Visualization of Parallel Matrix Multiplication Algorithms

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**ABSTRACT**

Parallel computing, unlike its counterpart serial computing, is the simultaneous use of multiple processors to complete a computational task. It has a variety of applications ranging from physics (applied, nuclear etc.,), mathematics to defense and weapons. At the university level, parallel computing is taught as an advanced computer science course. Often it is observed that a parallel algorithm is complex and hard to understand. As they are unconventional, they are harder to visualize and therefore need a lot of time to comprehend fully. Not only is it difficult for the learners but also the instructors to teach this course as explanations and diagrams do not provide the complete visualization that is needed. Parallel matrix multiplication algorithms are some of hard-to-visualize algorithms in this course. In this paper we will describe a java based tool created to help visualize four widely used parallel matrix multiplication algorithms and provide statistics on the influence the tool has had on the instructors ease and time to teach as well as students’ grades.

**INTRODUCTION**

Due to the inherent complex nature of parallel algorithms, instructors find certain topics tedious to explain. It also makes it harder for the students to grasp those concepts. This is due to the difficulty that arises in visualizing parallel algorithms. One such topic is the parallel matrix multiplication. As it involves multiple simultaneous interactions between processors and elements, it becomes hard for one to explain the workings

VPMM provides an interactive interface to understand as well as teach four parallel matrix multiplication algorithms used in four different processor networks; 2-DMesh, Hypercube Model, Shuffle Exchange and Row-Column oriented (Multi computing environment). VPMM helps in explaining and understanding the algorithms as it provides an interface with graphics which display how the elements move in each of the processor networks. Also, VPMM is extremely easy to use and doesn’t require any time to learn.

Visualization is one of the best aids to teaching any topic. It makes learning more engaging and fun…. (*HAVE to write more on visualization and why it helps in teaching with -references*).

**Background**

*Explain the origins of the four algorithms with references:*

*- 2-D Mesh*

*- Hypercube Model*

*- Shuffle Exchange*

*- Row-Column oriented....*

**Project Goals**

The main aim of the project described in this paper is to provide a user friendly interface for both instructors as well as students to explain and understand the four parallel matrix multiplication algorithms. VPMM

**METHODOLOGY**

VPMM is a parallel matrix multiplication algorithm visualization tool which can be used by an instructor as well as a student to teach/learn. This tool is written in java using the swing package.

VPMM design

VPMM Usage

**RESULT**

VPMM results are based on a comparison between the second assessment (Syllabus: Matrix Multiplication) of 2 batches of students who took the course Parallel Processing (ITE416) at VIT University, Vellore.

**CONCLUSIONS**

NP-complete problems have been shown to be ...

**REFERENCES**

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