ECE1747H Parallel Programming - Project Proposal

Group members:

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Purpose:

- Comparing the parallelization of a problem in CUDA on a GPU versus OpenMP on a multi-core and/or an FPGA (or all three).
- This topic is chosen from #9 of the Project List. The purpose of this project is to explore and compare the acceleration capability (speed up, accuracy) and efficiency (power, hardware cost) between different computation platforms.
- The target algorithm to be accelerated is Gravitational N Body Simulation, with a reference source code written in a serial implementation.

Objectives:

1. Record execution time of the serial source code on a reference CPU.
2. Identify potential data dependencies, problem size, memory access etc.
3. Identify functions or loops in the reference code that can be parallelized.
4. Modify the reference source code using OpenMP, compare the performance.
5. Modify or rewrite the algorithm using CUDA, compare the performance.
6. (Optional) Reimplement the algorithm in Verilog, test and compare on a FPGA, or calculate expected performance from the EDA tool.

Platforms:

OpenMP, CUDA, Original N-Body-Simulation code

Deliverable Goals and Verification:

1. Paralleled version of source code with OpenMP
2. Paralleled version of source code with CUDA
3. Performance comparison