

BÁO CÁO THỰC HÀNH TUẦN 2

Lương Thị Tâm – 20194663

BÀI 1:

*Code :

```

1 #truong hop if(i<=j)
2 .data
3 X: .word -4      #khoi tao x = -4
4 Y: .word 3       #khoi tao y = 3
5 Z: .word 2       #khoi tao z = 2
6 .text
7     addi $s1, $zero, 4    #i = 4
8     addi $s2, $zero, 5    #j = 5
9     la $t7, X
10    lw $t1, 0($t7)   # $t1 = X
11    la $t8, Y
12    lw $t2, 0($t8)   # $t2 = y
13    la $t9, Z
14    lw $t3, 0($t9)   # $t3 = z
15 start:
16     slt $t0, $s2, $s1      # j < i -> $t0 = 1
17     bne $t0, $zero, else    # $t0 = 1 nhay den else
18     addi $t1, $t1, 1        # x = x + 1
19     addi $t3, $zero, 1        # z = 1
20     j endif                # ket thuc chuong trinh
21 else:
22     addi $t2, $t2, -1       # y = y - 1
23     add $t3, $t3, $t3        # z = z * 2
24 endif:
25
26
27

```

*Giải thích :

Với i = 4 và j = 5 , sau khi chạy lệnh slt \$t0, \$s2, \$s1 vì j > i nên \$t0 = 0 → \$t0 != 0 vì vậy không nhảy đến else, chương trình tiếp tục thực hiện hai lệnh addi sau đó nhảy đến endif

giá trị của thanh ghi \$t1 thay đổi thành -3

giá trị của thanh ghi \$t3 thay đổi thành 1

giá trị của thanh ghi \$t2 không thay đổi.

*Chạy từng dòng lệnh :

| Name | Number | Value |
|--------|--------|------------|
| \$zero | 0 | 0 |
| \$at | 1 | 0 |
| \$v0 | 2 | 0 |
| \$v1 | 3 | 0 |
| \$a0 | 4 | 0 |
| \$a1 | 5 | 0 |
| \$a2 | 6 | 0 |
| \$a3 | 7 | 0 |
| \$t0 | 8 | 0 |
| \$t1 | 9 | 0 |
| \$t2 | 10 | 0 |
| \$t3 | 11 | 0 |
| \$t4 | 12 | 0 |
| \$t5 | 13 | 0 |
| \$t6 | 14 | 0 |
| \$t7 | 15 | 0 |
| \$t8 | 16 | 0 |
| \$t9 | 17 | 4 |
| \$s1 | 18 | 0 |
| \$s2 | 19 | 0 |
| \$s3 | 20 | 0 |
| \$s4 | 21 | 0 |
| \$s5 | 22 | 0 |
| \$s6 | 23 | 0 |
| \$s7 | 24 | 0 |
| \$s8 | 25 | 0 |
| \$s9 | 26 | 0 |
| \$k1 | 27 | 0 |
| \$gp | 28 | 28468224 |
| \$sp | 29 | 2147479445 |
| \$fp | 30 | 0 |
| \$ra | 31 | 0 |
| pc | | 4194308 |
| hi | | 0 |
| lo | | 0 |

The screenshot shows the MARS 4.5 assembly editor interface with several panes:

- Text Segment**: Shows assembly code for mips1.asm. The code includes instructions like addi, add, lw, and j. A yellow highlight covers the section from label \$t0 to label \$t1.
- Labels**: Lists labels defined in the assembly file, such as start, else, endif, X, Y, Z, and various \$t0-\$t10 labels.
- Data Segment**: Displays memory starting at address 0x10000000. It shows a series of 0x00 values across multiple pages.
- Registers**: Shows the state of CPU registers. The \$zero register is at 0x268500992, and the \$t1 register is at 0x-4.

At the bottom, there are buttons for running the program, selecting data or text mode, and navigating between memory, registers, and stack.

T6 Thg 4 15 23:50:41 • 11 21.07 KB/s en 14%

/home/thanhtam/THKienTructHT/Lab03/mips1.asm - MARS 4.5

File Edit Run Settings Tools Help

Run speed at max (no interaction)

Text Segment

| Bkpt | Address | Code | Basic | Source |
|------|------------|-------------------------------|--------------------------|----------------------------------|
| | 0x00400000 | 0x2010004 addi \$t1,\$zero,4 | # \$t1 = 4 | 7: addi \$t1,\$zero,4 # \$t1 = 4 |
| | 0x00400004 | 0x2012005 addi \$t1,\$zero,5 | # \$t1 = 5 | 8: addi \$t2,\$zero,5 # \$t1 = 5 |
| | 0x00400008 | 0x3c010000ori \$t1,\$t1,1 | # \$t1 = 1 | 9: la \$t1,X |
| | 0x00400012 | 0x3c010000ori \$t1,\$t1,1 | # \$t1 = 1 | 10: la \$t1,0(\$t7) # \$t1 = X |
| | 0x00400014 | 0x3c010000ori \$t1,\$t1,1 | # \$t1 = 1 | 11: la \$t1,Y |
| | 0x00400018 | 0x34380004ori \$t2,\$zero,1 | # \$t2 = 1 | 12: lw \$t2,0(\$t8) # \$t2 = y |
| | 0x00400020 | 0x2010004 addi \$t1,\$zero,1 | # \$t1 = 1 | 13: la \$t1,Z |
| | 0x00400024 | 0x34390008ori \$t2,\$zero,1 | # \$t2 = 1 | |
| | 0x00400028 | 0x8f2b0000lw \$t1,0(\$t2) | # \$t1 = Z | 14: lw \$t3,0(\$t9) # \$t3 = Z |
| | 0x0040002c | 0x0251402aslt \$t0,\$t2,\$t1 | # j < 1 -> \$t0 = 1 | 15: slt \$t0,\$t2,\$t1 |
| | 0x00400030 | 0x3c010000ori \$t1,\$t1,1 | # \$t1 = 1 nhay den else | 16: bne \$t0,\$zero,1 |
| | 0x00400034 | 0x21290001addi \$t1,\$zero,1 | # x = x + 1 | 17: addi \$t1,\$t1,1 |
| | 0x00400038 | 0x20800001addi \$t1,\$zero,1 | # z = 1 | 18: addi \$t3,\$zero,1 |
| | 0x0040003c | 0x08010001j 0x00400048 | # ket thuc chuong trinh | 19: addi \$t1,\$zero,1 |
| | 0x00400040 | 0x214affffffaddi \$t0,\$t0,-1 | # y = y - 1 | 20: jendif |
| | | | | 22: addi \$t2,\$t2,-1 |

Registers

| Name | Number | Value |
|--------|--------|-----------|
| \$zero | 0 | 0 |
| \$t0 | 1 | 268500992 |
| \$t1 | 2 | 0 |
| \$t2 | 3 | 0 |
| \$t3 | 4 | 0 |
| \$t4 | 5 | 0 |
| \$t5 | 6 | 0 |
| \$t6 | 7 | 0 |
| \$t7 | 8 | 0 |
| \$t8 | 9 | -4 |
| \$t9 | 10 | 0 |
| \$t10 | 11 | 0 |
| \$t11 | 12 | 0 |
| \$t12 | 13 | 0 |
| \$t13 | 14 | 0 |
| \$t14 | 15 | 268500992 |
| \$t15 | 16 | 0 |
| \$t16 | 17 | 4 |
| \$t17 | 18 | 5 |
| \$t18 | 19 | 0 |
| \$t19 | 20 | 0 |
| \$t20 | 21 | 0 |
| \$t21 | 22 | 0 |
| \$t22 | 23 | 0 |
| \$t23 | 24 | 268500996 |
| \$t24 | 25 | 0 |
| \$t25 | 26 | 0 |
| \$t26 | 27 | 0 |
| \$t27 | 28 | 268469224 |
| \$t28 | 29 | 214779548 |
| \$t29 | 30 | 0 |
| \$t30 | 31 | 0 |
| \$ra | | 419438 |
| hi | | 0 |
| lo | | 0 |

Data Segment

| Address | Value (+0) | Value (+4) | Value (+8) | Value (+c) | Value (+10) | Value (+14) | Value (+18) | Value (+1c) |
|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| 0x10010000 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010004 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010008 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001000c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010010 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010014 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010018 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001001c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010020 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010024 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010028 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001002c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010030 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010034 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010038 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001003c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010040 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010044 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010048 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001004c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010050 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010054 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010058 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001005c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010060 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010064 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010068 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001006c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010070 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010074 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010078 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001007c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010080 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010084 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010088 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001008c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010090 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010094 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010098 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001009c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100a0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100a4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100a8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100ac | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100b0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100b4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100b8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100bc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100c0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100c4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100c8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100cc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100d0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100d4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100d8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100dc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100e0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100e4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100e8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100ec | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100f0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100f4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100f8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100100fc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010104 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010108 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001010c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010110 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010114 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010118 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001011c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010120 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010124 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010128 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001012c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010130 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010134 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010138 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001013c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010144 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010148 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001014c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010154 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010158 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001015c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010160 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010164 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010168 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001016c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010170 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010174 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010178 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001017c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010180 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010184 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010188 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001018c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010190 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010194 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010198 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1001019c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101a0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101a4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101a8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101ac | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101b0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101b4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101b8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101bc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101c0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101c4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101c8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101cc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101d0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101d4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101d8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101dc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101e0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101e4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101e8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101ec | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101f0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101f4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101f8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100101fc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10010200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Registers

| Name | Number | Value |
|--------|--------|-----------|
| \$zero | 0 | 0 |
| \$t0 | 1 | 268500992 |
| \$t1 | 2 | 0 |
| \$t2 | 3 | 0 |
| \$t3 | | |

The screenshot shows the MARS 4.5 assembly editor interface with the following details:

- Text Segment:** Displays assembly code with comments. Key lines include:
 - 7: addi \$31, \$zero, 4 # \$i = 4
 - 8: addi \$52, \$zero, 5 # \$j = 5
 - 9: la \$t1, X
 - 10: lw \$t1, 0(\$t7) # \$t1 = X
 - 11: la \$t0, Y
 - 12: lw \$t2, 0(\$t8) # \$t2 = y
 - 13: la \$t0, Z
- Data Segment:** Shows memory starting at address 0x10001000 with all values set to 0.
- Labels:** Lists labels defined in the code: start, else, endif, X, Y, Z, t1, t2, t3, t4, t5, t6, t7, t8, t9, t10, t11, t12, t13, t14, t15, t16, t17, t18, t19, t20, t21, t22, t23, t24, t25, t26, t27, t28, t29, t30, t31, rfa, rfb, rfc, rfd, rfe, rff.
- Registers:** Shows the state of various registers:

| Name | Number | Value |
|--------|--------|-------------|
| \$zero | 0 | 0 |
| \$t1 | 1 | 268500992 |
| \$t2 | 2 | 0 |
| \$t3 | 3 | 0 |
| \$s0 | 4 | 0 |
| \$t4 | 5 | 0 |
| \$t5 | 6 | 0 |
| \$t6 | 7 | 0 |
| \$t7 | 8 | 0 |
| \$t8 | 9 | -3 |
| \$t9 | 10 | 0 |
| \$t10 | 11 | 0 |
| \$t11 | 12 | 0 |
| \$t12 | 13 | 0 |
| \$t13 | 14 | 0 |
| \$t14 | 15 | 268500992 |
| \$s0 | 16 | 0 |
| \$t15 | 17 | 4 |
| \$t16 | 18 | 5 |
| \$t17 | 19 | 0 |
| \$t18 | 20 | 0 |
| \$t19 | 21 | 0 |
| \$t20 | 22 | 0 |
| \$t21 | 23 | 0 |
| \$t22 | 24 | 268500992 |
| \$t23 | 25 | 268501000 |
| \$k0 | 26 | 0 |
| \$t24 | 27 | 0 |
| \$t25 | 28 | 268492224 |
| \$t26 | 29 | 21474779548 |
| \$fp | 30 | 0 |
| rfa | 31 | 0 |
| rc | | 4194364 |
| rh | | 0 |
| lo | | 0 |
- Coproc 1 & Coproc 0:** Both sections show all values as 0.

BÀI 2:

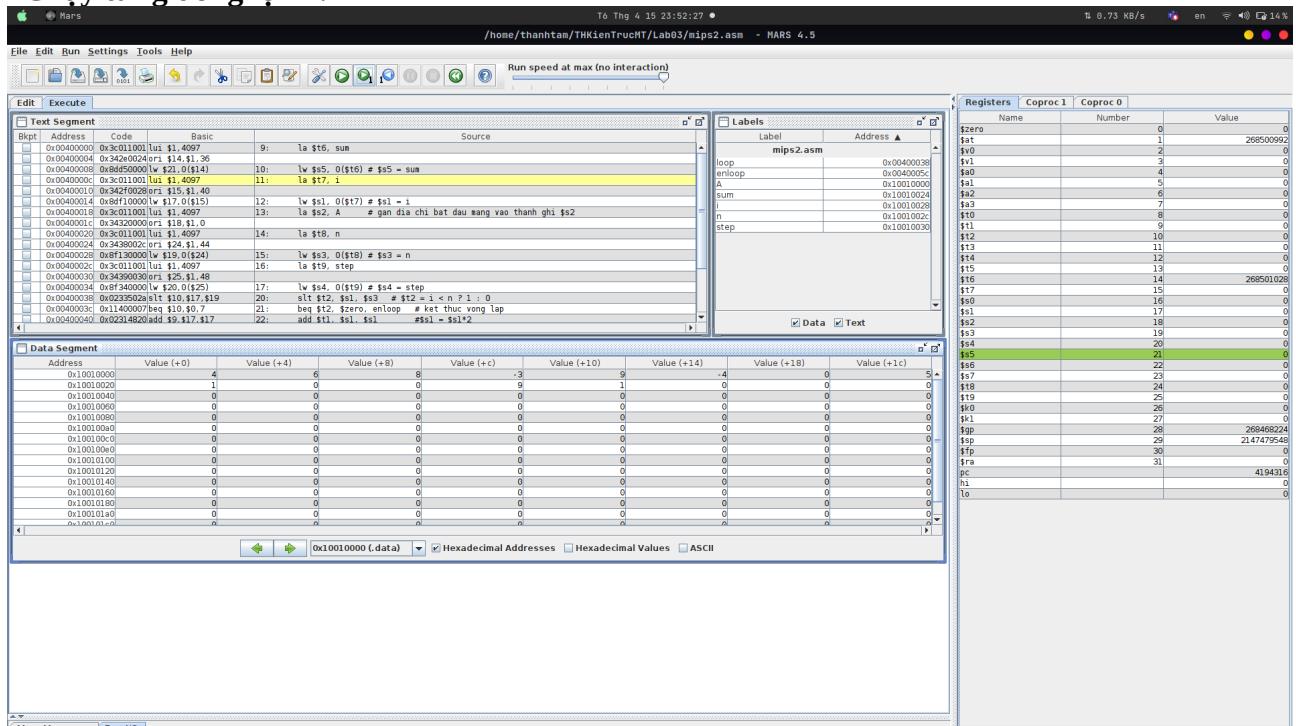
*Code :

```

1 .data
2     A: .word    4, 6, 8, -3, 9, -4, 0, 5, 1      #khoi tao mang
3     sum: .word  0                                #khai bao sum
4     i: .word   0                                #khai bao i
5     n: .word   9                                #so phan tu cua mang n = 9
6     step: .word 1                             #buoc nhay cua vong lap
7 .text
8     #nap gia tri vao cac thanh ghi
9     la $t6, sum
10    lw $s5, 0($t6) # $s5 = sum
11    la $t7, i
12    lw $s1, 0($t7) # $s1 = i
13    la $s2, A      # gan dia chi bat dau mang vao thanh ghi $s2
14    la $t8, n
15    lw $s3, 0($t8) # $s3 = n
16    la $t9, step
17    lw $s4, 0($t9) # $s4 = step
18    #thuc hien tinh tong      addi $s5, $zero, 0 #sum=0      addi $s1, $zero, 0 #i=0
19 loop:
20    slt $t2, $s1, $s3 # $t2 = i < n ? 1 : 0
21    beq $t2, $zero, enloop # ket thuc vong lap
22    add $t1, $s1, $s1      #$s1 = $s1*2
23    add $t1, $t1, $t1      #$t1 = $t1*4
24    add $t1, $t1, $s2      #gan dia chi cua A[i] cho $t1
25    lw $t0, 0($t1)          #A[i] = $t0
26    add $s5, $s5, $t0      # sum = sum + A[i]
27    add $s1, $s1, $s4      # i = i + step
28    j loop                # quay lai vong lap
29 enloop:
30

