UC Berkeley
Computer Science
Lecturer SOE
Dan Garcia

CS10
The Beauty and Joy of Computing

Lecture #1
Welcome; Abstraction

2012-01-18

CS10 : YOU'LL LOVE IT!

Watch the student testimonials about CS10, what it means to them, and how it has changed their lives. Inspiring!

inst.eecs.berkeley.edu/~cs10/

CS10 in one slide

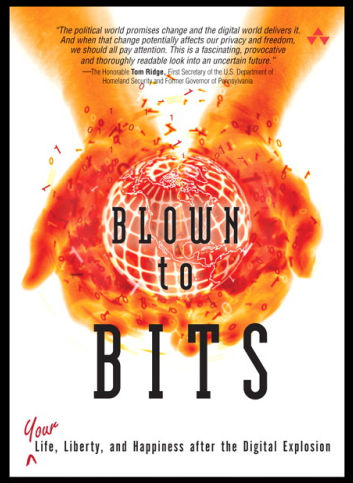
- **Big Ideas of Programming**
  - Abstraction
  - Algorithms (2)
  - Recursion (2)
  - Functions-as-data, λ (2)
  - *Programming Paradigms*
  - *Concurrency*
  - *Distributed Computing*
- **Beauty and Joy**
  - "CS Unplugged" activities
  - All lab work in pairs
  - Two 3-week projects in pairs
    - Of their own choice!!
  - One blog
    - Of students' own choice!!
- **Big Ideas of Computing**
  - HowStuffWorks
    - 3D Graphics
    - Video Games
    - Computational Game Theory
  - Research Summaries
    - AI
    - HCI
  - Apps that Changed the World
  - Social Implications of Computing
  - Saving the World with Computing
  - How Twitter Works (guest lecture)
  - Cloud Computing
  - Limits of Computing
  - Future of Computing

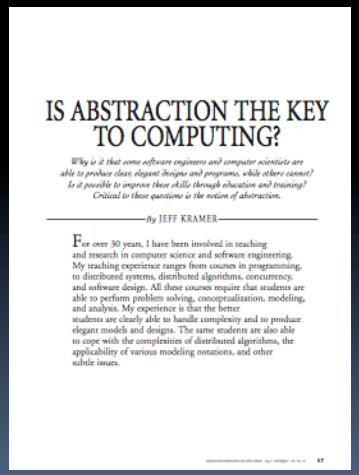
Format & Textbooks

- **Format (7 hrs/wk * 14 wks)**

Mon	Wed	Fri
Lecture	Lecture	Discussion
Lab	Lab	
Lab	Lab	

- **Selected Reading**
  - Taken from great book ("Blown to Bits" by Abelson, Ledeen & Lewis) + articles + videos
  - Current events EVERY DAY (e.g., IBM's Watson vs Jeopardy)
- **All resources FREE**
  - Even clickers!



