Operating systems lab 2

Multithreaded matrix

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Code organization:

Program is written in only one file , code is separated in to different method. Methods of reading matrices dimensions from txt file, reading matrices from txt file ,solving through one thread , solving through rows (thread per row) , solving through element (thread per element) , and two methods for creating threads (one invokes solving by rows and solving by elements)

Code main functions:

1- readrowcol(FILE *f ,int *row,int *col)

function to read row and column dimensions from file

2- void readmatrix(int **array,FILE * f,int row,int col)

function to copy file contents to 2d array ,array to be copied in , file to be read ,row ,column

void readmatrix(int **array,FILE * f,int row,int col)

3- void SolveForMatrix(int **a,int **b,int **c)

Function to solve in one thread

4- **void *SolveForRow(void *object)**

Function to solve matrix by rows , a thread for each row

5- **void *SolveForElement(void *object)**

Function to solve matrix by each elemnt , a thread for each element

6- **void RowThreads(int **a,int **b,int **c)**

creating Threads for solving by rows

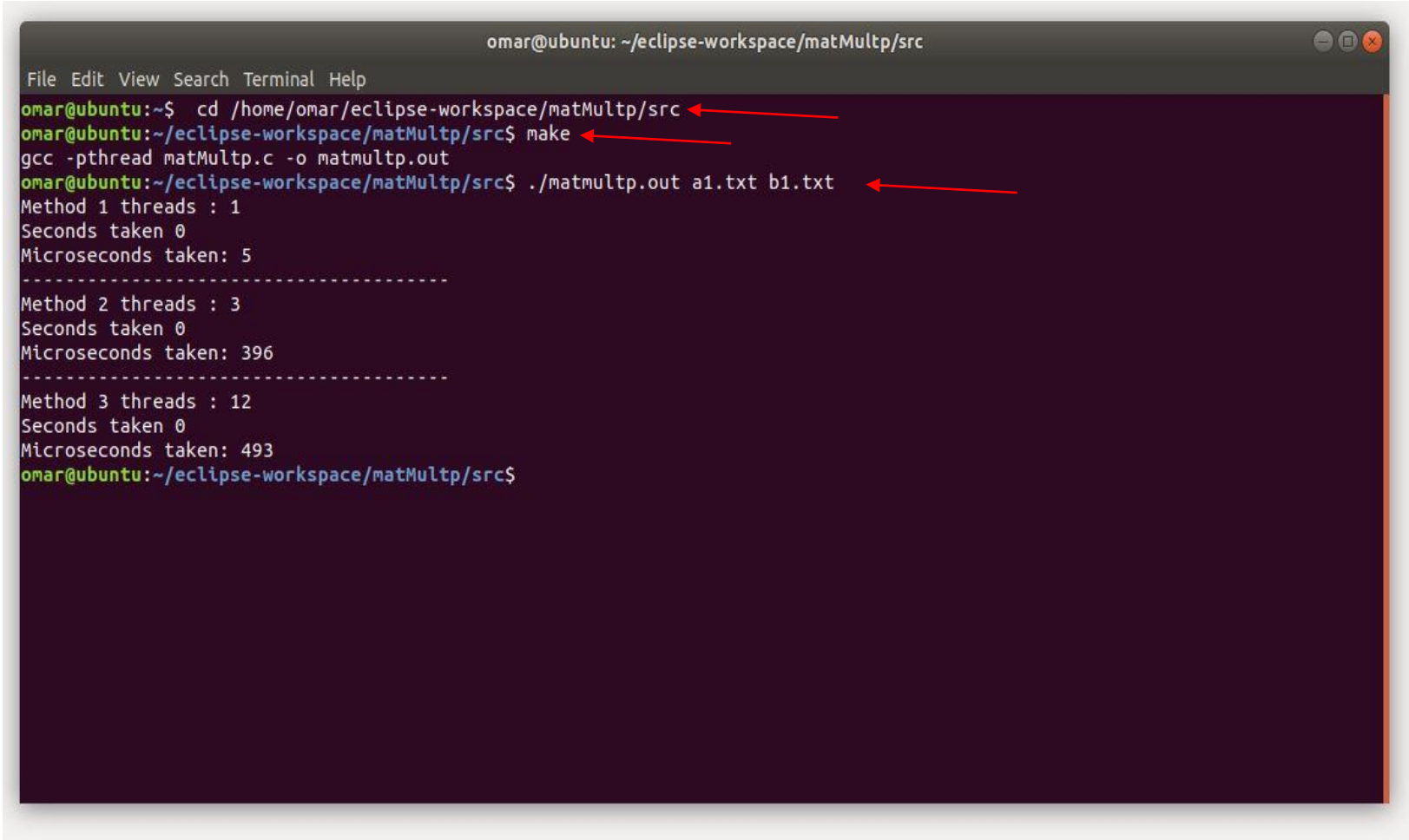
7- **void ElementsThreads(int **a,int **b,int **c)**