```

*Chạy từng dòng lệnh :



T6 Thg 4 15 23:52:44 • 1. 2.59 KB/s en 12% /home/thanhtam/THKienTructHT/Lab03/mips2.asm - MARS 4.5

File Edit Run Settings Tools Help Run speed at max (no interaction)

Text Segment

| Bkpt | Address | Code | Basic | Source |
|------|------------|------------------------------|-------|--|
| | 0x00400000 | 0x3c010000 lui \$1,4097 | 9: | la \$t6, sum |
| | 0x00400004 | 0x342e0024 ori \$14,\$1,36 | 10: | lw \$s5, 0(\$t6) # \$s5 = sum |
| | 0x00400008 | 0xb4d50000 lw \$21,0(\$14) | 11: | la \$t7, 1 |
| | 0x00400012 | 0x3c010000 lui \$1,4097 | 12: | lw \$s1, 0(\$t7) # \$s1 = i |
| | 0x00400016 | 0x342f0028 ori \$15,\$1,40 | 13: | la \$s2, A # gan dia chi bat dau mang vao thanh ghi \$s2 |
| | 0x0040001a | 0x49f10000 lw \$17,0(\$15) | | |
| | 0x0040001e | 0x3c010000 lui \$1,4097 | | |
| | 0x00400022 | 0x342e0024 ori \$14,\$1,36 | 14: | la \$t8, n |
| | 0x00400026 | 0xb4d50000 lw \$21,0(\$24) | 15: | lw \$s3, 0(\$t8) # \$s3 = n |
| | 0x0040002a | 0x3c010000 lui \$1,4097 | 16: | la \$t9, step |
| | 0x00400030 | 0x342f0028 ori \$15,\$1,48 | 17: | lw \$s4, 0(\$t9) # \$s4 = step |
| | 0x00400034 | 0x49f10000 lw \$17,0(\$25) | 18: | slt \$t2, \$zero, enloop # ket thuc vong lap |
| | 0x00400038 | 0x233502a8slt \$10,\$t7,\$19 | 20: | slt \$t2, \$s1, \$s3 # \$t2 = i < n ? 1 : 0 |
| | 0x00400040 | 0x02314620add \$9,\$t7,\$17 | 21: | beq \$t2, \$zero, enloop # ket thuc vong lap |
| | 0x00400042 | 0x02314620add \$9,\$t7,\$17 | 22: | add \$t1, \$s1, \$s1 # \$s1 = \$s1*2 |

Registers

| Name | Number | Value |
|--------|--------|-----------|
| \$zero | 0 | 0 |
| \$t0 | 1 | 268500992 |
| \$t1 | 2 | 0 |
| \$t2 | 3 | 0 |
| \$t3 | 4 | 0 |
| \$t4 | 5 | 0 |
| \$t5 | 6 | 0 |
| \$t6 | 7 | 0 |
| \$t7 | 8 | 0 |
| \$t8 | 9 | 0 |
| \$t9 | 10 | 0 |
| \$t10 | 11 | 0 |
| \$t11 | 12 | 0 |
| \$t12 | 13 | 0 |
| \$t13 | 14 | 268501028 |
| \$t14 | 15 | 268501028 |
| \$t15 | 16 | 0 |
| \$t16 | 17 | 0 |
| \$t17 | 18 | 0 |
| \$t18 | 19 | 0 |
| \$t19 | 20 | 0 |
| \$t20 | 21 | 0 |
| \$t21 | 22 | 0 |
| \$t22 | 23 | 0 |
| \$t23 | 24 | 0 |
| \$t24 | 25 | 0 |
| \$t25 | 26 | 0 |
| \$t26 | 27 | 0 |
| \$t27 | 28 | 268469224 |
| \$t28 | 29 | 21479548 |
| \$t29 | 30 | 0 |
| \$t30 | 31 | 0 |
| \$ra | | 4194395 |
| hi | | 0 |
| lo | | 0 |

Data Segment

| Address | Value (+0) | Value (+4) | Value (+8) | Value (+c) | Value (+10) | Value (+14) | Value (+18) | Value (+1c) |
|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| 0x10000000 | 4 | 6 | 8 | -2 | 0 | -4 | 0 | 5 |
| 0x10000004 | 1 | 0 | 0 | 9 | 1 | 0 | 0 | 0 |
| 0x10000008 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000000c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000010 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000014 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000018 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000001c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000020 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000024 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000028 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000002c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000030 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000034 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000038 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000040 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000044 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000048 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000004c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000050 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000054 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000058 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000005c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000060 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000064 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000068 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000006c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000070 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000074 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000078 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000007c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000080 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000084 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000088 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000008c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000090 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000094 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000098 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000009c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000a0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000a4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000a8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000ac | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000b0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000b4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000b8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000bc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000c0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000c4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000c8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000cc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000d0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000d4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000d8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000dc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000e0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000e4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000e8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000ec | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000f0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000f4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000f8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000fc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000104 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000108 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000010c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000110 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000114 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000118 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000011c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000120 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000124 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000128 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000012c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000130 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000134 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000138 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000013c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000144 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000148 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000014c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000154 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000158 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000015c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000160 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000164 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000168 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000016c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000170 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000174 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000178 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000017c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000180 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000184 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000188 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000018c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000190 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000194 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000198 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000019c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001a0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001a4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001a8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001ac | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001b0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001b4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001b8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001bc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001c0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001c4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001c8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001cc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001d0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001d4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001d8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001dc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001e0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001e4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001e8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001ec | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001f0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001f4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001f8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001fc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000204 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000208 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000020c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000210 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000214 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | |

The screenshot shows the MARS 4.5 assembly editor interface with several panes:

- Labels Pane:** Shows labels defined in the assembly code, such as `mips2.asm`, `loop`, `enloop`, `A`, `sum`, `l1`, `n`, and `step`.
- Registers Pane:** Displays the processor state with registers \$zero through \$31, all initialized to 0.
- Data Segment Pane:** Shows memory starting at address 0x00010000, with values for each byte, word, doubleword, and quadword.
- Registers Pane:** Shows the Coprocessor 0 and Coprocessor 1 registers, all initialized to 0.
- Code Segment Pane:** Displays the assembly code with comments and assembly mnemonics.

The screenshot shows the MARS 4.5 assembly editor interface with the following details:

- Text Segment:** Displays assembly code from address 0x00400000 to 0x00400040. Key instructions include `lui \$t6, sum` at line 9, `lw \$s5, 0(\$t6) # \$s5 = sum` at line 10, and a loop structure starting at line 11.
- Labels:** Shows labels defined in the code, such as `loop`, `enloop`, `A`, `sum`, and `step`.
- Data Segment:** Displays memory starting at address 0x10000000. The stack pointer (\$sp) is at address 0x10000030 with a value of 269500992.
- Registers:** Shows the register state with \$sp at 269500992.

T6 Thg 4 15 23:53:42 • /home/thanhtam/THKienTructHT/Lab03/mips2.asm - MARS 4.5

File Edit Run Settings Tools Help Run speed at max (no interaction)

Text Segment

| Bkpt | Address | Code | Basic | Source |
|------|------------|-------------------------------|-------|--|
| | 0x00400000 | 0x3c010000 lui \$1,4097 | 9: | la \$t6, sum |
| | 0x00400004 | 0x342e0024 ori \$14,\$1,36 | 10: | lw \$5\$, 0(\$t6) # \$5 = sum |
| | 0x00400008 | 0x3c010000 lw \$21,0(\$14) | 11: | la \$t7, 1 |
| | 0x00400012 | 0x3c010000 lui \$1,4097 | 12: | lw \$1\$, 0(\$t7) # \$1 = i |
| | 0x00400016 | 0x342f0028 ori \$15,\$1,40 | 13: | la \$s2, A # gan dia chi bat dau mang vao thanh ghi \$s2 |
| | 0x00400020 | 0x3c010000 lui \$1,4097 | 14: | la \$t8, n |
| | 0x00400024 | 0x3439002c ori \$24,\$1,44 | 15: | lw \$3\$, 0(\$t8) # \$3 = n |
| | 0x00400028 | 0x8f130000 lw \$19,0(\$24) | 16: | la \$t9, step |
| | 0x00400032 | 0x3c010000 lui \$1,4097 | 17: | lw \$4\$, 0(\$t9) # \$4 = step |
| | 0x00400036 | 0x3c010000 lui \$1,4097 | 18: | slt \$t2, \$zero, enloop # ket thuc vong lap |
| | 0x00400040 | 0x0235002a slt \$10,\$17,\$19 | 19: | beq \$t2, \$zero, enloop # ket thuc vong lap |
| | 0x00400044 | 0x02314620 add \$9,\$17,\$17 | 20: | add \$t1, \$s1, \$s1 # \$s1 = \$s1*2 |
| | | | 21: | |
| | | | 22: | |
| | | | 23: | |

Registers

| Name | Number | Value |
|--------|--------|-----------|
| \$zero | 0 | 0 |
| \$at | 1 | 268500992 |
| \$v0 | 2 | 0 |
| \$v1 | 3 | 0 |
| \$s0 | 4 | 0 |
| \$s1 | 5 | 0 |
| \$s2 | 6 | 0 |
| \$s3 | 7 | 0 |
| \$s4 | 8 | 0 |
| \$s5 | 9 | 0 |
| \$t0 | 10 | 1 |
| \$t1 | 11 | 0 |
| \$t2 | 12 | 0 |
| \$t3 | 13 | 0 |
| \$t4 | 14 | 268501028 |
| \$t5 | 15 | 268501028 |
| \$t6 | 16 | 0 |
| \$t7 | 17 | 0 |
| \$t8 | 18 | 268500992 |
| \$t9 | 19 | 0 |
| \$t10 | 20 | 1 |
| \$t11 | 21 | 0 |
| \$t12 | 22 | 0 |
| \$t13 | 23 | 0 |
| \$t14 | 24 | 268501036 |
| \$t15 | 25 | 268501040 |
| \$k0 | 26 | 0 |
| \$k1 | 27 | 0 |
| \$fp | 28 | 268469224 |
| \$sp | 29 | 21479548 |
| \$fp | 30 | 0 |
| \$ra | 31 | 0 |
| hi | | 419438 |
| lo | | 0 |

T6 Thg 4 15 23:53:57 • /home/thanhtam/THKienTructHT/Lab03/mips2.asm - MARS 4.5

File Edit Run Settings Tools Help Run speed at max (no interaction)

Text Segment

| Bkpt | Address | Code | Basic | Source |
|------|------------|-------------------------------|-------|--|
| | 0x00400004 | 0x342f0024 ori \$14,\$1,36 | 9: | lw \$5\$, 0(\$t6) # \$5 = sum |
| | 0x00400008 | 0x8d650000 lw \$21,0(\$14) | 10: | la \$t7, 1 |
| | 0x00400012 | 0x3c010000 lui \$1,4097 | 11: | la \$t8, n |
| | 0x00400016 | 0x3c010000 lui \$1,4097 | 12: | lw \$1\$, 0(\$t7) # \$1 = i |
| | 0x00400020 | 0x3c010000 lui \$1,4097 | 13: | la \$s2, A # gan dia chi bat dau mang vao thanh ghi \$s2 |
| | 0x00400024 | 0x3439002c ori \$24,\$1,44 | 14: | lw \$3\$, 0(\$t8) # \$3 = n |
| | 0x00400028 | 0x8f130000 lw \$19,0(\$24) | 15: | la \$t9, step |
| | 0x00400032 | 0x3c010000 lui \$1,4097 | 16: | lw \$4\$, 0(\$t9) # \$4 = step |
| | 0x00400036 | 0x3c010000 lui \$1,4097 | 17: | slt \$t2, \$zero, enloop # ket thuc vong lap |
| | 0x00400040 | 0x0235002a slt \$10,\$17,\$19 | 18: | beq \$t2, \$zero, enloop # ket thuc vong lap |
| | 0x00400044 | 0x02314620 add \$9,\$17,\$17 | 19: | add \$t1, \$s1, \$s1 # \$s1 = \$s1*2 |
| | | | 20: | |
| | | | 21: | |
| | | | 22: | |
| | | | 23: | |

Registers

| Name | Number | Value |
|--------|--------|-----------|
| \$zero | 0 | 0 |
| \$at | 1 | 268500992 |
| \$v0 | 2 | 0 |
| \$v1 | 3 | 0 |
| \$s0 | 4 | 0 |
| \$s1 | 5 | 0 |
| \$s2 | 6 | 0 |
| \$s3 | 7 | 0 |
| \$s4 | 8 | 0 |
| \$s5 | 9 | 0 |
| \$t0 | 10 | 1 |
| \$t1 | 11 | 0 |
| \$t2 | 12 | 0 |
| \$t3 | 13 | 0 |
| \$t4 | 14 | 268501028 |
| \$t5 | 15 | 268501028 |
| \$t6 | 16 | 0 |
| \$t7 | 17 | 0 |
| \$t8 | 18 | 268500992 |
| \$t9 | 19 | 0 |
| \$t10 | 20 | 1 |
| \$t11 | 21 | 0 |
| \$t12 | 22 | 0 |
| \$t13 | 23 | 0 |
| \$t14 | 24 | 268501036 |
| \$t15 | 25 | 268501040 |
| \$k0 | 26 | 0 |
| \$k1 | 27 | 0 |
| \$fp | 28 | 268469224 |
| \$sp | 29 | 21479548 |
| \$fp | 30 | 0 |
| \$ra | 31 | 0 |
| hi | | 419437 |
| lo | | 0 |

