UC Berkeley
Computer Science
Lecturer SOE
Dan Garcia

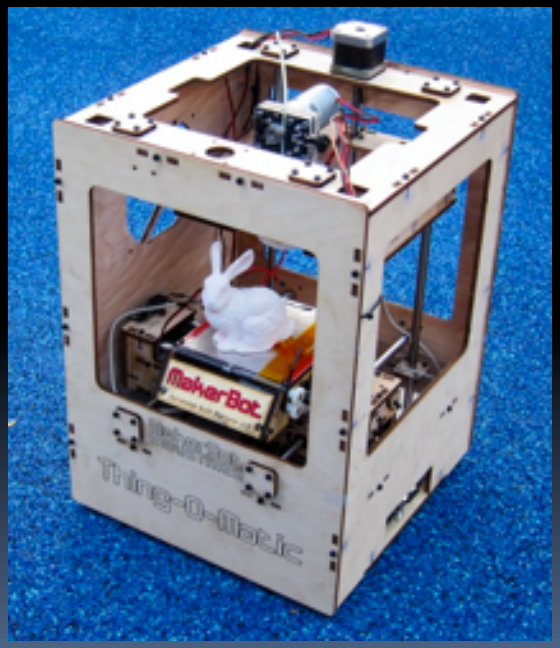
CS10
The Beauty and Joy of Computing

Lecture #1
Welcome; Abstraction

2011-01-19

CES 2011 : 3D PRINTING NOW!

At CES 2011 in Vegas, companies showed lots of tablets and internet TV devices. The coolest thing, IMHO, is that 3D printing is now available pretty cheaply!



Makerbot.com

Design constraints of CS10

- **CS61A expects program. experience, recursion**
  - CS10 hits that in week 5, just about the same time as CS3
- **What should ugrads know about computing?**
  - Computational Thinking
  - History, CS+X, Industry guests
  - apps that changed the world, hot research
  - "How stuff works" … demystifying computing
- **Passion, Beauty, Joy & Awe**
  - Take every step to make fun for non-traditional students
- **Make all resources free, available (Berkeley way)**
  - Videos, notes, exercises, book!

