Course Introduction

Dr. Mattox Beckman

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
DEPARTMENT OF COMPUTER SCIENCE

Welcome to CS 421!

Topics for discussion:

▶ Logisitics — instructor, course objectives

▶ Why study languages?

▶ Major themes for the course

Me!

Name   Mattox Beckman

History   PhD, Fall 2003, University of Illinois at Urbana-Champaign
Lecturer 2003–2015 Illinois Institute of Technology

Research Areas   CS Education, Programming Languages, Mathematical Foundations of
Computer Science

Specialty   Partial Evaluation, Functional Programming

Professional Interests   Teaching; Computer Science Education; Functional Programming;
Semantics and Types; Category Theory

Personal Interests   Cooking; Go (Baduk, Wei-Qi, Igo); Philosophy; Evolution; Meditation;
Kerbal Space Program; Home-brewing; … and many many more …

Mastery Grading

▶ The first thing: your grade is not based on points in this course!
▶ We use Mastery Grading.
  ▶ Your ability to demonstrate mastery of a concept is what counts.
  ▶ 20 (ish) Learning Modules
  ▶ Each module has some objectives
▶ Advantages:
  ▶ Once you have the LM, you're done with it.
  ▶ You will know precisely what to study for on the final!
  ▶ You will know precisely what you need to do for a particular grade!

Activities

- This is a **flipped** classroom!
  - Please watch the lecture video *before* coming to class!
- In class activities (TPS or POGIL) to reinforce learning.
- Post-class prairielearn activities to consolidate/apply learning.
  - These often fulfill part of an LM.
- There is not necessarily a post-class activity for each day.

Machine Problems

- ▶ Machine Problems
- ▶ Designed to help you study for the exams, and to achieve major course objectives
- ▶ You are allowed one partner for the programming part, but **you must cite your sources!** (Place partner netids in a comment at the top.)
- ▶ Don't use the "perturbation method" of solving machine problems! We expect you to *understand* the solution and the process very well.
- ▶ See the syllabus for more details.

Exams/Quizzes

- ▶ The purpose of an exam is to measure mastery of material.
  - ▶ Exams are subdivided into proficiency units that correspond to LMs.
  - ▶ Exams are "second chanced". Midterm 2 will have all of midterm 1 for a retry.
- ▶ We expect three midterms.

Why Study Languages?

- *Pai sei*
- Blub – see *Beating the Averages* by Paul Graham. [Gra03]
- Language families

Pai Sei

Different languages can express different concepts efficiently!

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- ▶ Languages and cultures grow together to shape each other.
- ▶ It's difficult to reason about something without vocabulary!
- ▶ See *Politics and the English Language* by George Orwell. [Orw46]

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▶ The difference between a known less powerful language to a more powerful language is not easy to see!

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4. Pragmatics
   You will learn some of the design decisions available to you when choosing (or creating!) a language.

So, what should you learn?

▶ Understand major classes of programming languages: techniques, features, styles.
▶ How to select an appropriate language for a given task.
▶ How to read a formal specification of a language and implement it.
▶ How to write a formal specification of a language.
▶ Some Powerful Ideas:
    1. Recursion
    2. Abstraction
    3. Transformation
    4. Unification

The emphasis is on learning the theory, knowing why the theory is valuable, and using it to implement a language.

Bibliography

[Bac97] John Backus. "Can Programming Be Liberated from the von Neumann Style? A functional Style and Its Algebra of Programs." In: ACM Turing Award Lecture (1997).

[Gra03] Paul Graham. *Beating the Averages*. Apr. 2003. URL: http://www.paulgraham.com/avg.html.

[Orw46] George Orwell. "Politics and the English Language." In: *Horizon* 13.76 (Apr. 1946), pp. 252–265. URL: http://www.resort.com/~prime8/Orwell/patee.html.