HPC project proposal

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March 2022

1 Introduction

The project aims to solve partial differential equations with Fast Fourier transformation(FFT). Essential parts are forward transformation, PDE solve, and inverse transformation. With OpenMP and appropriate for-loop optimization, we aim to accelerate computation time on 1-D problem.

2 Steps

2.1 Step 1

Use C++ to implement FFT and inverse FFT. We will use some test functions to verity the correctness of our FFT implementation.

2.2 Step 2

Rearrange iteration loop to optimize the memory access and achieve speedup in sequential version.

2.3 Step 3

Solve a realistic problem with FFT, e.g. Laplace equation. Compare the difference between FFT, Jacobi and Gauss-seidel in the aspect of speed and accuracy upon same loss magnitude.

2.4 Step 4

Use OpenMP to parallelize and optimize the efficiency of our code.

2.5 Step 5

Set up experiments to test the speedup brought by parallel FFT compared with original version.