Lecture Outline (CS 303, Dong Xu, 1/23/04)

• Things to start…
  – Questions from last lecture?
  – Midterm: Friday, March 19???
  – Office hours
  – Mailing list
  – Syllabus
  – Reading and homework

• Outline
  – Review on pseudocode (2.1)
  – Loop invariant (2.1)
  – Analyzing algorithms (2.2)
  – Divide-and-conquer and merge sort (2.3.1)
• **Pseudocode**
  – Lines, blocks
  – for/while/if-then
  – Assignment
  – Object, attributes/fields
  – Similarity and difference between C/JAVA

• **Correctness of Insertion Sort: loop invariant**
  – Initialization
  – Maintenance
  – Termination
• Analyzing algorithms
  – Concept of RAM
    o Generic machine
    o Instruction vs. operation
  – Analyzing running time
    o Input size
    o Time: instance, best, worst, average (expected)
    o Why worst time is important?
    o Example for an instance
    o Detailed analysis for insertion sort
    o Order of growth (Θ notion)
• Divide-and-Conquer Approach
  – Merging two sorted list
    o Definition
    o Using card example
    o Pseudocode
    o Sentinel card
    o Loop invariant
    o Running time

  – Divide-and-conquer
    o Idea: divide, conquer, combine
    o Pseudocode
    o Example for an instance
    o Why bother?
• **Reading**
  - Chapter 2: 2.1
  - Chapter 2: 2.2
  - Chapter 2: 2.3.1
  - Chapter 2: 2.3.2 (optional now, will be revisited when discussing recurrences in Chapter 4)

• **Homework**
  - Ex. 2.2-2
  - Ex. 2.3-1
  - Ex. 2.3-2
  - Prob. 2-2 (bubblesort)
  - Implement divide-and-conquer together with Merge Sort in any computer language (optional)