

Matrix experiment

Test program

The test program performs matrix transposition and evaluates given implementation:

- the cache-oblivious matrix transposition
- the trivial algorithm which transposed by definition.

It evaluates the implementation on simulated caches of m items organized in b -item blocks and matrices of different sizes n .

The simulated cache is fully associative and uses LRU replacement strategy.

- m1024-b16
- m8192-b64
- m65536-b256
- m65536-b4096

Performance

Performance is measured in terms of the average number of cache misses per item.

The diagonal items are not counted.

Plots

Each plot shows the dependence of the average number of misses on the matrix size n .

- the cache-oblivious algorithm: the green curve
- the trivial algorithm: the black curve

Theoretical facts

Number of memory transfers is:

- $O(n^2/b)$ for the cache-oblivious algorithm, $(m/b) < n$
- $O(n^2)$ for the trivial algorithm, $m > b^2$

- the cache-oblivious algorithm

The average number of misses on the matrix size n : $O(1/b)$.

- the number of items: n^2
- the number of transfers: $O(n^2/b)$
- $(n^2/b) / n^2 = (1/b)$

The number of misses is 0 on the matrix size n , if $n^2 < M$.

	$1/b$ (approx.)	$n: n = 2^k, 2^{2k} = M$
m1024-b16	0,0625	2^5
m8192-b64	0.0156	2^6
m65536-b256	0.0039	2^8
m65536-b4096	0,0002	2^8