Design & Analysis of Algorithms

Monsoon Semester III 2020-21

Lab - 1

Topics: To Compute the performance of sorting algorithms

INTRODUCTION

In this lab we would be evaluating the performance of sorting algorithm. Performance of bubble Sort, insertion sort, selection sort, merge sort & quick sort would be carried out.

EXERCISE

1. Implement insertion sort, selection sort bubble sort, merge sort and quick sort. The number of inputs elements has to be passed from command line arguments. The elements has to be generated randomly within the code. Compute:

   a. Check the performance of program by varying the number of elements.

   b. Compute the time taken by each case (for particular number of inputs) n = 10, 100, 1000, 10000, 1000000.

   c. plot a graph with number of inputs Vs time taken in seconds.

   d. Compare the graphical plots for each sorting algorithms with its theoretical time complexity.

   e. Also compute the time taken for sorted array (worst case) and compare with different number of elements. A sample example of sorting has been given below.

HELP

Taking input from command line arguments

There are two common ways to take arguments from command line and they are

- sys.argv
- argparse module

```python
import sys
# total arguments
n = int(sys.argv[1])
print("The number of elements is :", n)
```

Run this at terminal –> python3 test.py 10

Random Numbers

The code to generate random numbers is given below

```python
import random
# Generate 5 random numbers between 10 and 30
randomlist = random.sample(range(10, 30), 5)
print(randomlist)
```

Time

To compute the time taken by the program is given below

```python
import time

# starting time
start = time.time()

# program body starts
for i in range(10):
    print(i)

# sleeping for 1 sec to get 10 sec runtime
time.sleep(1)

# program body ends
# end time
end = time.time()

# total time taken
print(f"Runtime of the program is {end - start}")
```

EXAMPLE

A sample example to write sorting algorithm.

```python
import time

def Sort_Algorithm(arr):
    n = len(arr)
  # Your Sorting Algorithm

def printList(arr):
    for i in range(len(arr)):
        print(arr[i], end =" ")
    print()

# driver code to test the above code
if __name__ == '__main__':
    arr =
    print ("Given array is", end ="\n")
    printList(arr)
    # starting time
    start = time.time()
    # program body starts
    Sort_Algorithm(arr) # put different Sorting Algorithms
    # program body ends
    # end time
    end = time.time()
    print("Sorted array is: ", end ="\n")
    printList(arr)
    # total time taken
    print("Runtime of the program is {end - start}")
```