

BÁO CÁO THỰC HÀNH KIẾN TRÚC MÁY TÍNH – TUẦN 12

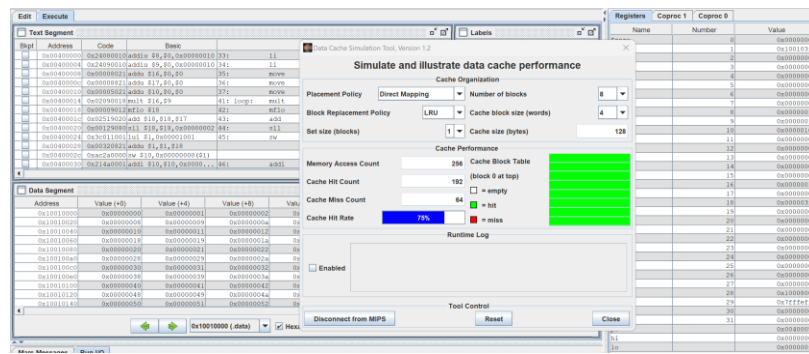
Họ và tên: Nguyễn Mạnh Tùng

MSSV: 20225682

Assignment 1:

* Chương trình row-major:

- Khi kết thúc chương trình:

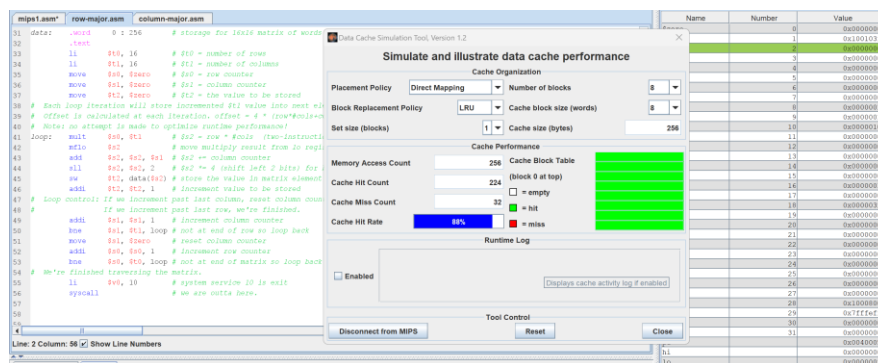


- Nhận xét:

+ Tỷ lệ truy cập bộ nhớ đệm cuối cùng: 75%

Bởi vì: với mỗi khối 4 từ được ghi vào bộ nhớ đệm, trong phép duyệt theo hàng, các phần tử được lưu trữ liên tiếp -> 4 lần truy cập bộ nhớ sẽ có 3 lần được giải quyết trong bộ nhớ đệm.

