

# **Report 2**

## **Lab 2**

### **Pthreads**

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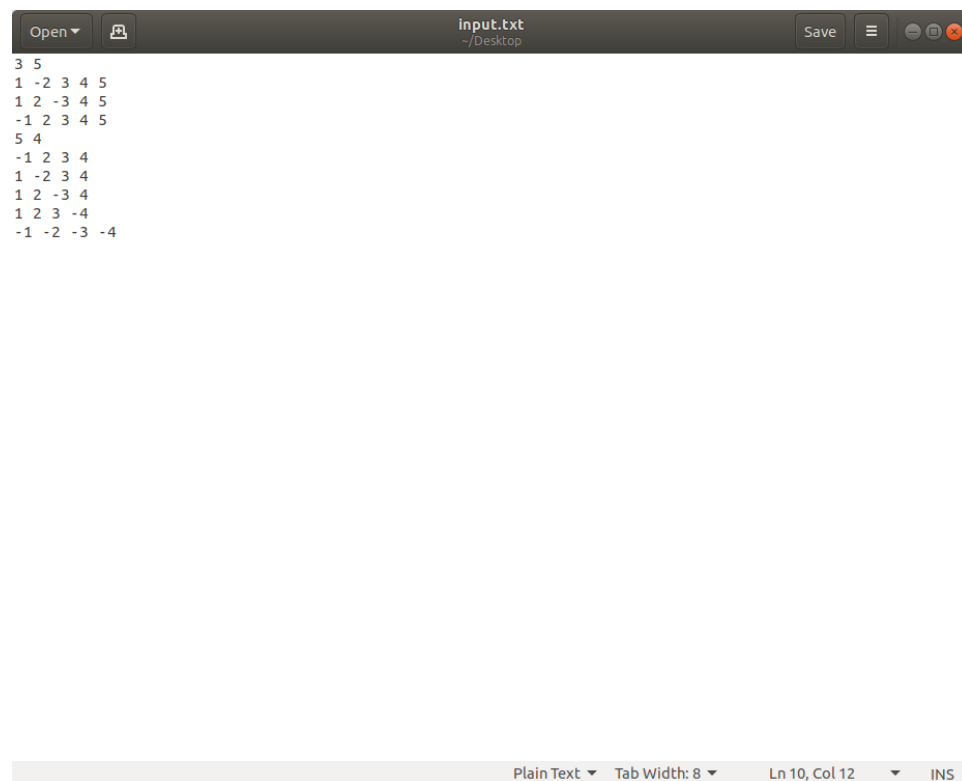
The following program is responsible for tackling the skills learned from the operating systems course in threads and thread management by implementing some of the famous algorithms using threads.

### **1- Matrix Multiplication:**

Matrices are being scanned at first one by one from the input.txt file and then each procedure has its own functions for procedure 1 each element is calculated in a thread alone, while in the second procedure each row is calculated in a thread alone. Time is calculated in each thread and ofcourse when each element is calculated in a thread it takes more time than each row because number of threads is greater in the first procedure.

### **Major Functions:**

1- Scaninputfile (): scans the two-D matrices into array data structures

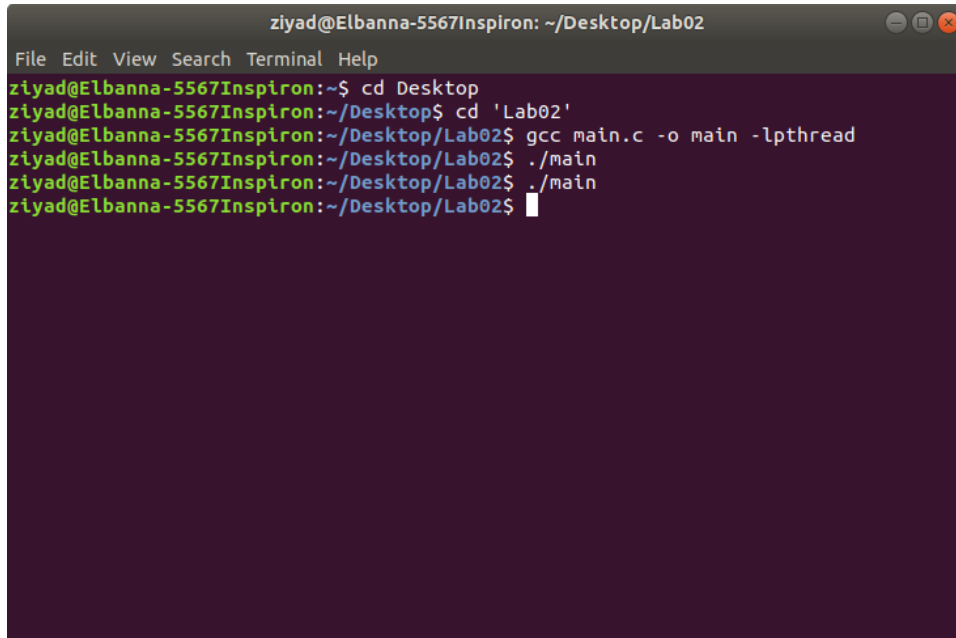


```
3 5
1 -2 3 4 5
1 2 -3 4 5
-1 2 3 4 5
5 4
-1 2 3 4
1 -2 3 4
1 2 -3 4
1 2 3 -4
-1 -2 -3 -4
```

Plain Text ▾ Tab Width: 8 ▾ Ln 10, Col 12 ▾ INS

Screen shot shows input.txt file before scanning matrices a and b

2- **Matmultiply1&2()**: each one has its own procedure using POSIX in different places of the iteration.