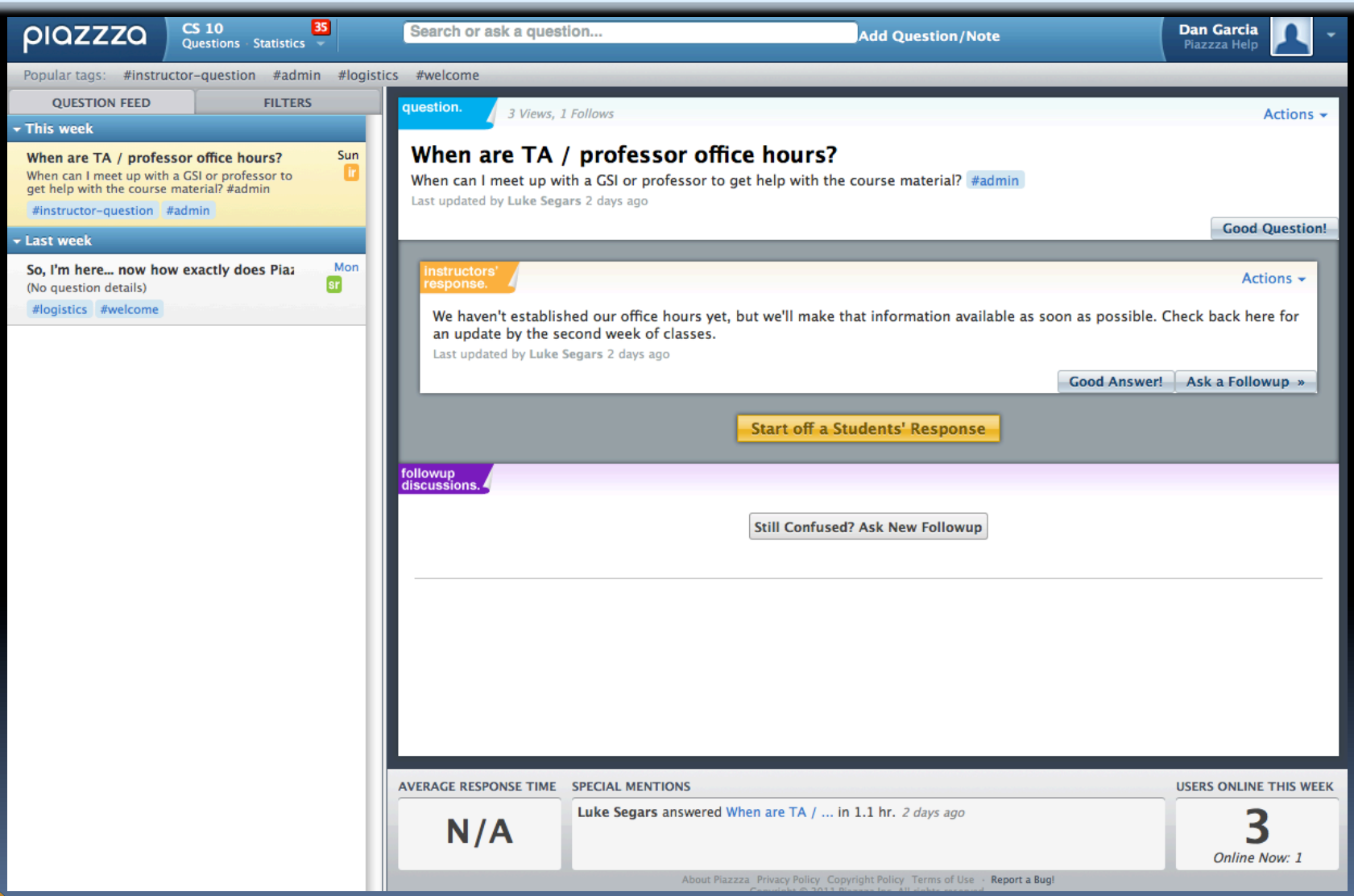


. . .

