

CS 101 Lab 3

Sorting

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The lab report is due before class on Wednesday 2/16/2011. You need to write your answers for all the exercises in a word file. Submit your word file through the lab3 dropbox on angel.

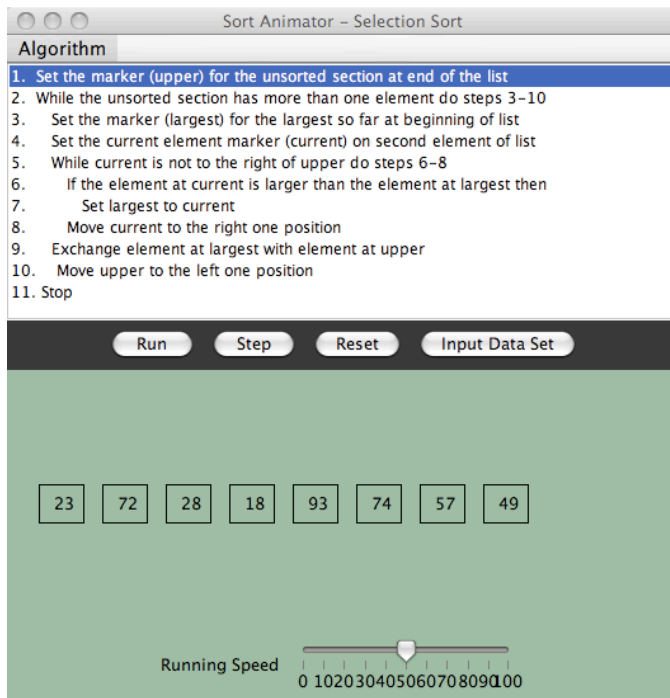
Objectives

- Use an animator to gain a better understanding of the selection sort and bubble sort algorithm.
- Interpret the distinctive data patterns generated by different sorting algorithms.

Part 1: Stepping through selection sort and bubble sort.

The lab software should be on your desktop since you have downloaded it for previous labs. If you need to download it again, go to the lab folder on ANGEL. To begin this part of the lab, click the **Sort Animator** button on your lab software menu. At this time, a new window will appear. The components on this window is very similar to the searching animator we used in lab 2. This animator provides selection sort, bubble sort, and three other sorting algorithms. You can select individual algorithms by clicking the **Algorithm** menu. We will only use selection sort and bubble sort algorithm.

You may again notice that the pseudo-code differs slightly from what we learned in the lecture. This is fine since pseudo-code isn't intended to be rigid and exact, but rather provide the constructs needed to convey in a fairly precise way how the algorithm performs its task.



Exercise 3.1

Choose the **Selection Sort** algorithm from the **Algorithm** menu. Click on the **Step** button until you see exactly how the algorithm works. Each time, before clicking, try to anticipate what is going to happen when you click on the button.

Q1: Enter the following data using the Input Data Set button: 34 52 21 14 67 59 30 18. Show the exact arrangement of the data after 3 major passes have been made by selection sort algorithm, where a major pass is completed each time we come back to step 2.

Exercise 3.2

Choose the **Bubble Sort** algorithm from the **Algorithm** menu. Click on the **Step** button until you see exactly how the algorithm works. Each

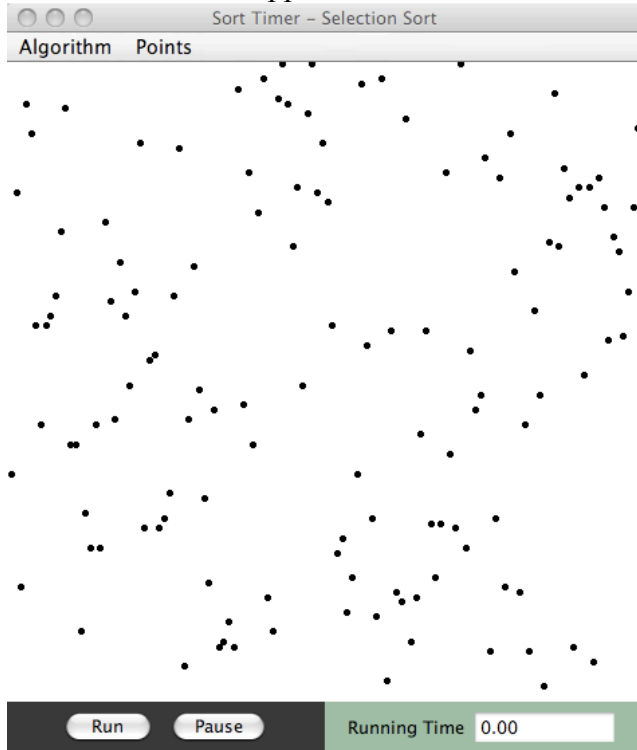
time, before clicking, try to anticipate what is going to happen when you click on the button.

Q2: Enter the following data using the Input Data Set button: 34 52 21 14 67 59 30 18. Show the

exact arrangement of the data after 3 major passes have been made by bubble sort algorithm, where a major pass is completed each time we come back to step 2.

Part 2: Sort Timing

To begin the second part of the lab, click the **Sort Timer** button on your lab software menu. At this time, a new window will appear.



The **Algorithm** menu provides a choice of sort algorithms including both selection sort and bubble sort. The **Points** menu gives a choice as to the number of points to be sorted. The time it takes to do the sort is shown in the lower-right. The **Pause** button can be used to temporarily suspend the sorting process. Clicking **Pause** again will resume the execution of the algorithm. You can obtain a new set of randomly generated data by making a selection from the **Points** menu.

Exercise 3.3

Choose the **Selection Sort** algorithm from the **Algorithm** menu. Choose **128 points** from the **Points** menu. Click **Run** button and observe the change on the scatter plots until sorting is finished. Repeat the above steps for **Bubble Sort** algorithm.

Q3: Use Selection Sort algorithm to sort a scatter plot with 128 points three times. Write down the time it took for each sorting. Calculate the average

time. Again use Bubble Sort to sort scatter plots with 128 points for three times. Calculate its average time. Are these two sorting algorithms on par with each other?

Q4: Discuss differences you note between the scatter plots for selection sort and bubble sort. Explain these differences in terms of the algorithms. In other words, if you were given a scatter plot of a partially completed sort, how could you tell whether it was selection sort or bubble sort?

Q5: Choose the Quick Sort algorithm from the algorithm menu and run it on a 128-point scatter plot for three times. What do you think about the efficiency of quick sort algorithm compared with selection sort or bubble sort?

When you are done with the lab, log out the computer.