Programming Languages and Techniques (CIS120)

Lecture 1

January 9, 2013

Course Overview and Logistics
Introduction to Program Design

Introductions

- Instructor: Dr. Stephanie Weirich*
  - Levine Hall 510
  - sweirich@cis.upenn.edu
  - http://www.cis.upenn.edu/~sweirich/

- Course Administrator: Laura Fox
  - Levine 308
  - lffox@cis.upenn.edu

*Pronounced phonetically as: "why rick". I won't get upset if you mispronounce my name (really!). I will answer to anything remotely close, or, you can call me Stephanie or just Professor. Whatever you feel comfortable with.

TA Staff*

- Harmony Li
- Patrick Hulce
- Noam Zilberstein
- Tate Mandel
- Lewis Ellis
- Max Scheiber
- Tiernan Garsys
- Connie Yuan
- Joe Schaffer
- Richard Eisenberg
- Mitchell Tang
- Jinesh Desai
- Jason Kong
- Ian Sibner
- Ashu Goel
- Sudarshan Mural
- Rachel Miao
- Cam Cogan
- Ran Chen

*AKA: CIS 120 spirit guides, student champions, and all-around defenders of the universe.

Course websites

- Web site: http://www.cis.upenn.edu/~cis120
- No required textbook. All materials online.
  - Lecture slides, lecture notes
  - Programming style guides
  - Homework assignments, submission, labs, exams
  - Supplementary resources
- Piazza: http://piazza.com/class#spring2013/cis120
  - Course discussion group for questions, clarifications, etc.
  - Allows *anonymous* posting
  - Allows private posting, visible only to course staff

Prerequisites

- We assume you can already write 10 to 100-line programs in some imperative or OO language
  - Not necessarily Java or any other particular language, though Java gives the best background
  - CIS 110 or AP CS is typical
  - But you should be familiar with using a compiler, editing code, and running programs you have created

- CIS 110 is an alternative this course
  - If you have doubts, come talk to me to figure out the right course for you

Registration

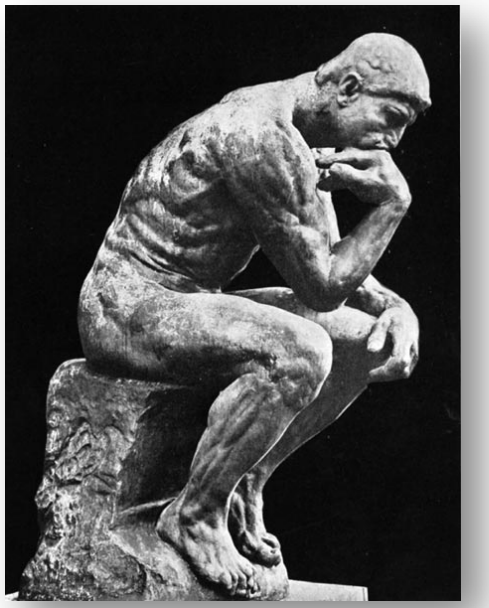
- There is still room to register for the lecture
- Newly added lab section: CIS 120 209
  - W 1:00-2:00p
- If you wish to add the class or switch lab sections, contact Jackie Caliman (jackie@cis.upenn.edu)
- Go to lab section you want to join this week

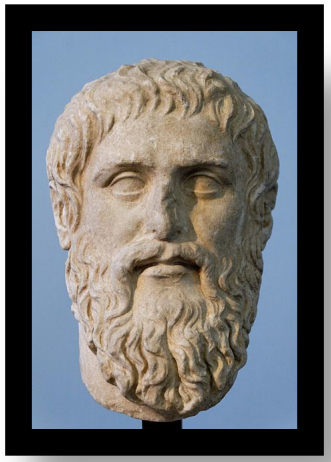
Course Goals

- Ability to write larger (~1000 lines) programs
  - increased independence ("working without a recipe")
- Fluency in program design
  - test-driven programming
  - modular decomposition
  - working with different programming idioms
- Fluency in core Java
- Firm grasp of principles of Computer Science

