Sorting

October 19, 2007

ComS 207: Programming I (in Java)
Iowa State University, FALL 2007
Instructor: Alexander Stoytchev

Midterm 2

- Next Tuesday (Oct 23, 2007)
- Location: Curtiss Hall, room 127 (classroom)
- Time: 6:30pm – 7:45pm
- Try to be there at least 10 minutes early.
- If you need extra time you can have it but this is **NOT** a 3 hour exam!

Midterm Format

- Covers Sections 1-5 & 7
- Also, Searching and Sorting
- Format same as Midterm 1

Midterm Format (last semester)

- True/False (10 x 1p each = 10p)
- Short answer (5 x 2p each = 10p)
- Code Snippets (5 x 3p each = 15p)
- Other Stuff (3 x 5p each = 15p)
- Other Stuff (3 x 5p each = 15p)
- Program 1 (15p)
- Program 2 (15p)
- Program 3 (15p)
- Program 4 (20p)

- TOTAL (130p)

Midterm Format

- You don't need to get all 130 points to get an A
- 100 is a 100
- You must get at least 65 points
  in order to pass this exam

Midterm Format

- Drop Deadline is next Friday (Oct 26)
- I cannot guarantee that all exams will be graded by then.
- If you believe that you did not do well please ask me to grade your exam first at the time when you are submitting it.

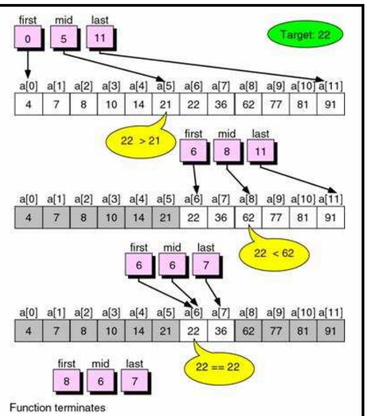
Quick review of last lecture

Binary Search

- At each step it splits the remaining array elements into two groups
- Therefore, it is faster than the linear search
- Works only on an already SORTED array
- Thus, there is a performance penalty for sorting the array

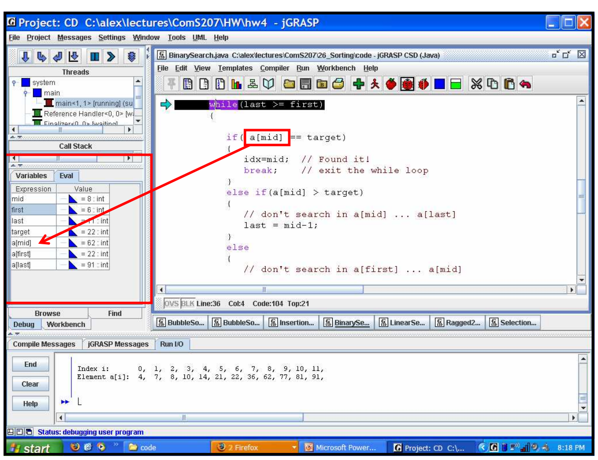
[http://web.ics.purdue.edu/~cs154/lectures/lecture011.htm]

Example: Successful Binary Search



[http://web.ics.purdue.edu/~cs154/lectures/lecture011.htm]

Example: BinarySearch.java



Analysis of Searching Methods

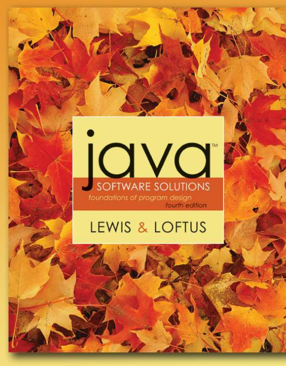
- For an array of size n

- Sequential Search (Average-Case) n/2
- Sequential Search (Worst-Case) n

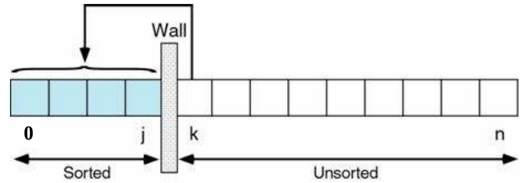
- Binary Search (Average-Case) log(n)/2
- Binary Search (Worst-Case) log(n)

Sorting

Not in the Textbook

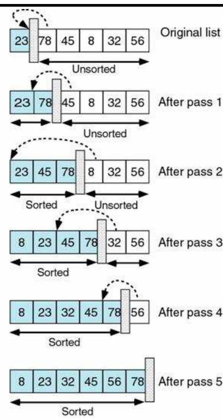


Insertion Sort



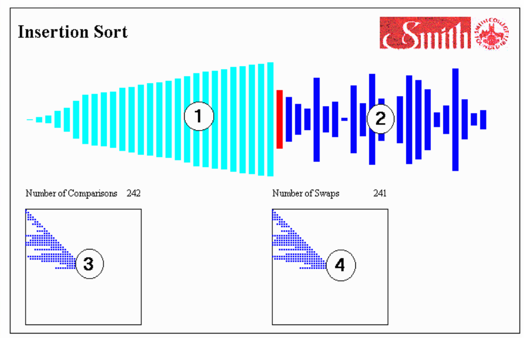
[http://web.ics.purdue.edu/~cs154/lectures/lecture010.htm]

