

Теория параллелизма

Отчет

Задание 6

Уравнение теплопроводности

Выполнил:

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Компилятор: g++

Профилировщик: Nsyght Systems

Замер времени: C++ chrono lib

Результат для матрицы 10x10

| | | | | | | | | | |
|-------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Final grid: | | | | | | | | | |
| 10 | 11.1111 | 12.2222 | 13.3333 | 14.4444 | 15.5556 | 16.6667 | 17.7778 | 18.8889 | 20 |
| 11.1111 | 12.2359 | 13.354 | 14.4625 | 15.5626 | 16.6596 | 17.7597 | 18.8682 | 19.9864 | 21.1111 |
| 12.2222 | 13.3672 | 14.4956 | 15.5999 | 16.684 | 17.7604 | 18.8445 | 19.9488 | 21.0773 | 22.2222 |
| 13.3333 | 14.515 | 15.6613 | 16.7575 | 17.8132 | 18.8535 | 19.9091 | 21.0054 | 22.1517 | 23.3333 |
| 14.4444 | 15.6983 | 16.8769 | 17.9558 | 18.9577 | 19.9312 | 20.9331 | 22.012 | 23.1906 | 24.4444 |
| 15.5556 | 16.9568 | 18.1921 | 19.2312 | 20.1305 | 20.9806 | 21.8799 | 22.919 | 24.1543 | 25.5556 |
| 16.6667 | 18.3812 | 19.7035 | 20.6464 | 21.3526 | 21.9807 | 22.6869 | 23.6298 | 24.9521 | 26.6667 |
| 17.7778 | 20.1979 | 21.5944 | 22.2984 | 22.6528 | 22.9028 | 23.2572 | 23.9612 | 25.3576 | 27.7778 |
| 18.8889 | 23.0383 | 24.1776 | 24.3 | 24.0572 | 23.7206 | 23.4778 | 23.6002 | 24.7395 | 28.8889 |
| 20 | 28.8889 | 27.7778 | 26.6667 | 25.5556 | 24.4444 | 23.3333 | 22.2222 | 21.1111 | 30 |

Результат для матрицы 13x13

| | | | | | | | | | | | | |
|-------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Final grid: | | | | | | | | | | | | |
| 10 | 10.8333 | 11.6667 | 12.5 | 13.3333 | 14.1667 | 15 | 15.8333 | 16.6667 | 17.5 | 18.3333 | 19.1667 | 20 |
| 10.8333 | 11.6739 | 12.5124 | 13.3476 | 14.179 | 15.0071 | 15.8333 | 16.6596 | 17.4877 | 18.3191 | 19.1543 | 19.9928 | 20.8333 |
| 11.6667 | 12.5163 | 13.3615 | 14.199 | 15.0279 | 15.8494 | 16.6667 | 17.484 | 18.3055 | 19.1343 | 19.9718 | 20.817 | 21.6667 |
| 12.5 | 13.3633 | 14.2183 | 15.0591 | 15.8841 | 16.6958 | 17.5 | 18.3042 | 19.1159 | 19.9409 | 20.7817 | 21.6367 | 22.5 |
| 13.3333 | 14.2187 | 15.0893 | 15.935 | 16.7537 | 17.5498 | 18.3333 | 19.1169 | 19.913 | 20.7316 | 21.5774 | 22.4479 | 23.3333 |
| 14.1667 | 15.089 | 15.9849 | 16.8381 | 17.6457 | 18.4163 | 19.1667 | 19.917 | 20.6876 | 21.4952 | 22.3484 | 23.2444 | 24.1667 |
| 15 | 15.9855 | 16.9233 | 17.7869 | 18.5746 | 19.3032 | 20 | 20.6968 | 21.4254 | 22.2131 | 23.0767 | 24.0145 | 25 |
| 15.8333 | 16.9299 | 17.936 | 18.8115 | 19.5626 | 20.2219 | 20.8333 | 21.4448 | 22.104 | 22.8551 | 23.7307 | 24.7368 | 25.8333 |
| 16.6667 | 17.9646 | 19.0791 | 19.9606 | 20.6425 | 21.1884 | 21.6667 | 22.1449 | 22.6908 | 23.3727 | 24.2542 | 25.3687 | 26.6667 |
| 17.5 | 19.1829 | 20.4554 | 21.3091 | 21.8586 | 22.2224 | 22.5 | 22.7776 | 23.1414 | 23.6909 | 24.5446 | 25.8171 | 27.5 |
| 18.3333 | 20.8115 | 22.2504 | 22.9619 | 23.2602 | 23.3428 | 23.3333 | 23.3239 | 23.4065 | 23.7047 | 24.4163 | 25.8552 | 28.3333 |
| 19.1667 | 23.4794 | 24.7728 | 25.0281 | 24.8775 | 24.5551 | 24.1667 | 23.7783 | 23.4558 | 23.3053 | 23.5605 | 24.8539 | 29.1667 |
| 20 | 29.1667 | 28.3333 | 27.5 | 26.6667 | 25.8333 | 25 | 24.1667 | 23.3333 | 22.5 | 21.6667 | 20.8333 | 30 |

Выполнение на CPU

CPU Sequential

| Размер сетки | Время | Точность | Кол-во итераций |
|--------------|--------|------------|-----------------|
| 128x128 | 1,27 | 9.99813e-7 | 43641 |
| 256x256 | 33,10 | 9.99979e-7 | 166766 |
| 512x512 | 376,28 | 9.99997e-7 | 632912 |

CPU Multicore

| Размер сетки | Время | Точность | Кол-во итераций |
|--------------|---------|-------------|-----------------|
| 128x128 | 3,58 | 9.99813e-7 | 43641 |
| 256x256 | 21,34 | 9.99979e-7 | 166766 |
| 512x512 | 194,53 | 9.99997e-7 | 632912 |
| 1024x1024 | 1104,84 | 0,000700391 | 1000000 |

Диаграмма сравнения времени выполнения работы



Выполнение на GPU

| Размер сетки | Время | Точность | Кол-во итераций |
|--------------|-------|------------|-----------------|
| 128x128 | 4,21 | 9.99813e-7 | 43641 |
| 256x256 | 8,62 | 9.99979e-7 | 166766 |
| 512x512 | 43,32 | 9.99997e-7 | 632912 |