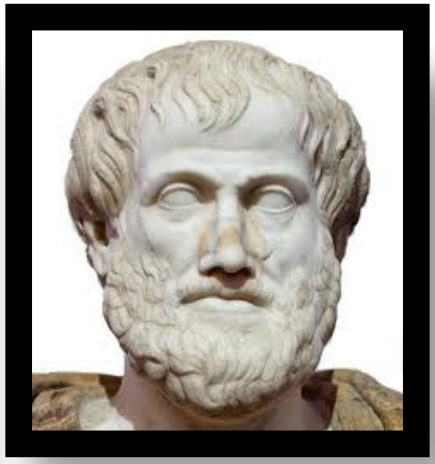
Philosophy

- Programming
  - … is *fun*, *useful*, and *rewarding* in its own right
  - … is also a conceptual *foundation* for all of computer science
  - … involves tools that are often large and complex, for good reasons!
  - … takes lots of practice to master





Plato



Aristotle

Al-Kwarizmi

Philosophy

- Teaching introductory computer science
  - Start with basic skills of "algorithmic thinking" (AP/110)
  - Develop more systematic design and analysis skills in the context of larger and more challenging problems (120)
  - Practice with industrial-strength tools and design processes (120, 121, and beyond)
- Role of CIS120
  - Concentrate on the process of *designing* programs
  - Start with foundations of programming using the rich grammar and precise semantics of the OCaml language
  - Transition to Java *after* setting up the context needed to understand why Java and OO programming are good tools
  - Give a taste of the breadth and depth of CS

CIS 120 Tools

- OCaml
  - Mature functional programming language
  - Lightweight, approachable setting for learning about program design
  - Levels the playing field at the start of the course

- Java
  - Industry-standard typed OO language
  - Many tools/libraries/resources available

- Eclipse
  - Popular open-source integrated development environment (IDE)

- We'll help you get these set up on your laptops in lab today and tomorrow

Who uses OCaml?

Why *two* languages?

- Pedagogic progression
- Perspective
- Disparity of background
- Confidence in learning new tools

"[The OCaml part of the class] was very essential to getting fundamental ideas of comp sci across. Without the second language it is easy to fall into routine and syntax lock where you don't really understand the bigger picture.''
---Anonymous CIS 120 Student

"[OCaml] made me better understand features of Java that seemed innate to programming, which were merely abstractions and assumptions that Java made. It made me a better Java programmer.''
--- Anonymous CIS 120 Student

Course Components

- Lectures
  - Presentation of ideas and concepts
  - Interactive demos
- Recitations (6% of final grade)
  - Practice and discussion in small group setting
  - Grade based on participation
  - START TODAY
- Homeworks (50% of final grade)
  - Practice, experience with tools
  - Exposure to broad ideas of computer science
  - Grade based on automated tests + style
- Exams (44% of final grade)
  - In class, pencil and paper
  - Do you understand the terminology? Can you model computation? Can you synthesize solutions?

Lecture Policy

- Laptops *closed*… minds *open*
  - Although this is a computer science class, the use of laptops, cell phones, mobile devices, iPads, etc., in lecture is *prohibited!*
- Why?
  - Laptop users tend to surf/chat/e-mail/game/etc.
  - They also **distract** those around them
  - You will get plenty of time in front of your computers while working on the course projects
- Instead:
  - Pay attention, ask questions, and take notes!

