DOCUMENTATION

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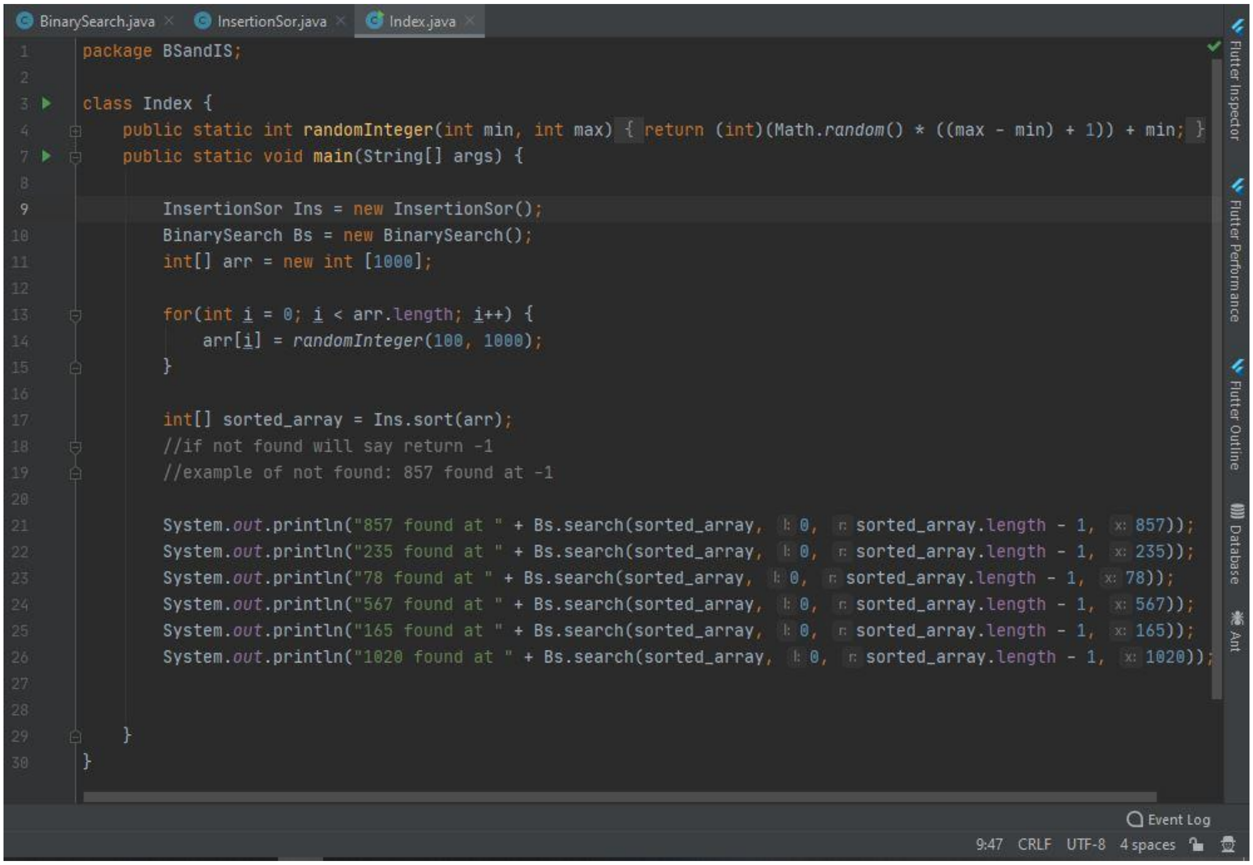
INTRODUCTION

I have chosen the Selection short data structure on an array to fit for my application for the Binary search and insertion sort as per the system.

The source code has not been included in this document as readability will be hindered. So I suggest opening index.java, BinarySearch.java, and InsertionSor.java in a suitable IDE or a text editor. Regardless, below I will include a few screenshots of the code and how it looks when it's running. Please check all the pages.

INDEX

Index is parent class file of BSandIS system. file name is index.java.