Creating Threads for solving by each element

8- **void WriteOutput(int **c, char *filepath)**

Writes output array to a distinct file

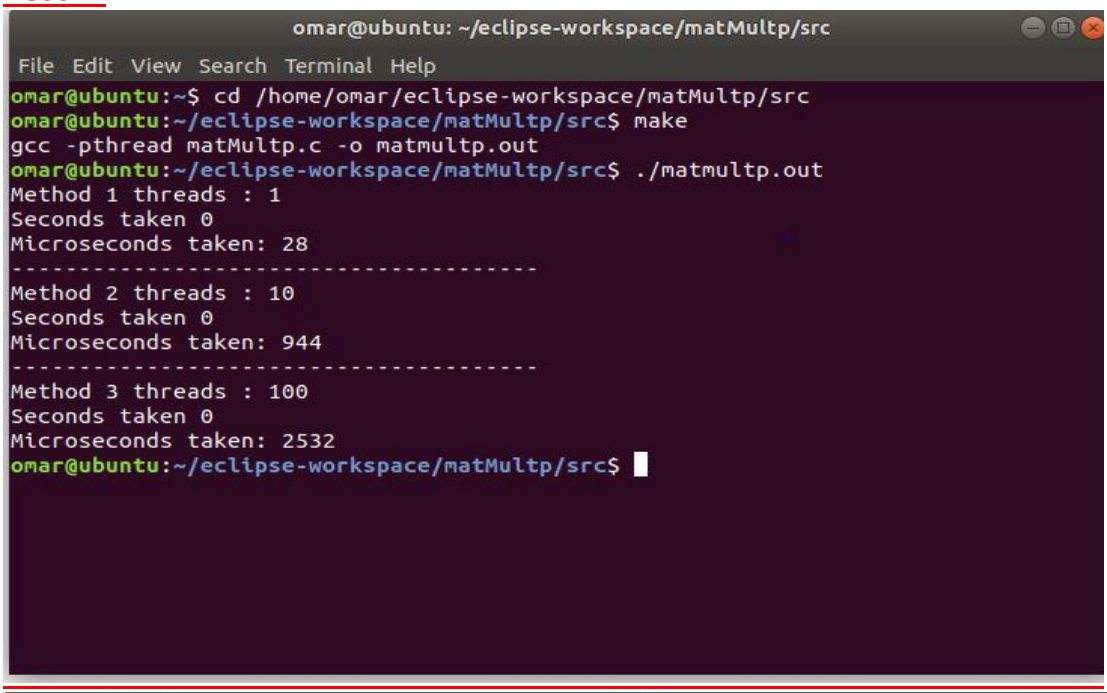
How to compile and run your code.

