Final Year B. Tech., Sem VII 2023-24
High Performance Computing Lab

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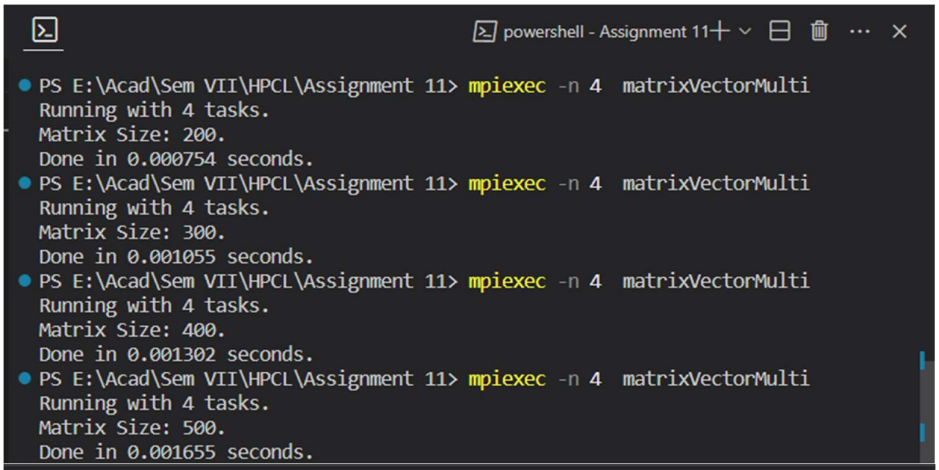
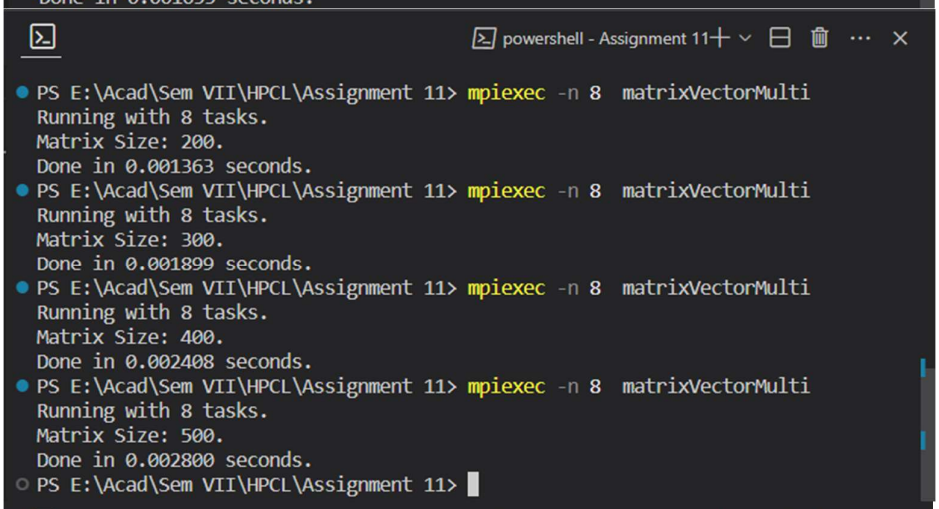
PRN: 2020BTECS00112