A terminal window titled 'ziyad@Elbanna-5567Inspiron: ~/Desktop/Lab02'. The window has a menu bar with 'File', 'Edit', 'View', 'Search', 'Terminal', and 'Help'. The terminal shows the following commands and their outputs:

```
ziyad@Elbanna-5567Inspiron:~$ cd Desktop
ziyad@Elbanna-5567Inspiron:~/Desktop$ cd 'Lab02'
ziyad@Elbanna-5567Inspiron:~/Desktop/Lab02$ gcc main.c -o main -lpthread
ziyad@Elbanna-5567Inspiron:~/Desktop/Lab02$ ./main
ziyad@Elbanna-5567Inspiron:~/Desktop/Lab02$ ./main
ziyad@Elbanna-5567Inspiron:~/Desktop/Lab02$
```

Code is run using command line as shown above

A text editor window titled 'output.txt' with a subtitle '~ /Desktop/Lab02'. The window has a menu bar with 'Open', 'Save', and a hamburger menu icon. The text content is as follows:

```
-1 10 -15 -28
-3 -10 15 -36
5 -2 -9 -20
END1 0.001946
-1 10 -15 -28
-3 -10 15 -36
5 -2 -9 -20
END2 0.000250
```

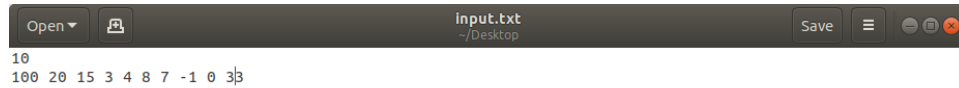
Results which are taken after multiplying of matrices a and b and saving the result in output.txt

## **2- Mergesort**

The famous function of mergesort is implemented using structures and threads to tackle the application of POSIX in os. Firstly the array is being input then its sorted using mergesort recursively and then output the array printed.

## **Major Functions:**

1- inputarray() : Inputs the array from the text file nput.txt and saves it in array data structure



Screen shot shows the input array before saving it in datastructure array.

2- mergeSort(): the famous function of merge sort by using pthreads for each subarray recursively and saving the data each time in a structure

```
ziyad@Elbanna-5567Inspiron: ~/Desktop/Lab02/Lab2 mergesort
File Edit View Search Terminal Help
ziyad@Elbanna-5567Inspiron:~/Desktop/Lab02$ ./main
ziyad@Elbanna-5567Inspiron:~/Desktop/Lab02$ ls
a.out  Lab02.cbp  Lab02.layout  main  obj
bin    Lab02.depend  'Lab2 mergesort'  main.c  output.txt
ziyad@Elbanna-5567Inspiron:~/Desktop/Lab02$ cd 'Lab02 mergesort'
bash: cd: Lab02 mergesort: No such file or directory
ziyad@Elbanna-5567Inspiron:~/Desktop/Lab02$ cd 'Lab2 mergesort'
ziyad@Elbanna-5567Inspiron:~/Desktop/Lab02/Lab2 mergesort$ gcc main.c -o main -lpthread
main.c: In function 'merge_sort_left':
main.c:91:9: warning: implicit declaration of function 'mergeSort'; did you mean 'merge'? [-Wimplicit-function-declaration]
    mergeSort(arr, argus->left, argus->mid);
    ^~~~~~
main.c: At top level:
main.c:103:6: warning: conflicting types for 'mergeSort'
    void mergeSort(int arr[], int l, int r)
    ^~~~~~
main.c:91:9: note: previous implicit declaration of 'mergeSort' was here
    mergeSort(arr, argus->left, argus->mid);
    ^~~~~~
main.c: In function 'mergeSort':
main.c:116:9: warning: implicit declaration of function 'pthread_attr_init' [-Wimplicit-function-declaration]
    pthread_attr_init (&attr);
    ^~~~~~
main.c:122:9: warning: implicit declaration of function 'pthread_create' [-Wimplicit-function-declaration]
    pthread_create(&threads[step],&attr,merge_sort_left,&subarray);
    ^~~~~~
main.c:123:9: warning: implicit declaration of function 'pthread_join' [-Wimplicit-function-declaration]
    pthread_join(threads[step],NULL);
    ^~~~~~
main.c: At top level:
main.c:4:5: warning: array 'arr' assumed to have one element
    int arr[] ;
    ^~~~~~
ziyad@Elbanna-5567Inspiron:~/Desktop/Lab02/Lab2 mergesort$ ./main
-1 0 3 4 7 8 15 20 33 100
ziyad@Elbanna-5567Inspiron:~/Desktop/Lab02/Lab2 mergesort$
```

Code is run from command line as shown and the new sorted array is printed.

3- print array() prints the array to the console application