMP
- Then we start the openMP threads to do computation in parallel while reading from the previously computed auxiliary array and writing to the original array.
- As we aren't modifying the aux array, so the reads are safe.
- For the next iteration we again update the original array by copying the aux array value to it via openMP.

CUDA implementation -

- The CUDA implementation is also similar to the one described above.
- We maintain a grid of threads on the GPU of size tileSize x blockSize
- Also we have two device memory addresses one for the original computation and other for the auxiliary purpose (parallel reads)
- We read and write to both the memory location alternately for e.g for iteration 0 (even) we read from aux array and write to original array and for iteration 1(odd) we read from original array and write to aux array.
- When the computation is finished we copy one of the arrays from device to host.