**Part A**

The CPU used in each is Intel core i7 4770S, which is 4C/8T CPU. The table below shows the speed up from imflipPM.c to imflipPMC.c. (The time recorded is got by repeat 101 times )

|  |  |  |  |
| --- | --- | --- | --- |
| **# Threads** | **imflipHM(ms)** | **imflipHMC(ms)** | **Speed up HM→HMC** |
| 1 | 33.2772 | 13.5954 | 2.45x |
| 2 | 17.3366 | 7.2581 | 2.4x |
| 3 | 13.4554 | 5.4362 | 2.48x |
| 4 | 12.2277 | 6.0402 | 2.02x |
| 5 | 13.4158 | 5.7927 | 2.32x |
| 6 | 11.4653 | 4.6638 | 2.46x |
| 7 | 11.3168 | 5.0995 | 2.2x |
| 8 | 12.5248 | 5.0698 | 2.47x |

**Part B**

The table below shows the speed up from MTFlipVM.c (initial) to MTFlipVM2.c to MTFlipVM3.c. (The time recorded is got by repeat 101 times )

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **# Threads** | **VM(ms)** | **VM2** | **VM3** | **Speed up VM→VM2** | **Speed up VM→VM3** | **Speed up VM2→VM3** |
| 1 | 3.8911 | 3.2871 | 3.5849 | 1.18x | 1.09x | 0.92x |
| 2 | 2.7525 | 2.5545 | 2.6436 | 1.10x | 1.04x | 0.966x |
| 3 | 2.4158 | 2.4356 | 2.4059 | 0.99x | 1x | 1.01x |
| 4 | 2.5545 | 2.4554 | 2.4455 | 1.04x | 1.05x | 1x |
| 5 | 2.5446 | 2.4158 | 2.4851 | 1.05x | 1.024x | 0.97x |
| 6 | 2.7030 | 2.3960 | 2.4554 | 1.125x | 1.1x | 0.9758x |
| 7 | 2.5050 | 2.3762 | 2.4455 | 1.05x | 1.02x | 0.97x |
| 8 | 2.4653 | 2.5149 | 2.4851 | 0.98x | 0.99x | 1.011x |

**Part C & Part D**

The table below shows the speed of function Rotate8 and Rotate9. It is clear the execution time of rotate9 decrease with increasing of the unmber of thread compared with rotate8.

|  |  |  |
| --- | --- | --- |
| **# Thread** | **Rotate8** | **Rotate9** |
| 1 | 74.94 | 74.4356 |
| 2 | 39.1287 | 43.0594 |
| 3 | 29.4554 | 30.1287 |
| 4 | 30.2302 | 23.3861 |
| 5 | 27.297 | 21.8416 |
| 6 | 23.7129 | 20.6040 |
| 7 | 20.8218 | 19.5446 |
| 8 | 26.4458 | 19.4455 |