Parallel Programming

Mini Project 01

Team Members

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Topic

Simulation of Stock prices using Geometric Brownian Motion

(Serial Code output Document)

1 Output

1.1 Language Used : C

1.2 Outputs(Execution Time Snapshots) :

Given the parameters,
S0, initial price of stock= 10,
μ, expected return=13%,
σ, standard deviation of returns=15%,
time, t=100

1. For 100 simulations :

```
gaurav@Gaurav:~/Desktop/1$ gcc GBM_seq.c -o GBM_seq -lm
gaurav@Gaurav:~/Desktop/1$ time ./GBM_seq
Enter Initial stock price : $10
Enter the expected return: 13
Enter the standard deviation of returns: 15
Enter the time: 100
Enter number of simulations: 100

real    0m5.313s
user    0m0.000s
sys     0m0.000s
```

Figure 1 : Time for 100 Simulations

2.For 1000 simulations :

```
gaurav@Gaurav:~/Desktop/1$ gcc GBM_seq.c -o GBM_seq -lm
gaurav@Gaurav:~/Desktop/1$ time ./GBM_seq
Enter Initial stock price : $10
Enter the expected return: 13
Enter the standard deviation of returns: 15
Enter the time: 100
Enter number of simulations: 1000

real    0m4.979s
user    0m0.004s
sys     0m0.004s
```

Figure 2 : Time for 1000 Simulations

3. For 10000 simulations :

```
gaurav@Gaurav:~/Desktop/1$ gcc GBM_seq.c -o GBM_seq -lm
gaurav@Gaurav:~/Desktop/1$ time ./GBM_seq
Enter Initial stock price : $10
Enter the expected return: 13
Enter the standard deviation of returns: 15
Enter the time: 100
Enter number of simulations: 10000

real    0m5.783s
user    0m0.024s
sys     0m0.000s
```

Figure 3 : Time for 10000 Simulations

4. For 100000 simulations

```
gaurav@Gaurav:~/Desktop/1$ gcc GBM_seq.c -o GBM_seq -lm
gaurav@Gaurav:~/Desktop/1$ time ./GBM_seq
Enter Initial stock price : $10
Enter the expected return: 13
Enter the standard deviation of returns: 15
Enter the time: 100
Enter number of simulations: 100000

real    0m5.803s
user    0m0.232s
sys     0m0.000s
```

Figure 4 : Time for 100000 Simulations

5. For 1000000 simulations

```
gaurav@Gaurav:~/Desktop/1$ gcc GBM_seq.c -o GBM_seq -lm
gaurav@Gaurav:~/Desktop/1$ time ./GBM_seq
Enter Initial stock price : $10
Enter the expected return: 13
Enter the standard deviation of returns: 15
Enter the time: 100
Enter number of simulations: 1000000

real    0m9.808s
user    0m2.208s
sys     0m0.008s
```

