Research Plan

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Program: REU-Computer Science 2009
Title:
STAPL Parallel Algorithms - Implementation and Evaluation

Description:
I will design, implement, and evaluate the performance of parallel algorithms for the STAPL project.

Purpose:
I have an interest in parallel computing and would like to get to know the field, possibly as a research field in the future.

Project Goals and Implications:
• I plan to design and implement several parallel algorithms for STAPL. Currently, the only one assigned to me is the p_unique (2 functions) family. As time permits, I’ll identify and complete other algorithms.
• I also plan to evaluate each algorithm’s performance in comparison to its theoretical model; I will also be evaluating some algorithms that have already been implemented.
• If done well, my work will help progress the STAPL project. It should also reveal a little about the parallelization of some well-known algorithms.

Personal Goals:
• I would like to learn about the field of parallel computing, as well as gain more programming experience.
• Get to know about other topics in Computer Science through my work here.
• Gain some experience in research so that I might get a better idea of whether or not it’s something I can do in the future.

Approach:
• Review literature.
• Discuss concepts and ideas with the group.
• Design the algorithms and the tests.
• Implement and run them on the Manhattan Cluster to detect bugs and design flaws.
• Once the algorithms and tests are implemented, run the performance tests on a supercomputer (listed in “Method & Materials”).
Method & Materials:

- I use the Manhattan Cluster for most of my work.
- For performance tests, I will use the Hydra supercomputer at Texas A&M University or the BlueGene machine at KAUST.
- Since STAPL is built using C++, I’ll be working in C++.
- STAPL itself is built off of many libraries alongside original code (Boost, mtl, BLAS, etc.) and uses OpenMP and MPI. Our C++ compiler is gcc.

Work Schedule:

- I’m expected to work a minimum of 20 hours per week; however, I’ll work as much as I’m able to on the project.
- Each weekday I’ll be in around 9 or 9:30 am until 1:00pm. I’ll return to the lab by 4pm at latest and continue working.

Deliverables:

- Research Plan - June 11
- Initial website - June 11
- Performance evaluation code for 3 pre-implemented algorithms - June 17
- Parallel algorithm (p_unique family) - June 24
- Performance evaluation code for the p_unique family - June 29
- Identify, implement, and evaluate other parallel algorithms - June 30 - July 29
- Abstract - July 22
- Poster - August 3
- Final website - August 5
- Paper - August 5