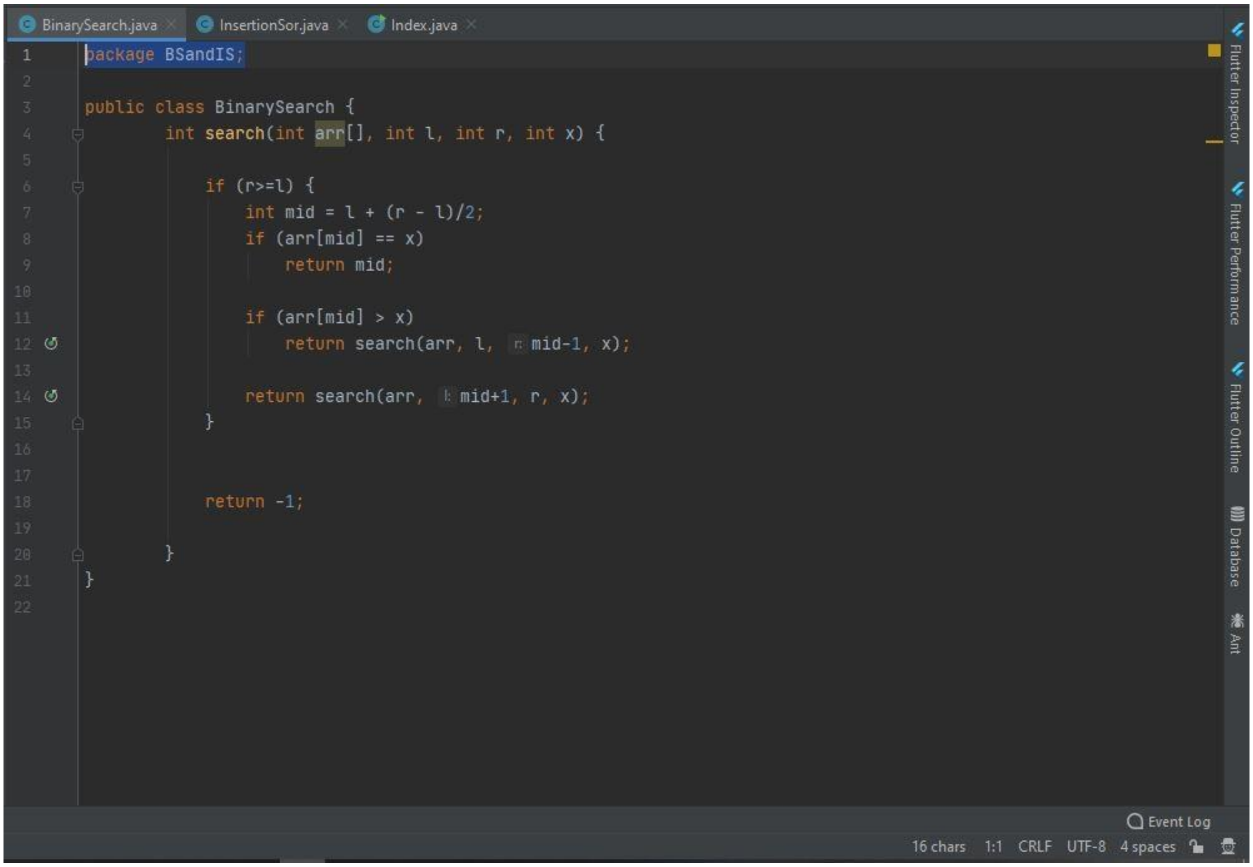


```java
package BSandIS;

class Index {
    public static int randomInteger(int min, int max) { return (int)(Math.random() * ((max - min) + 1)) + min; }
    public static void main(String[] args) {

        InsertionSor Ins = new InsertionSor();
        BinarySearch Bs = new BinarySearch();
        int[] arr = new int[1000];

        for(int i = 0; i < arr.length; i++) {
            arr[i] = randomInteger(100, 1000);
        }

        int[] sorted_array = Ins.sort(arr);
        //if not found will say return -1
        //example of not found: 857 found at -1

        System.out.println("857 found at " + Bs.search(sorted_array, l: 0, r: sorted_array.length - 1, x: 857));
        System.out.println("235 found at " + Bs.search(sorted_array, l: 0, r: sorted_array.length - 1, x: 235));
        System.out.println("78 found at " + Bs.search(sorted_array, l: 0, r: sorted_array.length - 1, x: 78));
        System.out.println("567 found at " + Bs.search(sorted_array, l: 0, r: sorted_array.length - 1, x: 567));
        System.out.println("165 found at " + Bs.search(sorted_array, l: 0, r: sorted_array.length - 1, x: 165));
        System.out.println("1020 found at " + Bs.search(sorted_array, l: 0, r: sorted_array.length - 1, x: 1020));


    }
}
```

Figure 1: Index.java file screen shot

BINARY SEARCH

Binary Search is children class file of BSandIS system. file name is BinarySearch.java.