T6 Thg 4 15 23:54:14 • /home/thanhtam/THKienTructu/Lab03/mips2.asm - MARS 4.5

File Edit Run Settings Tools Help Run speed at max (no interaction)

Text Segment

| Bkpt | Address | Code | Basic | Source |
|------------|------------|------------------------|-------|---|
| 0x00400010 | 0x342f0028 | ori \$15,\$1,40 | | |
| 0x00400014 | 0xbff10000 | lw \$17,0(\$15) | 12: | lw \$15, 0(\$15) # \$15 = i |
| 0x00400018 | 0x3c011000 | lui \$1,4097 | 13: | la \$22, A # gan dia chi bat dau mang vao thanh ghi \$2 |
| 0x00400020 | 0x3c012000 | lui \$1,0 | | |
| 0x00400020 | 0x3c011000 | lui \$1,4097 | 14: | la \$18, n |
| 0x00400024 | 0x3438002c | ori \$24,\$1,44 | | |
| 0x00400028 | 0x3438002c | ori \$24,\$1,44 | 15: | lw \$33, 0(\$18) # \$33 = n |
| 0x0040002c | 0x3438002c | ori \$24,\$1,44 | 16: | la \$19, step |
| 0x00400030 | 0x34390030 | ori \$25,\$1,48 | | |
| 0x00400034 | 0x8f340000 | lw \$20,0(\$25) | 17: | lw \$44, 0(\$19) # \$44 = step |
| 0x00400038 | 0x0f350000 | or \$25,\$17,\$19 | 20: | slt \$12,\$31,\$30 # \$30 = 1 < n ? 1 : 0 |
| 0x0040003c | 0x11400007 | beq \$12,\$zero,enloop | 21: | beq \$12,\$zero,enloop # ket thuc vong lap |
| 0x00400040 | 0x02140020 | add \$9,\$17,\$17 | 22: | add \$11,\$31,\$31 # \$31 = \$31*2 |
| 0x00400044 | 0x01240020 | add \$9,\$19,\$9 | 23: | add \$11,\$31,\$31 # \$31 = \$31*4 |
| 0x00400048 | 0x02140020 | add \$9,\$19,\$18 | 24: | add \$11,\$31,\$32 # gan dia chi cua A[i] cho \$11 |
| 0x0040004c | 0x8d280000 | lw \$18,0(\$19) | 25: | lw \$10, 0(\$11) # \$11 = \$10 |
| 0x00400050 | 0x02a8a020 | add \$21,\$21,\$8 | 26: | add \$55,\$55,\$10 # sum = sum + A[i] |
| 0x00400054 | 0x02348020 | add \$17,\$17,\$20 | 27: | add \$31,\$31,\$34 # i = i + step |

Registers

| Name | Number | Value |
|--------|--------|-----------|
| \$zero | 0 | 0 |
| \$at | 1 | 268500992 |
| \$v0 | 2 | 0 |
| \$v1 | 3 | 0 |
| \$s0 | 4 | 0 |
| \$s1 | 5 | 0 |
| \$s2 | 6 | 0 |
| \$s3 | 7 | 0 |
| \$t0 | 8 | 4 |
| \$t1 | 9 | 268500992 |
| \$t2 | 10 | 0 |
| \$t3 | 11 | 0 |
| \$t4 | 12 | 0 |
| \$t5 | 13 | 0 |
| \$t6 | 14 | 268501028 |
| \$t7 | 15 | 268501028 |
| \$t8 | 16 | 0 |
| \$t9 | 17 | 0 |
| \$t10 | 18 | 268500992 |
| \$t11 | 19 | 0 |
| \$t12 | 20 | 1 |
| \$t13 | 21 | 0 |
| \$t14 | 22 | 0 |
| \$t15 | 23 | 0 |
| \$t16 | 24 | 268501036 |
| \$t17 | 25 | 268501040 |
| \$k0 | 26 | 0 |
| \$k1 | 27 | 0 |
| \$sp | 28 | 268468224 |
| \$fp | 29 | 214779548 |
| \$ra | 30 | 0 |
| hi | 31 | 0 |
| lo | | 4194395 |

Data Segment

| Address | Value (+0) | Value (+4) | Value (+8) | Value (+c) | Value (+10) | Value (+14) | Value (+18) | Value (+1c) |
|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| 0x10000000 | 4 | 0 | 6 | 0 | 0 | -4 | 0 | 0 |
| 0x10000004 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000008 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000000c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000010 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000014 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000018 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000001c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000020 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000024 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000028 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000002c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000030 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000034 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000038 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000003c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000040 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000044 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000048 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000004c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000050 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000054 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000058 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000005c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000060 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000064 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000068 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000070 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000074 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000078 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000007c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000080 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000084 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000088 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000008c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000090 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000094 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000098 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000009c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000a0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000a4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000a8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000ac | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000b0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000b4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000b8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000bc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000c0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000c4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000c8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000cc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000d0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000d4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000d8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000dc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000e0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000e4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000e8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000ec | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000f0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000f4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000f8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000fc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000104 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000108 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000010c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000110 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000114 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000118 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000011c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000120 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000124 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000128 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000012c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000130 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000134 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000138 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000013c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000144 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000148 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000014c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000154 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000158 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000015c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000160 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000164 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000168 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000016c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000170 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000174 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000178 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000017c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000180 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000184 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000188 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000018c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000190 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000194 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000198 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000019c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001a0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001a4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001a8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001ac | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001b0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001b4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001b8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001bc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001c0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001c4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001c8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001cc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001d0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001d4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001d8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001dc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001e0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001e4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001e8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001ec | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001f0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001f4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001f8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001fc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000204 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000208 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000020 | | | | | | | | |

T6 Thg 4 15 23:54:35 • 10.07 KB/s en 12%

/home/thanhtam/THKienTructHT/Lab03/mips2.asm - MARS 4.5

File Edit Run Settings Tools Help

Run speed at max (no interaction)

Edit Execute

Text Segment

| Bkpt | Address | Code | Source |
|------------|-------------------------------|--|--------|
| 0x00400018 | 0x3c011001 lui \$1,4097 | 13: la \$s2, A # gan dia chi bat dau mang vao thanh ghi \$s2 | |
| 0x0040001c | 0x34320000 ori \$10,\$1,0 | 14: la \$t8, n | |
| 0x00400020 | 0x3c011001 lui \$1,4097 | 15: lw \$s3, 0(\$t8) # \$s3 = n | |
| 0x00400024 | 0x24280002 add \$t2,\$t1,1 | 16: la \$t9, step | |
| 0x00400028 | 0xbff130000 lw \$19,0(\$24) | 17: lw \$s4, 0(\$t9) # \$s4 = step | |
| 0x0040002c | 0x3c011001 lui \$1,4097 | 18: sll \$t2,\$s1,\$s3 # \$t2 = i < n ? 1 : 0 | |
| 0x00400030 | 0x023502a9 slt \$t2,\$s1,\$s3 | 19: beq \$t2,\$zero,enloop # ket thuc vong lap | |
| 0x00400033 | 0x11400007 beg \$10,0,7 | 20: add \$t1,\$s1,\$s1 # \$t1 = \$s1+1 | |
| 0x00400040 | 0x02348020 add \$t1,\$s1,\$s1 | 21: add \$t1,\$s1,\$s2 # gan dia chi cua A[i] cho \$t1 | |
| 0x00400044 | 0x02348020 add \$t1,\$s1,\$s1 | 22: add \$t1,\$s1,\$s2 # \$t1 = \$t1+1 | |
| 0x00400048 | 0x02348020 add \$t1,\$s1,\$s1 | 23: add \$t1,\$s1,\$s2 # \$t1 = \$t1+1 | |
| 0x0040004c | 0x02348020 add \$t1,\$s1,\$s1 | 24: add \$t1,\$s1,\$s2 # gan dia chi cua A[i] cho \$t1 | |
| 0x00400050 | 0x02348020 add \$t1,\$s1,\$s1 | 25: lw \$t0, 0(\$t1) # \$t1 = \$t0 | |
| 0x00400054 | 0x02348020 add \$t1,\$s1,\$s1 | 26: add \$s5,\$s5,\$t0 # sum = sum + A[i] | |
| 0x00400058 | 0x02348020 add \$t1,\$s1,\$s1 | 27: add \$s1,\$s1,\$s4 # i = i + step | |
| 0x0040005c | 0x0810000e 0x00400038 | 28: j loop # quay lai vong lap | |

Registers Coproc 1 Coproc 0

| Name | Number | Value |
|--------|--------|-----------|
| \$zero | 0 | 0 |
| \$at | 1 | 268500992 |
| \$v0 | 2 | 0 |
| \$v1 | 3 | 0 |
| \$s0 | 4 | 0 |
| \$s1 | 5 | 0 |
| \$s2 | 6 | 0 |
| \$s3 | 7 | 0 |
| \$t0 | 8 | 4 |
| \$t1 | 9 | 268500992 |
| \$t2 | 10 | 0 |
| \$t3 | 11 | 0 |
| \$t4 | 12 | 0 |
| \$t5 | 13 | 0 |
| \$t6 | 14 | 268501028 |
| \$t7 | 15 | 268501028 |
| \$t8 | 16 | 0 |
| \$t9 | 17 | 1 |
| \$t10 | 18 | 268500992 |
| \$t11 | 19 | 9 |
| \$t12 | 20 | 1 |
| \$t13 | 21 | 4 |
| \$t14 | 22 | 0 |
| \$t15 | 23 | 0 |
| \$t16 | 24 | 268501036 |
| \$t17 | 25 | 268501040 |
| \$k0 | 26 | 0 |
| \$k1 | 27 | 0 |
| \$fp | 28 | 268468224 |
| \$sp | 29 | 214779548 |
| \$fp | 30 | 0 |
| \$ra | 31 | 0 |
| hi | | 419432 |
| lo | | 0 |

Data Segment

| Address | Value (+0) | Value (+4) | Value (+8) | Value (+c) | Value (+10) | Value (+14) | Value (+18) | Value (+1c) |
|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| 0x10000000 | 4 | 6 | 8 | -2 | 0 | -4 | 0 | 5 |
| 0x10000004 | 1 | 0 | 9 | 1 | 0 | 0 | 0 | 5 |
| 0x10000008 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000000c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000010 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000014 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000018 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000001c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000020 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000024 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000028 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000030 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000034 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000038 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000003c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000040 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000044 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000048 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000004c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000050 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000054 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000058 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000005c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000060 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000064 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000068 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000006c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000070 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000074 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000078 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000007c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000080 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000084 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000088 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000008c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000090 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000094 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000098 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000009c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000a0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000a4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000a8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000ac | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000b0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000b4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000b8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000bc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000c0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000c4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000c8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000cc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000d0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000d4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000d8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000dc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000e0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000e4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000e8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000ec | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000f0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000f4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000f8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100000fc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000104 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000108 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000010c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000110 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000114 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000118 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000011c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000120 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000124 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000128 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000012c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000130 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000134 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000138 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000013c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000144 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000148 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000014c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000154 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000158 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000015c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000160 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000164 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000168 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000016c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000170 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000174 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000178 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000017c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000180 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000184 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000188 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000018c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000190 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000194 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000198 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000019c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001a0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001a4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001a8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001ac | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001b0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001b4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001b8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001bc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001c0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001c4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001c8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001cc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001d0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001d4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001d8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001dc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001e0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001e4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001e8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001ec | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001f0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001f4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001f8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x100001fc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000204 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000208 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x1000020c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000210 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0x10000214 | 0 | 0 | | | | | | |

Mars

T6 Thg 4 15 23:55:09 • 1.46 KB/s en 10%

File Edit Run Settings Tools Help

Laptop battery low Approximately 15 minutes remaining (10%)

Text Segment

| Bkpt | Address | Code | Source |
|------|------------|-------------------------------|--|
| | 0x00400018 | 0x3c011001 lui \$1,4097 | la \$s2, A # gan dia chi bat dau mang vao thanh ghi \$s2 |
| | 0x0040001c | 0x34320000 ori \$18,\$1,0 | |
| | 0x00400020 | 0x24380000 lui \$1,41,44 | |
| | 0x00400024 | 0x24380002 lui \$1,41,44 | |
| | 0x00400028 | 0xbff130000 lw \$19,0(\$24) | lw \$s3, 0(\$s1) # \$s3 = n |
| | 0x0040002c | 0x3c011001 lui \$1,4097 | la \$t9, step |
| | 0x00400030 | 0x34320000 ori \$18,\$1,48 | |
| | 0x00400034 | 0x24380000 lui \$1,4097 | |
| | 0x00400038 | 0x023502a9 slt \$10,\$17,\$19 | lw \$s4, 0(\$10) # \$s4 = step |
| | 0x0040003c | 0x11400007 beg \$10,\$0,7 | slt \$t2, \$s1, \$s3 # \$t2 = i < n ? 1 : 0 |
| | 0x00400040 | 0x34320000 ori \$17,\$1,17 | beq \$t2, \$zero, enloop # ket thuc vong lap |
| | 0x00400044 | 0x023502a9 add \$11,\$1,\$s1 | add \$t1, \$s1, \$s1 |
| | 0x00400048 | 0x023502a9 add \$11,\$1,\$s1 | # \$t1 = \$s1 + \$s1 |
| | 0x0040004c | 0x01324802 add \$19,\$18 | add \$t1, \$t1, \$s2 # gan dia chi cua A[i] cho \$t1 |
| | 0x00400050 | 0x023502a9 add \$12,\$21,\$8 | lw \$t0, 0(\$t1) # \$t0 |
| | 0x00400054 | 0x023502a9 add \$12,\$21,\$8 | add \$s5, \$s5, \$t0 # sum = sum + A[i] |
| | 0x00400058 | 0x023502a9 add \$12,\$21,\$8 | # \$t1 = \$t1 + step |
| | 0x0040005c | 0x023502a9 add \$12,\$21,\$8 | j loop # quay lai vong lap |

