**OpenMP Assignment**

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**Details:**

The submission folder consists of 3 versions of matrix LU decomposition: sequential (lud\_seq), parallel (lud\_par) and optimal (lud\_opt).

**Explanation:**

Lud\_par: **parallel pragmas** are used to create multiple threads for the for loop. Reduction variables “sum” are enclosed in **a parallel reduction pragma** so that the subtraction is optimized for all threads. **Private pragmas** are used which enclose the variables used in the for loops so that they are maintained in the threads’ private memory for faster access.

Lud\_opt:

**Results:**

*Note: All time results are averaged over a run of 10 times.*

**Matrix size – 256 x 256**

|  |  |  |  |
| --- | --- | --- | --- |
| Sequential | OpenMP | | |
| Lud\_seq (ms) | Number of threads | Lud\_par (ms) | Lud\_opt (ms) |
| 8.99 | 5 | 12.30 | 8.51 |
| 10 | 12.35 | 7.29 |
| 15 | 14.04 | 4.63 |
| 20 | 14.22 | 4.81 |
| 26 | 12.66 | 5.02 |

**Matrix size – 512 x 512**

|  |  |  |  |
| --- | --- | --- | --- |
| Sequential | OpenMP | | |
| Lud\_seq (ms) | Number of threads | Lud\_par (ms) | Lud\_opt (ms) |
| 71.21 | 5 | 73.45 | 39.05 |
| 10 | 73.21 | 25.24 |
| 15 | 81.26 | 22.52 |
| 20 | 82.81 | 19.21 |
| 26 | 77.99 | 18.10 |

**Matrix size – 1024 x 1024**

|  |  |  |  |
| --- | --- | --- | --- |
| Sequential | OpenMP | | |
| Lud\_seq (ms) | Number of threads | Lud\_par (ms) | Lud\_opt (ms) |
| 660.09 | 5 | 531.02 | 264.01 |
| 10 | 505.14 | 149.75 |
| 15 | 519.46 | 169.34 |
| 20 | 522.94 | 168.16 |
| 26 | 554.62 | 137.00 |

**Observations:**