CSC 103: How Computers Work

Spring 2016
Smith College
Prof. Sheehan
Class 1: March 21
Outline

• Syllabus and course overview

• Introductions

• Historical overview and examples of computers

• Binary numbers
Big Questions

- How should we define “computer”? “computing”?
- What do computers do?
- How do they do it?
- How do computers affect us?
- Are computers intelligent? Do they “think”?
- What will computers be like in the future?
Syllabus
Course Overview

WEEK 1:
  binary numbers, Boolean algebra, logic gates
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**WEEK 2:**
building blocks of computers (hardware)
transistors, memory, CPU, etc
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**WEEK 3:**
assembly programming (software)
Course Overview

WEEK 4:
higher-level programming (Processing, software)
Course Overview

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higher-level programming (Processing, software)

**WEEK 5:**
Artificial Intelligence (AI), future of computers
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WEEK 5: Artificial Intelligence (AI), future of computers

WEEK 6: final project presentations
Course Overview

Throughout:

* history of computers and computing
* discussion of file systems and terminal
* common computer applications
Coursework

0 Assignments
- Due Monday at the beginning of class
- Include pencil & paper, code, short essay
- One part will often be an in-class lab or quiz
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0 Final project
  • On a topic of your choice
  • Presentation (2-3min) + writeup
Piazza

- Online discussion
- Homework questions (no email!)
- Announcements
- Counts toward participation (asking and answering)

https://piazza.com smith/spring2016/csc103/home
Honor Code

Collaboration is encouraged in this course, but all submitted work must be your own that you have written and understood. If you do used any resources from the internet, they must be clearly cited. If you worked with or received help from another student, list them as a collaborator at the top of your assignment. In general, for each assignment, cite your sources (classmates, books, and online resources), as per the Smith College honor code:

"Smith College expects all students to be honest and committed to the principles of academic and intellectual integrity in their preparation and submission of course work and examinations. All submitted work of any kind must be the original work of the student who must cite all the sources used in its preparation."

The one exception is in-class labs, which may occasionally be in pairs. In this case, partners are expected to work together; "divide and conquer" is not an acceptable strategy.
Grading

• Assignments (including quizzes): 50%

• Participation: 20%

• Final project and presentation: 30%
Notes

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• **Accommodations:** please give letters to me as soon as possible so we can discuss how to best meet accommodations
Examples of Computers
Analog Computers

- Uses continuous values/quantities for computation
  - Electric, hydraulic, mechanical
- Simple analog computer: slide rule

Credit: ArnoldReinhold (wikipedia)
Antikythera mechanism

Ancient (first?) analog computer
Greek, around 200 BC
Used for predicting astronomical events (eclipses, etc)
Made of (30?) bronze gears

Credit: Marsyas, wikipedia
Differential analyser

Another analog computer (mechanical)
Used for solving differential equations through integration
Height of use: 1930s-1950s
(left) used for studying tides

Credit: Andy Dingley, wikipedia
Early digital computer: abacus

Early as 2500 BC
Appeared in many cultures
Used for addition, multiplication

More info: https://en.wikipedia.org/wiki/Abacus
Difference Engine

Credit: Dominique Thiebaut

Charles Babbage
“Father of the computer”

Credit: wikipedia

“world’s first computer”

Used for tabulating polynomial functions

Inspiration: frustration with errors made by human mathematicians
DNA computers

Prototype DNA computer -- MAYA-II

Credit: Dominique Thiebaut