Registers Coproc 1 Coproc 0

| Name | Number | Value |
|--------|--------|------------|
| \$zero | 0 | 0 |
| \$at | 1 | 268500992 |
| \$v0 | 2 | 0 |
| \$v1 | 3 | 0 |
| \$s0 | 4 | 0 |
| \$s1 | 5 | 0 |
| \$s2 | 6 | 0 |
| \$s3 | 7 | 0 |
| \$t0 | 8 | 4 |
| \$t1 | 9 | 4 |
| \$t2 | 10 | 11 |
| \$t3 | 11 | 0 |
| \$t4 | 12 | 0 |
| \$t5 | 13 | 0 |
| \$t6 | 14 | 268501028 |
| \$t7 | 15 | 268501028 |
| \$t8 | 16 | 0 |
| \$t9 | 17 | 1 |
| \$t10 | 18 | 268500992 |
| \$t11 | 19 | 9 |
| \$t12 | 20 | 11 |
| \$t13 | 21 | 4 |
| \$t14 | 22 | 0 |
| \$t15 | 23 | 0 |
| \$t16 | 24 | 268501036 |
| \$t17 | 25 | 268501040 |
| \$k0 | 26 | 0 |
| \$k1 | 27 | 0 |
| \$fp | 28 | 268468224 |
| \$sp | 29 | 2147479548 |
| \$fp | 30 | 0 |
| \$ra | 31 | 0 |
| hi | | 419439 |
| lo | | 0 |

Data Segment

| Address | Value (+0) | Value (+4) | Value (+8) | Value (+c) | Value (+10) | Value (+14) | Value (+18) | Value (+1c) |
|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| 0x10000000 | 4 | 6 | 8 | 10 | 9 | -4 | 0 | 5 |
| 0x10000004 | 1 | 0 | 9 | 1 | 0 | 0 | 0 | 0 |
| 0x10000008 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000000c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000010 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000014 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000018 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000001c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000020 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000024 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000028 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000002c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000030 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000034 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000038 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000040 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000044 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000048 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000004c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000050 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000054 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000058 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000005c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000060 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000064 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000068 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000072 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000076 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000080 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000084 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000088 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000092 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000096 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000a0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000a4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000a8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000ac | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000f0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000f4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000f8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100000fc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000104 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000108 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000010c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000110 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000114 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000118 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000011c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000120 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000124 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000128 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000012c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000130 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000134 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000138 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000013c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000144 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000148 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000014c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000154 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000158 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000015c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000160 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000164 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000168 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000016c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000170 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000174 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000178 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000017c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000180 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000184 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000188 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000018c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000190 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000194 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000198 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000019c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001a0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001a4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001a8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001ac | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001f0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001f4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001f8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100001fc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000204 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000208 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000020c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000210 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000214 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000218 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000021c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000220 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000224 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000228 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000022c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000230 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000234 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000238 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000023c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000240 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000244 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000248 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000024c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000250 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000254 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000258 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000025c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000260 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000264 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000268 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000026c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000270 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000274 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000278 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000027c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000280 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000284 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000288 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000028c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000290 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000294 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x10000298 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x1000029c | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100002a0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100002a4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100002a8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0x100002ac | 0 | 0 | 0</ | | | | | |

```

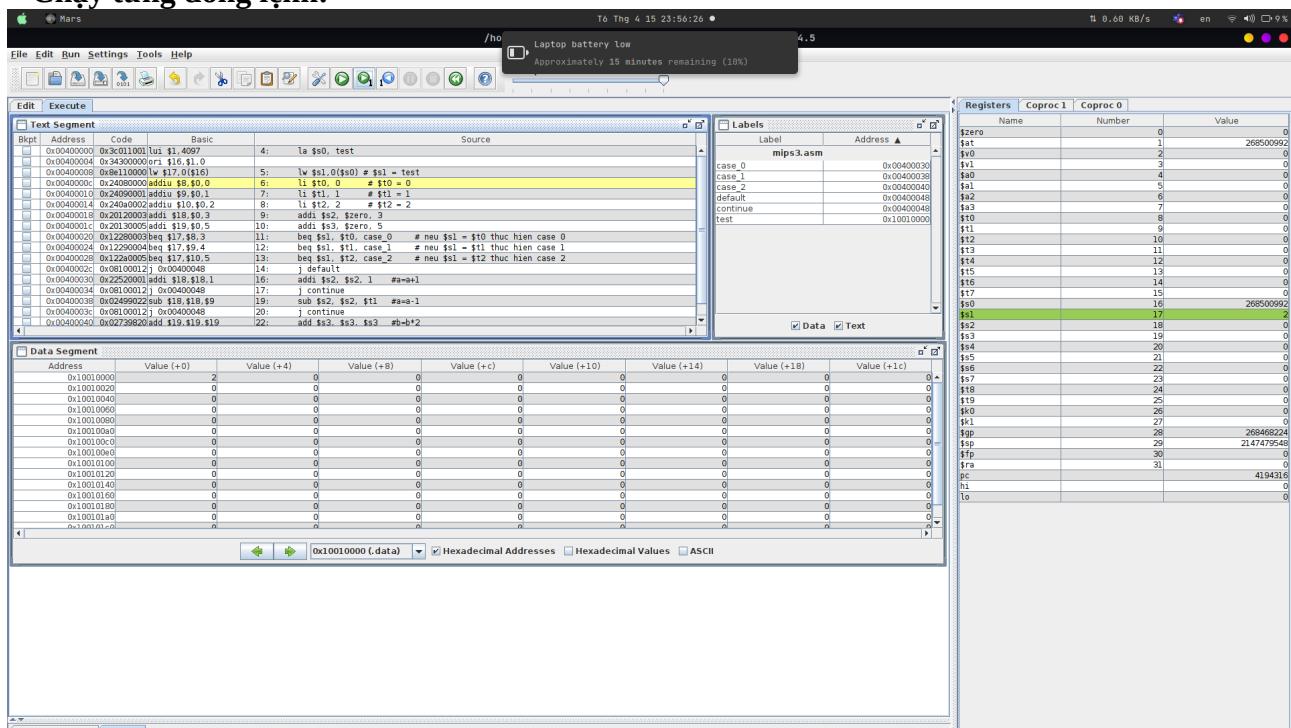
1 .data
2     test: .word 2
3 .text
4     la $s0, test
5     lw $s1,0($s0) # $s1 = test
6     li $t0, 0      # $t0 = 0
7     li $t1, 1      # $t1 = 1
8     li $t2, 2      # $t2 = 2
9     addi $s2, $zero, 3
10    addi $s3, $zero, 5
11    beq $s1, $t0, case_0    # neu $s1 = $t0 thuc hien case 0
12    beq $s1, $t1, case_1    # neu $s1 = $t1 thuc hien case 1
13    beq $s1, $t2, case_2    # neu $s1 = $t2 thuc hien case 2
14    j default
15 case_0:
16    addi $s2, $s2, 1      #a=a+1
17    j continue
18 case_1:
19    sub $s2, $s2, $t1    #a=a-1
20    j continue
21 case_2:
22    add $s3, $s3, $s3   #b=b*2
23    j continue
24 default:
25 continue:
26

```

* Giải thích:

Với test = 2, sau khi chạy câu lệnh beq \$s1, \$t2, case_2 sẽ bỏ qua case_0, case_1 và nhảy đến case_2 sau đó thực hiện lệnh add \$s3, \$s3, \$s3.
 giá trị thanh ghi \$s3 thay đổi thành 10
 giá trị thanh ghi \$2 không thay đổi.

* Chạy từng dòng lệnh:



The screenshot shows the Immunity Debugger interface with several windows open:

- Text Segment**: Shows assembly code for mips3.asm. The code includes instructions like lw, add, and beq, along with labels for cases 0, 1, and 2.
- Registers**: Displays CPU register values. The \$t0 register is highlighted in green.
- Stack**: Shows the current state of the stack.
- Data Segment**: Displays memory dump data from address 0x10010000 to 0x100101d0.

At the bottom, there are several status indicators and checkboxes for address formats.

The screenshot shows the QEMU debugger interface with the following panels:

- Text Segment:** Displays assembly code for the mips3.asm file. The code includes instructions like `lui`, `addi`, `beq`, and `add`. A yellow box highlights the instruction `addi $2,$zero,3` at address 0x00400008.
- Labels:** Shows labels defined in the assembly code, such as `case_0`, `case_1`, `case_2`, `default`, `continue`, and `test`.
- Data Segment:** Displays memory dump starting at address 0x10000000, showing values for various memory locations.
- Registers:** Shows the state of CPU registers. The `$zero` register is 0, and `$t0` is 268500992.
- Coproc 1:** Shows floating-point coprocessor registers.
- Coproc 0:** Shows floating-point coprocessor registers.

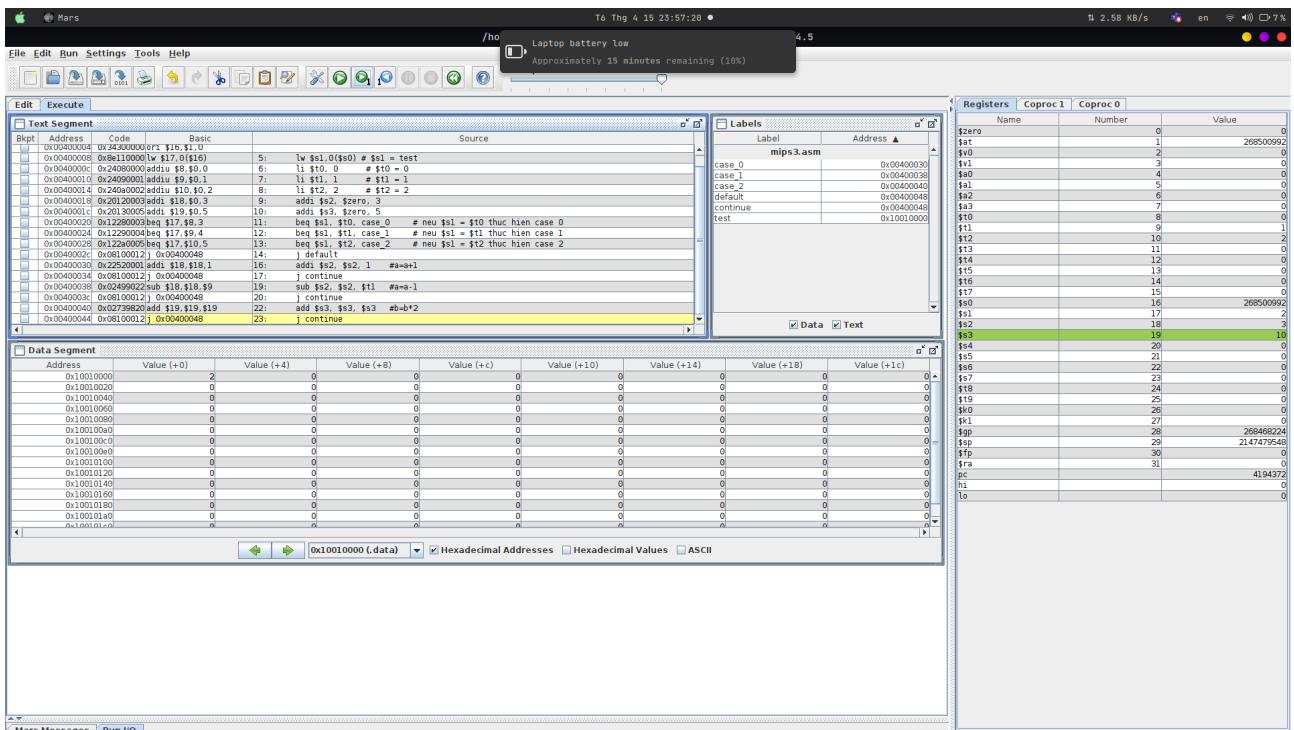
At the bottom, there are buttons for navigating between memory pages and selecting data types: `0x10010000 (.data)`, `Hexadecimal Addresses`, `Hexadecimal Values`, and `ASCII`.

The screenshot shows the QEMU debugger interface with several windows open:

