**Scientific Computing Assignment 1**

120555A

M.R.M.J. Sally

Q1 :

(a)

Based on the equation : the problem of finding is broken into small pieces so that we can add them up and calculate the iteratively (numerically). To do that it has taken the integration of which means in another way,

. Therefore we calculate this integration as a summation of small *steps* as defined in the program.

(h) The calculated values rounded.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| # Trials | SP/DP |  | CPU  Sequential [curand] | CPU Parallel [curand]  (T = #Threads) | | | GPU | | | |
| T=2 | T=4 | T=8 | mystery | myrand | curand | curand-  thrust |
|  | SP | PI Estimate | 3.154 | 3.14142 | 3.1415 | 3.1416 | 6.0693 | 3.1442 | 3.1416 | 3.1411 |
| Error | 1.2x10-2 | -1.7x10-5 | -10-5 | 3x10-5 | 2.928 | 2.66x10-3 | -1.1x10-5 | -4.9x10-5 |
| Time (ms) | 1008.763 | 18898.7 | 16474 | 87200 | 389.651 | 7.261000 | 20.801 | 22.342 |
| DP | PI Estimate | 4.159 | 3.1428 | 3.1411 | 3.1416 | 3.1416 | 3.1443 | 3.1416 | 3.1411 |
| Error | 1.017 | 1.23x10-3 | -5.27x10-4 | -1.7x10-5 | 0.000 | 0.002657 | -1.1x10- | -4.97x10-4 |
| Time (ms) | 983.899 | 17913.0 | 13176 | 78558 | 20.911 | 6.976 | 32.337 | 26.22 |
|  | SP | PI Estimate | 3.930 | 3.14470 | 3.1417 | 3.1411 | 5.29940 | 3.139517 | 3.14158 | 3.1412 |
| Error | 0.789 | 0.00311 | 6x10-5 | -4.85x10-4 | 2.15781 | -2.076x10-4 | -1.1x10-5 | -3.888x10-4 |
| Time (ms) | 4010.676 | 75143.8 | 62626 | 346955 | 389.689 | 15.846 | 36.225 | 22.285 |
| DP | PI Estimate | 4.181 | 3.142 | 3.1418 | 3.1409 | 3.14159 | 3.139517 | 3.14158 | 3.1412 |
| Error | 1.039395 | 4.11x10-4 | 2.5x10-4 | -6.51x10-4 | -1x10-6 | -2.076x10-3 | -1.1x10-5 | -3.9x10-4 |
| Time (ms) | 3860.34 | 69661.3 | 66930 | 342542 | 83.268 | 19.177 | 34.472 | 26.448 |
|  | SP | PI Estimate | 4.124136 | 3.14150 | 3.1416 | 3.1410 | 3.14111 | 3.141507 | 3.14158 | 3.14143 |
| Error | 0.982544 | -9.1x10-5 | -3x10-5 | -1.1416 | -4.76x10-4 | -8.5x10-5 | -1.7x10-5 | -1.65x10-4 |
| Time (ms) | 15978.45 | 62247.7 | 261909 | 1384583 | 389.712 | 55.44200 | 46.507 | 27.859 |
| DP | PI Estimate | 4.186888 | 3.14157 | 3.1414 | 3.1410 | 3.14159 | 3.141507 | 3.14158 | 3.14143 |
| Error | 1.045295 | -2.5x10-5 | -2.08x10-4 | -5.71x10-4 | -3x10-6 | -8.5x10-5 | 1.266x10-5 | -1.65x10-4 |
| Time | 15337.37 | 54100.8 | 194655 | 1491840 | 332.178 | 68.026 | 33.899 | 34.752 |

Q2 :

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| N | SP/  DP | CPU  Sequential | CPU Parallel (T = #Threads) | | | GPU |
| T=2 | T=4 | T=8 |
|  | SP | 175.328995 | 236.576004 | 360.9220 | 796.629 | 1511.704956 |
| DP | 210.415009 | 328.725006 | 694.466 | 1494.867 | 237.623001 |
| 8 | SP | 919.973999 | 1050.94006 | 1748.733 | 3805.134 | 291.913 |
| DP | 1093.2970 | 1607.597 | 3533.235 | 7086.545 | 295.367 |
| 9 | SP | 2287.449 | 2015.563 | 3102.39 | 5204.311 | 508.571 |
| DP | 11620.63 | 3608.49682 | 6750.644 | 13391.015 | 550.249 |

Q3 :

Tiling approach of Matrices is used for GPU Computation.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NxN | SP/  DP | CPU  Sequential | CPU Parallel (T = #Threads) | | | GPU |
| T=2 | T=4 | T=8 |
| 600 | SP | 481.833 | 915.36 | 1086.19 | 1386.92 | 20.951 |
| DP | 499.894 | 987.108 | 1063.69 | 1137.57 | 21.525 |
| 1200 | SP | 21065.8 | 23261.7 | 23882.3 | 24818 | 103.887 |
| DP | 22531.1 | 15779 | 24716.5 | 25954.7 | 161.796 |
| 1800 | SP | 34918.9 | 14484.6 | 15143.2 | 17282.4 | 323.239 |
| DP | 46714.9 | 25884.2 | 24383.5 | 27092.7 | 525.672 |

Students Who helped me in the assignment

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