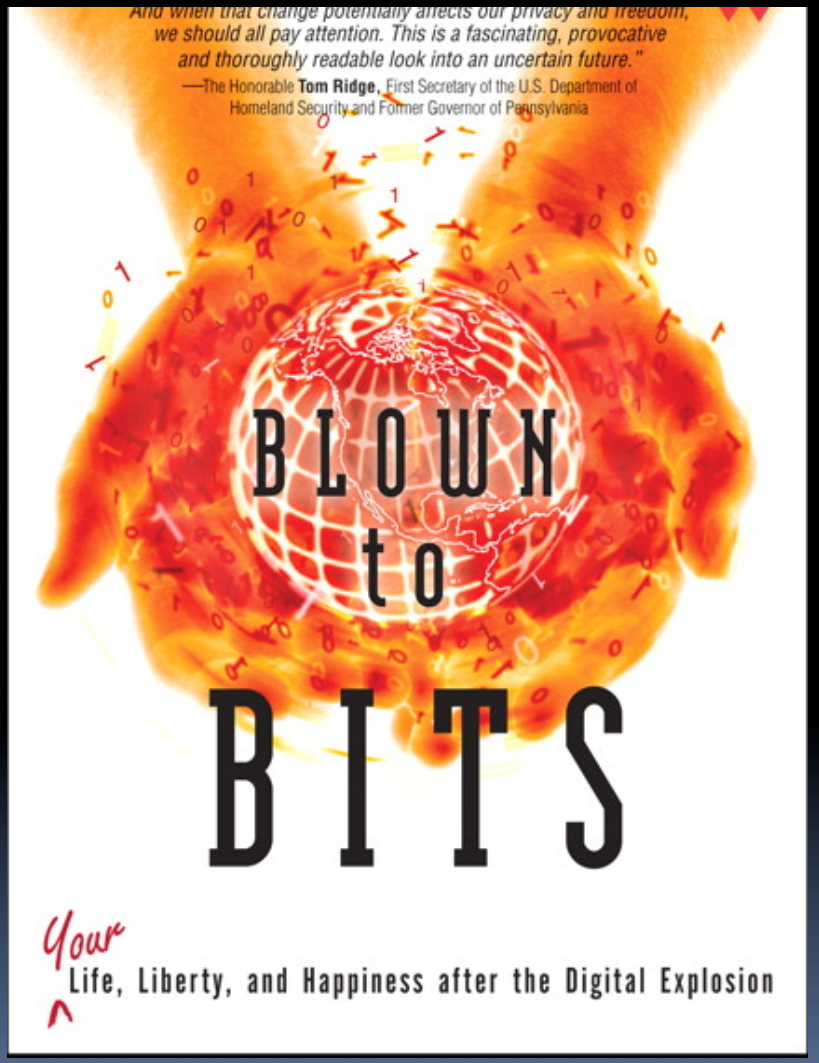
Non-majors: Out with CS3, In with CS10

- **CS3S & CS3L**
  - Programming, programming, programming
    - Prog Ideas: Recursion, Functions-as-data
  - Scheme
    - \+ Same as CS61A
    - – some take CS3L for wrong reason
    - Never remix code
    - Maybe graphical, interactive by week 15
  - 1 big Final project

- **CS10**
  - Programming ½ story
    - Big ideas, HowStuffWorks, history, great applications, social implications too!
    - Prog Ideas: Recursion, Functions-as-data
  - Scratch + BYOB
    - CS10,61[ABC] each in a different language
    - Graphical, interactive, musical by week 2
    - Share and upload code!
  - Two projects + essay

Format, Textbooks, Grading

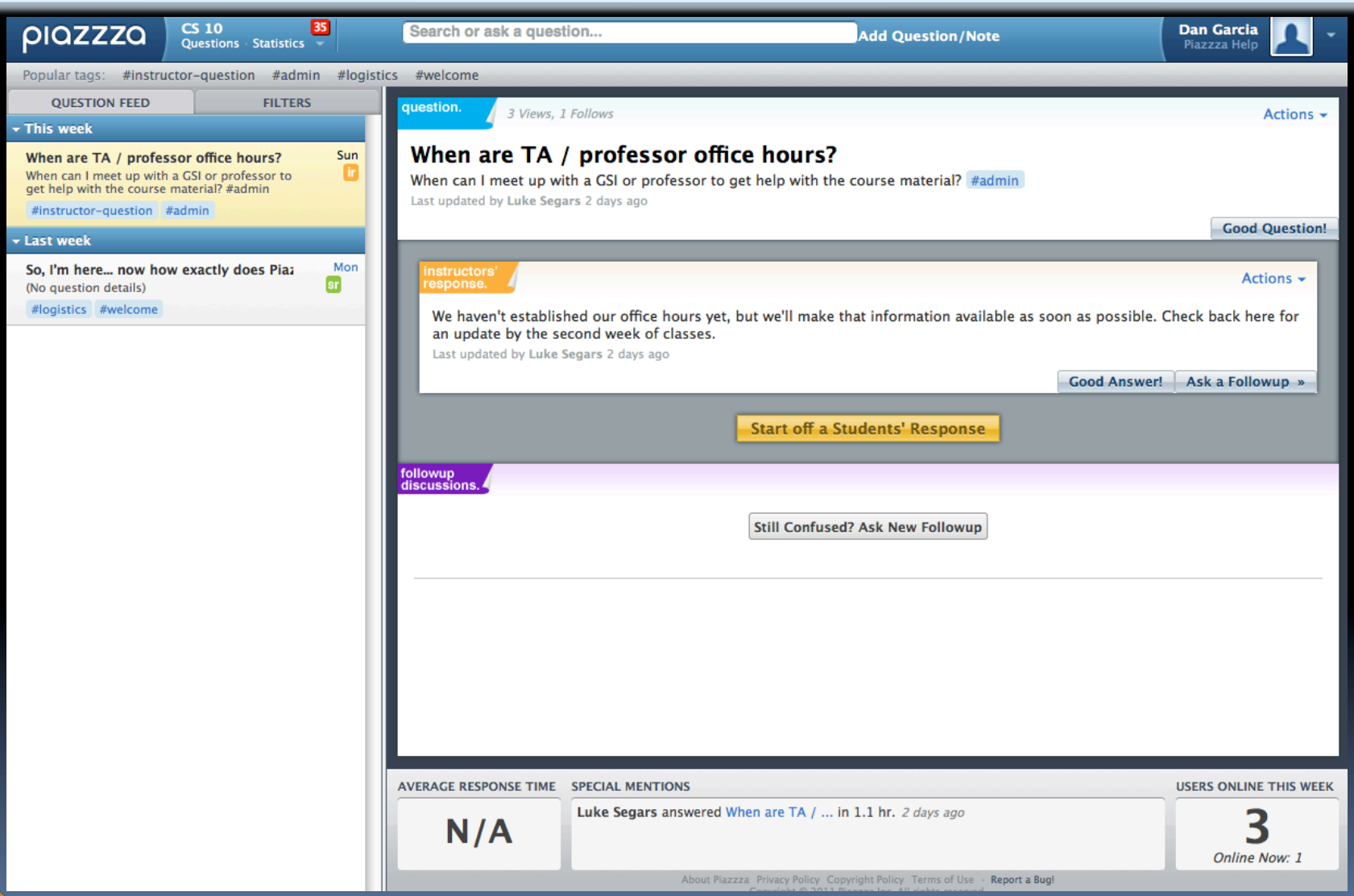
- **Format**
  - Two 1-hr lectures / wk
  - Two 2-hr labs / wk
  - One 1-hr TA discussion/wk
- **Selected Reading**
  - Taken from recent books and papers
- **Grading**
  - Quest, Midterm, Final
  - One paper (or blog)
  - Midterm project
  - Final project
  - Weekly readings & HW
  - Effort, Participation, Altruism



