CS501
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Week9:Homework9

```java
package week9;

public class Executiontime {

    public static void main(String args[]) {

        int arr2D[][] = { { 1, 3, 5, 7, 9, 3, 4, 4, 5, 6 },

                { 1, 3, 5, 7, 9, 3, 4, 4, 5, 6 },

                { 1, 3, 5, 7, 9, 3, 4, 4, 5, 6 },

                { 1, 3, 5, 20, 25, 24, 33, 5, 6, 4 },

                { 1, 3, 5, 20, 35, 24, 32, 5, 6, 4 },

                { 1, 3, 5, 20, 28, 34, 23, 5, 6, 4 },

                { 1, 3, 5, 21, 25, 27, 23, 5, 6, 4 },

                { 1, 3, 5, 7, 9, 3, 4, 4, 5, 6 },

                { 1, 3, 5, 7, 9, 3, 4, 4, 5, 6 },

                { 1, 3, 5, 7, 9, 3, 4, 4, 5, 6 }

        };

        // Convert to 1D array.

        int arr1D[] = new int[arr2D.length * arr2D.length]; // since rows & column are same.

        for (int i = 0; i < arr2D.length; i++) {

            for (int j = 0; j < arr2D.length; j++) {

                arr1D[(i * arr2D.length) + j] = arr2D[i][j];

            }

        }

        // print(arr1D);

        long startTime = System.nanoTime();

        int cArr[] = countingSort(arr1D);

        long stopTime = System.nanoTime();

        // print(cArr);

        System.out.println("Execution time for CountingSort is : " + (stopTime - startTime) + " nano sec");
```

```
        startTime = System.nanoTime();

        int histArr[] = histogramSort(arr1D);

        stopTime = System.nanoTime();

        // print(histArr);

        System.out.println("Execution time for HistogramSort is : " + (stopTime - startTime) + " nano sec");

    }

    private static int[] histogramSort(int[] arr) {

        int n = arr.length;

        int output[] = new int[n];

        int counter = 0;

        int count[] = new int[256];

        for (int i = 0; i < 256; ++i)

            count[i] = 0;

        for (int i = 0; i < arr.length; ++i)

            ++count[arr[i]];

        for (int i = 0; i < 256; ++i) {

                if (count[i] > 0) {

                    int num = count[i];

                    while (num > 0) {

                        output[counter++] = i;

                        num--;

                    }

                }

            }

            return output;

        }

        private static void print(int[] arr) {

            for (int i = 1; i <= arr.length; i++) {

                System.out.print(arr[i - 1] + " ");

                if (i % 10 == 0) {

                    System.out.println();
```

```
117             }
118
119         }
120
121     }
122
123     private static int[] countingSort(int[] arr) {
124
125         int n = arr.length;
126
127         int output[] = new int[n];
128
129         int count[] = new int[256];
130
131         for (int i = 0; i < 256; ++i)
132
133             count[i] = 0;
134
135         for (int i = 0; i < arr.length; ++i)
136
137             ++count[arr[i]];
138
139         // Change count[i] so that count[i] now contains actual
140
141         // position of this character in output array
142
143         for (int i = 1; i <= 255; ++i)
144
145             count[i] += count[i - 1];
146
147         // Build the output character array
```

```
148
149         // To make it stable we are operating in reverse order.
150
151         for (int i = n - 1; i >= 0; i--)
152
153         {
154
155             output[count[arr[i]] - 1] = arr[i];
156
157             --count[arr[i]];
158
159         }
160
161         return output;
162
163     }
164
165 }
166
```

Problems Javadoc Declaration Console

<terminated> Executiontime [Java Application] C:\Program Files\Java\jre1.8.0_211\bin\javaw.exe (Nov 11, 2019, 11:46:38 PM)

```
Execution time for CountingSort is : 10300 nano sec
Execution time for HistogramSort is : 8900 nano sec
```