- Registers**: Shows the CPU register state. The \$zero register is at address 0, value 0. Other registers like \$t0-\$t9, \$s0-\$s9, \$a0-\$a9, \$t10-\$t19, \$s10-\$s19, \$a10-\$a19, \$t20-\$t29, \$s20-\$s29, \$a20-\$a29, \$t30-\$t39, \$s30-\$s39, \$a30-\$a39, \$t40-\$t49, \$s40-\$s49, \$a40-\$a49, \$t50-\$t59, \$s50-\$s59, \$a50-\$a59, \$t60-\$t69, \$s60-\$s69, \$a60-\$a69, \$t70-\$t79, \$s70-\$s79, \$a70-\$a79, \$t80-\$t89, \$s80-\$s89, \$a80-\$a89, \$t90-\$t99, \$s90-\$s99, \$a90-\$a99, \$t100-\$t199, \$s100-\$s199, \$a100-\$a199, \$t200-\$t299, \$s200-\$s299, \$a200-\$a299, \$t300-\$t399, \$s300-\$s399, \$a300-\$a399, \$t400-\$t499, \$s400-\$s499, \$a400-\$a499, \$t500-\$t599, \$s500-\$s599, \$a500-\$a599, \$t600-\$t699, \$s600-\$s699, \$a600-\$a699, \$t700-\$t799, \$s700-\$s799, \$a700-\$a799, \$t800-\$t899, \$s800-\$s899, \$a800-\$a899, \$t900-\$t999, \$s900-\$s999, \$a900-\$a999, \$t1000-\$t1999, \$s1000-\$s1999, \$a1000-\$a1999, \$t2000-\$t2999, \$s2000-\$s2999, \$a2000-\$a2999, \$t3000-\$t3999, \$s3000-\$s3999, \$a3000-\$a3999, \$t4000-\$t4999, \$s4000-\$s4999, \$a4000-\$a4999, \$t5000-\$t5999, \$s5000-\$s5999, \$a5000-\$a5999, \$t6000-\$t6999, \$s6000-\$s6999, \$a6000-\$a6999, \$t7000-\$t7999, \$s7000-\$s7999, \$a7000-\$a7999, \$t8000-\$t8999, \$s8000-\$s8999, \$a8000-\$a8999, \$t9000-\$t9999, \$s9000-\$s9999, \$a9000-\$a9999, \$t10000-\$t19999, \$s10000-\$s19999, \$a10000-\$a19999, \$t20000-\$t29999, \$s20000-\$s29999, \$a20000-\$a29999, \$t30000-\$t39999, \$s30000-\$s39999, \$a30000-\$a39999, \$t40000-\$t49999, \$s40000-\$s49999, \$a40000-\$a49999, \$t50000-\$t59999, \$s50000-\$s59999, \$a50000-\$a59999, \$t60000-\$t69999, \$s60000-\$s69999, \$a60000-\$a69999, \$t70000-\$t79999, \$s70000-\$s79999, \$a70000-\$a79999, \$t80000-\$t89999, \$s80000-\$s89999, \$a80000-\$a89999, \$t90000-\$t99999, \$s90000-\$s99999, \$a90000-\$a99999, \$t100000-\$t199999, \$s100000-\$s199999, \$a100000-\$a199999, \$t200000-\$t299999, \$s200000-\$s299999, \$a200000-\$a299999, \$t300000-\$t399999, \$s300000-\$s399999, \$a300000-\$a399999, \$t400000-\$t499999, \$s400000-\$s499999, \$a400000-\$a499999, \$t500000-\$t599999, \$s500000-\$s599999, \$a500000-\$a599999, \$t600000-\$t699999, \$s600000-\$s699999, \$a600000-\$a699999, \$t700000-\$t799999, \$s700000-\$s799999, \$a700000-\$a799999, \$t800000-\$t899999, \$s800000-\$s899999, \$a800000-\$a899999, \$t900000-\$t999999, \$s900000-\$s999999, \$a900000-\$a999999, \$t1000000-\$t1999999, \$s1000000-\$s1999999, \$a1000000-\$a1999999, \$t2000000-\$t2999999, \$s2000000-\$s2999999, \$a2000000-\$a2999999, \$t3000000-\$t3999999, \$s3000000-\$s3999999, \$a3000000-\$a3999999, \$t4000000-\$t4999999, \$s4000000-\$s4999999, \$a4000000-\$a4999999, \$t5000000-\$t5999999, \$s5000000-\$s5999999, \$a5000000-\$a5999999, \$t6000000-\$t6999999, \$s6000000-\$s6999999, \$a6000000-\$a6999999, \$t7000000-\$t7999999, \$s7000000-\$s7999999, \$a7000000-\$a7999999, \$t8000000-\$t8999999, \$s8000000-\$s8999999, \$a8000000-\$a8999999, \$t9000000-\$t9999999, \$s9000000-\$s9999999, \$a9000000-\$a9999999, \$t10000000-\$t19999999, \$s10000000-\$s19999999, \$a10000000-\$a19999999, \$t20000000-\$t29999999, \$s20000000-\$s29999999, \$a20000000-\$a29999999, \$t30000000-\$t39999999, \$s30000000-\$s39999999, \$a30000000-\$a39999999, \$t40000000-\$t49999999, \$s40000000-\$s49999999, \$a40000000-\$a49999999, \$t50000000-\$t59999999, \$s50000000-\$s59999999, \$a50000000-\$a59999999, \$t60000000-\$t69999999, \$s60000000-\$s69999999, \$a60000000-\$a69999999, \$t70000000-\$t79999999, \$s70000000-\$s79999999, \$a70000000-\$a79999999, \$t80000000-\$t89999999, \$s80000000-\$s89999999, \$a80000000-\$a89999999, \$t90000000-\$t99999999, \$s90000000-\$s99999999, \$a90000000-\$a99999999, \$t100000000-\$t199999999, \$s100000000-\$s199999999, \$a100000000-\$a199999999, \$t200000000-\$t299999999, \$s200000000-\$s299999999, \$a200000000-\$a299999999, \$t300000000-\$t399999999, \$s300000000-\$s399999999, \$a300000000-\$a399999999, \$t400000000-\$t499999999, \$s400000000-\$s499999999, \$a400000000-\$a499999999, \$t500000000-\$t599999999, \$s500000000-\$s599999999, \$a500000000-\$a599999999, \$t600000000-\$t699999999, \$s600000000-\$s699999999, \$a600000000-\$a699999999, \$t700000000-\$t799999999, \$s700000000-\$s799999999, \$a700000000-\$a799999999, \$t800000000-\$t899999999, \$s800000000-\$s899999999, \$a800000000-\$a899999999, \$t900000000-\$t999999999, \$s900000000-\$s999999999, \$a900000000-\$a999999999, \$t1000000000-\$t1999999999, \$s1000000000-\$s1999999999, \$a1000000000-\$a1999999999, \$t2000000000-\$t2999999999, \$s2000000000-\$s2999999999, \$a2000000000-\$a2999999999, \$t3000000000-\$t3999999999, \$s3000000000-\$s3999999999, \$a3000000000-\$a3999999999, \$t4000000000-\$t4999999999, \$s4000000000-\$s4999999999, \$a4000000000-\$a4999999999, \$t5000000000-\$t5999999999, \$s5000000000-\$s5999999999, \$a5000000000-\$a5999999999, \$t6000000000-\$t6999999999, \$s6000000000-\$s6999999999, \$a6000000000-\$a6999999999, \$t7000000000-\$t7999999999, \$s7000000000-\$s7999999999, \$a7000000000-\$a7999999999, \$t8000000000-\$t8999999999, \$s8000000000-\$s8999999999, \$a8000000000-\$a8999999999, \$t9000000000-\$t9999999999, \$s9000000000-\$s9999999999, \$a9000000000-\$a9999999999, \$t10000000000-\$t19999999999, \$s10000000000-\$s19999999999, \$a10000000000-\$a19999999999, \$t20000000000-\$t29999999999, \$s20000000000-\$s29999999999, \$a20000000000-\$a29999999999, \$t30000000000-\$t39999999999, \$s30000000000-\$s39999999999, \$a30000000000-\$a39999999999, \$t40000000000-\$t49999999999, \$s40000000000-\$s49999999999, \$a40000000000-\$a49999999999, \$t50000000000-\$t59999999999, \$s50000000000-\$s59999999999, \$a50000000000-\$a59999999999, \$t60000000000-\$t69999999999, \$s60000000000-\$s69999999999, \$a60000000000-\$a69999999999, \$t70000000000-\$t79999999999, \$s70000000000-\$s79999999999, \$a70000000000-\$a79999999999, \$t80000000000-\$t89999999999, \$s80000000000-\$s89999999999, \$a80000000000-\$a89999999999, \$t90000000000-\$t99999999999, \$s90000000000-\$s99999999999, \$a90000000000-\$a99999999999, \$t100000000000-\$t199999999999, \$s100000000000-\$s199999999999, \$a100000000000-\$a199999999999, \$t200000000000-\$t299999999999, \$s200000000000-\$s299999999999, \$a200000000000-\$a299999999999, \$t300000000000-\$t399999999999, \$s300000000000-\$s399999999999, \$a300000000000-\$a399999999999, \$t400000000000-\$t499999999999, \$s400000000000-\$s499999999999, \$a400000000000-\$a499999999999, \$t500000000000-\$t599999999999, \$s500000000000-\$s599999999999, \$a500000000000-\$a599999999999, \$t600000000000-\$t699999999999, \$s600000000000-\$s699999999999, \$a600000000000-\$a699999999999, \$t700000000000-\$t799999999999, \$s700000000000-\$s799999999999, \$a700000000000-\$a799999999999, \$t800000000000-\$t899999999999, \$s800000000000-\$s899999999999, \$a800000000000-\$a899999999999, \$t900000000000-\$t999999999999, \$s900000000000-\$s999999999999, \$a900000000000-\$a999999999999, \$t1000000000000-\$t1999999999999, \$s1000000000000-\$s1999999999999, \$a1000000000000-\$a1999999999999, \$t2000000000000-\$t2999999999999, \$s2000000000000-\$s2999999999999, \$a2000000000000-\$a2999999999999, \$t3000000000000-\$t3999999999999, \$s3000000000000-\$s3999999999999, \$a3000000000000-\$a3999999999999, \$t4000000000000-\$t4999999999999, \$s4000000000000-\$s4999999999999, \$a4000000000000-\$a4999999999999, \$t5000000000000-\$t5999999999999, \$s5000000000000-\$s5999999999999, \$a5000000000000-\$a5999999999999, \$t6000000000000-\$t6999999999999, \$s6000000000000-\$s6999999999999, \$a6000000000000-\$a6999999999999, \$t7000000000000-\$t7999999999999, \$s7000000000000-\$s7999999999999, \$a7000000000000-\$a7999999999999, \$t8000000000000-\$t8999999999999, \$s8000000000000-\$s8999999999999, \$a8000000000000-\$a8999999999999, \$t9000000000000-\$t9999999999999, \$s9000000000000-\$s9999999999999, \$a9000000000000-\$a9999999999999, \$t10000000000000-\$t19999999999999, \$s10000000000000-\$s19999999999999, \$a10000000000000-\$a9999999999999, \$t20000000000000-\$t29999999999999, \$s20000000000000-\$s29999999999999, \$a20000000000000-\$a9999999999999, \$t30000000000000-\$t39999999999999, \$s30000000000000-\$s39999999999999, \$a30000000000000-\$a9999999999999, \$t40000000000000-\$t49999999999999, \$s40000000000000-\$s49999999999999, \$a40000000000000-\$a9999999999999, \$t50000000000000-\$t59999999999999, \$s50000000000000-\$s59999999999999, \$a50000000000000-\$a9999999999999, \$t60000000000000-\$t69999999999999, \$s60000000000000-\$s69999999999999, \$a60000000000000-\$a9999999999999, \$t70000000000000-\$t79999999999999, \$s70000000000000-\$s79999999999999, \$a70000000000000-\$a9999999999999, \$t80000000000000-\$t89999999999999, \$s80000000000000-\$s89999999999999, \$a80000000000000-\$a9999999999999, \$t90000000000000-\$t99999999999999, \$s90000000000000-\$s99999999999999, \$a90000000000000-\$a99999999999999, \$t100000000000000-\$t199999999999999, \$s100000000000000-\$s199999999999999, \$a100000000000000-\$a99999999999999, \$t200000000000000-\$t299999999999999, \$s200000000000000-\$s299999999999999, \$a200000000000000-\$a99999999999999, \$t300000000000000-\$t399999999999999, \$s300000000000000-\$s399999999999999, \$a300000000000000-\$a99999999999999, \$t400000000000000-\$t499999999999999, \$s400000000000000-\$s499999999999999, \$a400000000000000-\$a99999999999999, \$t500000000000000-\$t599999999999999, \$s500000000000000-\$s599999999999999, \$a500000000000000-\$a99999999999999, \$t600000000000000-\$t699999999999999, \$s600000000000000-\$s699999999999999, \$a600000000000000-\$a99999999999999, \$t700000000000000-\$t799999999999999, \$s700000000000000-\$s799999999999999, \$a700000000000000-\$a99999999999999, \$t800000000000000-\$t899999999999999, \$s800000000000000-\$s899999999999999, \$a800000000000000-\$a99999999999999, \$t900000000000000-\$t999999999999999, \$s900000000000000-\$s999999999999999, \$a900000000000000-\$a999999999999999, \$t1000000000000000-\$t1999999999999999, \$s1000000000000000-\$s1999999999999999, \$a1000000000000000-\$a999999999999999, \$t2000000000000000-\$t2999999999999999, \$s2000000000000000-\$s2999999999999999, \$a2000000000000000-\$a999999999999999, \$t3000000000000000-\$t3999999999999999, \$s3000000000000000-\$s3999999999999999, \$a3000000000000000-\$a999999999999999, \$t4000000000000000-\$t4999999999999999, \$s4000000000000000-\$s4999999999999999, \$a4000000000000000-\$a999999999999999, \$t5000000000000000-\$t5999999999999999, \$s5000000000000000-\$s5999999999999999, \$a5000000000000000-\$a999999999999999, \$t6000000000000000-\$t6999999999999999, \$s6000000000000000-\$s6999999999999999, \$a6000000000000000-\$a999999999999999, \$t7000000000000000-\$t7999999999999999, \$s7000000000000000-\$s7999999999999999, \$a7000000000000000-\$a999999999999999, \$t8000000000000000-\$t8999999999999999, \$s8000000000000000-\$s8999999999999999, \$a8000000000000000-\$a999999999999999, \$t9000000000000000-\$t9999999999999999, \$s9000000000000000-\$s9999999999999999, \$a9000000000000000-\$a9999999999999999, \$t10000000000000000-\$t19999999999999999, \$s10000000000000000-\$s19999999999999999, \$a10000000000000000-\$a9999999999999999, \$t20000000000000000-\$t29999999999999999, \$s20000000000000000-\$s29999999999999999, \$a20000000000000000-\$a9999999999999999, \$t30000000000000000-\$t39999999999999999, \$s30000000000000000-\$s39999999999999999, \$a30000000000000000-\$a9999999999999999, \$t40000000000000000-\$t49999999999999999, \$s40000000000000000-\$s49999999999999999, \$a40000000000000000-\$a9999999999999999, \$t50000000000000000-\$t59999999999999999, \$s50000000000000000-\$s59999999999999999, \$a50000000000000000-\$a9999999999999999, \$t60000000000000000-\$t69999999999999999, \$s60000000000000000-\$s69999999999999999, \$a60000000000000000-\$a9999999999999999, \$t70000000000000000-\$t79999999999999999, \$s70000000000000000-\$s79999999999999999, \$a70000000000000000-\$a9999999999999999, \$t80000000000000000-\$t89999999999999999, \$s80000000000000000-\$s89999999999999999, \$a80000000000000000-\$a9999999999999999, \$t90000000000000000-\$t99999999999999999, \$s90000000000000000-\$s99999999999999999, \$a90000000000000000-\$a99999999999999999, \$t100000000000000000-\$t199999999999999999, \$s100000000000000000-\$s199999999999999999, \$a100000000000000000-\$a99999999999999999, \$t200000000000000000-\$t299999999999999999, \$s200000000000000000-\$s299999999999999999, \$a200000000000000000-\$a99999999999999999, \$t300000000000000000-\$t399999999999999999, \$s300000000000000000-\$s399999999999999999, \$a300000000000000000-\$a99999999999999999, \$t400000000000000000-\$t499999999999999999, \$s400000000000000000-\$s499999999999999999, \$a400000000000000000-\$a99999999999999999, \$t500000000000000000-\$t599999999999999999, \$s500000000000000000-\$s599999999999999999, \$a500000000000000000-\$a99999999999999999, \$t600000000000000000-\$t699999999999999999, \$s600000000000000000-\$s699999999999999999, \$a600000000000000000-\$a99999999999999999, \$t700000000000000000-\$t799999999999999999, \$s700000000000000000-\$s799999999999999999, \$a700000000000000000-\$a99999999999999999, \$t800000000000000000-\$t899999999999999999, \$s800000000000000000-\$s899999999999999999, \$a800000000000000000-\$a99999999999999999, \$t900000000000000000-\$t999999999999999999, \$s900000000000000000-\$s999999999999999999, \$a900000000000000000-\$a999999999999999999, \$t1000000000000000000-\$t1999999999999999999, \$s1000000000000000000-\$s1999999999999999999, \$a1000000000000000000-\$a999999999999999999, \$t2000000000000000000-\$t2999999999999999999, \$s2000000000000000000-\$s2999999999999999999, \$a2000000000000000000-\$a999999999999999999, \$t3000000000000000000-\$t3999999999999999999, \$s3000000000000000000-\$s3999999999999999999, \$a3000000000000000000-\$a999999999999999999, \$t4000000000000000000-\$t4999999999999999999, \$s4000000000000000000-\$s4999999999999999999, \$a4000000000000000000-\$a999999999999999999, \$t5000000000000000000-\$t5999999999999999999, \$s5000000000000000000-\$s5999999999999999999, \$a5000000000000000000-\$a999999999999999999, \$t6000000000000000000-\$t6999999999999999999, \$s6000000000000000000-\$s6999999999999999999, \$a6000000000000000000-\$a999999999999999999, \$t7000000000000000000-\$t7999999999999999999, \$s7000000000000000

The screenshot shows the Mars 32-bit CPU Simulator interface. The top status bar displays the date and time (T6 Thg 4 15 23:57:04), battery level (Laptop battery low, approximately 15 minutes remaining (10%)), and system information (1. 3.87 KB/s, en). The menu bar includes File, Edit, Run, Settings, Tools, Help. The toolbar contains various icons for file operations and simulation controls. The main window is divided into several panes:

- Text Segment:** Shows assembly code for mips3.asm. The code includes instructions like lui, la, lw, addi, beq, bne, j, jal, and add. Labels defined in the code are case_0, case_1, case_2, default, continue, and test.
- Registers:** Displays the state of the CPU registers (\$zero through \$t1, \$a0-\$a3, \$s0-\$s3, \$t0-\$t2, \$t3-\$t5, \$t6-\$t7, \$t8-\$t9, \$t10-\$t11, \$t12-\$t13, \$t14-\$t15, \$t16-\$t17, \$t18-\$t19, \$t20-\$t21, \$t22-\$t23, \$t24-\$t25, \$t26-\$t27, \$t28-\$t29, \$t30-\$t31).
- Labels:** Lists the labels defined in the assembly code along with their addresses.
- Data Segment:** Displays memory dump and data segment details.