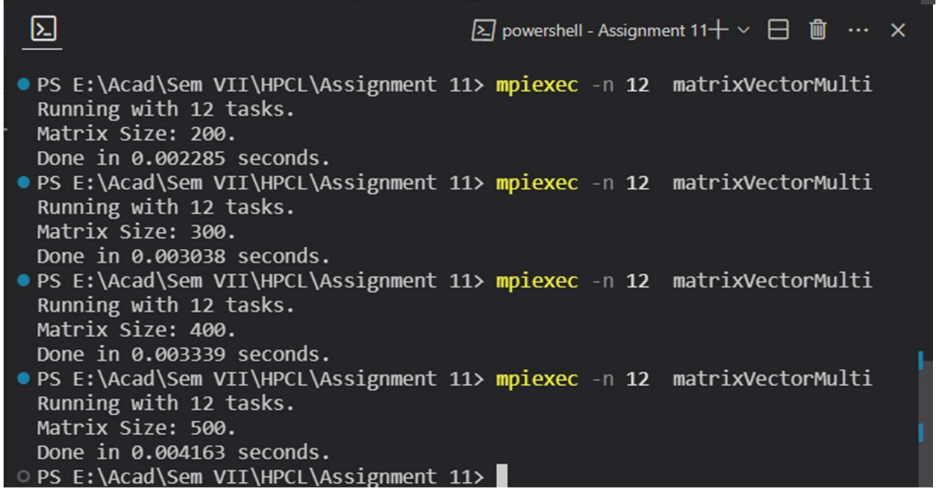
Practical No. 11

1. Implement Matrix-Vector Multiplication using MPI. Use different number of processes and analyze the performance.

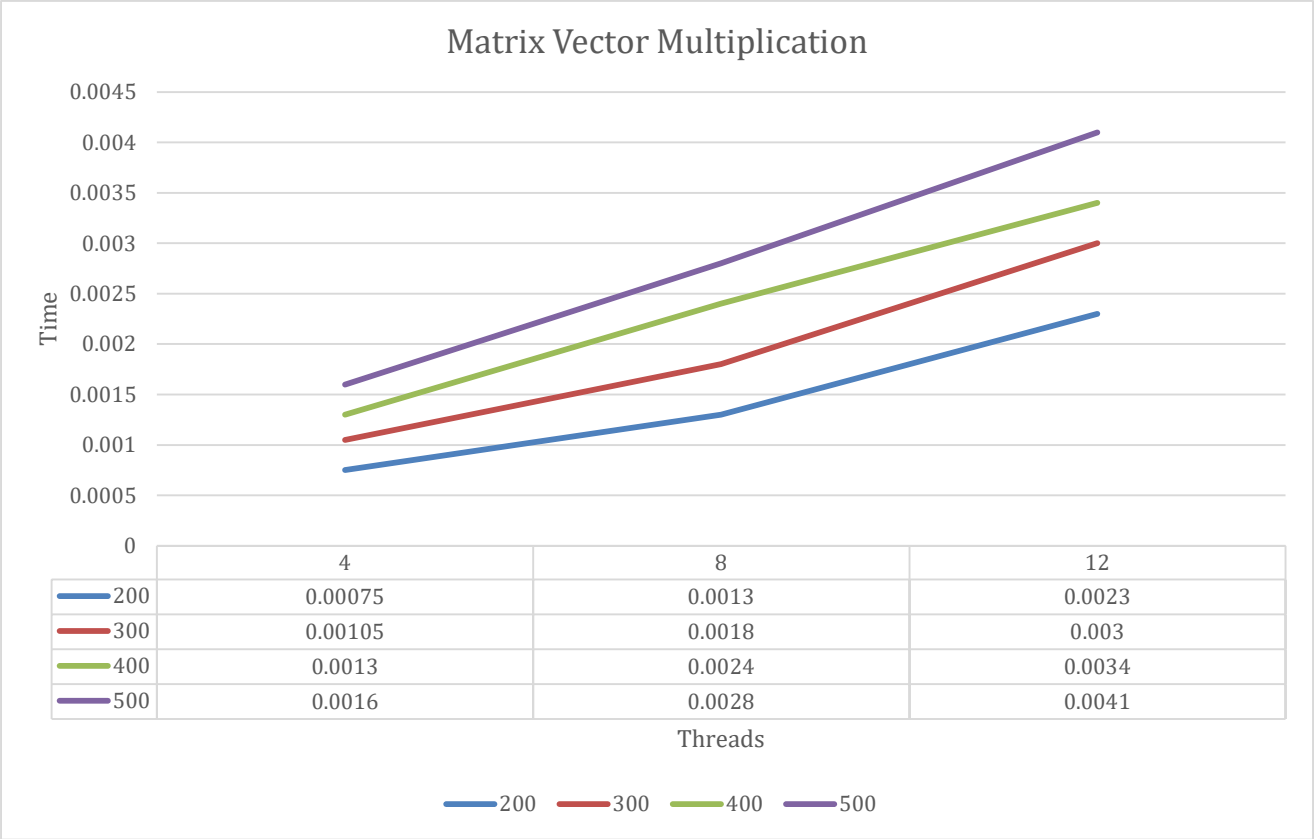
**Screenshots:**



**Analysis:**




| | 4 | 8 | 12 |
|---|---|---|---|
| 200 | 0.00075 | 0.0013 | 0.0023 |
| 300 | 0.00105 | 0.0018 | 0.003 |
| 400 | 0.0013 | 0.0024 | 0.0034 |
| 500 | 0.0016 | 0.0028 | 0.0041 |

