CS653 Topics in Programming Languages Implementation

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CS 342
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Plan for Today

Introductions

Announcements
- Read FIT and ParaPLOP papers before Thursday. Andy will be presenting them and his wiki for evaluating programming models with parallel patterns.

Course Goals and Outline

Administrivia
- You are responsible for what is on the syllabus, on the schedule, and sent out to the class mailing list. (send email address to be used to mstrout@cs.colostate.edu).

Paper Reviews
- Over the semester you need to write 10 reviews.
- Reviews are due before class on the day the paper is being discussed, can turn in a review this week

Projects and Mini-Research Exam
Course Goals

Questions we will be exploring
– With the advent of multi-core, what should the programming model be?
– How can the distribution of computation, distribution of data, and mapping of data to storage be specified orthogonal to the algorithm?
– What should the programming model for sparse computations be?
– How should programming models be evaluated?

Approach
– read and critique recent and influential papers
– do a research project involving a parallel programming model, a sparse programming model, and/or evaluating a programming model(s)

Other Important Course Goals

Research Exam Preparation
– paper reviewing skills will be critical for the research exam
– presenting the crucial points in a paper
– synthesizing ideas between papers
– suggesting future research questions

Thesis Project Preparation
– how to break projects into manageable pieces
– how to leverage existing research tools
– presenting research in a succinct fashion
Outline

Evaluating Programming Models

Parallel Programming models
– previous programming models and emerging programming models
– Models that use an architectural model
– Models that attempt to specify implementation details orthogonally

Sparse Matrix Programming Models
– Some relevant applications
– How can the sparse matrix data format be specified orthogonally?

Administrative Matters

Turn to your syllabus
Tips for Reading a Research Paper (by Tia Newhall)

Read the paper three times
- First read the abstract, introduction, related work, and conclusion.
- Next read the entire paper writing down questions and vocabulary words you need to look up. Do some examples to understand concepts.
- Look up the vocabulary words and understand what the mean.
- Finally re-read the paper critically, answer the paper review questions.

Questions to answer in a paper review (see example review online)
- What problem did the paper address?
- Is it important/interesting? What was the context for the paper?
- What is the approach used to solve the problem?
- How does the paper support or otherwise justify the conclusions it reaches?
  How does it evaluate the approach?
- What problems are explicitly or implicitly left as future research questions?
  What are the limitations of the research?

Selecting a Paper to Present

Read the abstract, introduction, and conclusion for all papers you are seriously considering

Consider selecting a paper related to your course project

Schedule around your deadlines in this course and other courses

Paper selection will be first-come-first-serve
- I will start posting assignments as soon as they are sent
- You must indicate which paper you would like to present by September 7
Project

Five deliverables
- proposed tool/programming model example with preliminary project proposal
- proposal and tool/programming model example
- verbal status report (15 minutes)
- intermediate report
- final report and poster

Possible projects accessible from colostate.edu

Tool Example

Programming Models: X10, Chapel, STAPL, Alphaz, etc.
- Write a parallel pattern example in the programming model

TAU: Tuning and Analysis Utilities
- http://www.cs.uoregon.edu/research/tau/home.php
- could profile a parallel pattern example

LLVM compiler infrastructure
- http://llvm.cs.uiuc.edu/docs/Projects.html, describes how to create a project that uses LLVM
- could count operations or memory references or if statements or ...
Possible Projects

http://www.cs.colostate.edu/~cs653/Project/possible-projects.html

Next Time

Reading
– Qualitative Evaluation Criteria for Parallel Programming Models
– Mechanisms that Separate Algorithms from Implementations for Parallel Patterns

Class
– Discussion about questions we want to ask this semester.

Due
– Paper review for the FIT and ParaPLOP papers, if you want that to be one of the 10 reviews you will be writing this semester.