

Multi-Core Programming

Lecture 1 Overview

Course Objectives

- Opportunity to learn:
 - Multi-core architectures
 - Programming multi-core systems
- Emphasis on programming:
 - Using multi-threading paradigm
 - Understand the complexities
 - Apply to generic computing problems
 - Implement on an popular multi-core platform

Grading Policy and Reference Books

■ Grading Policy

- Final Exam (40%)
- Labs (40%)
- Quizzes (daily) (10%)

■ Reference material:

- Shameem Akhtar and Jason Roberts, *Multi-Core Programming*, Intel Press, 2006
- David E. Culler and Jaswinder Pal Singh, *Parallel Computer Architecture: A Hardware/Software Approach*, Morgan Kaufmann, 1998
- Class notes and others

课件网盘: <http://1drv.ms/1hDKegd>

作业提交: Onedrive, 联系 email: multicorecssysu@outlook.com

Course Outline - Multi-Core Programming

- Lecture 1 Computing platforms (Multi-Core Architectures)
- Lecture 2 Programming Multi-core (programming Models)
- Lecture 3 Inter Process Communication
- Lecture 4 Developing parallel applications I (Mapping to multi-core)
- Lecture 4 Developing parallel applications II (Performance Consideration)
- Lecture 5 Message Passing (MPI)
- Lab 1 MPI Programming
- Lecture 6 Multi-threading (Windows)
- Lab 2 win32 threading
- Lecture 7 Multi-threading (pthread)
- Lab 3 Pthreading
- Lecture 8 Multi-threading with OpenMP
- Lab 4 OpenMP
- Lecture 9 Complexity : Consistency and Coherence
- Lecture 10 Synchronization
- Lab 5 Synchronization
- Lecture 11 Performance Measurement and Tuning
- Lab 6 Performance

基础

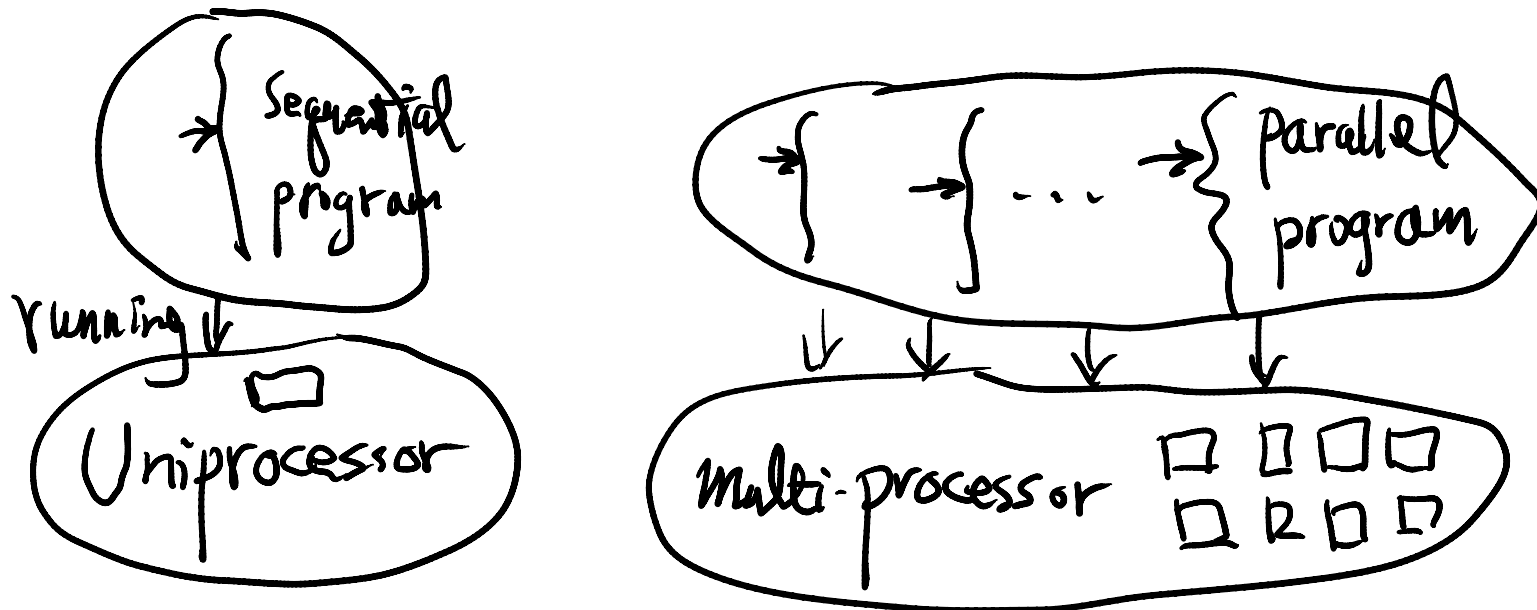
编程技术

可能会作大的修改，这指
体系结构层的内容。

相关专题

What is multicore Programming

- It is a Kind of Parallel Programming (Computing) in the Context of Multicore system
- Multicore system is a Parallel architectures
- Parallel programming (computing)
 - Many programs running in parallel



Paradigm Shift from Traditional to MultiCore

传统

■ Application developers are typically oblivious of underlying hardware architecture

- Sequential program 只考虑顺序程序
- Automatic/guaranteed performance benefit with processor upgrade 如硬件升级好像解决了问题
- No work on the programmer 程序员不用考虑“并行问题”

多核

■ No “free lunch” with multi-core systems

- Multiple cores in modern processors 有多核如何可用?
- Parallel programs needed to exploit parallelism 并行程序
- Parallel computing is now part of main-stream 成为主流

Old vs. New Parallel Programming Paradigms

- Known tools and techniques:
 - High performance computing and communication (HPCC)
 - Wealth of existing knowledge about parallel algorithms, programming paradigms, languages and compilers, and scientific/engineering applications
- Multi-threading for multi-core
 - Common in desktop and enterprise applications
 - Exploits parallelism of multi-core with its challenges
- New realizations of old paradigms:
 - Parallel computing on Reconfigurable architecture
 - Parallel computing on GPUs
 - Cluster computing for large volume data

Challenge of Multi-Core Programming

- Our objective is two-fold
 - Overview the known paradigms for background
有关并行程序设计范式的基础内容
 - Learn using the state-of-the-art implementations
学习现有的各种实现 (OS层, 语言层)
(体系结构层)

Discussion: How to improve program performance (speed)

Considering:

- Any method, approach, or technology you think that works
- the reasons why that works

Speedup in different levels

- Algorithm (programmer)
 - Compiler (Software Vender)
 - OS (system vender)
 - Hardware (Hardware Vender)
-
- finally realized by hardware (processors)

Homework

Everyone send message:

110xxxx.姓名. emailxx@YYY.com

← Your Email address

to multicorecssysu@outlook.com

我会发给你一个 OneDrive 的共享链接, 保存此链接,
作业, 实验, 报告等均提交到 OneDrive.

Home Work and Reading list

MCP (multi-Core Programming) Chapter 1

Homework 1:

How to speed up your programs?

(Answer as much in detail as you can)