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

Piazza for {ask,answer}ing questions

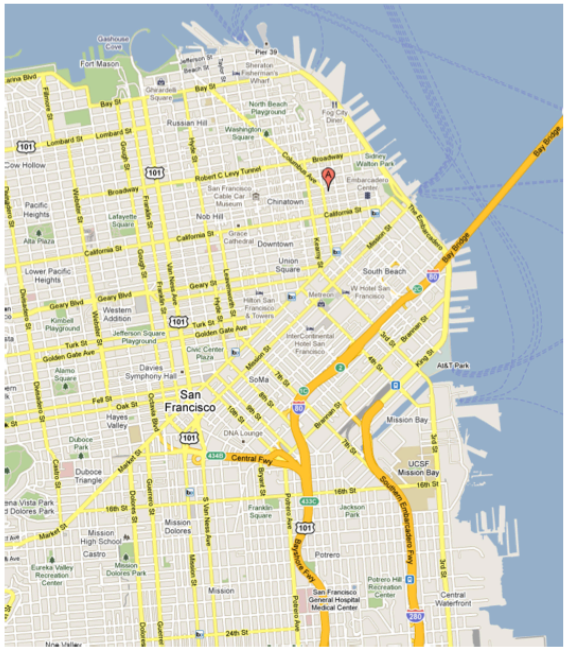


Abstraction

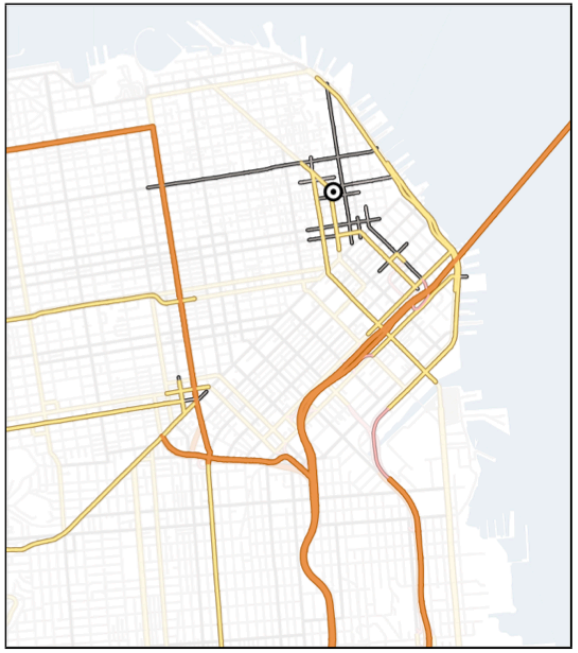
- **Detail removal**
  - "The act or process of leaving out of consideration one or more properties of a complex object so as to attend to others."
- **Generalization**
  - "The process of formulating general concepts by abstracting common properties of instances"

