CS10
The Beauty and Joy of Computing

Lecture #1
Welcome; Abstraction

2012-06-15

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 projects in pairs
    - Of your own choice!
    - Of your 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 (14 hrs/wk * 8 wks)

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- 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 dickers!

Peer Instruction

- Increase real-time learning in lecture, test understanding of concepts vs. details

- As we complete a "segment" we 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

Grading

- EPA
  - Effort
  - Participation
  - Altruism

- Not Competitive
  - Absolute Grading [No Curve, No Limit on A's]

- Course Historical Average = B/B+
  - CS Department Average = B-

Piazza for [ask, answering] questions

UC Berkeley CS10 "The Beauty and Joy of Computing"; Welcome, Abstraction (2)
**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."

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**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."

- "The process of formulating general concepts by abstracting common properties of instances."

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**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.

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**Generalization Example**

- You have a farm with many kinds of animals
  - 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!

Anyone who knows how to drive can operate a hybrid, an electric car, or a diesel car, because they've kept the same abstraction! (right pedal faster, left pedal slower)