+ Nếu kích thước tăng từ 4 lên 8 => tỉ lệ 87,5%

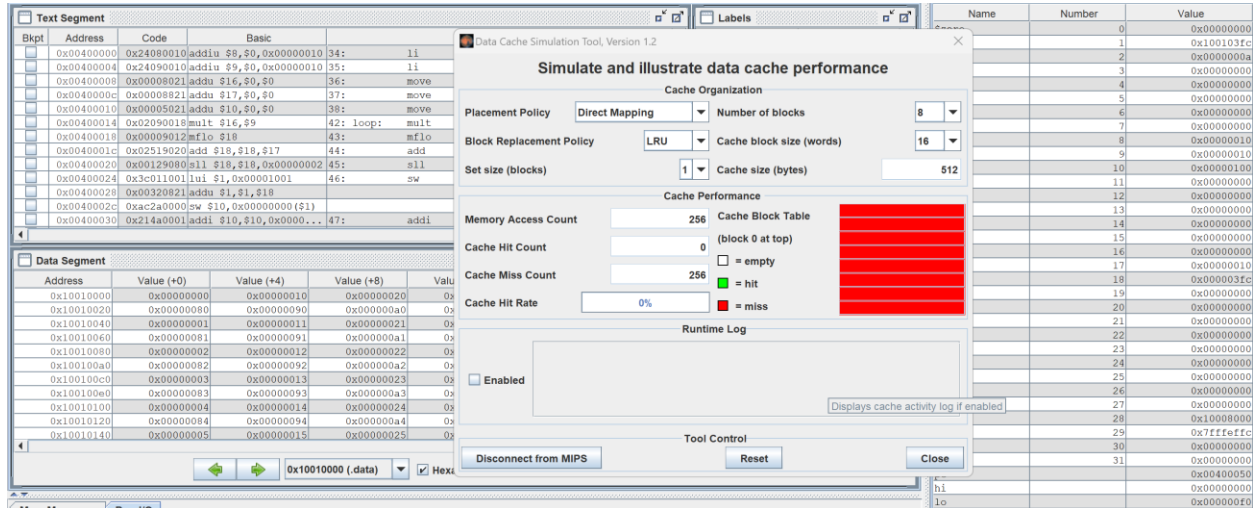


➔ Kết quả đúng với lí thuyết

+ Nếu kích thước giảm từ 4 -> 2 => tỉ lệ 50%

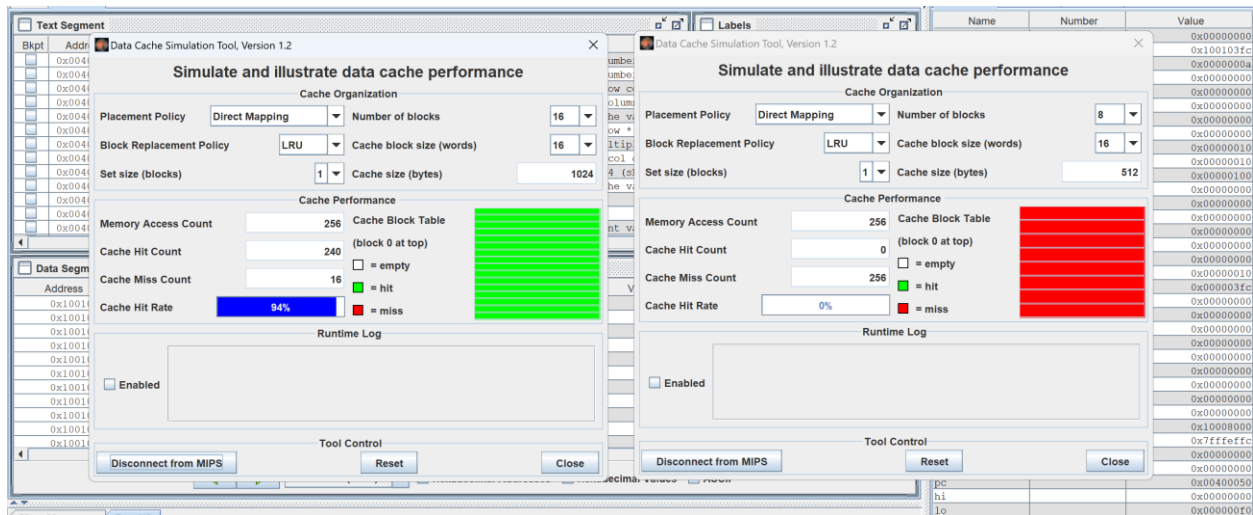
The screenshot shows the 'Data Cache Simulation Tool, Version 1.2' interface. On the left, the 'column-major.asm' program is displayed, which is a MIPS assembly code for a 16x16 matrix multiplication. The program uses registers \$s0, \$s1, \$s2, \$s3, \$s4, \$s5, \$s6, \$s7, \$s8, \$s9, \$s10, \$s11, \$s12, \$s13, \$s14, \$s15, \$s16, \$s17, \$s18, \$s19, \$s20, \$s21, \$s22, \$s23, \$s24, \$s25, \$s26, \$s27, \$s28, \$s29, \$s30, \$s31, \$s32, \$s33, \$s34, \$s35, \$s36, \$s37, \$s38, \$s39, \$s40, \$s41, \$s42, \$s43, \$s44, \$s45, \$s46, \$s47, \$s48, \$s49, \$s50, \$s51, \$s52, \$s53, \$s54, \$s55, \$s56, \$s57, \$s58, \$s59, \$s60, \$s61, \$s62, \$s63, \$s64, \$s65, \$s66, \$s67, \$s68, \$s69, \$s70, \$s71, \$s72, \$s73, \$s74, \$s75, \$s76, \$s77, \$s78, \$s79, \$s80, \$s81, \$s82, \$s83, \$s84, \$s85, \$s86, \$s87, \$s88, \$s89, \$s90, \$s91, \$s92, \$s93, \$s94, \$s95, \$s96, \$s97, \$s98, \$s99, \$s100, \$s101, \$s102, \$s103, \$s104, \$s105, \$s106, \$s107, \$s108, \$s109, \$s110, \$s111, \$s112, \$s113, \$s114, \$s115, \$s116, \$s117, \$s118, \$s119, \$s120, \$s121, \$s122, \$s123, \$s124, \$s125, \$s126, \$s127, \$s128, \$s129, \$s130, \$s131, \$s132, \$s133, \$s134, 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+ Nếu kích thước tăng từ 4->16 => tỉ lệ 0%