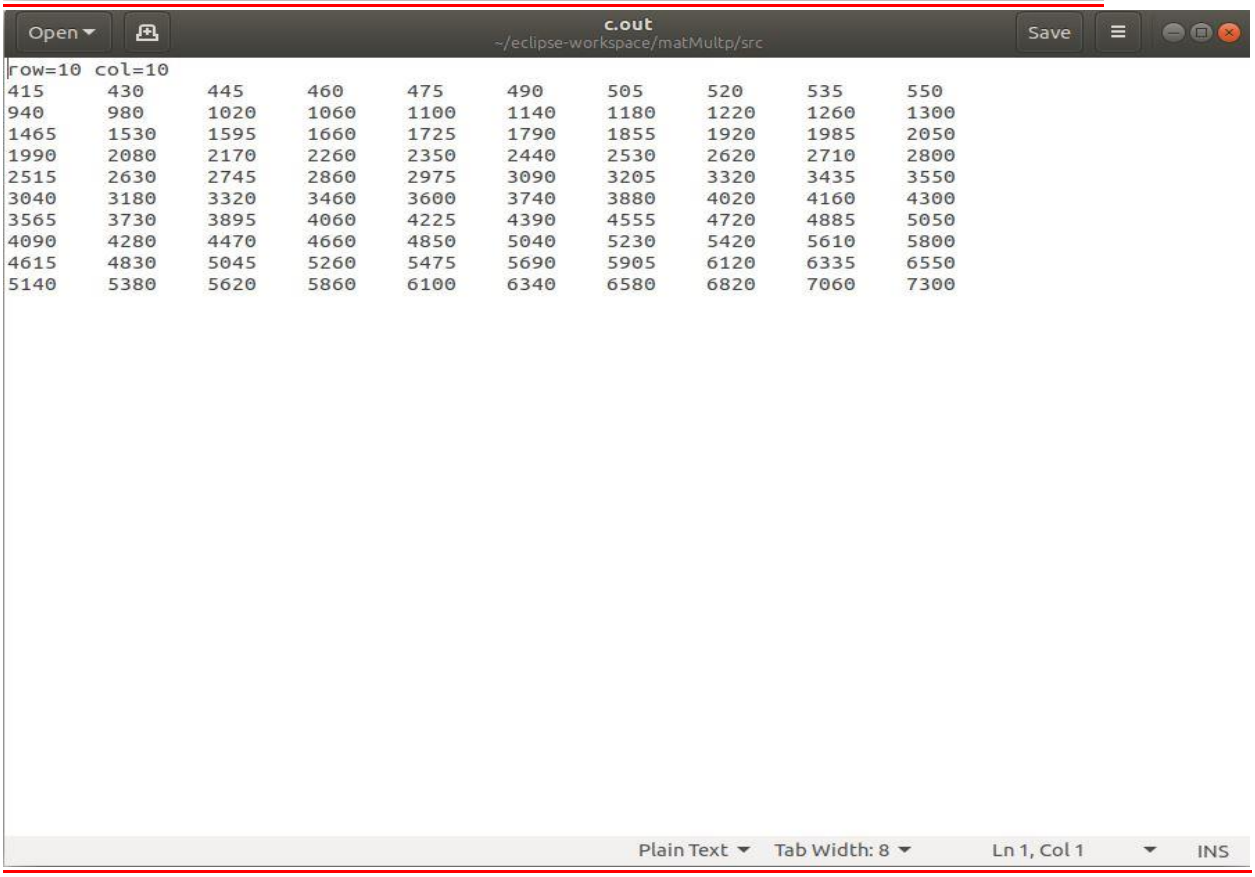


1- Open ubuntu terminal
2- Write: cd c file path
3- Write: make
4- Write: ./matmultp.out matrix1_path matrix2_path outputmatrixfilepath

Sample runs

Test 1:





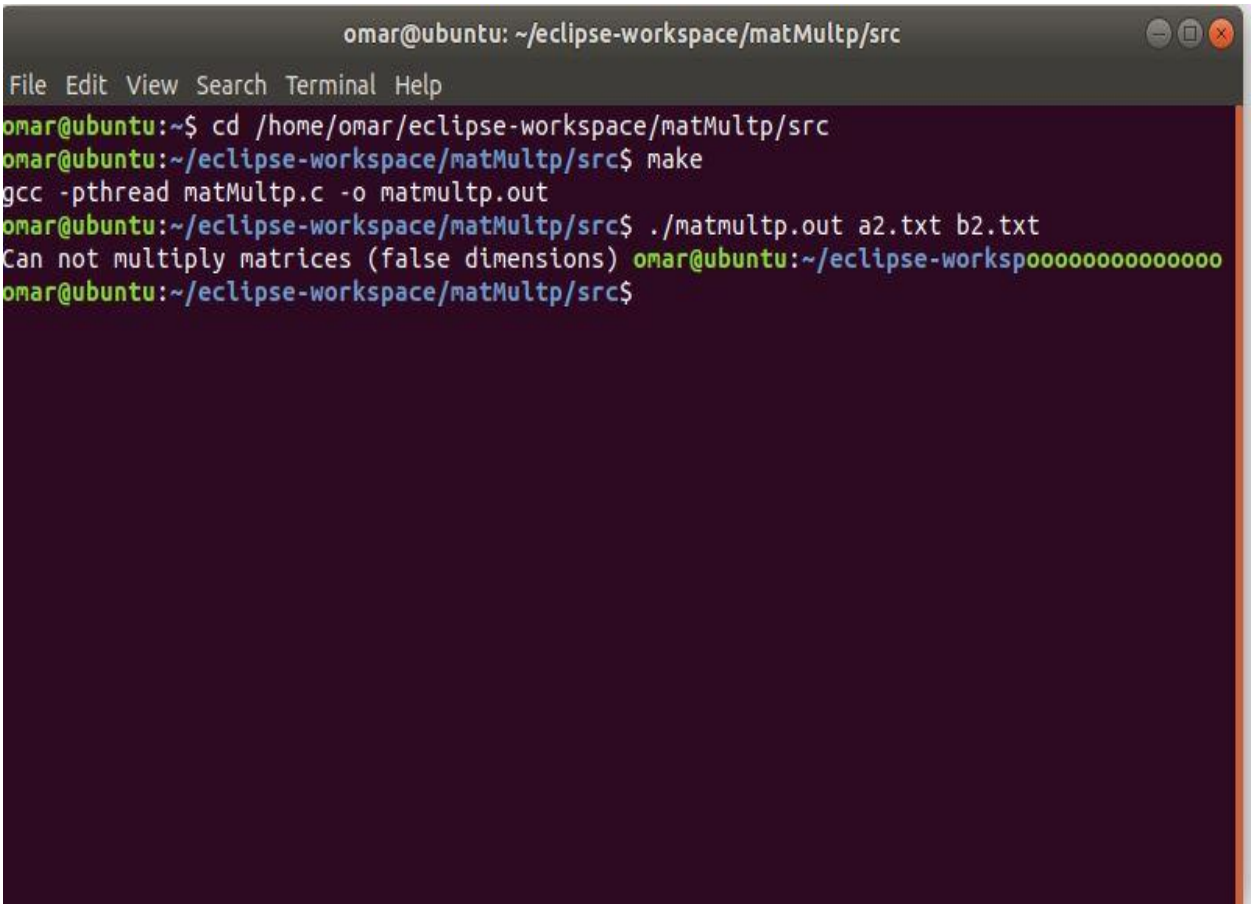
Test 2

```
omar@ubuntu: ~/eclipse-workspace/matMultp/src
File  Edit  View  Search  Terminal  Help
omar@ubuntu:~$ cd /home/omar/eclipse-workspace/matMultp/src
omar@ubuntu:~/eclipse-workspace/matMultp/src$ make
gcc -pthread matMultp.c -o matmultp.out
omar@ubuntu:~/eclipse-workspace/matMultp/src$ ./matmultp.out a1.txt b1.txt
Method 1 threads : 1
Seconds taken 0
Microseconds taken: 27
--------------------------------------
Method 2 threads : 3
Seconds taken 0
Microseconds taken: 338
--------------------------------------
Method 3 threads : 12
Seconds taken 0
Microseconds taken: 583
omar@ubuntu:~/eclipse-workspace/matMultp/src$
```

```
Open        c.out
            ~/eclipse-workspace/matMultp/src        Save
row=3 col=4
-1      10      -15     -28
-3      -10     15      -36
5       -2      -9      -20

Plain Text   Tab Width: 8   Ln 1, Col 1   INS
```

Test 3
Wrong input matrices dimensions



A comparison between the three methods of matrix multiplication.

Method	Method1	Method2	Method3
Number of threads	1	Number of rows of first matrix	Number of elements in output matrix
Execution time	O(n^3)	O(n^3)	O(n^3)

All execution time is the same but when a method creates more threads it takes much time, because each threads waits the other thread to finish (threads are joined) to handle synchronization.