Lab 4

Objectives:

- Sign up for the lab
- Recursive Solutions
- Submit one file: *SortedArrayLis.java* at the end of the lab. Click the "Submit" button

1. Lab4.java

Recursion is an extremely powerful problem-solving technique. Some problems can be solved elegantly with recursion. Recursion is based on the strategy called divide and conquer. You solve the problem by divide the problem into a smaller problem. The dividing continues until you reach the base case, which is small enough to be solved. Note that not all the recursive solutions are efficient. For example, the recursive solution to Fibonacci Sequence is not efficient. The iterative solution is much faster. Download Lab4.java and examine the code.

2. SortedArrayList.java

Searching is an important task that occurs frequently. To search a number in an integer array, using linear search, the running time is O(n). If the integers are sorted, a binary search can improve the efficiency to O(lg(n)). For example, to search a phone number in a phonebook using binary search, every time half of the items are discarded. Though binary search is more efficient, the pre-condition is that the items are sorted.

The algorithm for binary search is:

```
 int binarySearch (first, last, value)
{
        if ( first > last )
                return -1;
        middle = (last+first)/2;

        if(storage[middle] < value)
                return binarySearch (middle+1, last, value);
        else if ( value < storage[middle])
                return binarySearch (first, middle-1,value);
        return middle;
}
```

Use Connex to submit one file: *SortedArrayLis..java* at the end of the lab. Make sure you click the "Submit" button.