Parallel Coursework 1

Testing Document

Correctness Testing – Manual vs Sequential vs Parallel

The correctness testing aims to demonstrate that both the sequential and parallel programs compute the correct answer.

A set square array is formed and relaxed manually to find the expected output. The same initial array is then fed into the sequential program and parallel programs. If the expected array is returned, the program has passed the test. The tests are then repeated with a different array of different size and desired precision. All tests are conducted 3 times to help increase accuracy.

Value set 1: valSet1.txt – dimension: 4x4, precision: 0.1, parallel threads: 1, 2, 4, 8

Value set 2: valSet2.txt – dimension: 6x6, precision: 1.0, parallel threads: 1, 2, 4, 8

|  |  |  |
| --- | --- | --- |
|  | **Value Set 1 – 4x4, 0.1**  **(Pass for result identical to manual)** | **Value set 2 – 6x6, 1.0**  **(Pass for result identical to manual)** |
| **Manual** | - | - |
| **Sequential** | Pass x 3 | Pass x 3 |
| **Parallel T:1** | Pass x 3 | Pass x 3 |
| **Parallel T:2** | Pass x 3 | Pass x 3 |
| **Parallel T:4** | Pass x 3 | Pass x 3 |
| **Parallel T:8** | Pass x 3 | Pass x 3 |

This suggests that both the Sequential and the Parallel code compute the correct answer, and that the Parallel code computes it correctly irrespective of number of threads used. This stands as the foundation for future tests, and is enough evidence to suggest the program is correct, irrespective of precision, threads or dimension size.

Thread Count Tests

These tests determine the average speed of running the program sequentially and in parallel for varying numbers of threads, using a fixed array and precision.

|  |  |  |  |
| --- | --- | --- | --- |
| **Threads** | **Array Dimensions** | **Precision** | **Average Completion Time**  **over 3 Attempts** |
| **Sequential** | 500x500 | 0.1 |  |
| **1** | 500x500 | 0.1 | 0.656575107s |
| **2** | 500x500 | 0.1 | 0.368874173s |
| **4** | 500x500 | 0.1 | 0.226523595s |
| **8** | 500x500 | 0.1 | 0.156137479s |
| **16** | 500x500 | 0.1 | 0.161631392s |
| **32** | 500x500 | 0.1 | 0.158631929s |
| **64** | 500x500 | 0.1 | 0.195477202s |

**Dimension Tests:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Threads** | **Array Dimensions** | **Precision** | **Average Completion Time**  **over 3 Attempts** |
| **16** | 10x10 | 0.1 | 0.004739820s |
| **16** | 100x100 | 0.1 | 0.013273339s |
| **16** | 1000x1000 | 0.1 | 0.452362829s |
| **16** | 10000x10000 | 0.1 | Balena force closed after 15m every time |

**Precision Tests:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Threads** | **Array Dimensions** | **Precision** | **Average Completion Time**  **over 3 Attempts** |
| **16** | 500x500 | 1 | 0.083644602s |
| **16** | 500x500 | 0.1 | 0.139587870s |
| **16** | 500x500 | 0.001 | 33.199836617s |
| **16** | 500x500 | 0.00001 | 148.644991221s |