Example: Insertion Sort



[http://web.ics.purdue.edu/~cs154/lectures/lecture010.htm]

Animations for Insertion Sort



[http://maven.smith.edu/~thiebaut/java/sort/demo.html]

Animations of Sorting Algoritms

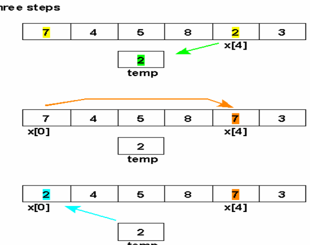
- http://maven.smith.edu/~thiebaut/java/sort/demo.html
- http://www.cs.ubc.ca/spider/harrison/Java/sorting-demo.html

Swapping Array Elements

Assume smallest element has been found at x[4]

Want to swap with x[0] element, bring smallest to beginning

Three steps



[http://www.scs.ryerson.ca/jpanar/w2006/cps125/example.gifs/ch7/Arr.Swap.gif]

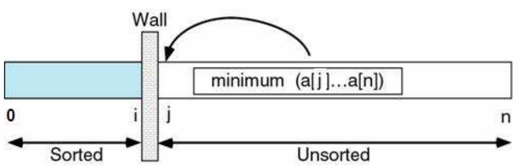
Java code

```
// Swap a[i] with the smallest element

int temp = a[i];
a[i] = a[minIndex];
a[minIndex] = temp;
```

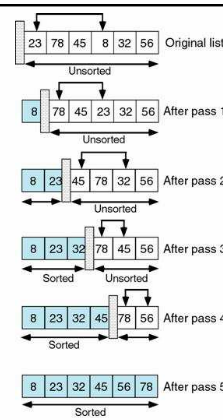

Example: InsertionSort.java

Selection Sort



[http://web.ics.purdue.edu/~cs154/lectures/lecture010.htm]

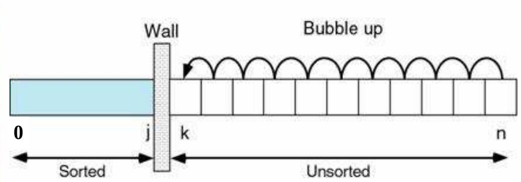
Example: Selection Sort



[http://web.ics.purdue.edu/~cs154/lectures/lecture010.htm]

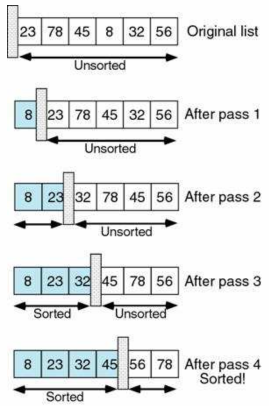
Example: SelectionSort.java

Bubble Sort



[http://web.ics.purdue.edu/~cs154/lectures/lecture010.htm]

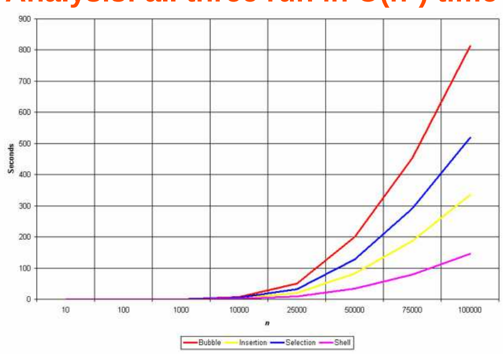
Example: Bubble Sort



[http://web.ics.purdue.edu/~cs154/lectures/lecture010.htm]

Example: BubbleSort.java

Analysis: all three run in O(n^2) time

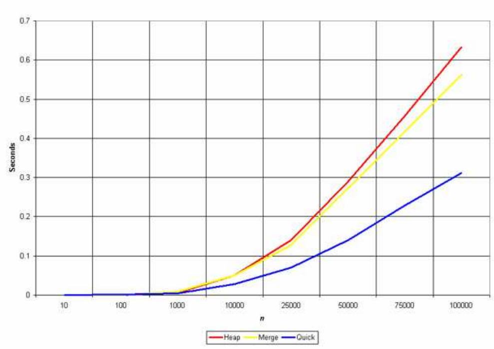


[http://linux.wku.edu/~lamonml/algor/sort/sort.html]

Analysis

- There are faster sorting algorithms
  - Heap sort
  - Quick sort
  - Merge Sort
- We will not cover those but feel free to study them on your own.
- They run in O(n log n) time.

O(n log n) sorting algorithms



[http://linux.wku.edu/~lamonml/algor/sort/sort.html]

THE END