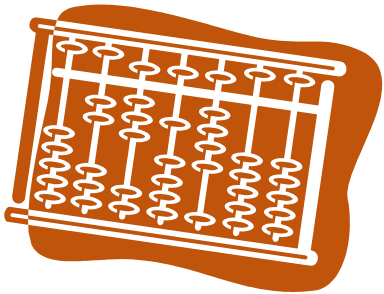


Parallel Programming Principle and Practice

Lab Syllabus



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Objective and Requirement

- Understand the purpose, ideas and methods of parallel programming, familiar with parallel computing analysis and problem solving skills
 - use the basic principles and methods of using the common tools and program models, such as pthread, OpenMP, MPI ,MapReduce and CUDA, to parallel existing algorithms and develop new parallel algorithms
 - analysis of parallel processes and results, let the students understand the purpose of the parallelization and reasons of performance improvement on a deeper level of the theories of parallelization, fundamentals of compiling and operating system

Syllabus

□ Lab

- **Lab1 Be Familiar with the parallel programming environment (Required)**
- **Lab2 Parallel implementation of matrix multiplication (pthread, OpenMP, MPI, CUDA are ok)(Required)**
- **Lab3 PageRank algorithm implementation based on MapReduce (Elective)**

□ Project

- **Project1 Solve Akari problem using parallelizing backtracking (Elective)**
- **Project2 parallel optimization of Breadth First Search (Elective)**
- **Project3 parallel optimization of K-means algorithm (Elective)**

Labs

- ❑ **Lab1 Be Familiar with the parallel programming environment (Required)**
 - become familiar with the parallel development environments, and the basic principles and methods of parallel programming and performance optimization by using tools and frameworks like pthread, OpenMP, MPI under Linux system

Labs

- ❑ **Lab2 Parallel implementation of matrix multiplication using pthread (Required)**
 - master the basic principles and methods of parallel programming design and performance optimization using pthread
 - understand the basic method for data partition and task decomposition in parallel programming
 - implement the parallel algorithm of matrix multiplication using pthread
 - then carries on the simple analysis and summary of the program execution results

Labs

- ❑ **Lab2 Parallel implementation of matrix multiplication using OpenMP (Required)**
 - master the basic principles and methods of parallel programming design and performance optimization using OpenMP
 - implement the parallel algorithm of matrix multiplication using OpenMP
 - carries on the simple analysis and summary of the program execution results

Labs

- **Lab2 Parallel implementation of matrix multiplication using MPI (Required)**
 - master the basic principles and methods of parallel programming design and performance optimization using MPI
 - implement the parallel algorithm of matrix multiplication using MPI
 - carries on the simple analysis and summary of the program execution results

Labs

- ❑ **Lab2 Parallel implementation of matrix multiplication using CUDA (Required)**
 - understand deeply the architecture of GPGPU and master the CUDA programming model
 - implement the parallel algorithm of matrix multiplication using CUDA
 - carries on the simple analysis and summary of the program execution results
 - propose optimization solution based on the execution results and hardware environment

Labs

- **Lab3 PageRank algorithm implementation based on MapReduce (Elective)**
 - realize of the PageRank algorithm based on MapReduce
 - master the MapReduce programming model
 - understand the distributed programming methods in cloud computing environments

Project

- **Project1 Solve Akari problem using parallelizing backtracking (Elective)**
 - master the methods to parallelize and improve a program
 - understand the relationship between parallel granularity and performance
 - master how to partition data and decompose tasks of a complex algorithm

Project

- **Project2 Parallel optimization of Breadth First Search (Elective)**
 - master the methods to parallelize and improve BFS algorithm
 - adjust and analyze the parallel granularity of the generated parallel algorithms because of optimization
 - further understand the principles of parallel programming and what should pay attention to

Project

- **Project3 Parallel optimization of K-means algorithm (Elective)**
 - master the methods to parallelize and improve K-means algorithm
 - master the synchronization and communication methods of parallelize program

实验时间和方式

- ?月?日在东五楼210教室讲授实验操作过程
- 通过账号使用服务器进行实验
- 随时答疑

实验报告

□ 实验一

- 实验目的与要求
- 实验内容
- 实验结果

□ 实验二/三

- 实验目的与要求
- 算法描述
- 实验方案（含开发与运行环境描述）
- 实验结果与分析

□ 实验小结

华中科技大学

课程实验报告

课程名称: 计算方法

专业班级:

学 号:

姓 名:

指导教师:

报告日期:

计算机科学与技术学院

project 报告

□ 锻炼分析与解决问题的能力

- 我的目的是什么？
- 分析问题，做出假设
- 我准备用什么方法？
- 设计与实现
- 结果比较与分析
- 思考与总结

Project Name

(Your Name, Class, & ID)

AIM

What are the purposes of this project?

HYPOTHESIS

Do you have any hypothesis you are going to test in this project?

METHODS

Detailed description of models, algorithms, experimental scheme, and program design et al.

RESULTS

Results and necessary explanation

DISCUSSION & CONCLUSION

References

- The content expressed in this chapter comes from
 - Michael Wrinn, Intel Manager, Innovative Software Education