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

Digital Colors

• Color Synthesis site

A little “bit” more....

DIGITAL REPRESENTATION

Video

• NetPoint Video on Digital Imaging
  ∗ http://uweoconnect.edu.washington.edu/digitalImaging/digit2/

What’s The Plan? Algorithmic Thinking

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

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Algorithm

• A precise, systematic method for producing a specified result
• In real life we do this all the time:

Video

• Algorithms
  • [Link](http://uwescannot.exn.washington.edu/algorithm/)

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.
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?

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
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

Announcements

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