Parallel and Distributed Computing

First Project

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1 Introduction

This report presents the algorithms, performance results and respective analysis of the first project in the Parallel and Distributed Computing course.

The aim of this project was to evaluate performance between single-core (in 2 languages) and multi-core (using OpenMP) approaches to a problem. Specifically, we wanted to implement and compare 5 different algorithms to perform the multiplication of two matrices (see Algorithms Explanation).

By developing the code for these tasks, we became more familiar with modern and high performance C++ and Lua, since we chose it as our alternative implementation language. Moreover, we also had to research about matrix multiplication algorithms and optimizations, a common benchmark in computing. Last but not least, in order to implement multi-core solutions, we explored about the OpenMP standard and learned more about CPU multi-threading.

2 Algorithms Explanation

To see the effects of cache locality and parallel computing on matrix multiplication implementations, we used five different matrix multiplication algorithms, described in this section. These algorithms all

2.1 Classic Matrix Multiplication

2.2 Line Matrix Multiplication

2.3 Block Matrix Multiplication

2.4 Parallel Matrix Multiplication

2.4.1 First Version

2.4.2 Second Version

3 Performance Metrics

MM.

4   Results and Analysis

5   Conclusion

References