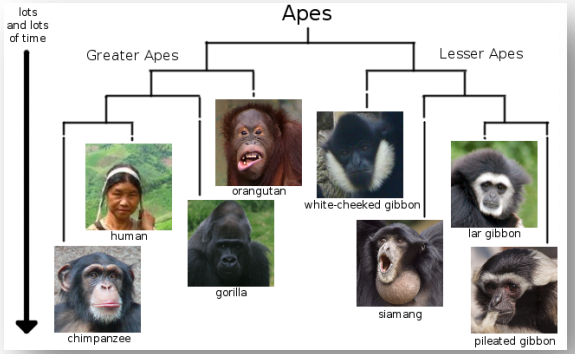
Recitations / Lab Sections

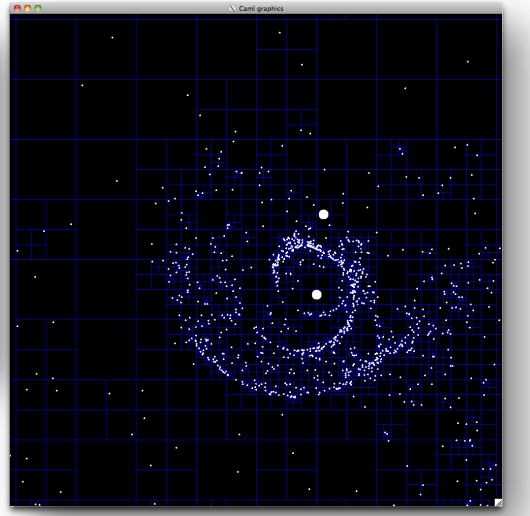
- First recitation, TODAY and TOMORROW
  - Bring your laptops
  - Attendance won't be counted until next week

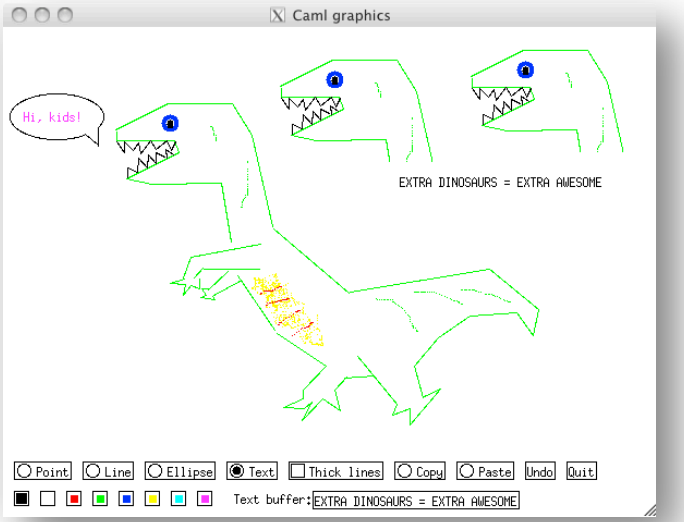
- Goals of first meeting:
  - Meet your TAs and classmates
  - Set up tools (OCaml, eclipse) your laptops
  - Get to see a bit of OCaml

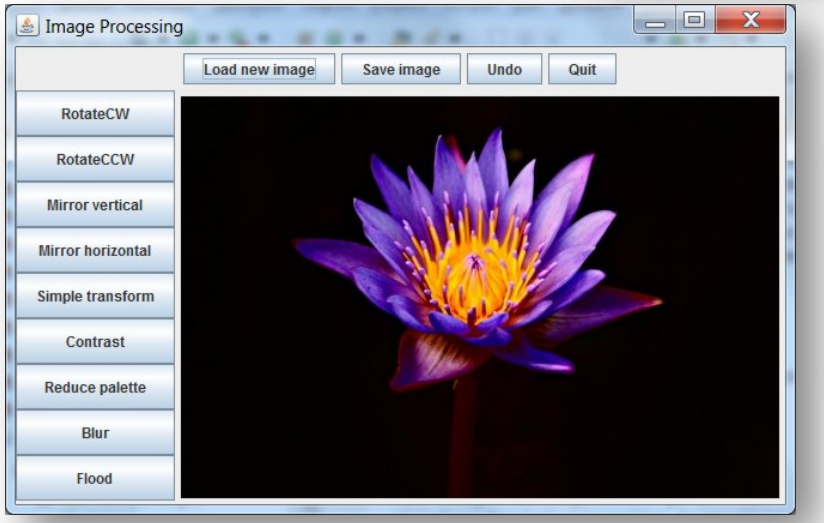
- If you need to register/switch recitation sections, contact Jackie Caliman (jackie@cis.upenn.edu)

