**DAA Programming Project**

**Program File** : DAASortAlgorithms.py

**Python Version** : Python 3.9

**Python packages Imported:**

import copy

import random

import time

import matplotlib.pyplot

Install the above packages in Python Interpreter if not present.

IDE Used : PyCharm

IDE version - 2021.2.1

Program Explanation:

**sortingComparison()** is the main method that is executed in the program inside which the user inputs are received and the appropriate algorithms are executed.

1. The programs asks the user on how many lists are to be sorted. Once user enters the number of lists, the size of these lists are received as input from user.

Eg: if 3 different sized list are to be sorted, the user then enters three different sizes as next input.

1. The size of the lists to be sorted is displayed in a list to user.
2. The program lists all the algorithm and asks user to select which algorithms to execute.

Note: The user can select any number of algorithms or choose 8 to run and compare all the algorithms. (only numbers 1 to 9 are accepted) and entering 9 at the end will run the selected algorithms.

1. The program displays the selected options as a list and executes and displays the selected algorithms.
2. Once executed, the graph is displayed plotting the size of the input and runtime.

Methods called for execution:

Mainmethod: **sortingComparison()**

Insertion Sort --- insertionSort(list)

Merge Sort --- mergeSort(list)

Heapsort --- heapSort(list), form\_heap(list,length,i)

Bubble Sort ---bubbleSort(list)

Selection Sort ---selectionSort(list)

Quick Sort --- partition(list, start, end), quicksort(list, start, end)

Three Way Quick Sort ---

threewaypartition(list,first,last,start,mid), threewayQuicksort(list, first, last).

Sample Program Execution: (Entries in **Bold** are user inputs)

Enter the number of lists to sort: **3**

Enter the size of elements in each of these lists

**5**

**10**

**15**

The size of the Lists: [5,10,15]

Select the Algorithm to sort from the options :

1.Insertion Sort

2.Merge Sort

3.HeapSort

4.BubbleSort

5.Selection Sort

6.Quick Sort

7.Three Way Quick Sort

8.All Algorithms Comparison

Press ‘9’ to view the selected algorithms

**1**

**3**

**5**

**9**

The selected algorithms are [1,3,5]

The list before using sort is :

[16, 900, 565]

The sorted List after using Insertion Sort is :

[16, 565, 900]

Runtime after using Insertion Sort is :

[1.3113021850585938e-05]

The list before using sort is :

[16, 900, 565]

The sorted List after using Heap Sort is :

[16, 565, 900]

Runtime after using Heap Sort is :

[2.09808349609375e-05]

The list before using sort is :

[16, 900, 565]

The sorted List after using Selection Sort is :

[16, 565, 900]

Runtime after using Selection Sort is :

[8.106231689453125e-06]

The list before using sort is :

[933, 205, 328, 906, 510]

The sorted List after using Insertion Sort is :

[205, 328, 510, 906, 933]

Runtime after using Insertion Sort is :

[1.3113021850585938e-05, 9.059906005859375e-06]

The list before using sort is :

[933, 205, 328, 906, 510]

The sorted List after using Heap Sort is :

[205, 328, 510, 906, 933]

Runtime after using Heap Sort is :

[2.09808349609375e-05, 9.799003601074219e-05]

The list before using sort is :

[933, 205, 328, 906, 510]

The sorted List after using Selection Sort is :

[205, 328, 510, 906, 933]

Runtime after using Selection Sort is :

[8.106231689453125e-06, 1.9788742065429688e-05]

The list before using sort is :

[739, 204, 935, 366, 602, 154]

The sorted List after using Insertion Sort is :

[154, 204, 366, 602, 739, 935]

Runtime after using Insertion Sort is :

[1.3113021850585938e-05, 9.059906005859375e-06, 1.3828277587890625e-05]

The list before using sort is :

[739, 204, 935, 366, 602, 154]

The sorted List after using Heap Sort is :

[154, 204, 366, 602, 739, 935]

Runtime after using Heap Sort is :

[2.09808349609375e-05, 9.799003601074219e-05, 2.6226043701171875e-05]

The list before using sort is :

[739, 204, 935, 366, 602, 154]

The sorted List after using Selection Sort is :

[154, 204, 366, 602, 739, 935]

Runtime after using Selection Sort is :

[8.106231689453125e-06, 1.9788742065429688e-05, 1.3113021850585938e-05]

Process finished with exit code 0