Peer Instruction

- Increase real-time learning in lecture, test understanding of concepts vs. details
- As complete a "segment" ask multiple choice question
  - 1-2 minutes to decide yourself
  - 2 minutes in pairs/triples to reach consensus. Teach others!
  - 2 minute discussion of answers, questions, clarifications

Piazzza for {ask,answer}ing questions

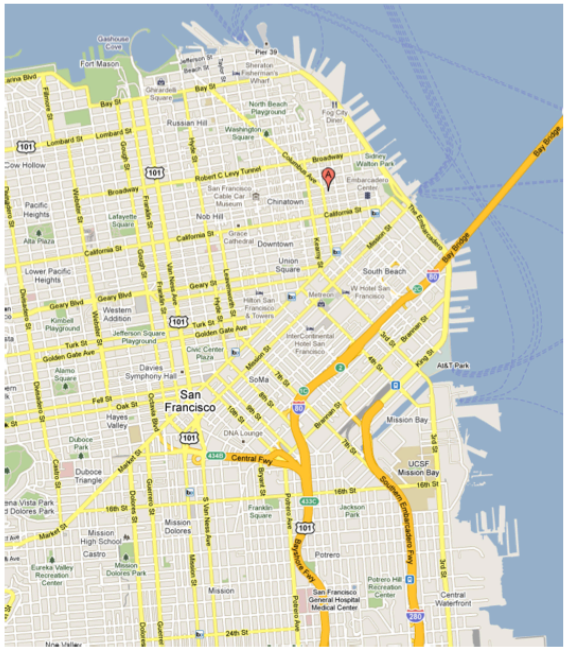


Abstraction

- **Detail removal**
  - "The act or process of leaving out of consideration one or more properties of a complex object so as to attend to others."
- **Generalization**
  - "The process of formulating general concepts by abstracting common properties of instances"

