CSC4005 FA22 HW04

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1 Introduction

2 Method

2.1 System setup

2.2 Program design and implementation

2.3 Usage

2.4 Performance evaluation

The program was executed under different configurations to evaluate performance. With 20 different CPU core numbers (from 1 to 20 with increment 1, $p = 1, 2, \ldots, 20$) and 20 different n (from 50 to 1000 with increment 50), 400 cases in total were sampled for sequential, MPI, OpenMP, and Pthread programs. Test for CUDA program is implemented separately since GPU is much faster than all CPU programs and only large-scale performance will be discussed on CUDA program. Recorded runtime is analyzed through the Numpy package in Python. Figures were plotted through the Matplotlib and the Seaborn packages in Python. Analysis codes were written in `analysis/main.ipynb`.

3   Result and discussion

3.1   CPU parallelization

3.2   GPU parallelization

4   Conclusion

In conclusion, four parallel computing schemes for n-body simulation are implemented and their performances are evaluated. For large, ignoring the precision, one may use GPU to accelerate the calculation.

A   Supplementary figures

B Source code