Sorting

3-25-2011

Opening Discussion

- Do you have any questions about the IcP?

- Minute essay comments:

    - How to read the Scala API?

    - What would happen with an infinite loop that opens windows?

    - Move with click? Click and drag?

    - Changing fonts.

    - How do I feel about Spurs-Timmy?

Motivation

- There are many reasons that you might want the data you are working with to be in a particular order.

- If nothing else, humans often like seeing things in certain orders.

- It turns out that ordered data can be beneficial for the computer as well.

- Putting things in order by some value is called sorting.

Methods of Sorting

- If I ask you to sort a bunch of items, how would you go about doing it? Describe your approach.

- How does it vary for different types or configurations of objects?

O(n²) Sorts

- We are going to look at three different sorting techniques today.

- These sorts all do work that is proportional to the square of the number of elements.

- That isn't good for large collections, but the sorts are fairly simple to write.

- These work "in place" so we use arrays.

- Each involves an inner loop that reorders things and an outer loop that makes the inner one happen over and over.

Bubble Sort

- Inner loop:
  - Compare adjacent elements and swap them if they are out of order.

- Outer loop:
  - Repeat n-1 times or until no swaps are done.
  - The latter option is called a flagged bubble sort.

Selection Sort

- This is often called a min-sort or a max-sort depending on how you write it. I'll describe a min-sort here.

- Inner loop:
  - Find the smallest element and SWAP it into position if not already there.

- Outer loop:
  - Repeat n-1 times so all elements are in the right place.

- Does only O(n) swaps, but still O(n^2) comparisons.

Insertion Sort

- Inner loop:
  - Take the next element and shift it down to the right spot.
- Outer loop:
  - Run through all the elements starting with the second.
- This sort is actually a bit faster (factor of 2) on random data. It is really efficient on nearly sorted data.

Watching Them Work

- One advantage of doing graphics before sorting is that we can write code to visualize what is happening when we sort numbers with these sorts.

- Let's write this code and watch our sorts work.

Minute Essay

- Show me what would happen after each iteration of the inner loop if we min-sort these values.
  - 4, 7, 1, 3, 8, 2
- The IcP is on Monday.