CS211: Computer Programming Laboratory Date: 17.8.07

Topic: Sorting and Searching

LINEAR SEARCH: Linear(Data,N,Item,Loc)

*Here **Data** is a linear array with N elements, and **Item** is a given item to be searched. The algorithm finds the location **Loc** of **Item** in **Data**, or sets Loc=-1, if search is unsuccessful.*

Step 1: Insert **Item** at the end of **Data**
Step 2: Initialize counter
Step 3: Search for Item:
Repeat while Data[Loc]≠Item
Set Loc=Loc+1
Step 4: If Loc=N+1, then LOC=-1
Step 5: Exit

What is the best and worst case number of comparisions? Can you compute the average number of comparisions? (Hint: assume that the Item being searched can be in any of the locations with equal probability. Using this compute the expected number of comparisions.)

BINARY SEARCH: Binary(Data,LB,UB,Item,Loc)

*Here **Data** is a sorted array with lower bound **LB** and upper bound **UB** and **Item** is a given information. The variables **Beg**, **End** and **Mid** denote, respectively, the beginning, end and the middle locations of a segment of **Data**. This algorithm finds the location **Loc** of **Item** in **Data** or sets **Loc**=Null.*

Step 1: Initialize: Set: Beg=LB, End=UB, Mid=int((Beg+End)/2)
Step 2: Repeat Steps 3 and 4 while Beg ≤ End and Data[Mid] ≠Item.
Step 3: If Item<Data[Mid], then:
Set: End=Mid-1
Else
Set: Beg=Mid+1
Step 4: Set Mid=int((Beg+End)/2)
Step 5: If Data[Mid]=Item,
Then Set: LOC=Mid
Else
Set: LOC=NULL
Step 6: Exit

Compute the worst case and best case number of comparisions.
Disadvantages: The list has to be maintained as a sorted array, which might be very expensive in real life. Hence, other data structures are used *(The data may be organized in many different ways; the logical or mathematical model of a particular organization of data is called a data structure).*

Todays Programming Problem

The median of an array of numbers is the element m of the array such that half the remaining numbers in the array are greater than or equal to m and half are less than or equal to m, if the numbers of elements in the array is odd. If the number of elements is even, the median is the average of the two elements m_1 and m_2, st half the remaining elements are greater than or equal to m_1 and m_2, and half the elements are lesser than or equal to m_1 and m_2. Write a C function that accepts an array of numbers and returns the median of the numbers in the array.

Home Assignment Deadline: 25.8.07

Definition of lexicographic sorting:

We say that $c_1c_2\ldots c_k<d_1d_2\ldots d_m$ if either of the following conditions hold:
1. The first string is a proper prefix of the second, which means that k<m and for i=1,2,…,k we have $c_i=d_i$. According to this rule, bat<batter. As a special case of this rule, we could have k=0, in which the first string is empty.

2. For some value of i>0, the first i-1 characters of the two strings agree, but the i^{th} character of the 1^{st} string is less than the i^{th} character of the 2^{nd} string. That is, $c_j=d_j$ for j=1,2,…,i-1, and $c_i<d_i$. According to this rule, ball<base.

Write a function to compare(string1,string2) which returns 0 if string1<string2 else 1. Use the function to perform a sort (use insertion sort) on an array of strings.