BÀI 4:

a.i<j

*Code:

```

1 #truong hop if(i<j)
2 .data
3 X: .word -4      #khoi tao x = -4
4 Y: .word 3       #khoi tao y = 3
5 Z: .word 2       #khoi tao z = 2
6 .text
7     addi $s1, $zero, 5 #i = 5
8     addi $s2, $zero, 5 #j = 5
9     la $t7, X
10    lw $t1, 0($t7)  # $t1 = X
11    la $t8, Y
12    lw $t2, 0($t8)  # $t2 = y
13    la $t9, Z
14    lw $t3, 0($t9)  # $t3 = Z
15 start:
16     slt $t0, $s1, $s2          # i < j -> $t0 = 1
17     beq $t0, $zero, else       # $t0 = 0 nhay den else
18     addi $t1, $t1, 1           # x = x + 1
19     addi $t3, $zero, 1          # z = 1
20     j endif                  # ket thuc chuong trinh
21 else:
22     addi $t2, $t2, -1          # y = y - 1
23     add $t3, $t3, $t3          # z = z * 2
24 endif:
25
26

```

*Kết quả chạy:

The screenshot shows the QEMU debugger interface with three windows:

- Text Segment**: Shows assembly code for the mips4_1.asm file. The code includes instructions like add, la, lw, and addi, with comments explaining the purpose of each line.
- Labels**: A list of labels defined in the assembly code, such as start, else, endif, X, Y, Z, and various \$ registers.
- Data Segment**: A table showing memory addresses from 0x1000.0000 to 0x1001.6000 with their corresponding values.

b.i>=j

*Code:

```

1 #truong hop if(i>=j)
2 .data
3 X: .word -4      #khoi tao x = -4
4 Y: .word 3       #khoi tao y = 3
5 Z: .word 2       #khoi tao z = 2
6 .text
7     addi $s1, $zero, 6    #i = 6
8     addi $s2, $zero, 5    #j = 5
9     la $t7, X
10    lw $t1, 0($t7)   # $t1 = X
11    la $t8, Y
12    lw $t2, 0($t8)   # $t2 = y
13    la $t9, Z
14    lw $t3, 0($t9)   # $t3 = Z
15 start:
16     slt $t0, $s1, $s2          # i < j -> $t0 = 1
17     bne $t0, $zero, else        # $t0 = 1 nhay den else
18     addi $t1, $t1, 1            # x = x + 1
19     addi $t3, $zero, 1          # z = 1
20     j endif                  # ket thuc chuong trinh
21 else:
22     addi $t2, $t2, -1          # y = y - 1
23     add $t3, $t3, $t3          # z = z * 2
24 endif:
```

*Kết quả chạy:

The screenshot shows the QEMU debugger interface with three windows:

- Text Segment**: Shows assembly code for mips4_2.asm. The code includes various arithmetic operations like addi, sub, and add, as well as logical operations like and, or, and not. It also contains conditional branches (jne, jne) and loops (j). Labels like start, else, endif, X, Y, Z, and main are used.
- Labels**: A table showing labels and their addresses. Labels include start, else, endif, X, Y, Z, and main, with addresses ranging from 0x00400024 to 0x01000008.
- Data Segment**: A table showing memory starting at address 0x10000000. Values for memory locations 0x10000000 through 0x1000001f are listed.

c.i+j<=0

*Code:

```
1 #truong hop if(i+j<=0)
2 .data
3 X: .word -4      #khoi tao x = -4
4 Y: .word 3       #khoi tao y = 3
5 Z: .word 2       #khoi tao z = 2
6 .text
7     addi $s1, $zero, 6  #i = 6
8     addi $s2, $zero, 5  #j = 5
9     la $t7, X
10    lw $t1, 0($t7)   # $t1 = X
11    la $t8, Y
12    lw $t2, 0($t8)   # $t2 = y
13    la $t9, Z
14    lw $t3, 0($t9)   # $t3 = z
15 start:
16    add $t4, $s1, $s2  #$t4 = i + j
17    bgtz $t4, else    # nhay den else neu i + j > 0
18    addi $t1, $t1, 1      # x = x + 1
19    addi $t3, $zero, 1      # z = 1
20    j endif            # ket thuc chuong trinh
21 else:
22    addi $t2, $t2, -1      # y = y - 1
23    add $t3, $t3, $t3      # z = z * 2
24 endif:
```

*Kết quả chạy:

| Text Segment | | Labels | | Data | | |
|--------------|--|--------|------------|------|--------|-----------|
| Bkpt Address | Code Basic | Label | Address | Name | Number | Value |
| 0x04000000 | 0x00000000 addi \$t7, \$zero, 6 #i = 6 | start | 0x0000002c | \$t7 | 1 | 268500992 |
| 0x04000004 | 0x02020005 addi \$t8, \$zero, 5 #j = 5 | | | \$v0 | 2 | 0 |
| 0x04000008 | 0x3c011001 lui \$t1,4097 | | | \$v1 | 3 | 0 |
| 0x0400000c | 0x342f0000 ori \$t5, \$zero, 0 | | | \$s0 | 4 | 0 |
| 0x04000010 | 0x00000000 lw \$t1, 0(\$t7) # \$t1 = X | | | \$s1 | 5 | 0 |
| 0x04000014 | 0x3c011001 lui \$t1,4097 | | | \$s2 | 6 | 0 |
| 0x04000018 | 0x34380004 ori \$t4, \$zero, 1 | | | X | 7 | 0 |
| 0x0400001c | 0x0f000000 lw \$t1,0(\$t4) # \$t1 = y | | | Y | 8 | 0 |
| 0x04000020 | 0x9c011001 lui \$t1,4097 | | | Z | 9 | -4 |
| 0x04000024 | 0x00000000 lw \$t1,0(\$t4) # \$t1 = z | | | \$t1 | 10 | 2 |
| 0x04000028 | 0x0f000000 lw \$t1,0(\$t5) # \$t1 = Z | | | \$t2 | 11 | 4 |
| 0x0400002c | 0x0226020 add \$t2,\$t1,118 | | | \$t3 | 12 | 11 |
| 0x04000030 | 0x1d900003 addi \$t1, \$zero, 1 | | | \$t4 | 13 | 0 |
| 0x04000034 | 0x00000000 addi \$t1, \$zero, 1 | | | \$t5 | 14 | 0 |
| 0x04000038 | 0x20000001 addi \$t1,40,1 | | | \$t6 | 15 | 268500992 |
| 0x0400003c | 0x08010012 j 0x04000048 | | | \$t7 | 16 | 0 |
| 0x04000040 | 0x214fffff addi \$t0,410,-1 | | | \$s1 | 17 | 6 |
| | | | | \$s2 | 18 | 5 |
| | | | | \$s3 | 19 | 0 |
| | | | | \$s4 | 20 | 0 |
| | | | | \$s5 | 21 | 0 |
| | | | | \$s6 | 22 | 0 |
| | | | | \$s7 | 23 | 0 |
| | | | | \$t8 | 24 | 268500996 |
| | | | | \$t9 | 25 | 268501000 |
| | | | | \$s0 | 26 | 0 |
| | | | | \$s1 | 27 | 0 |
| | | | | \$t0 | 28 | 268468224 |
| | | | | \$t1 | 29 | 214747945 |
| | | | | \$ra | 30 | 0 |
| | | | | pc | 31 | 4194376 |
| | | | | hi | | 0 |
| | | | | la | | 0 |

d.i+j>m+n

*Code:

```
mips1.asm mips2.asm mips3.asm mips4_1.asm mips4_2.asm mips4_3.asm mips4_4.asm
1 #truong hop if(i+j>m+n)
2 .data
3 X: .word -4      #khoi tao x = -4
4 Y: .word 3       #khoi tao y = 3
5 Z: .word 2       #khoi tao z = 2
6 .text
7     addi $s1, $zero, 6  #i = 6
8     addi $s2, $zero, 5  #j = 5
9     addi $s3, $zero, 7  #m = 7
10    addi $s4, $zero, 8  #n = 8
11    la $t7, X
12    lw $t1, 0($t7)  # $t1 = X
13    la $t8, Y
14    lw $t2, 0($t8)  # $t2 = y
15    la $t9, Z
16    lw $t3, 0($t9)  # $t3 = Z
17 start:
18     add $t4, $s1, $s2  #$t4 = i + j
19     add $t5, $s3, $s4  #$t5 = m + n
20     slt $t0, $t5, $t4  #$t0 = $t5 < $t4 ? 1 : 0
21     beq $t0, $zero, else  # neu $t0 = 0 thi nhay den else
22     addi $t1, $t1, 1          # x = x + 1
23     addi $t3, $zero, 1          # z = 1
24     j endif                # ket thuc chuong trinh
25 else:
26     addi $t2, $t2, -1         # y = y - 1
27     add $t3, $t3, $t3         # z = z * 2
28 endif:
```

*Kết quả chạy:

