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| Multicore Computing Project1 |

- Problem 1 -

측정기이(가) 표시된 사진

자동 생성된 설명

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**1. Problem-2: Matrix Multiplication**

**(a). Environment**

Model: MacBook Air(M1, 2020)

Chip: Apple M1

Cores: 4+4 (P: 4 / E: 4)

RAM: 16 GB

**(b). Result**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Thread** | **1** | **2** | **4** | **6** | **8** | **10** | **12** | **14** | **16** | **32** |
| **exec time(ms)** | 269 | 142 | 104 | 102 | 57 | 65 | 89 | 79 | 99 | 87 |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Thread** | **1** | **2** | **4** | **6** | **8** | **10** | **12** | **14** | **16** | **32** |
| **performance (1/exec time)** | 3.72 | 7.04 | 9.62 | 9.80 | 17.54 | 15.38 | 11.24 | 12.66 | 10.10 | 11.49 |

**(c). Explanation/Analysis**

When we multiply matrices, we repeat getting a row from first matrix and a column from matrix. Then we multiply each elements in these two vectors and add up all multiplication output. In the program, we assign first matrix’s each rows to all the threads by using static cylic load balancing.

If we look at the result, overall execution time showed decreasing trend and performance showed the opposite. What is interesting is that at thread 8 the program showed the best performance and started to decrease a little when more threads were used. This is because using large number of threads leads to overhead due to context switching and so on.

So by conducting this experiment, we get a conclusion that load balancing and overhead have a tradeoff relationship.

**(d). Source code**

**• Matrix multiplication code**

텍스트이(가) 표시된 사진

자동 생성된 설명

텍스트이(가) 표시된 사진

자동 생성된 설명텍스트이(가) 표시된 사진

자동 생성된 설명

**• Matrix multiplication output**

**텍스트이(가) 표시된 사진

자동 생성된 설명텍스트이(가) 표시된 사진

자동 생성된 설명**

텍스트이(가) 표시된 사진

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**• How to run**

Store the matrices you want to multiply in the txt file (ex. mat500.txt)

Set *else thread\_no = ?* to set the total number of threads you want to make.