Henri Matisse *"Naked Blue IV"*

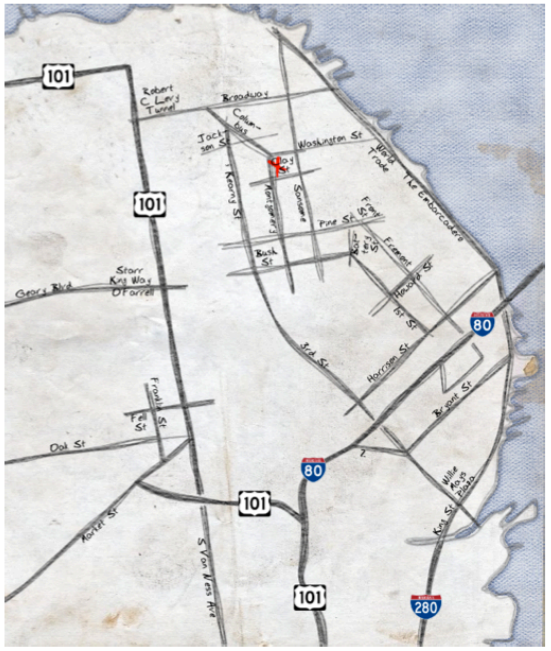
Detail Removal



General Purpose Online Map



Selected Roads



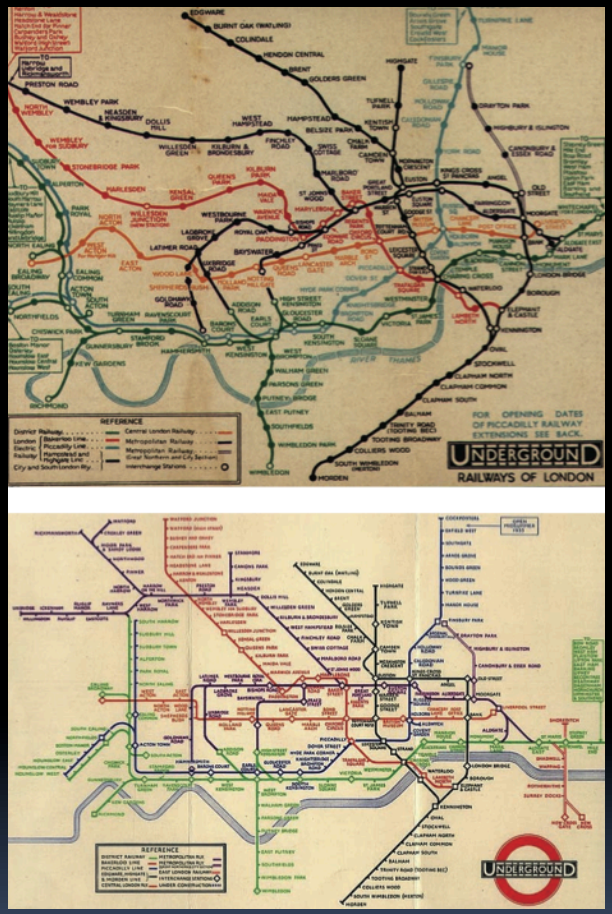
Our Result

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

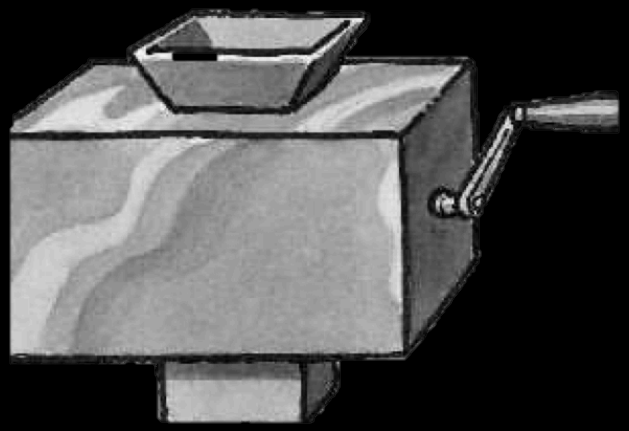
- **You have a farm with many animal kinds.**
- **Different food for each**
- **You have directions that say**
  - To feed dog, put dog food in dog dish
  - To feed chicken, put chicken food in chicken dish
  - To feed rabbit, put rabbit food in rabbit dish
  - Etc…
- **How could you do better?**
  -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

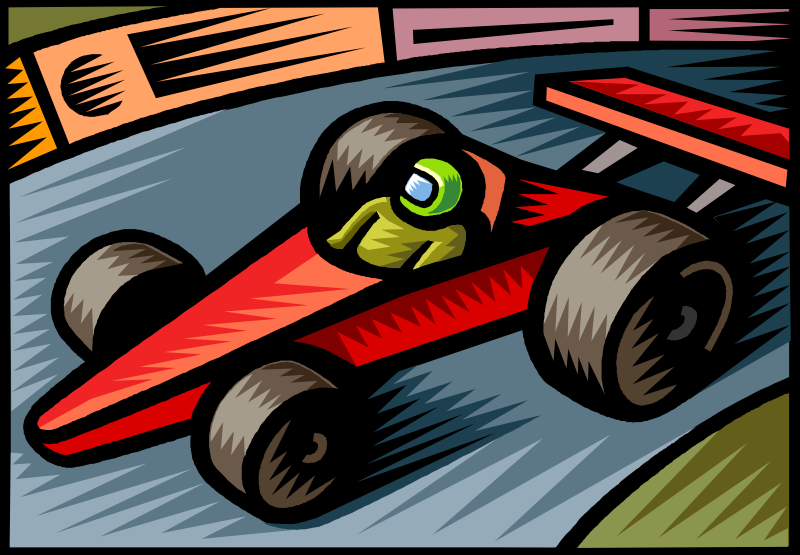


"Function machine" from *Simply Scheme* (Harvey)

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)