| Text Segment | | Labels | | Data Segment | |
|--------------|------------|--------------------------------------|-------|--------------|------------|
| Bkpt | Address | Code | Label | Address | Address |
| | 0x00400000 | 0x20110006 addi \$t1,\$zero,6 #i = 6 | start | 0x00400034 | \$zero 0 |
| | 0x00400004 | 0x20120005 addi \$t2,\$zero,5 #j = 5 | | 0x00400035 | \$t1 1 |
| | 0x00400006 | 0x20130007 addi \$t3,\$zero,7 #m = 7 | | 0x00400036 | \$t2 2 |
| | 0x00400008 | 0x20140008 addi \$t4,\$zero,8 #n = 8 | | 0x00400037 | \$t3 3 |
| | 0x00400010 | 0x3c011000 lui \$t1,4097 | | 0x10010004 | \$v1 4 |
| | 0x00400011 | 0x3d2f0000 ori \$t1,\$t1,0 | X | 0x10010005 | \$t0 5 |
| | 0x00400012 | 0x3c011001 lui \$t2,4097 | | 0x10010006 | \$v2 6 |
| | 0x00400013 | 0x3d2f0001 ori \$t2,\$t2,0 | Y | 0x10010007 | \$t4 7 |
| | 0x00400014 | 0x342f0000 ori \$t3,\$t3,0 | | 0x10010008 | \$t5 8 |
| | 0x00400015 | 0x3c011002 lui \$t4,4097 | | 0x10010009 | \$t6 9 |
| | 0x00400016 | 0x3d2f0002 ori \$t4,\$t4,0 | Z | 0x1001000a | \$t7 10 |
| | 0x00400017 | 0x3c011003 lui \$t5,4097 | | 0x1001000b | \$t8 11 |
| | 0x00400018 | 0x3d2f0003 ori \$t5,\$t5,0 | | 0x1001000c | \$t9 12 |
| | 0x00400019 | 0x3c011004 lui \$t6,4097 | | 0x1001000d | \$t10 13 |
| | 0x0040001a | 0x3d2f0004 ori \$t6,\$t6,0 | | 0x1001000e | \$t11 14 |
| | 0x0040001b | 0x3c011005 lui \$t7,4097 | | 0x1001000f | \$t12 15 |
| | 0x0040001c | 0x3d2f0005 ori \$t7,\$t7,0 | | 0x10010010 | \$t13 16 |
| | 0x0040001d | 0x3c011006 lui \$t8,4097 | | 0x10010011 | \$t14 17 |
| | 0x0040001e | 0x3d2f0006 ori \$t8,\$t8,0 | | 0x10010012 | \$t15 18 |
| | 0x0040001f | 0x3c011007 lui \$t9,4097 | | 0x10010013 | \$t16 19 |
| | 0x00400020 | 0x3d2f0007 ori \$t9,\$t9,0 | | 0x10010014 | \$t17 20 |
| | 0x00400021 | 0x3c011008 lui \$t10,4097 | | 0x10010015 | \$t18 21 |
| | 0x00400022 | 0x3d2f0008 ori \$t10,\$t10,0 | | 0x10010016 | \$t19 22 |
| | 0x00400023 | 0x3c011009 lui \$t11,4097 | | 0x10010017 | \$t20 23 |
| | 0x00400024 | 0x3d2f0009 ori \$t11,\$t11,0 | | 0x10010018 | \$t19 24 |
| | 0x00400025 | 0x3c01100a lui \$t12,4097 | | 0x10010019 | 268500996 |
| | 0x00400026 | 0x3d2f000a ori \$t12,\$t12,0 | | 0x1001001a | 268501000 |
| | 0x00400027 | 0x3c01100b lui \$t13,4097 | | 0x1001001b | 0 |
| | 0x00400028 | 0x3d2f000b ori \$t13,\$t13,0 | | 0x1001001c | 0 |
| | 0x00400029 | 0x3c01100c lui \$t14,4097 | | 0x1001001d | 268689224 |
| | 0x0040002a | 0x3d2f000c ori \$t14,\$t14,0 | | 0x1001001e | 2147479548 |
| | 0x0040002b | 0x3c01100d lui \$t15,4097 | | 0x1001001f | 0 |
| | 0x0040002c | 0x3d2f000d ori \$t15,\$t15,0 | | 0x10010020 | 4194392 |
| | 0x0040002d | 0x3c01100e lui \$t16,4097 | | 0x10010021 | 0 |
| | 0x0040002e | 0x3d2f000e ori \$t16,\$t16,0 | | 0x10010022 | 0 |
| | 0x0040002f | 0x3c01100f lui \$t17,4097 | | 0x10010023 | 0 |
| | 0x00400030 | 0x3d2f000f ori \$t17,\$t17,0 | | 0x10010024 | 0 |
| | 0x00400031 | 0x3c011010 lui \$t18,4097 | | 0x10010025 | 0 |
| | 0x00400032 | 0x3d2f0010 ori \$t18,\$t18,0 | | 0x10010026 | 0 |
| | 0x00400033 | 0x3c011011 lui \$t19,4097 | | 0x10010027 | 0 |
| | 0x00400034 | 0x3d2f0011 ori \$t19,\$t19,0 | | 0x10010028 | 0 |
| | 0x00400035 | 0x3c011012 lui \$t20,4097 | | 0x10010029 | 0 |
| | 0x00400036 | 0x3d2f0012 ori \$t20,\$t20,0 | | 0x1001002a | 0 |
| | 0x00400037 | 0x3c011013 lui \$t1,4097 | | 0x1001002b | 0 |
| | 0x00400038 | 0x3d2f0013 ori \$t1,\$t1,0 | | 0x1001002c | 0 |
| | 0x00400039 | 0x3c011014 lui \$t2,4097 | | 0x1001002d | 0 |
| | 0x0040003a | 0x3d2f0014 ori \$t2,\$t2,0 | | 0x1001002e | 0 |
| | 0x0040003b | 0x3c011015 lui \$t3,4097 | | 0x1001002f | 0 |
| | 0x0040003c | 0x3d2f0015 ori \$t3,\$t3,0 | | 0x10010030 | 0 |
| | 0x0040003d | 0x3c011016 lui \$t4,4097 | | 0x10010031 | 0 |
| | 0x0040003e | 0x3d2f0016 ori \$t4,\$t4,0 | | 0x10010032 | 0 |
| | 0x0040003f | 0x3c011017 lui \$t5,4097 | | 0x10010033 | 0 |
| | 0x00400040 | 0x3d2f0017 ori \$t5,\$t5,0 | | 0x10010034 | 0 |
| | 0x00400041 | 0x3c011018 lui \$t6,4097 | | 0x10010035 | 0 |
| | 0x00400042 | 0x3d2f0018 ori \$t6,\$t6,0 | | 0x10010036 | 0 |
| | 0x00400043 | 0x3c011019 lui \$t7,4097 | | 0x10010037 | 0 |
| | 0x00400044 | 0x3d2f0019 ori \$t7,\$t7,0 | | 0x10010038 | 0 |
| | 0x00400045 | 0x3c01101a lui \$t8,4097 | | 0x10010039 | 0 |
| | 0x00400046 | 0x3d2f001a ori \$t8,\$t8,0 | | 0x1001003a | 0 |
| | 0x00400047 | 0x3c01101b lui \$t9,4097 | | 0x1001003b | 0 |
| | 0x00400048 | 0x3d2f001b ori \$t9,\$t9,0 | | 0x1001003c | 0 |
| | 0x00400049 | 0x3c01101c lui \$t10,4097 | | 0x1001003d | 0 |
| | 0x0040004a | 0x3d2f001c ori \$t10,\$t10,0 | | 0x1001003e | 0 |
| | 0x0040004b | 0x3c01101d lui \$t11,4097 | | 0x1001003f | 0 |
| | 0x0040004c | 0x3d2f001d ori \$t11,\$t11,0 | | 0x10010040 | 0 |
| | 0x0040004d | 0x3c01101e lui \$t12,4097 | | 0x10010041 | 0 |
| | 0x0040004e | 0x3d2f001e ori \$t12,\$t12,0 | | 0x10010042 | 0 |
| | 0x0040004f | 0x3c01101f lui \$t13,4097 | | 0x10010043 | 0 |
| | 0x00400050 | 0x3d2f001f ori \$t13,\$t13,0 | | 0x10010044 | 0 |
| | 0x00400051 | 0x3c011020 lui \$t14,4097 | | 0x10010045 | 0 |
| | 0x00400052 | 0x3d2f0020 ori \$t14,\$t14,0 | | 0x10010046 | 0 |
| | 0x00400053 | 0x3c011021 lui \$t15,4097 | | 0x10010047 | 0 |
| | 0x00400054 | 0x3d2f0021 ori \$t15,\$t15,0 | | 0x10010048 | 0 |
| | 0x00400055 | 0x3c011022 lui \$t16,4097 | | 0x10010049 | 0 |
| | 0x00400056 | 0x3d2f0022 ori \$t16,\$t16,0 | | 0x1001004a | 0 |
| | 0x00400057 | 0x3c011023 lui \$t17,4097 | | 0x1001004b | 0 |
| | 0x00400058 | 0x3d2f0023 ori \$t17,\$t17,0 | | 0x1001004c | 0 |
| | 0x00400059 | 0x3c011024 lui \$t18,4097 | | 0x1001004d | 0 |
| | 0x0040005a | 0x3d2f0024 ori \$t18,\$t18,0 | | 0x1001004e | 0 |
| | 0x0040005b | 0x3c011025 lui \$t19,4097 | | 0x1001004f | 0 |
| | 0x0040005c | 0x3d2f0025 ori \$t19,\$t19,0 | | 0x10010050 | 0 |
| | 0x0040005d | 0x3c011026 lui \$t20,4097 | | 0x10010051 | 0 |
| | 0x0040005e | 0x3d2f0026 ori \$t20,\$t20,0 | | 0x10010052 | 0 |
| | 0x0040005f | 0x3c011027 lui \$t1,4097 | | 0x10010053 | 0 |
| | 0x00400060 | 0x3d2f0027 ori \$t1,\$t1,0 | | 0x10010054 | 0 |
| | 0x00400061 | 0x3c011028 lui \$t2,4097 | | 0x10010055 | 0 |
| | 0x00400062 | 0x3d2f0028 ori \$t2,\$t2,0 | | 0x10010056 | 0 |
| | 0x00400063 | 0x3c011029 lui \$t3,4097 | | 0x10010057 | 0 |
| | 0x00400064 | 0x3d2f0029 ori \$t3,\$t3,0 | | 0x10010058 | 0 |
| | 0x00400065 | 0x3c01102a lui \$t4,4097 | | 0x10010059 | 0 |
| | 0x00400066 | 0x3d2f002a ori \$t4,\$t4,0 | | 0x1001005a | 0 |
| | 0x00400067 | 0x3c01102b lui \$t5,4097 | | 0x1001005b | 0 |
| | 0x00400068 | 0x3d2f002b ori \$t5,\$t5,0 | | 0x1001005c | 0 |
| | 0x00400069 | 0x3c01102c lui \$t6,4097 | | 0x1001005d | 0 |
| | 0x0040006a | 0x3d2f002c ori \$t6,\$t6,0 | | 0x1001005e | 0 |
| | 0x0040006b | 0x3c01102d lui \$t7,4097 | | 0x1001005f | 0 |
| | 0x0040006c | 0x3d2f002d ori \$t7,\$t7,0 | | 0x10010060 | 0 |
| | 0x0040006d | 0x3c01102e lui \$t8,4097 | | 0x10010061 | 0 |
| | 0x0040006e | 0x3d2f002e ori \$t8,\$t8,0 | | 0x10010062 | 0 |
| | 0x0040006f | 0x3c01102f lui \$t9,4097 | | 0x10010063 | 0 |
| | 0x00400070 | 0x3d2f002f ori \$t9,\$t9,0 | | 0x10010064 | 0 |
| | 0x00400071 | 0x3c011030 lui \$t10,4097 | | 0x10010065 | 0 |
| | 0x00400072 | 0x3d2f0030 ori \$t10,\$t10,0 | | 0x10010066 | 0 |
| | 0x00400073 | 0x3c011031 lui \$t11,4097 | | 0x10010067 | 0 |
| | 0x00400074 | 0x3d2f0031 ori \$t11,\$t11,0 | | 0x10010068 | 0 |
| | 0x00400075 | 0x3c011032 lui \$t12,4097 | | 0x10010069 | 0 |
| | 0x00400076 | 0x3d2f0032 ori \$t12,\$t12,0 | | 0x1001006a | 0 |
| | 0x00400077 | 0x3c011033 lui \$t13,4097 | | 0x1001006b | 0 |
| | 0x00400078 | 0x3d2f0033 ori \$t13,\$t13,0 | | 0x1001006c | 0 |
| | 0x00400079 | 0x3c011034 lui \$t14,4097 | | 0x1001006d | 0 |
| | 0x0040007a | 0x3d2f0034 ori \$t14,\$t14,0 | | 0x1001006e | 0 |
| | 0x0040007b | 0x3c011035 lui \$t15,4097 | | 0x1001006f | 0 |
| | 0x0040007c | 0x3d2f0035 ori \$t15,\$t15,0 | | 0x10010070 | 0 |
| | 0x0040007d | 0x3c011036 lui \$t16,4097 | | 0x10010071 | 0 |
| | 0x0040007e | 0x3d2f0036 ori \$t16,\$t16,0 | | 0x10010072 | 0 |
| | 0x0040007f | 0x3c011037 lui \$t17,4097 | | 0x10010073 | 0 |
| | 0x00400080 | 0x3d2f0037 ori \$t17,\$t17,0 | | 0x10010074 | 0 |
| | 0x00400081 | 0x3c011038 lui \$t18,4097 | | 0x10010075 | 0 |
| | 0x00400082 | 0x3d2f0038 ori \$t18,\$t18,0 | | 0x10010076 | 0 |
| | 0x00400083 | 0x3c011039 lui \$t19,4097 | | 0x10010077 | 0 |
| | 0x00400084 | 0x3d2f0039 ori \$t19,\$t19,0 | | 0x10010078 | 0 |
| | 0x00400085 | 0x3c01103a lui \$t20,4097 | | 0x10010079 | 0 |
| | 0x00400086 | 0x3d2f003a ori \$t20,\$t20,0 | | 0x1001007a | 0 |
| | 0x00400087 | 0x3c01103b lui \$t1,4097 | | 0x1001007b | 0 |
| | 0x00400088 | 0x3d2f003b ori \$t1,\$t1,0 | | 0x1001007c | 0 |
| | 0x00400089 | 0x3c01103c lui \$t2,4097 | | 0x1001007d | 0 |
| | 0x0040008a | 0x3d2f003c ori \$t2,\$t2,0 | | 0x1001007e | 0 |
| | 0x0040008b | 0x3c01103d lui \$t3,4097 | | 0x1001007f | 0 |
| | 0x0040008c | 0x3d2f003d ori \$t3,\$t3,0 | | 0x10010080 | 0 |
| | 0x0040008d | 0x3c01103e lui \$t4,4097 | | 0x10010081 | 0 |
| | 0x0040008e | 0x3d2f003e ori \$t4,\$t4,0 | | 0x10010082 | 0 |
| | 0x0040008f | 0x3c01103f lui \$t5,4097 | | 0x10010083 | 0 |
| | 0x00400090 | 0x3d2f003f ori \$t5,\$t5,0 | | 0x10010084 | 0 |
| | 0x00400091 | 0x3c011040 lui \$t6,4097 | | 0x10010085 | 0 |
| | 0x00400092 | 0x3d2f0040 ori \$t6,\$t6,0 | | 0x10010086 | 0 |
| | 0x00400093 | 0x3c011041 lui \$t7,4097 | | 0x10010087 | 0 |
| | 0x00400094 | 0x3d2f0041 ori \$t7,\$t7,0 | | 0x10010088 | |

BÀI 5:

b.i<=n

***Code:**

```

1 # i<=n
2 .data
3     A: .word    4, 6, 8, -3, 9, -4, 0, 5, 1      #khoi tao mang
4     sum: .word  0                                #khai bao sum
5     i: .word   0                                #khai bao i
6     n: .word   5                                #so phan tu cua mang n = 9
7     step: .word 1                             #buoc nhay cua vong lap
8 .text
9     #nap gia tri vao cac thanh ghi
10    la $t6, sum
11    lw $s5, 0($t6) # $s5 = sum
12    la $t7, i
13    lw $s1, 0($t7) # $s1 = i
14    la $s2, A      # gan dia chi bat dau mang vao thanh ghi $s2
15    la $t8, n
16    lw $s3, 0($t8) # $s3 = n
17    la $t9, step
18    lw $s4, 0($t9) # $s4 = step
19    #thuc hien tinh tong      addi $s5, $zero, 0 #sum=0      addi $s1, $zero, 0 #i=0
20 loop:
21    slt $t2, $s3, $s1  # $t2 = n < i ? 1 : 0
22     bne $t2, $zero, enloop  # ket thuc vong lap
23     add $t1, $s1, $s1      # $s1 = $s1*2
24     add $t1, $t1, $t1      # $t1 = $s1*4
25     add $t1, $t1, $s2      # gan dia chi cua A[i] cho $t1
26     lw $t0, 0($t1)        # A[i] = $t0
27     add $s5, $s5, $t0      # sum = sum + A[i]
28     add $s1, $s1, $s4      # i = i + step
29     j loop                  # quay lai vong lap
30 enloop:

```

***Kết quả chạy:**

The screenshot shows the QEMU debugger interface with several windows open:

- Text Segment**: Shows assembly code for mips5_2.asm, including labels like .zero, .int, .loop, .enloop, .A, .sum, .n, .step, and .end. It includes comments and various assembly instructions.
- Registers**: Displays the CPU register state, including \$zero, \$t0 through \$t11, \$s0 through \$s1, \$t2, \$t3, \$t4, \$t5, \$t6, \$t7, \$t8, \$t9, \$t10, \$t11, \$t12, \$t13, \$t14, \$t15, \$t16, \$t17, \$t18, \$t19, \$t20, \$t21, \$t22, \$t23, \$t24, \$t25, \$t26, \$t27, \$t28, \$t29, \$t30, \$t31, \$ra, \$pc, \$hi, and \$lo.
- Labels**: A list of labels from the assembly code, such as .zero, .int, .loop, .enloop, .A, .sum, .n, .step, and .end.
- Data Segment**: Shows memory dump and data segment details for addresses 0x10000000 to 0x10001000.

c.sum >=0

*Code:

```
2 .data
3     A: .word    -4, 6, 8, -3, 9, -4, 0, 5, 1      #khoi tao mang
4     sum: .word   0                                #khai bao sum
5     i: .word    0                                #khai bao i
6     n: .word    9                                #so phan tu cua mang n = 9
7     step: .word 1                                #buoc nhay cua vong lap
8 .text
9     #nap gia tri vao cac thanh ghi
10    la $t6, sum
11    lw $s5, 0($t6) # $s5 = sum
12    la $t7, i
13    lw $s1, 0($t7) # $s1 = i
14    la $s2, A      # gan dia chi bat dau mang vao thanh ghi $s2
15    la $t8, n
16    lw $s3, 0($t8) # $s3 = n
17    la $t9, step
18    lw $s4, 0($t9) # $s4 = step
19    #thuc hien tinh tong      addi $s5, $zero, 0 #sum=0      addi $s1, $zero, 0 #i=0
20 loop:
21    slt $t2, $s1, $s3  # $t2 = i < n ? 1 : 0
22    beq $t2, $zero, enloop  # ket thuc vong lap
23    add $t1, $s1, $s1      #$s1 = $s1*2
24    add $t1, $t1, $t1      #$t1 = $s1*4
25    add $t1, $t1, $s2      #gan dia chi cua A[i] cho $t1
26    lw $t0, 0($t1)        #A[i] = $t0
27    add $s5, $s5, $t0      # sum = sum + A[i]
28    bgez $s5, enloop      # $s5 >= 0, nhay den enloop
29    add $s1, $s1, $s4      # i = i + step
30    j loop                # quay lai vong lap
31 enloop:
```