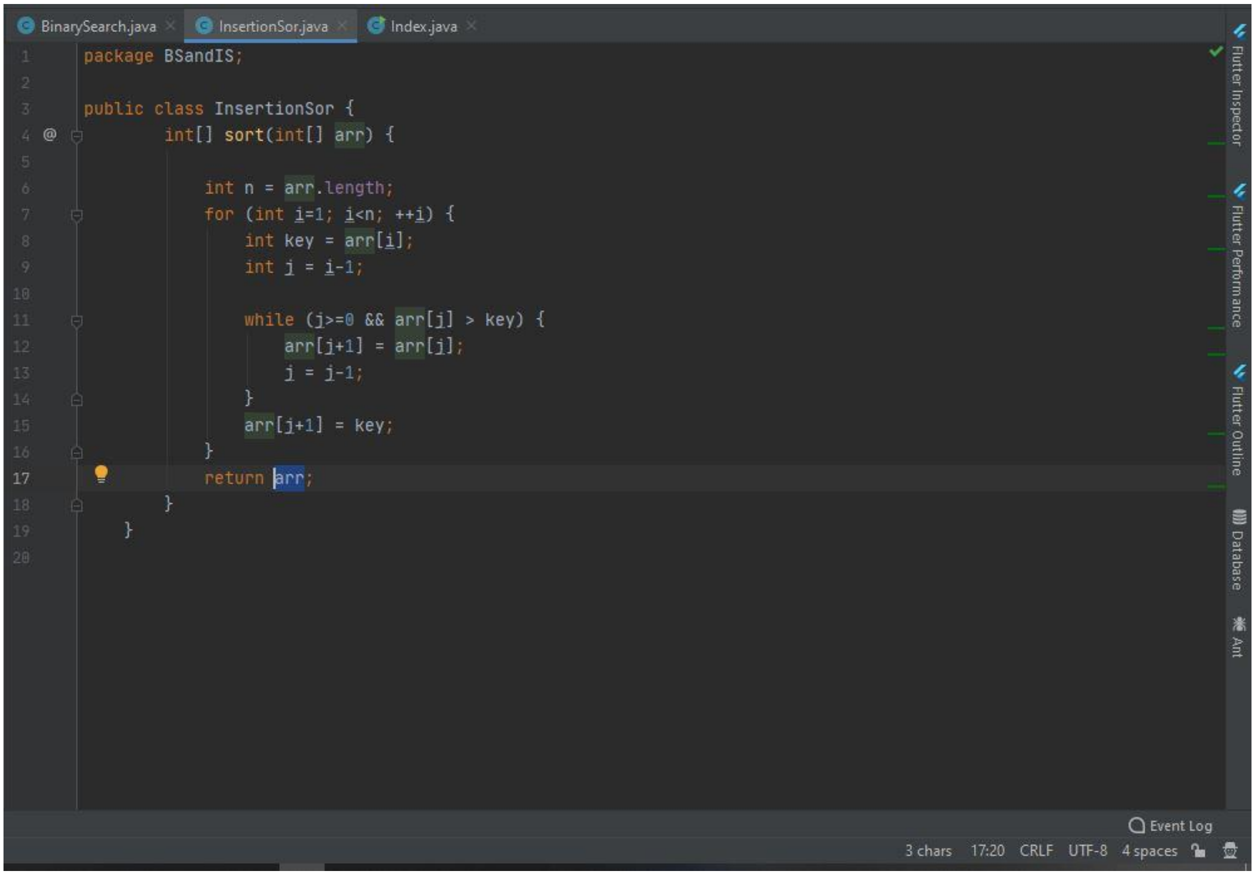


```java
package BSandIS;

public class BinarySearch {
        int search(int arr[], int l, int r, int x) {

            if (r>=l) {
                int mid = l + (r - l)/2;
                if (arr[mid] == x)
                    return mid;

                if (arr[mid] > x)
                    return search(arr, l, r: mid-1, x);

                return search(arr, l: mid+1, r, x);
            }


            return -1;

        }
}
```

Figure 2: BinarySearvh.java file screen shot

INSERTION SORT

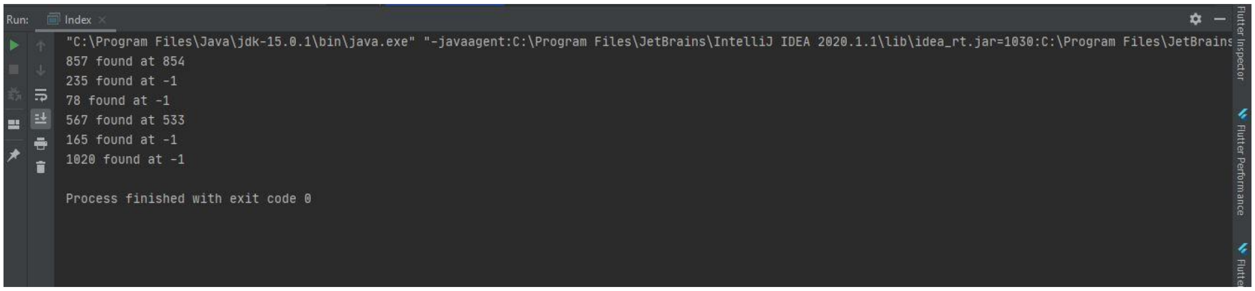
Insertion sort also another children class file of BSandIS system. file name is InsertionSor.java



```java
package BSandIS;

public class InsertionSor {
        int[] sort(int[] arr) {

            int n = arr.length;
            for (int i=1; i<n; ++i) {
                int key = arr[i];
                int j = i-1;

                while (j>=0 && arr[j] > key) {
                    arr[j+1] = arr[j];
                    j = j-1;
                }
                arr[j+1] = key;
            }
            return arr;
        }
    }
```

Figure 3: InsertionSor.java file screen shot

OUTPUT



```
"C:\Program Files\Java\jdk-15.0.1\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2020.1.1\lib\idea_rt.jar=1030:C:\Program Files\JetBrains
857 found at 854
235 found at -1
78 found at -1
567 found at 533
165 found at -1
1020 found at -1

Process finished with exit code 0
```

Figure 4: BSandIS system output screen shot