(Selected) CIS 120 Homeworks







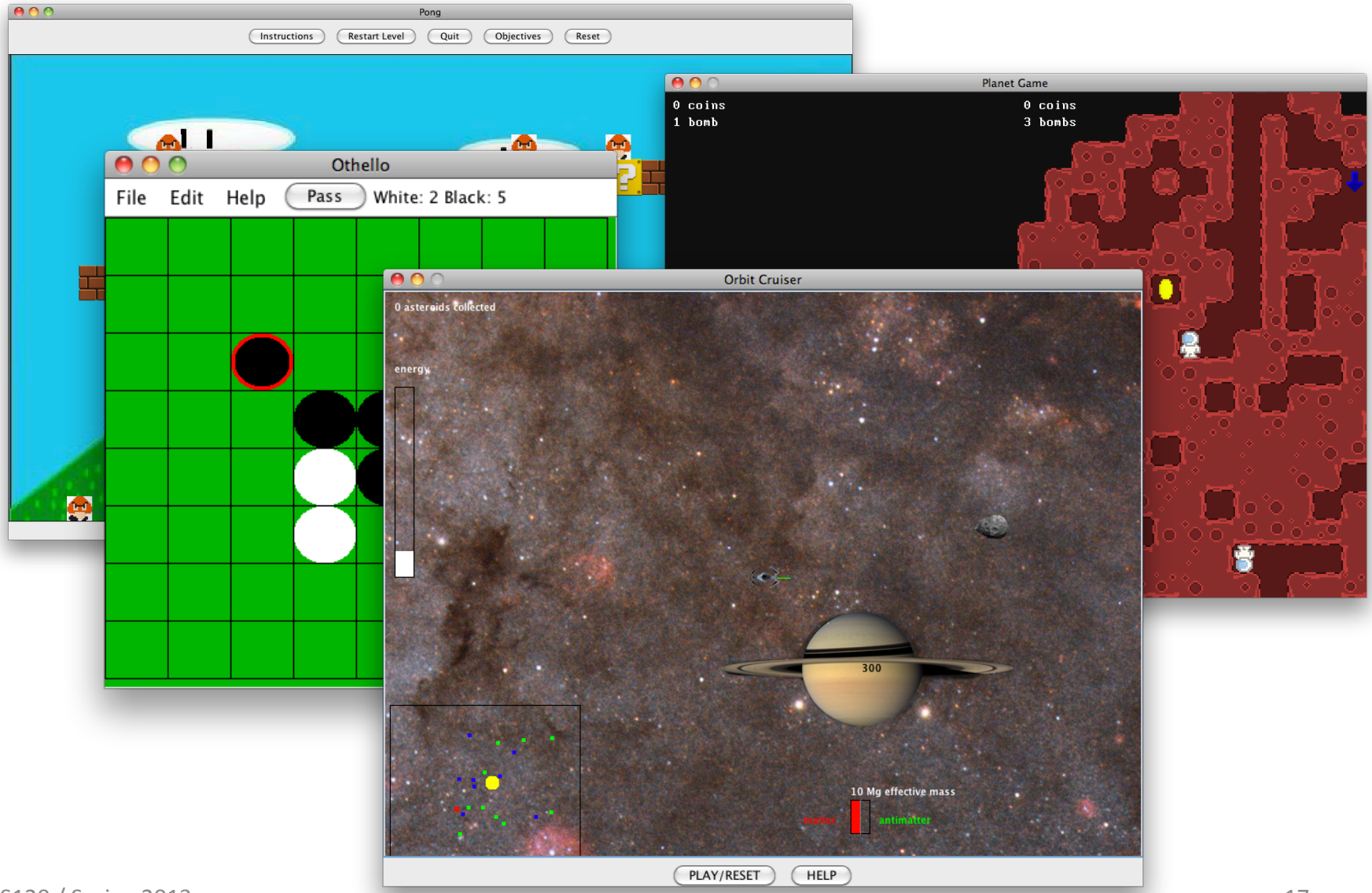



```
Welcome to the Adventure Game.
Type "help" at any time to get a list of available commands.

You are in the ballroom.
There are exits to the south and east.
You have 10 health and 7 coins.
>>>
```