➔ Kết quả đúng với lý thuyết

+ So sánh kết quả khi number_of_blocks=16 và number_of_blocks=8:



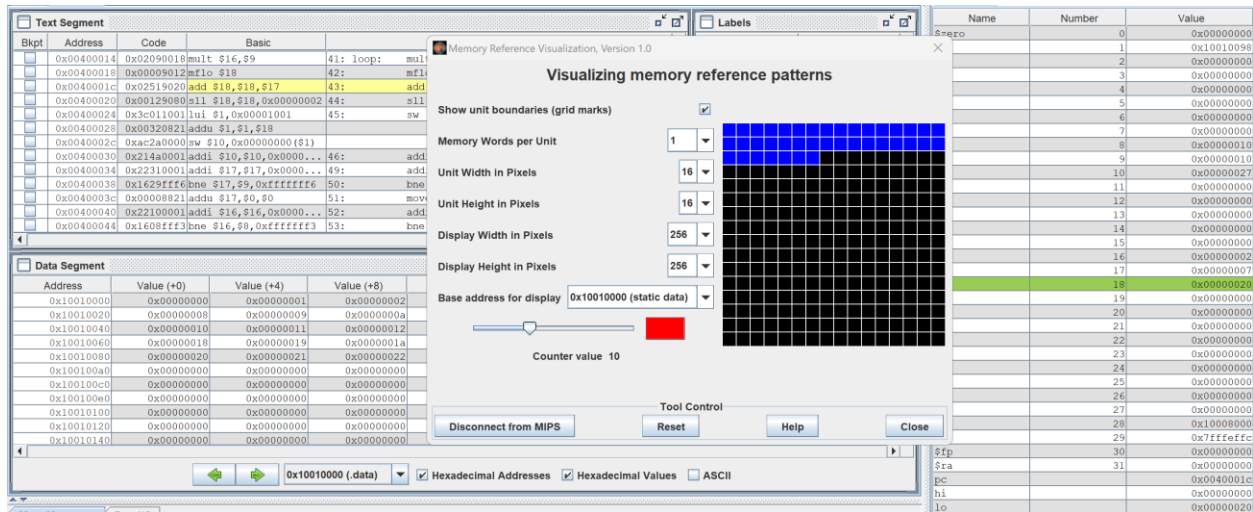
- Tỉ lệ truy cập bộ nhớ đệm khi number_of_blocks=16 là 94%

Bởi vì: toàn bộ ma trận nằm gọn trong bộ nhớ đệm, chỉ có lần truy cập đầu tiên đến một khối mới gây ra cache miss. Sau khi một khoosid được tải vào bộ nhớ đệm, nó không bị thay thế và tất cả các lần truy cập tiếp theo trong khối đó đều là cache hits -> hiệu suất truy cập vào bộ nhớ cao.

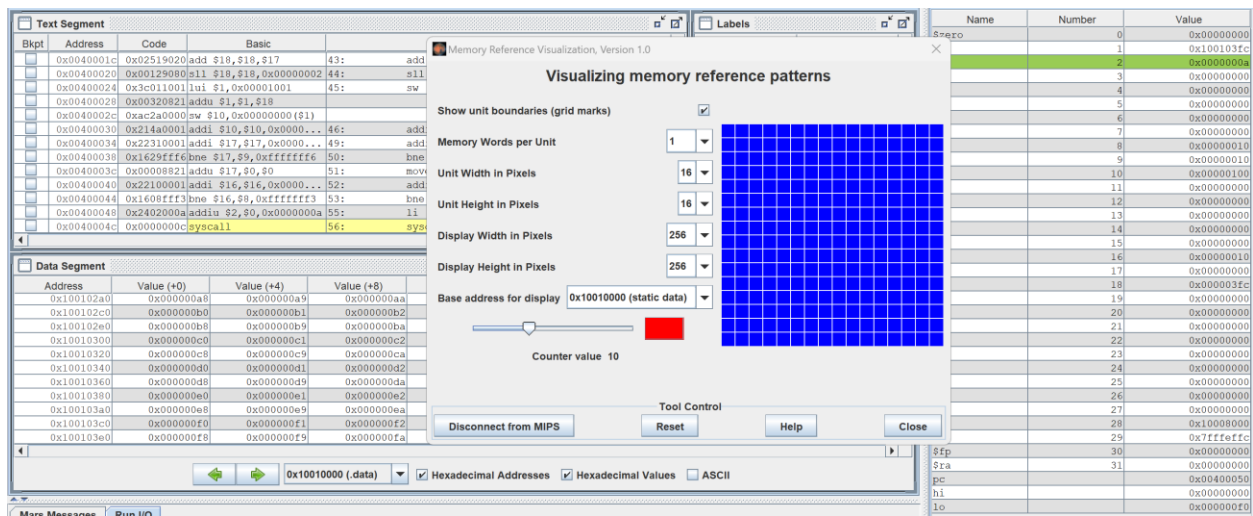
Assignment 2:

* Chương trình row-major:

- Khi dừng chương trình đột ngột:



- Khi kết thúc chương trình:

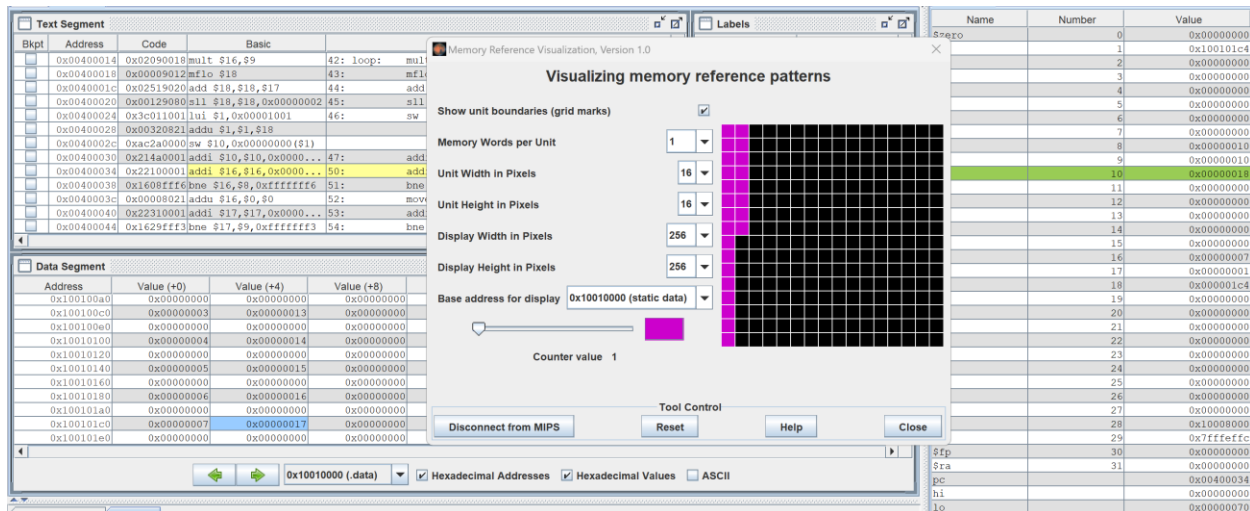


+ Các phần tử được ghi theo hàng, từ trái qua phải, từ trên xuống dưới

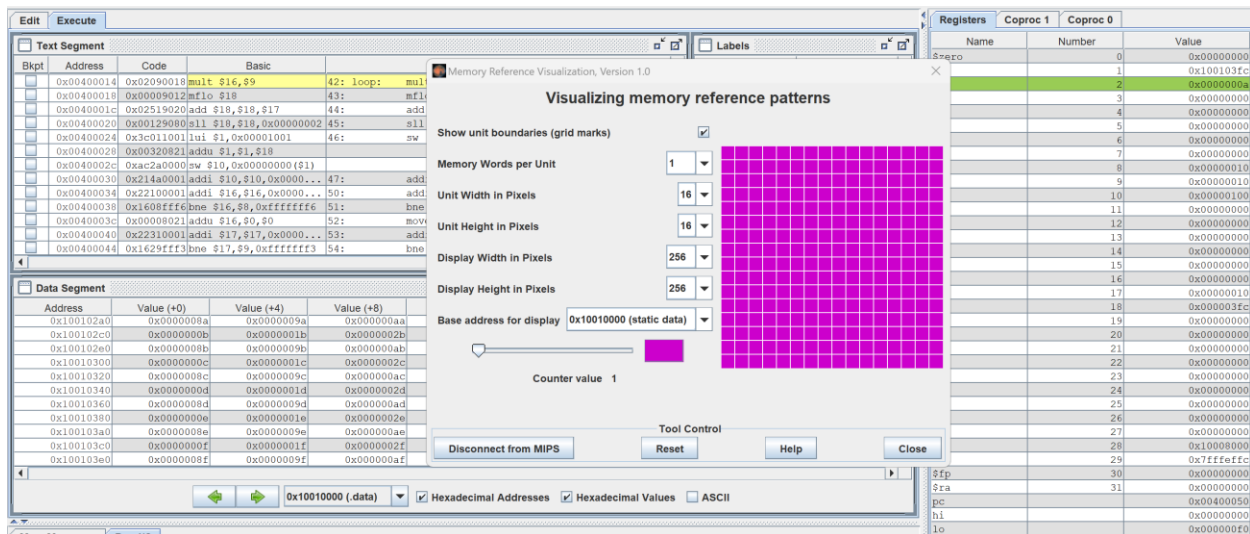
➔ Kết quả đúng với lý thuyết

* Chương trình column-major:

- Khi dừng chương trình đột ngột:



- Khi kết thúc chương trình:



+ Các phần tử được ghi theo cột, từ trên xuống dưới, từ trái qua phải

➔ Kết quả đúng với lý thuyết

* Chương trình fibonacci:

- Kết quả:

The screenshot displays the Mars MIPS simulator interface. The main window shows the assembly code for a Fibonacci program. The Text Segment window lists instructions such as `addiu $2,$0,0x0000000a`, `syscall`, `add $9,$0,$5`, `lui $1,0x00001001`, `ori $4,$1,0x00000046`, `addiu $2,$0,0x00000004`, `syscall`, `lw $4,0x00000000($8)`, `out: $3`, `addiu $2,$0,0x00000001`, `syscall`, `lui $1,0x00001001`, and `ori $4,$1,0x00000044`. The Data Segment window shows memory addresses and their corresponding values. The Memory Reference Visualization window displays a grid of memory access patterns, with a counter value of 1. The Registers window on the right shows the state of various registers, including `$zero`, `$at`, `$v0`, `$v1`, `$a0`, `$a1`, `$a2`, `$a3`, `$t0`, `$t1`, `$t2`, `$t3`, `$t4`, `$t5`, `$t6`, `$t7`, `$s0`, `$s1`, `$s2`, `$s3`, `$s4`, `$s5`, `$s6`, `$s7`, `$s8`, `$s9`, `$k0`, `$k1`, `$gp`, `$sp`, `$fp`, `$ra`, `$pc`, `$hi`, and `$lo`. The Mars Messages window at the bottom shows the output of the program, including the message "program is finished running --" and the Fibonacci sequence: "The Fibonacci numbers are: 1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987".

Registers

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0x10010000
\$v0	2	0x0000000a
\$v1	3	0x00000000
\$a0	4	0x10010044
\$a1	5	0x00000010
\$a2	6	0x00000000
\$a3	7	0x00000000
\$t0	8	0x10010040
\$t1	9	0x00000000
\$t2	10	0x000003db
\$t3	11	0x00000179
\$t4	12	0x00000262
\$t5	13	0x00000010
\$t6	14	0x00000000
\$t7	15	0x00000000
\$s0	16	0x00000000
\$s1	17	0x00000000
\$s2	18	0x00000000
\$s3	19	0x00000000
\$s4	20	0x00000000
\$s5	21	0x00000000
\$s6	22	0x00000000
\$s7	23	0x00000000
\$s8	24	0x00000000
\$s9	25	0x00000000
\$k0	26	0x00000000
\$k1	27	0x00000000
\$gp	28	0x10008000
\$sp	29	0x7ffff0fc
\$fp	30	0x00000000
\$ra	31	0x00400054
\$pc		0x0040005c
\$hi		0x00000000
\$lo		0x00000000

Mars Messages

```
-- program is finished running --  
Reset: reset completed.  
The Fibonacci numbers are:  
1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987  
-- program is finished running --
```

➔ Kết quả đúng với lý thuyết.