Welcome To...

Data Structures, Algorithms, & Applications

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Clip Art Sources

▲ www.barrysclipart.com
▲ www.livinggraphics.com
▲ www.rad.kumc.edu
▲ www.graphicmaps.com
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.
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

```java
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;
}