HW ASSIGNMENT - 3

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TASKS :

Multi-threaded matrix multiplication :

- Firstly we checked whether we need to implement it in Interactive mode or non-interactive mode. Then we used appropriate functions.
  In our case, the functions are init_matrix and input_matrix respectively.
- We created crow's number of threads to compute one row of the matrix C. It uses a multiplication function to compute the values correspondingly.
- There would be a context switch between the threads but there will not be any synchronization issues as for different threads, we are accessing the different elements of the matrix.
- Next,we use the wait function for the main threads to wait until all the threads complete their work.
- After the wait of the main thread, we print the output, that is the computed matrix C.

Multi-process Matrix Multiplication :

- We sent the C matrix to the shared memory using shmat function.
- Then we created a child process which again creates a child process that computes the two half separately.

- Here we didn't use more processes because it takes much time and the context switching also computes much more time.

Measurements of CPU time :

For the sake of easy understanding let us take all the dimensions of the matrices to be equal.

Input Size	T(Single Process)	T(Multi-Process)	T(Multi-Thread)	SpeedUp (Multi-process)	SpeedUp (Multi-Thread)
3	1	790	114	0.00	0.01
10	13	748	104	0.02	0.12
30	430	1117	188	0.38	2.29
50	772	940	461	0.82	1.67
100	10938	4880	2303	2.24	4.75
400	376899	289966	12034	1.30	31.32
800	3567440	2683421	669341	1.33	5.33

Observations :

1. On increasing the Input size the speed up of multi-process increases and decreases but it becomes greater than the single process. This says that multiprocess makes the work much less time than using a single process.

2. On increasing the Input size the speed up of Multithread increases and decreases. This is due to the context switching between the threads which compute some time and increases as the number of threads increases.

3. we have tried using a constant number of threads but the speedup is much less than using crows no. of threads.