2. Implement Matrix-Matrix Multiplication using MPI. Use different number of processes and analyze the performance.

**Screenshots:**

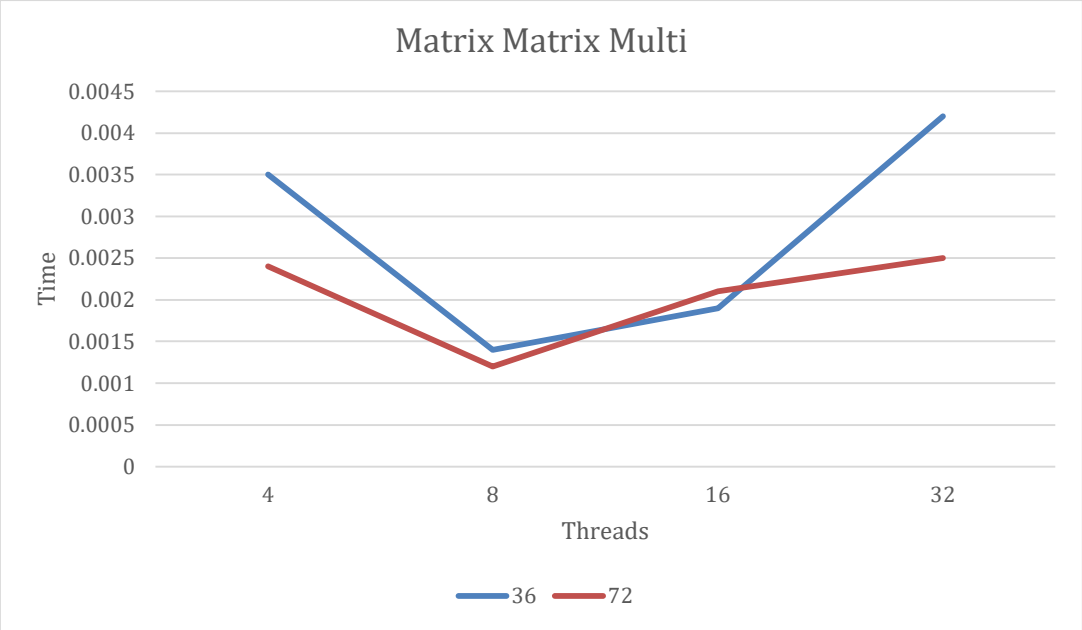
Matrix Size: 72

```
PS E:\Acad\Sem VII\HPCL\Assignment 11> mpiexec -n 8 matrixMatrixMulti
Running with 8 tasks.
Matrix Size: 72.
Done in 0.001229 seconds.
PS E:\Acad\Sem VII\HPCL\Assignment 11> mpiexec -n 12 matrixMatrixMulti
Running with 12 tasks.
Matrix Size: 72.
Done in 0.001632 seconds.
PS E:\Acad\Sem VII\HPCL\Assignment 11> mpiexec -n 18 matrixMatrixMulti
Running with 18 tasks.
Matrix Size: 72.
Done in 0.002094 seconds.
PS E:\Acad\Sem VII\HPCL\Assignment 11> mpiexec -n 4 matrixMatrixMulti

job aborted:
[ranks] message

[0] process exited without calling finalize

[1-3] terminated

---- error analysis -----

[0] on DESKTOP-AF6P6IM
matrixMatrixMulti ended prematurely and may have crashed. exit code 0xc0000005

---- error analysis -----
PS E:\Acad\Sem VII\HPCL\Assignment 11> mpiexec -n 6 matrixMatrixMulti
Running with 6 tasks.
Matrix Size: 72.
Done in 0.001053 seconds.
PS E:\Acad\Sem VII\HPCL\Assignment 11>
```

Matrix Size: 32*32

```
PS E:\Acad\Sem VII\HPCL\Assignment 11> mpiexec -n 4 matrixMatrixMulti
Running with 4 tasks.
Matrix Size: 32.
Done in 0.003512 seconds.
PS E:\Acad\Sem VII\HPCL\Assignment 11> mpiexec -n 8 matrixMatrixMulti
Running with 8 tasks.
Matrix Size: 32.
Done in 0.001454 seconds.
PS E:\Acad\Sem VII\HPCL\Assignment 11> mpiexec -n 16 matrixMatrixMulti
Running with 16 tasks.
Matrix Size: 32.
Done in 0.001890 seconds.
PS E:\Acad\Sem VII\HPCL\Assignment 11> mpiexec -n 32 matrixMatrixMulti
Running with 32 tasks.
Matrix Size: 32.
Done in 0.004220 seconds.
PS E:\Acad\Sem VII\HPCL\Assignment 11>
```

**Analysis:**




| Size \ Threads | 4 | 8 | 16 | 32 |
|---|---|---|---|---|
| 36 | 0.0035 | 0.0014 | 0.0019 | 0.0042 |
| 72 | 0.0024 | 0.0012 | 0.0021 | 0.0025 |

**GitHub:** https://github.com/meetgandhi692/HPC-Lab/tree/d6ca84bab6f00d6626db7094652cc8792ecaac9a/Assignment%2011