10 homework assignments total, weighted equally

Final projects



Homework Policies

- Projects will be (mostly) automatically graded
  - We'll give you some tests, as part of the assignment
  - You'll write your own tests to supplement these
  - Our grading script will apply additional tests
  - Your score is based on how many of these you pass
  - Your code must compile to get *any* credit
- You will be given your score (on the automatically graded portion of the assignment) immediately
- Multiple submissions *are allowed*
  - First *few* submissions: no penalty
  - Each submission after the first few will be penalized
  - Your final grade is determined by the *best* raw score
- Late submissions
  - 10 point penalty if less than 24 hours late
  - 20 point penalty if 24-48 hours late
  - *Submissions not accepted after 48 hours past the deadline*

Exam Dates

- 12% First midterm: Friday, February 15th, in class
- 12% Second midterm: Friday, March 29th, in class
- 20% Final exam: Friday, May 3rd, 9AM

- Contact me *in advance* if you have a conflict

Academic Integrity

- All submitted homework must be individual work

Not OK:
- Copying / sharing of code
- Discussions of specific homework problems with other students

OK / encouraged:
- "High level" discussions of concepts from lecture

- Course staff will check for copying.

Violations will be treated seriously!

- *If in doubt, ask.*

Penn's code of academic integrity:
http://www.vpul.upenn.edu/osl/acadint.html

Where to ask questions

- Course material
  - **Piazza Discussion Boards**
  - TA email (tas120@lists.seas.upenn.edu)
  - TA office hours, schedule on webpage
  - Tutoring, Sunday and Monday evenings
  - Prof office hours: Mon. 3:30-5:00pm, or by appt

    Today: 3:30 – 5 PM
- HW/Exam Grading: see webpage
- About the CIS majors
  - Ms. Jackie Caliman, CIS Undergraduate coordinator

Program Design

Course goal

Strive for beautiful code.

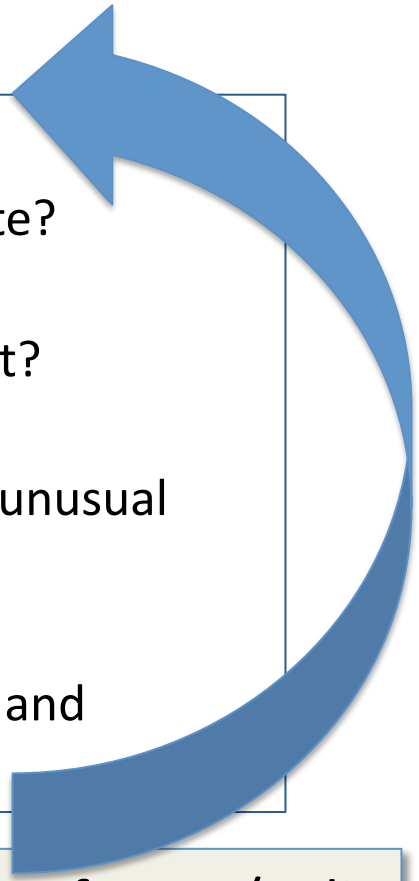
- Beautiful code
  - is simple
  - is easy to understand
  - is likely to be correct
  - is easy to maintain
  - takes skill to develop

- Beautiful code stems from a good design *process*

Fundamental Design Process

Design is the process of translating informal specifications ("word problems") into running code.

1. Understand the problem
   What are the relevant concepts and how do they relate?
2. Formalize the interface
   How should the program interact with its environment?
3. Write test cases
   How does the program behave on typical inputs? On unusual ones? On erroneous ones?
4. Implement the required behavior
   Often by decomposing the problem into simpler ones and applying the same recipe to each



5. Revise / Refactor / Edit