Sorting

11-2-2011

Opening Discussion

- Minute essay comments:
  - Will your final project game look like what we did in class last time?
  - Getting diagonal movement with keys.
  - User input to draw stuff. (No API call.)
  - How much do these graphics calls translate to the real world?
  - You can listen to mouse.wheel for scrolling.
  - Resubmit assignments whenever. Just e-mail me.
  - Why can't Putty pop up GUI windows?
- IcP Solutions

Writing Transforms

- Last time we mentioned AffineTransforms, but didn't see what they can do.
- Let's take some time now to write code that uses an AffineTransform in our drawing.

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(n^2) 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
- Registration info:
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