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# Matrix Multiplication With Different Combinations:

• In the matrix operation how the data element is acceses matters alot.
In the two programs 1) SEQUENTIAL
2) PARRALEL (USING openMP)

***SEQUENTIAL PROGRAM :***

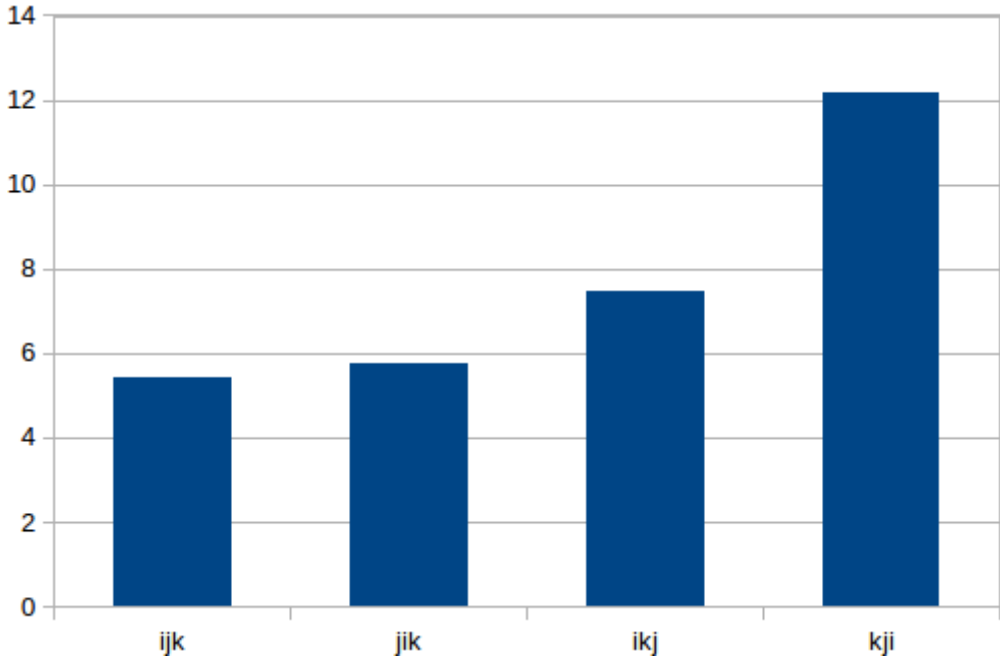
• I changed the index of the main for loop which are “i,j,k” and analysed the performance for different indexing. So the problem of spacial locality and the temporal location can be analyzed in this matrix multiplication.

• I have implemented both the sequencial code, parralel (openmp) code and analyzed the performance of both.

• Below are the result for the sequential code by changing the access of the elements in the matrix by interchanging the index of the programs.

• The program is profiled using gprof.

• Problem Size: 1000 X 1000 ( I have given an input.text file which is values of size 1000 * 1000 created randomly by a user created program.)




where the vertical line represent the number of threads used and the horzontal line represent the different combinations of the indices in the main for loop of the Matrix Multiplication program.

***PARALLEL MATRIX MULTIPLICATION WITH OPENMP:***

• This matrix multiplication is independent operation so this can be parallized. So i have used openmp to parallelized this matrix multiplication. The outer most loop is parallized using ***#pragma omp parallel*** for compiler directive.So the outer loop determines the no of threads used in the program.

• The results after parallizing the matrix multiplication.

Problem Size: 1000 X 1000
Number of thread: 12

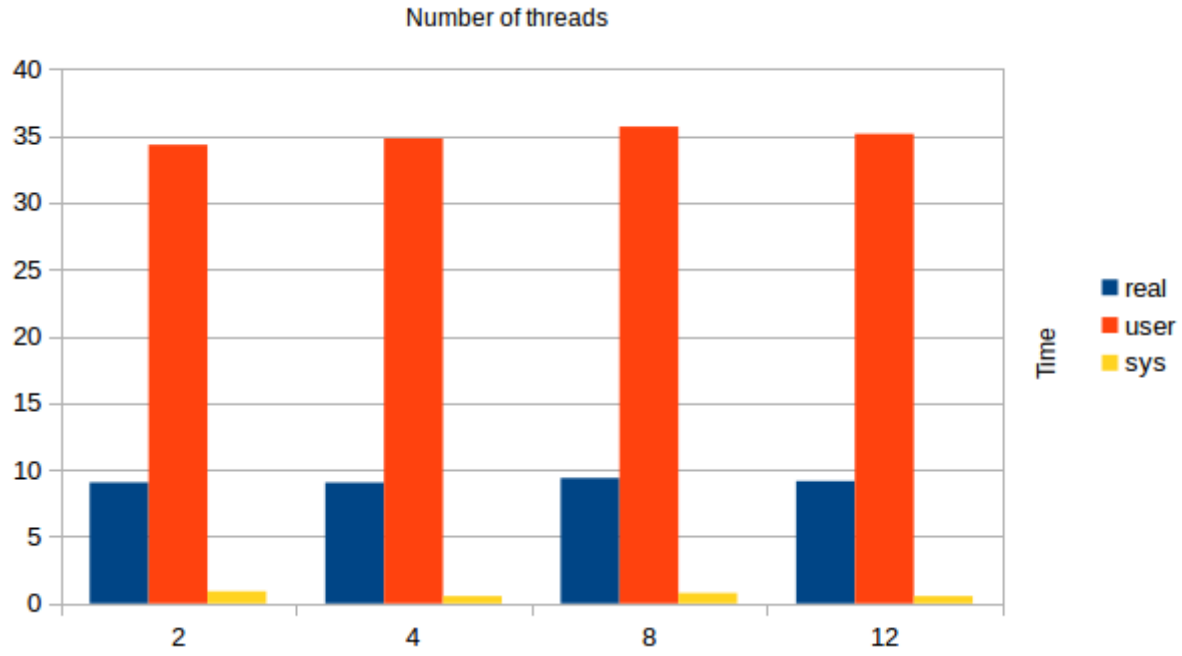
• The openmp is profiled using the gprof. Below is the profile of the paralleized matrix multiplication profile.

Each sample counts as 0.01 seconds.
no time accumulated

| % time | cumulative seconds | self seconds | calls | self Ts/call | total Ts/call | name |
|---|---|---|---|---|---|---|
| 0.00 | 0.00 | 0.00 | 1 | 0.00 | 0.00 | ijk |
| 0.00 | 0.00 | 0.00 | 1 | 0.00 | 0.00 | ikj |
| 0.00 | 0.00 | 0.00 | 1 | 0.00 | 0.00 | jik |
| 0.00 | 0.00 | 0.00 | 1 | 0.00 | 0.00 | jki |
| 0.00 | 0.00 | 0.00 | 1 | 0.00 | 0.00 | kij |
| 0.00 | 0.00 | 0.00 | 1 | 0.00 | 0.00 | kji |

• The result for the openmp matrix multiplication using time command.

• The time command calculates the real, system and user time.




| No of threads | 2 | 4 | 8 | 12 |
|---|---|---|---|---|
| real | 9.054 | 9.042 | 9.387 | 9.158 |
| user | 34.32 | 34.784 | 35.676 | 35.144 |
| sys | 0.908 | 0.548 | 0.784 | 0.548 |