



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

* <http://www.telecable.es/personales/alberto9/color/index.htm>



Video

- NetPoint Video on Digital Imaging
 - * <http://uweoconnect.extn.washington.edu/digitalimagingdsifit7/>



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:



Video

- Algorithms

- * <http://uweoconnect.extn.washington.edu/algoithmsdslfit7/>



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.

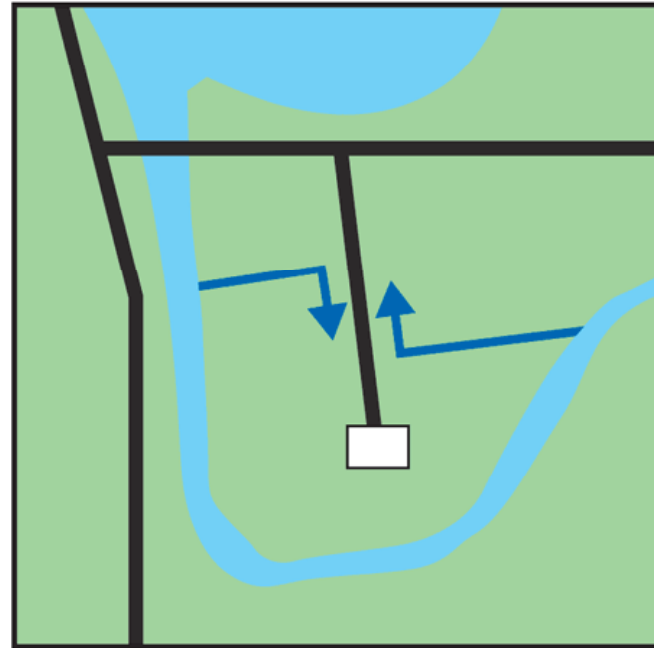


Figure 10.1. Diagram of approaching a street (Bahnhof Strasse) from different directions, giving the “turn right” instruction different meanings.



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

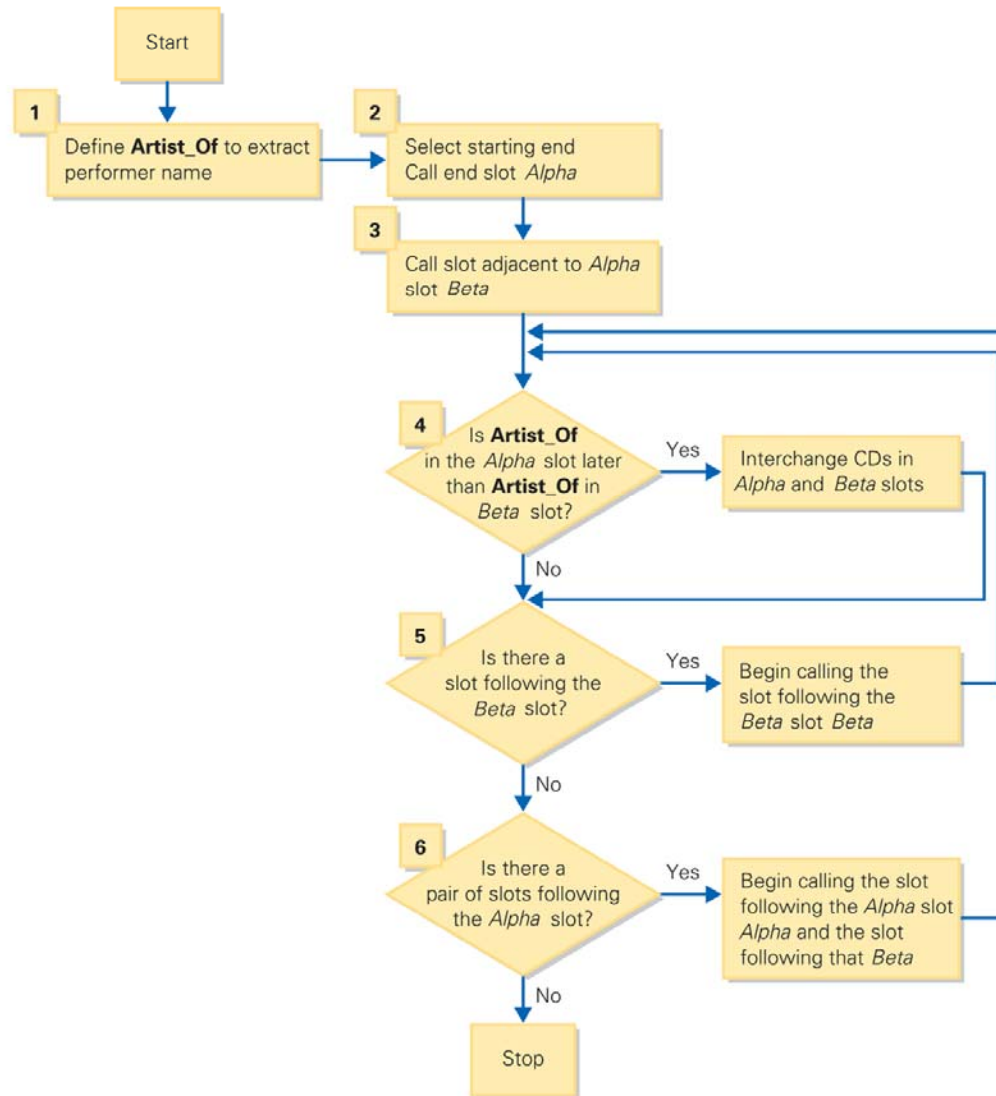


Figure 10.3. Flowchart of Alphabetize CDs. Operations are shown in rectangles; decisions are shown in diamonds. Arrows indicate the sequencing of the operations.



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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