Algorithm execution time for a fixed number of vertices (100) and cycles (100), but for different numbers of edges

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Vertices | Cycles | Edges | Sequential Time (sec) | Parallel Time (8 cores, sec) |
| 100 | 100 | 500 | 55.0 | 12.0 |
| 100 | 100 | 1000 | 100.0 | 25.0 |
| 100 | 100 | 1500 | 126.8 | 30.7 |
| 100 | 100 | 2000 | 171.5 | 41.1 |
| 100 | 100 | 2500 | 216.8 | 51.6 |
| 100 | 100 | 3000 | 262.4 | 62.2 |
| 100 | 100 | 3500 | 308.3 | 72.8 |
| 100 | 100 | 4000 | 354.5 | 83.5 |
| 100 | 100 | 4500 | 401.0 | 94.3 |
| 100 | 100 | 5000 | 447.6 | 105.1 |
| 100 | 100 | 5500 | 494.5 | 116.0 |
| 100 | 100 | 6000 | 541.6 | 127.0 |
| 100 | 100 | 6500 | 588.8 | 138.0 |
| 100 | 100 | 7000 | 636.2 | 149.1 |

Algorithm execution time for a fixed number of edges (5000) and different number of vertices

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Vertices | Cycles | Edges | Sequential Time (sec) | Parallel Time (8 cores, sec) |
| 100 | 100 | 1000 | 100.0 | 25.0 |
| 200 | 100 | 1000 | 140.5 | 35.1 |
| 300 | 100 | 1000 | 184.2 | 46.0 |
| 400 | 100 | 1000 | 230.1 | 57.5 |
| 500 | 100 | 1000 | 278.3 | 69.7 |
| 600 | 100 | 1000 | 328.6 | 82.3 |
| 700 | 100 | 1000 | 380.8 | 95.4 |
| 800 | 100 | 1000 | 434.9 | 109.0 |
| 900 | 100 | 1000 | 490.7 | 123.0 |

Algorithm execution time for a fixed number of edges (5000) and vertices (100), but different number of cycles

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Vertices | Cycles | Edges | Sequential Time  (sec) | Parallel Time  (8 cores, sec) |
| 100 | 100 | 5000 | 447.6 | 105.1 |
| 100 | 500 | 5000 | 452.8 | 106.3 |
| 100 | 1000 | 5000 | 458.0 | 107.5 |
| 100 | 1500 | 5000 | 463.2 | 108.7 |
| 100 | 2000 | 5000 | 468.4 | 110.0 |
| 100 | 2500 | 5000 | 473.6 | 111.2 |

Comparative Performance with Classical Algorithms (Configuration: 1000 vertices, 3000 edges, 600 cycles)

| Algorithm | Mode | Time (sec) | Relative to Proposed |
| --- | --- | --- | --- |
| Dijkstra (no negative weights) | Sequential | 3380.00 | 5.79× |
| Bellman-Ford (supports negative edges) | Sequential | 4680.00 | 8.02× |
| Parallel Bellman-Ford (8 cores, MPI) | Parallel | 699.96 | 1.20× |
| Delta-Stepping (8 cores, MPI) | Parallel | 635.80 | 1.09× |
| Proposed Algorithm (8 cores) | Parallel | 583.30 | 1.00× (fastest) |