What The Course Is About

- Data structures is concerned with the representation and manipulation of data.
- All programs manipulate data.
- So, all programs represent data in some way.
- Data manipulation requires an algorithm.

What The Course Is About

- Algorithm design methods needed to develop programs that do the data manipulation.
- The study of data structures and algorithms is fundamental to Computer Science.

Clip Art Sources

- www.barrysclipart.com
- www.livinggraphics.com
- www.rad.kumc.edu
- www.graphicmaps.com
Prerequisites

- Java
- Asymptotic Complexity
  - Big Oh, Theta, and Omega notations

Web Site

- www.cise.ufl.edu/~sahni/cop3530
- Handouts, syllabus, text, source codes, exercise solutions, lectures, assignments, past exams, past exam solutions, TAs, etc.
- My office data.

Assignments

- Assignment guidelines
- Submission procedures
- Do Assignment 0 by next week.

Source Codes

- Read download and use instructions.
- Must have Java 1.2 or higher.
- See ProgramIndex.htm, AllNames.html and other html files produced by Javadoc for Java codes.
Discussion Sections

- Go to any one
- TA will answer your questions
- TA will go through a few exercises from the book
- Web site lists what is done in each meeting of the discussion section

Organization of Text

- Three parts
- Part I … Chapters 1-4, Background
- Part 2 … Chapters 5-17, Data Structures
- Part 3 … Chapters 18-22, Algorithms
- Each chapter … concepts + applications

Grades

- 25% for assignments
- 25% for each test

Grades (Rough Cutoffs)

- A  >= 83%
- B+ >= 75%
- B  >= 70%
- C+ >= 65%
- C  >= 60%
- D+ >= 55%
- D  >= 50%
Sorting

- Rearrange \( a[0], a[1], \ldots, a[n-1] \) into ascending order. When done, \( a[0] \leq a[1] \leq \ldots \leq a[n-1] \)
- \( 8, 6, 9, 4, 3 \Rightarrow 3, 4, 6, 8, 9 \)

Sort Methods

- Insertion Sort
- Bubble Sort
- Selection Sort
- Count Sort
- Shaker Sort
- Shell Sort
- Heap Sort
- Merge Sort
- Quick Sort

Insert An Element

- Given a sorted list/sequence, insert a new element
- Given 3, 6, 9, 14
- Insert 5
- Result 3, 5, 6, 9, 14

Insert an Element

- 3, 6, 9, 14
- insert 5
- Compare new element (5) and last one (14)
- Shift 14 right to get 3, 6, 9, , 14
- Shift 9 right to get 3, 6, , 9, 14
- Shift 6 right to get 3, , 6, 9, 14
- Insert 5 to get 3, 5, 6, 9, 14
Insert An Element

// insert t into a[0:i-1]
int j;
for (j = i - 1; j >= 0 && t < a[j]; j--)
    a[j + 1] = a[j];
a[j + 1] = t;

Insertion Sort

▲ Start with a sequence of size 1
▲ Repeatedly insert remaining elements

Insertion Sort

▲ Sort 7, 3, 5, 6, 1
▲ Start with 7 and insert 3 => 3, 7
▲ Insert 5 => 3, 5, 7
▲ Insert 6 => 3, 5, 6, 7
▲ Insert 1 => 1, 3, 5, 6, 7

Insertion Sort

for (int i = 1; i < a.length; i++)
    { // insert a[i] into a[0:i-1]
        // code to insert comes here
    }
Insertion Sort

for (int i = 1; i < a.length; i++)
  // insert a[i] into a[0:i-1]
  int t = a[i];
  int j;
  for (j = i - 1; j >= 0 && t < a[j]; j--)
    a[j + 1] = a[j];
  a[j + 1] = t;
}