

ASSIGNMENT NO 1

Details of Computer Used: -

HP laptop (Windows 10) Intel core i3 7TH generation CPU @2.30 GHz

64-bit Operating System.

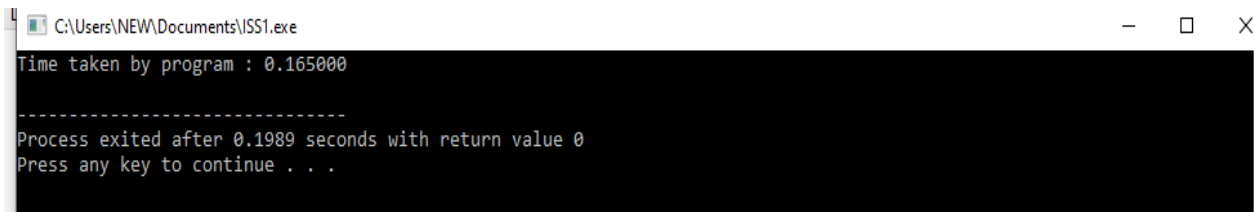
RAM: - 4 GB

A) Loop Interchanging: -

I have done matrix multiplication of **A** and **B** matrices of size 256*256 for three loop *ijk*, *kij*, *jki* respectively.

Execution Time required for each loop is given as below: -

1) CPU time for *ijk* loop=



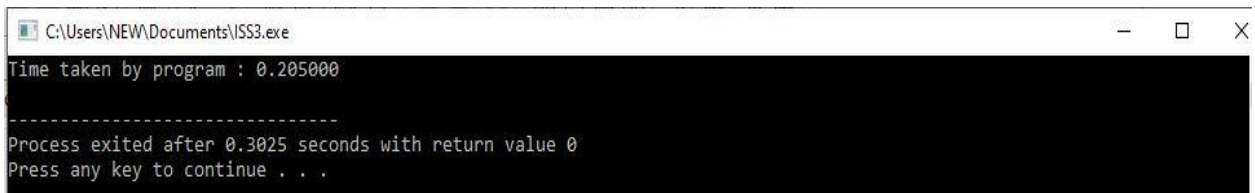
```
C:\Users\NEW\Documents\ISS1.exe
Time taken by program : 0.165000
-----
Process exited after 0.1989 seconds with return value 0
Press any key to continue . . .
```

2) CPU time for *kij* loop=



```
C:\Users\NEW\Documents\ISS2.exe
Time taken by program : 0.068000
-----
Process exited after 0.1088 seconds with return value 0
Press any key to continue . . .
```

3) CPU time for *jki* loop =



```
C:\Users\NEW\Documents\ISS3.exe
Time taken by program : 0.205000
-----
Process exited after 0.3025 seconds with return value 0
Press any key to continue . . .
```

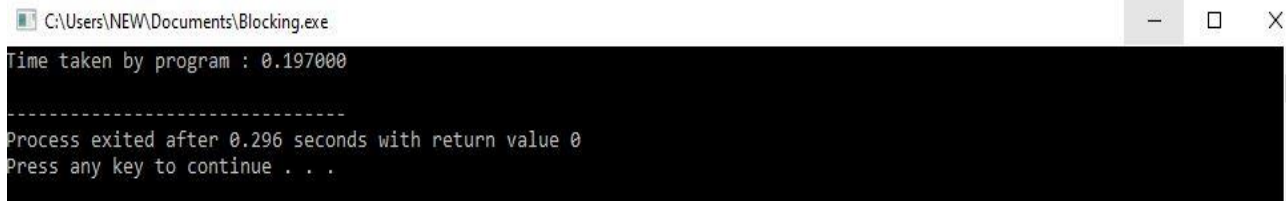
Time Required for *kij* loop is minimum than *ijk* and *jki* loop and maximum time is required for *jki* loop. Load per instruction is same in all three loops. Misses per instruction is different for each loop and its values are 0.5, 1.25, 2 respectively.

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B] Blocking/Tiling: -

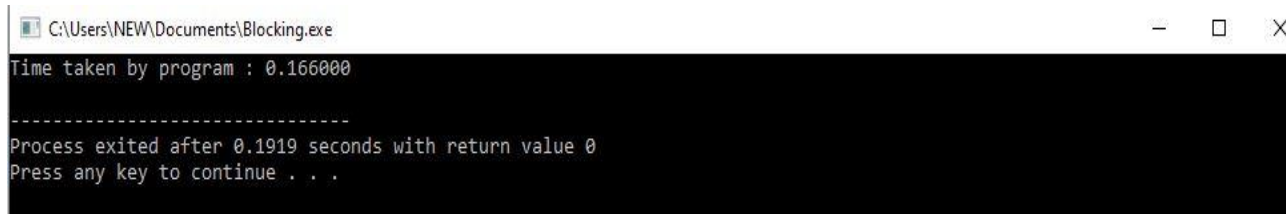
I have tried this program for different values of block sizes and its execution time values are following

Block size: - 25




```
C:\Users\NEW\Documents\Blocking.exe
Time taken by program : 0.197000
-----
Process exited after 0.296 seconds with return value 0
Press any key to continue . . .
```

Block size: - 50



```
C:\Users\NEW\Documents\Blocking.exe
Time taken by program : 0.166000
-----
Process exited after 0.1919 seconds with return value 0
Press any key to continue . . .
```

Block size: - 100

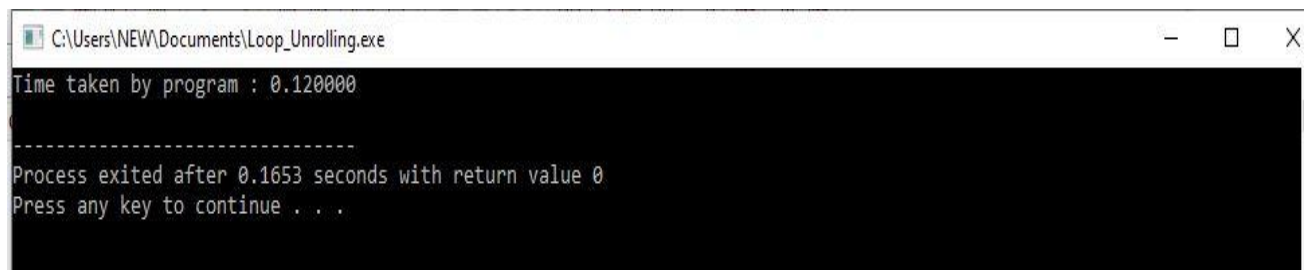


```
C:\Users\NEW\Documents\Blocking.exe
Time taken by program : 0.147000
-----
Process exited after 0.1791 seconds with return value 0
Press any key to continue . . .
```

From above we can see that as the block size increases execution time decreases.

C] Loop Unrolling: -

I opened j loop once and try to calculate matrix multiplication.



```
C:\Users\NEW\Documents\Loop_Unrolling.exe
Time taken by program : 0.120000
-----
Process exited after 0.1653 seconds with return value 0
Press any key to continue . . .
```

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CONCUSION: -

From above we can see that minimum time required for execution of program is for *kij* loop.