

EC527 – Project

Broad Objectives

The purpose of the project is to give you in-depth experience with high performance programming, especially, by using the methods you've learned this semester.

Collectively, the presentations should comprise a practical workshop on which methods work well and when and with how much effort and on which problems.

Deliverables

→ A program that is an improvement over the serial reference version. It should use at least some single core and some multicore methods. Ideally it would map to a GPU as well, but this is not required.

→ A 20 minute presentation -- see below

→ A write-up – see below

Timeline

To do soon → Form a group of size ≤ 2 . If you'd prefer to work alone, that's fine too. For groups size = 3, that's probably OK, but talk with me first.

By Friday March 8th → Choose an application. Let's keep these easy to follow. That is, the topic/problem should be easy to present and visualize.

By Friday March 22nd → Create a serial reference code. To keep this project manageable, you should write your own, but this must also be validated for correctness.

By Friday April 12th → A brief document describing the application and the way you plan on partitioning the problem.

During Week of April 16th-19th → Group meetings to check progress/problems.

By Wednesday April 24th → A full presentation (20 minutes) describing the bulk of the work. There are tentatively three presentation days, 4/24, 4/29, and 5/1. You should be prepared to go on any of the days.

By Friday May 3rd @17:00 → Final write-up (put together the pieces and incorporate feed-back)

Project suggestions

- N-body Simulation
- Multigrid
- FFT and other transforms
- Linear Algebra functions such as MMM, sparse matrix operations, Gaussian Elimination, finding Eigenvalues.
- Bioinformatics functions such as Sequence Alignment
- Neural Nets
- Image Processing and Computer Vision
- Working on something completely new such as OpenCL
- Graph applications

Note: I know a lot about some of these, but for others you will be mostly on your own.

Note: I'm interested in using GPUs for multiple sequence alignment, specifically to do MAFFT. I also have other research-oriented projects.

Presentation guidelines

The talk should be high quality and well-prepared. It's OK if you haven't completely finished, but you should be substantially done. Giving a 20 minute presentation on a problem that most of the audience is not familiar with is challenging and will take real work to make coherent. In any case, your talk should include the following:

- Presentation of the problem
- What the serial code/algorithm looks like
- How you modified the algorithm to run in parallel (or selected one)
- Overview of your code
- Experiments and results
- A couple minutes for some brief Q&A

Writeup guidelines

Basically the same as the presentation guidelines, except this time I'll be your audience and you will have reached some definite conclusions.