Announcements

• Chapter 10 for today
  • Chapter 9, if 10 seemed confusing

• Chapters 18 and 19 for Friday
  • We’re going to start skipping around
  • Pay attention to the online calendar
    • It’s the only up-to-date calendar
    • Throw away your printed syllabus!
Announcements

• This week’s Quiz is canceled
A little “bit” more….

DIGITAL REPRESENTATION
Digital Colors

• **Color Synthesis site**
Video

- NetPoint Video on Digital Imaging
  * http://uweoconnect.extn.washington.edu/digitalimagingdsfit7/
What's The Plan?
Algorithmic Thinking

Step-by-step directions for whatever someone, or the computer, needs to do
Algorithm

• A precise, systematic method for producing a specified result

• In real life we do this all the time:
• Algorithms
  * http://uweoconnect.extn.washington.edu/algorithmsdslfit7/
Five Essential Properties of Algorithms

1. **Input specified**
   * Data to be transformed during the computation to produce the output
   * Must specify type, amount, and form of data

2. **Output specified**
   * Data resulting from the computation—intended result
   * It is possible to have no output
Five Essential Properties (cont'd)

3. Definiteness
   * Specify the sequence of events
   * Details of each step, including how to handle errors

4. Effectiveness
   * The operations are doable

5. Finiteness
   * Must eventually stop
Language in Algorithms

• Natural language
  * For people, we use a natural language like English
  * Ambiguity is common in natural language

• Programming Language
  * Formal languages designed to express algorithms
  * Precisely defined; no ambiguity
Context Matters

- Program can fulfill five properties of an algorithm, be unambiguous, and still not work right because it is executed in the wrong context
  - e.g., last name in Western countries means family name; in Asian countries it may mean given name

- Context matters: Driving instructions
  - "From the Limmat River go to Bahnhof Strasse and turn right."
  - Assumes you are traveling in a specific direction. If you are not, the directions will fail.
Figure 10.1. Diagram of approaching a street (Bahnhof Strasse) from different directions, giving the “turn right” instruction different meanings.
Program vs. Algorithm

• A program is an algorithm that has been customized to
  • solve a specific task
    • under a specific set of circumstances
      - using a specific language
  • Algorithm is a general method; program is a specific method
An Algorithm: Alphabetize CDs

• Imagine CDs in a slotted rack, not organized

• You want to alphabetize by name of group, performing musician, or composer

• How do you solve this problem?
Animation

• Sorting CDs
Analyzing Alphabetize CDs Algorithm

- Illustrates the five basic properties of algorithms
  - Inputs and Outputs were listed
  - Each instruction was defined precisely (definiteness)
  - Operations are effective because they are simple and mechanically doable
  - Alphabetizing is mechanical, so our algorithm is effective
  - Finiteness is satisfied because there are only a finite number of slots that can be paired, so instructions 4, 5, and 6 cannot be repeated indefinitely
A Deeper Analysis

• **Structural features**
  * Two instructions, 5 and 6, in which the agent is directed to go back and repeat instructions. This is called a loop.

* **Loops and Tests**
  * A loop must include a test to determine whether the instructions should be repeated one more time

* **Assumptions**
  * We assume that
    - The CD rack is full (instructions do not handle the case of an empty slot)
    - The word "following" means a slot further from the start point
Figure 10.3. Flowchart of Alphabetize CDs. Operations are shown in rectangles; decisions are shown in diamonds. Arrows indicate the sequencing of the operations.
Exchange Sort Algorithm

- The Alphabetize CDs example illustrates the standard Exchange Sort algorithm
  - The idea of comparing pairs of items chosen in a particular way, exchanging them if they are out of order, and continuing to sweep through the items
  - We could use the same algorithm to sort on a different principle
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