*Kết quả chạy:

| Text Segment | | Labels | | Data Segment | | | | |
|--------------|------------|--------------------|-------|---|------------|--------|--------|------------|
| Bkpt | Address | Code | Basic | Label | Address | Name | Number | Value |
| 0x04000000 | 0x42120000 | ori \$t1,\$t0 | | \$Zero | 0x00000000 | \$Zero | 0 | 0 |
| 0x04000020 | 0x3c010001 | lui \$1,4097 | 15: | la \$t8, n | 0x00000001 | \$t8 | 1 | 268500992 |
| 0x04000024 | 0x34390002 | ori \$24,\$1,44 | | loop | 0x00000002 | \$t0 | 2 | 0 |
| 0x04000028 | 0x8f130000 | lw \$s5,0(\$t6) | 16: | lw \$s5, 0(\$t6) # \$s5 = n | 0x00000003 | \$s5 | 3 | 0 |
| 0x04000032 | 0x34390000 | ori \$24,\$1,44 | | enloop | 0x00000004 | \$t1 | 4 | 0 |
| 0x04000036 | 0x34390000 | ori \$25,\$1,48 | 17: | la \$t9, step | 0x00000005 | \$s1 | 5 | 0 |
| 0x04000040 | 0x8f140000 | lw \$t0,0(\$t1) | 18: | lw \$s4, 0(\$t9) # \$s4 = step | 0x00000006 | \$s2 | 6 | 0 |
| 0x04000044 | 0x34390029 | elt \$10,\$17,\$19 | 21: | slt \$t2,\$s1,\$s3 # \$t2 = i < n ? 1 : 0 | 0x00000007 | \$t2 | 7 | 0 |
| 0x04000048 | 0x34390000 | ori \$24,\$1,44 | | bgez \$s5, enloop # ket thuc vong lap | 0x00000008 | \$t3 | 8 | 0 |
| 0x04000052 | 0x34390000 | ori \$24,\$1,44 | 22: | add \$t1,\$s1,\$s1 # \$s1 = \$s1*2 | 0x00000009 | \$t4 | 9 | 0 |
| 0x04000056 | 0x34390000 | ori \$24,\$1,44 | 23: | add \$t1,\$t1,\$t1 # \$t1 = \$t1*4 | 0x0000000a | \$t5 | 10 | 0 |
| 0x04000060 | 0x34390000 | ori \$25,\$1,48 | 24: | add \$t1,\$t1,\$s2 #gan dia chi cua A[i] cho \$t1 | 0x0000000b | \$t6 | 11 | 0 |
| 0x04000064 | 0x34390000 | ori \$25,\$1,48 | 25: | add \$t1,\$t1,\$s2 #gan dia chi cua A[i] cho \$t1 | 0x0000000c | \$t7 | 12 | 0 |
| 0x04000068 | 0x34390000 | ori \$25,\$1,48 | 26: | lw \$t0,0(\$t1) | 0x0000000d | \$t8 | 13 | 0 |
| 0x04000072 | 0x34390000 | ori \$25,\$1,48 | 27: | add \$s5,\$s5,\$t0 # sum = sum + A[i] | 0x0000000e | \$t9 | 14 | 2685010268 |
| 0x04000076 | 0x06a10002 | bgez \$s5,21,2 | 28: | bgez \$s5, enloop # \$s5 >= 0, nhay den enloop | 0x0000000f | \$t10 | 15 | 2685010332 |
| 0x04000080 | 0x02348820 | add \$17,\$17,\$20 | 29: | add \$s1,\$s1,\$s4 # i = i + step | 0x00000010 | \$t11 | 16 | 0 |
| 0x04000084 | 0x02348820 | add \$17,\$17,\$20 | 30: | j loop # quay lai vong lap | 0x00000011 | \$t12 | 17 | 1 |
| 0x04000088 | 0x02348820 | add \$17,\$17,\$20 | | | 0x00000012 | \$t13 | 18 | 268500992 |
| 0x04000092 | 0x02348820 | add \$17,\$17,\$20 | | | 0x00000013 | \$t14 | 19 | 9 |
| 0x04000096 | 0x02348820 | add \$17,\$17,\$20 | | | 0x00000014 | \$t15 | 20 | 1 |
| 0x040000a0 | 0x02348820 | add \$17,\$17,\$20 | | | 0x00000015 | \$t16 | 21 | 0 |
| 0x040000a4 | 0x02348820 | add \$17,\$17,\$20 | | | 0x00000016 | \$t17 | 22 | 0 |
| 0x040000a8 | 0x02348820 | add \$17,\$17,\$20 | | | 0x00000017 | \$t18 | 23 | 0 |
| 0x040000b2 | 0x02348820 | add \$17,\$17,\$20 | | | 0x00000018 | \$t19 | 24 | 2685010395 |
| 0x040000b6 | 0x02348820 | add \$17,\$17,\$20 | | | 0x00000019 | \$t20 | 25 | 2685010400 |
| 0x040000c0 | 0x02348820 | add \$17,\$17,\$20 | | | 0x0000001a | \$t21 | 26 | 0 |
| 0x040000c4 | 0x02348820 | add \$17,\$17,\$20 | | | 0x0000001b | \$t22 | 27 | 0 |
| 0x040000c8 | 0x02348820 | add \$17,\$17,\$20 | | | 0x0000001c | \$t23 | 28 | 268468224 |
| 0x040000d2 | 0x02348820 | add \$17,\$17,\$20 | | | 0x0000001d | \$t24 | 29 | 2147479548 |
| 0x040000d6 | 0x02348820 | add \$17,\$17,\$20 | | | 0x0000001e | \$t25 | 30 | 0 |
| 0x040000e0 | 0x02348820 | add \$17,\$17,\$20 | | | 0x0000001f | \$t26 | 31 | 0 |
| 0x040000e4 | 0x02348820 | add \$17,\$17,\$20 | | | 0x00000020 | pc | 32 | 4194400 |
| 0x040000e8 | 0x02348820 | add \$17,\$17,\$20 | | | 0x00000021 | hi | 33 | 0 |
| 0x040000f2 | 0x02348820 | add \$17,\$17,\$20 | | | 0x00000022 | lo | 34 | 0 |

d.A[i]==0

***Code:**

```

1 #A[i] == 0
2 .data
3     A: .word    4, 6, 8, -3, 9, -4, 0, 5, 1      #khoi tao mang
4     sum: .word  0                                #khai bao sum
5     i: .word   0                                #khai bao i
6     n: .word   9                                #so phan tu cua mang n = 9
7     step: .word 1                             #buoc nhay cua vong lap
8 .text
9     #nap gia tri vao cac thanh ghi
10    la $t6, sum
11    lw $s5, 0($t6) # $s5 = sum
12    la $t7, i
13    lw $s1, 0($t7) # $s1 = i
14    la $s2, A      # gan dia chi bat dau mang vao thanh ghi $s2
15    la $t8, n
16    lw $s3, 0($t8) # $s3 = n
17    la $t9, step
18    lw $s4, 0($t9) # $s4 = step
19    #thuc hien tinh tong      addi $s5, $zero, 0 #sum=0      addi $s1, $zero, 0 #i=0
20 loop:
21     slt $t2, $s1, $s3  # $t2 = i < n ? 1 : 0
22     beq $t2, $zero, enloop  # ket thuc vong lap
23     add $t1, $s1, $s1      # $s1 = $s1*2
24     add $t1, $t1, $t1      # $t1 = $s1*4
25     add $t1, $t1, $s2      # gan dia chi cua A[i] cho $t1
26     lw $t0, 0($t1)        # A[i] = $t0
27     beq $t0, $zero, enloop # A[i] = 0 nhay den enloop
28     add $s5, $s5, $t0      # sum = sum + A[i]
29     add $s1, $s1, $s4      # i = i + step
30     j loop                  # quay lai vong lap
31 enloop:

```

*Kết quả chạy:

The screenshot shows the QEMU debugger interface with three main panes:

- Registers**: Shows CPU registers (r0-r31, pc, sp) and memory dump.
- Stack**: Shows the stack content.
- Data Segment**: Shows memory dump across various segments.

BÀI 6:

*Code:

```

1 .data
2     A: .word    4, 6, -16, -3, 9, -4, 0, 5, 1      #khoi tao mang
3     sum: .word  0                                #khai bao sum
4     i: .word   0                                #khai bao i
5     n: .word   9                                #so phan tu cua mang n = 9
6     step: .word 1                               #buoc nhay cua vong lap
7 .text
8     #nap gia tri vao cac thanh ghi
9     addi $s6, $zero, 0 # max = 0
10    la $t6, sum
11    lw $s5, 0($t6) # $s5 = sum
12    la $t7, i
13    lw $s1, 0($t7) # $s1 = i
14    la $s2, A      # gan dia chi bat dau mang vao thanh ghi $s2
15    la $t8, n
16    lw $s3, 0($t8) # $s3 = n
17    la $t9, step
18    lw $s4, 0($t9) # $s4 = step
19    #thuc hien tinh tong      addi $s5, $zero, 0 #sum=0      addi $s1, $zero, 0 #i=0
20 loop:
21     slt $t2, $s1, $s3  # $t2 = i < n ? 1 : 0
22     beq $t2, $zero, enloop # ket thuc vong lap
23     add $t1, $s1, $s1      #$s1 = $s1*2
24     add $t1, $t1, $t1      #$t1 = $s1*4
25     add $t1, $t1, $s2      #gan dia chi cua A[i] cho $t1
26     lw $t0, 0($t1)         #A[i] = $t0
27     blitz $t0, enif       #neu A[i] < 0, nhay den enif
28     slt $t2, $s6, $t0      # $t2 = max < A[i] ? 1 : 0
29     beq $t2, $zero, enif_2 # $t2 = 0 nhay den step
30     add $s6, $zero, $t0      # max = A[i]
31     add $s1, $s1, $s4      # i = i + step
32     j loop                # quay lai vong lap
33 enif:
34     sub $t0, $zero, $t0      #A[i] = -A[i]
35     slt $t2, $s6, $t0      #$t2 = max < A[i] ? 1 : 0
36     beq $t2, $zero, enif_2 #neu $t2 = 0 nhay den step
37     add $s6, $zero, $t0      # max = A[i]
38 enif_2: # tang gia tri cho buoc nhay
39     add $s1, $s1, $s4      # i = i + step
40     j loop                # quay ve vong lap
41 enloop:

```

*Kết quả chạy:

| Text Segment | | Labels | | Data Segment | | | | |
|--------------|------------|--------------------|-------|--------------|------------|--------|--------|------------|
| Bkpt | Address | Code | Basic | Label | Address | Name | Number | Value |
| 0x00400000 | 0x20160000 | addi \$22,\$0,0 | | loop | 0x0040002c | \$zero | 0 | 0 |
| 0x00400004 | 0x3c011000 | lw \$1,\$0,0 | | enif | 0x0040006c | \$t | 1 | 268500992 |
| 0x00400008 | 0x34240024 | ori \$14,\$1,36 | | enif_2 | 0x0040007c | \$v0 | 2 | 0 |
| 0x00400010 | 0x3c011040 | lw \$1,\$1,36 | | enloop | 0x00400084 | \$s0 | 4 | 0 |
| 0x00400014 | 0x3c011000 | lw \$1,\$0,0 | | | 0x00400094 | \$s1 | 5 | 0 |
| 0x00400018 | 0x34210028 | ori \$15,\$1,40 | | | 0x01000244 | \$s2 | 6 | 0 |
| 0x00400020 | 0x3c011000 | lw \$1,\$0,40 | | | 0x01000248 | \$s3 | 7 | 0 |
| 0x00400024 | 0x3c011000 | lw \$1,\$0,0 | | | 0x0100024c | \$t0 | 8 | 0 |
| 0x00400028 | 0x34380002 | ori \$24,\$1,44 | | | 0x01000250 | \$t1 | 9 | 268501024 |
| 0x00400030 | 0x3c011000 | lw \$1,\$0,44 | | | 0x01000254 | \$t2 | 10 | 0 |
| 0x00400034 | 0x34290039 | ori \$25,\$1,48 | | | 0x01000258 | \$t3 | 11 | 0 |
| 0x00400038 | 0x8f340000 | lw \$20,\$0,48 | | | 0x0100025c | \$t4 | 12 | 0 |
| 0x0040003c | 0x0235502a | slt \$10,\$17,\$19 | | | 0x01000260 | \$t5 | 13 | 0 |
| 0x00400040 | 0x11400000 | beq \$10,\$10,16 | | | 0x01000264 | \$t6 | 14 | 268501028 |
| | | | | | 0x01000268 | \$t7 | 15 | 268501032 |
| | | | | | 0x01000270 | \$t8 | 16 | 0 |
| | | | | | 0x01000274 | \$t9 | 17 | 0 |
| | | | | | 0x01000278 | \$t10 | 18 | 268500992 |
| | | | | | 0x01000280 | \$s4 | 19 | 0 |
| | | | | | 0x01000284 | \$s5 | 20 | 1 |
| | | | | | 0x01000288 | \$s6 | 21 | 0 |
| | | | | | 0x01000290 | \$t7 | 22 | 16 |
| | | | | | 0x01000294 | \$t8 | 23 | 0 |
| | | | | | 0x01000298 | \$t9 | 24 | 268501036 |
| | | | | | 0x0100029c | \$t10 | 25 | 268501040 |
| | | | | | 0x010002a0 | \$t11 | 26 | 0 |
| | | | | | 0x010002a4 | \$t12 | 27 | 0 |
| | | | | | 0x010002a8 | \$t13 | 28 | 268660214 |
| | | | | | 0x010002b0 | \$t14 | 29 | 2147479548 |
| | | | | | 0x010002b4 | \$t15 | 30 | 0 |
| | | | | | 0x010002b8 | \$t16 | 31 | 0 |
| | | | | | 0x010002bc | \$t17 | 32 | 4194495 |
| | | | | | 0x010002c0 | \$t18 | 33 | 0 |
| | | | | | 0x010002c4 | \$t19 | 34 | 0 |
| | | | | | 0x010002c8 | \$t20 | 35 | 0 |
| | | | | | 0x010002cc | \$t21 | 36 | 0 |