Figure 5 : Time for 1000000 Simulations

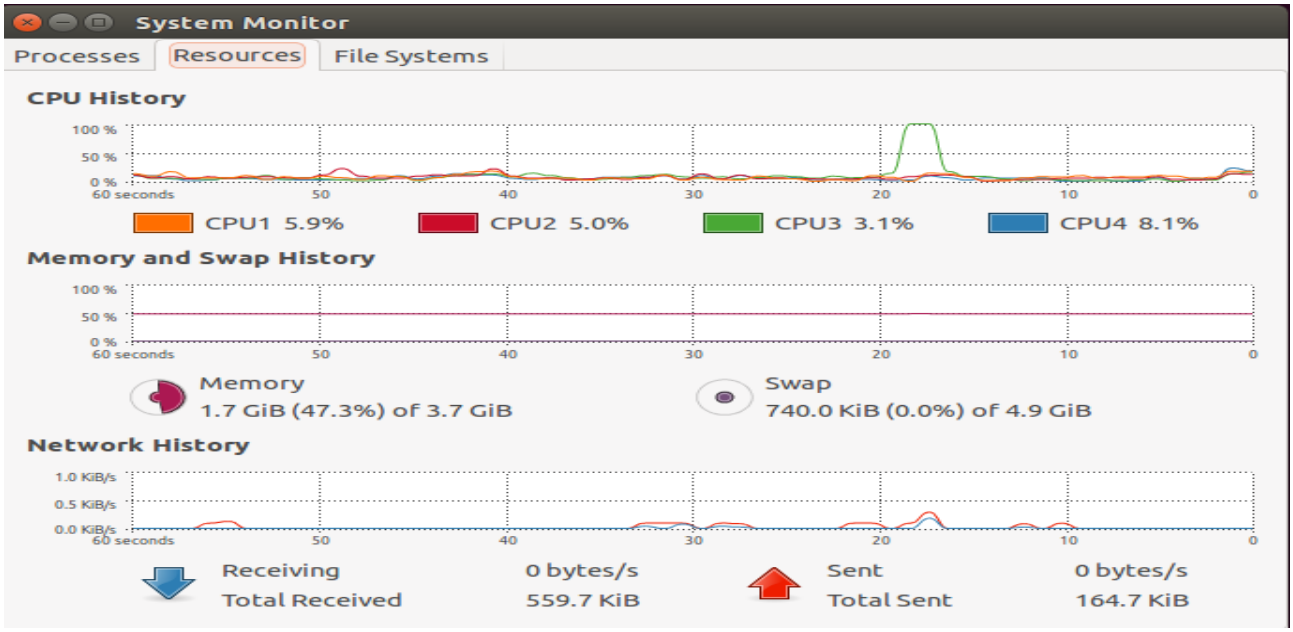
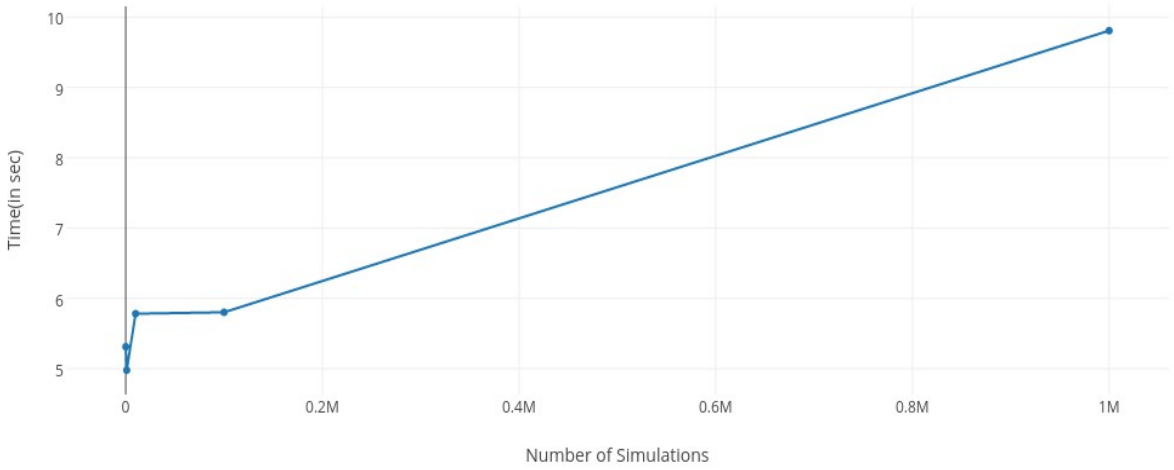


Figure 6 : System monitor for 1000000 simulations

1.3 Time Matrix for different number of simulations:

Number of Iterations	100	1000	10000	100000	1000000
Time(In seconds)	5.313	4.979	5.783	5.803	9.808

1.4 Graph Between number of iterations and corresponding time taken:



2 Conclusion:

We observe that with increasing number of simulations, the execution time increases and when its 1000000, the time for executions nearly doubles from what it was in 100000. Also we note that one of the four cpu cores reaches 100% processing power but others are left idle which is not a favourable condition and this performance can be increased by parallelizing the code.

3. Future Work:

Previously we did the same code in R and calculated the time for different number of iterations. Now the serial part is done and we will implement the same code's parallel version in C and note the time for the parallel code. After that we would move onto MPI and note the time taken in MPI for the same code and compare the performances.