Thực hành kiến trúc máy tính – tuần 10

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1. Assignment 1

-Mã nguồn:

```
.eqv SEVENSEG LEFT
                   0xFFFF0011 # Dia chi cua den led 7 doan trai.
                                         Bit 0 = doan a;
                                        Bit 1 = \text{doan b}; \dots
                                         Bit 7 = dau.
.eqv SEVENSEG RIGHT     0xFFFF0010 # Dia chi cua den led 7 doan phai
.data
A: .word 0x3F, 0x6,0x5B,0x4F, 0X66,0X6D, 0X7D, 0X7, 0X7F, 0X6F
.text
main:
               #load the address of the array
     la $s1, A
     addi $t1, $0, 0 #i = 0
     addi $t2, $0, 10 #n = 10
                #i++
     li $t3, 1
     li $t4, 1
     li $t5, -1
loop_0to9:
     lw $a0, ($s1)
                            #set value for segments
     jal SHOW_7SEG_LEFT
                            #show
     addi $s1, $s1, 4 #point to the next element
     add $t1, $t1, $t3
     beq $t1, $t2, change_direction
     j loop_0to9
loop 9to0:
   lw $a0, ($s1)
   jal SHOW 7SEG LEFT
   addi $s1, $s1, -4
   add $t1, $t1, $t3
   beq $t1, $0, change_direction
```

```
j loop_9to0
change direction:
  sub $t3, $0, $t3  #change the direction i++-->i--->i++-->...
  beq $t3, $t4, loop 0to9
  beq $t3, $t5, loop 9to0
#-----
# Function SHOW_7SEG_LEFT : turn on/off the 7seg
# param[in] $a0 value to shown
# remark $t0 changed
#-----
SHOW_7SEG_LEFT: li $t0, SEVENSEG_LEFT # assign port's address
           sb $a0, 0($t0) # assign new value
           nop
           jr $ra
           nop
#-----
# Function SHOW_7SEG_RIGHT : turn on/off the 7seg
# param[in] $a0 value to shown
# remark $t0 changed
#-----
SHOW_7SEG_RIGHT: li $t0, SEVENSEG_RIGHT # assign port's address
           sb $a0, 0($t0) # assign new value
           nop
           jr
              $ra
           nop
```

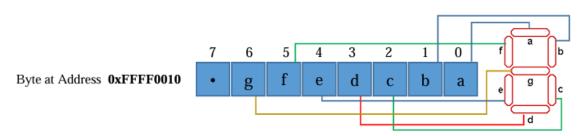
-Kết quả chạy:



LED đếm các số từ 0 đến 9, rồi sau đó lại từ 9 về 0, rồi tiếp tục lặp lại.

-Giải thích:

Thanh ghi \$a0 dùng để lưu giá trị muốn hiển thị lên LED



Ví dụ, nếu muốn hiển thị số 0, dấu chấm và thanh g sẽ tắt nên giá trị của bit là 0, a,b,c,d,e,f hiển thị nên giá trị của bit là 1

 \rightarrow Mã nhị phân \$a0 = 0x001111111 = 0x3F. Tương tự với các số còn lại

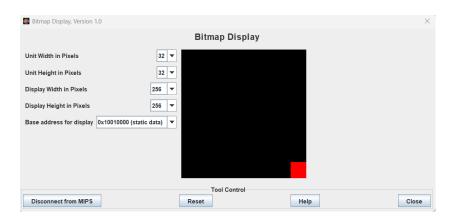
Thanh ghi \$t1 là biến i để chạy vòng lặp, thanh ghi \$t2 để lưu lại số phần tử trong mảng. Thanh ghi \$s1 lưu địa chỉ của mảng A, mảng A chứa các giá trị từ 0 đến 9 để có thể hiển thị lên LED. Thanh ghi \$t3 dùng để chuyển hướng đếm, nếu như đếm từ 0 đến 9 thì \$t1 hay i sẽ cộng với 1, còn nếu như đếm từ 9 đến 0 thì \$t1 hay i sẽ giảm đi 1.

2. Assignment 2:

-Mã nguồn

```
.eqv MONITOR SCREEN 0x10010000
                                #Dia chi bat dau cua bo nho man hinh
.eqv RED
                    0x00FF0000
                                #Cac gia tri mau thuong su dung
.eqv GREEN
                    0x0000FF00
.eqv BLUE
                    0x000000FF
                    0x00FFFFFF
.eqv WHITE
                    0x00FFFF00
.eqv YELLOW
                 0x00000000
.eqv BLACK
.text
      li $k0, MONITOR SCREEN
      addi $k0, $k0, 256  #Dat dia chi bat dau la o cuoi cung goc phai hinh
loop: li $t0, RED #To mau do cho o vuong
      li $t1, BLACK #To de mau den len o mau do
      sw $t0, ($k0)
      sw $t1, ($k0)
      addi $k0, $k0, -4
                         #Di chuyen
      bne $k0, $0, loop
      nop
exit:
```

-Kết quả chạy:



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-Giải thích:

Ta hiển thị theo màn hình 256x256, mỗi pixel là 32x32 thì sẽ có 64 ô. Đặt vị trí đầu tiên của hình vuông ở ô cuối cùng bên phải, hàng cuối cùng → địa chỉ bắt đầu là địa chỉ monitor_screen + 256.

Để di chuyển, ta lần tô màu đỏ cho ô đó, sau đó tô đè màu đen lên rồi giảm địa chỉ lưu trong thanh ghi k0 sang ô cạnh đó bên trái, rồi tiếp tục vòng lặp thì ta có ô đỏ di chuyển dần từ phải sang trái