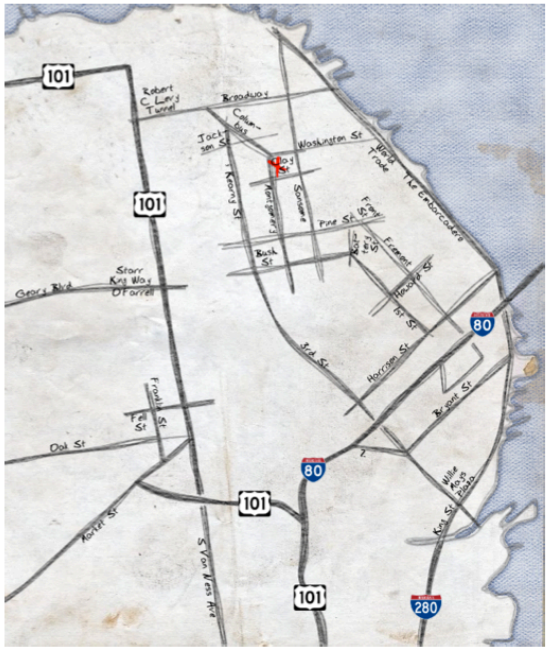
Henri Matisse *"Naked Blue IV"*

Detail Removal



General Purpose Online Map

Selected Roads



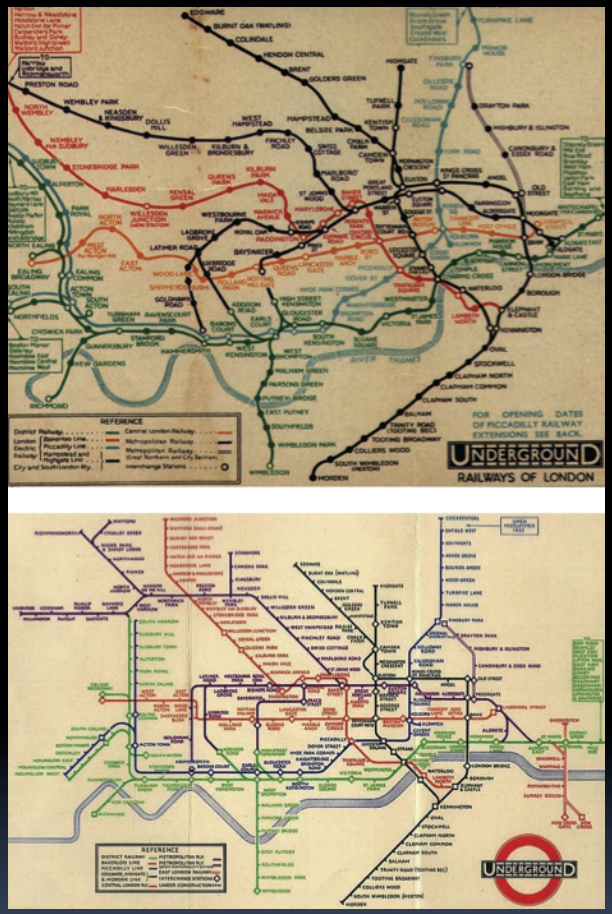
Our Result

Automatic Generation of Detail Maps

Maneesh Agrawala (UCB EECS), among others

Detail Removal (in CS10)

- You'll want to write a project to **simulate a real-world situation**, or play a game, or …
- Abstraction is the idea that you **focus on the essence**, the cleanest way to map the messy real world to one you can build



The London Underground 1928 Map & the 1933 map by Harry Beck.

Generalization Example

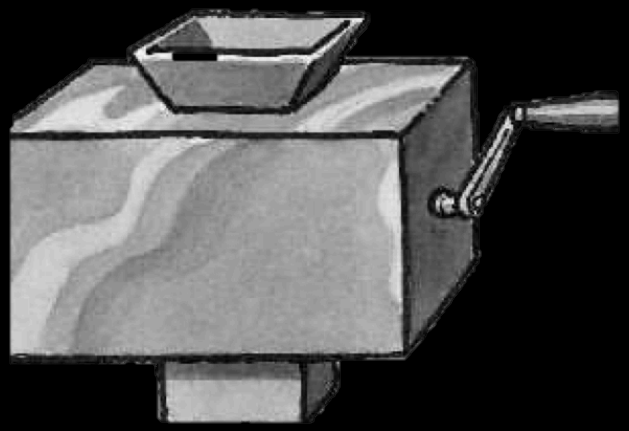
- **You have a farm with many animal kinds.**
- **Different food for each**
- **You have directions that say**
  - To feed dog, put dog food in dog dish
  - To feed chicken, put chicken food in chicken dish
  - To feed rabbit, put rabbit food in rabbit dish
  - Etc…
- **How could you do better?**
  - To feed <animal>, put <animal> food in <animal> dish

Generalization (in CS10)

- You are going to learn to write functions, like in math class:

$$y = \sin(x)$$

- You should think about what inputs make sense to use so you don't have to duplicate code



"Function machine" from *Simply Scheme* (Harvey)

Summary

- Abstraction is one of the big ideas of computing and computational thinking

- Think about driving. How many of you know how a car works? How many can drive a car? Abstraction!

Someone who died in 1930 could still drive a car today because they've kept the same Abstraction!
(right pedal faster, left pedal slow)