Design & Analysis of Algorithms
Monsoon Semester III 2020-21
Lab - 2
Due Date: **14 September 2020**
Topic: Iterative Vs Recursion

INTRODUCTION

In this lab we would be implementation two sorting algorithm, quick sort and merge sort. The implementation would be carried out using iterative and recursive methods. Additionally, you would be also computing the memory utilization for each program.

EXERCISE

1. Implement merge sort and quick sort using iterative and recursive methods. 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).
    c. Plot a graph with number of inputs to time taken in seconds.
    d. Compute and compare the memory taken by recursive and iteration implementation of the two sorting algorithms.

SUBMISSION

You would be submitting three types of files in your folder under LAB2 in google drive. These are

1. One/Two page write up report.
2. Source code : It should run on any PC just by giving the number of elements as command line arguments.
3. snaps of Output

HELP

Computing Memory Utilization

Inorder to compute the memory utilize by program, python library **psutil** is used. Psutil is a module providing an interface for retrieving information on running processes and system utilization (CPU, memory) in a portable way by using Python, implementing many functionalities offered by tools like ps, top and Windows task manager.

It currently supports Linux, Windows both 32-bit and 64-bit architectures, with Python versions from 2.6 to 3.5 (users of Python 2.4 and 2.5 may use 2.1.3 version).

```
import psutil
# gives a single float value
psutil.cpu_percent()
# gives an object with many fields
psutil.virtual_memory()
# you can convert that object to a dictionary
dict(psutil.virtual_memory()._asdict())
# you can have the percentage of used RAM
psutil.virtual_memory().percent
79.2
# you can calculate percentage of available memory
psutil.virtual_memory().available * 100 / psutil.
   virtual_memory().total
20.8
```

Installation psutil

The installation guide for installing psutil package is given **WebLinkClickHere**

Linux Ubuntu / Debian:

sudo apt-get install gcc python3-dev

sudo pip3 install psutil

Linux Redhat:

sudo yum install gcc python3-devel

sudo pip3 install psutil

Windows:

pip3 install psutil

Sample Function to get memory utilization

```
def memory_usage_psutil():
    # return the memory usage in MB
    import psutil
    process = psutil.Process(os.getpid())
    mem = process.get_memory_info()[0] / float(2 ** 20)
    return mem
```

The above function returns the memory usage of the current Python process in MiB. Depending on the platform it will choose the most accurate and fastest way to get this information.

Happy Learning