Báo cáo Thực hành KTMT buổi 6

Họ và tên: Nguyễn Đức Phú

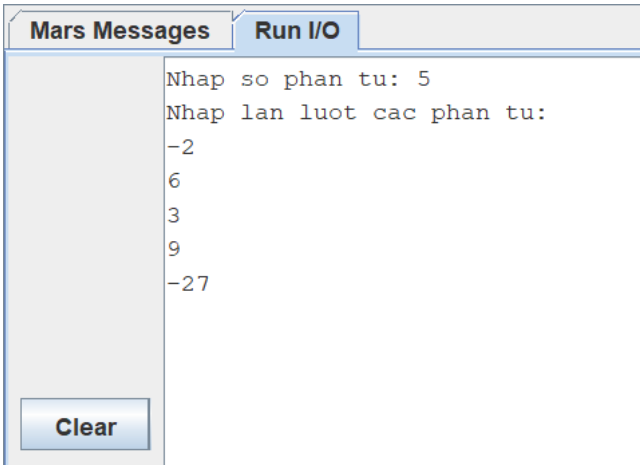
MSSV: 20215116

Assignment 1: Maximum-sum prefix

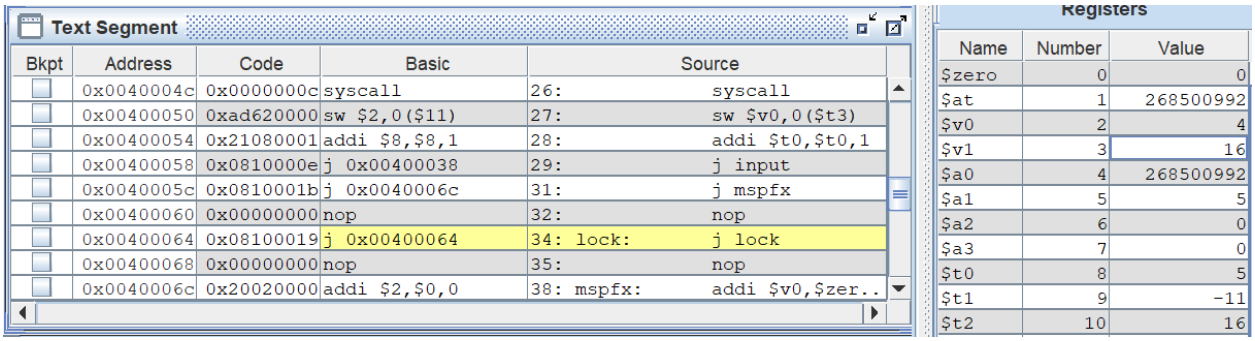
- Bổ sung đoạn code nhập dữ liệu:

```
.data
    A: .word
    message1: .asciiz "Nhap so phan tu: "
    message2: .asciiz "Nhap lan luot cac phan tu:\n"
.text
main:
    li $v0, 4
    la $a0, message1
    syscall
    li $v0, 5
    syscall

    add $a1,$zero,$v0     # $a1 chua so phan tu

    li $v0, 4
    la $a0, message2
    syscall
    la $a0,A
    addi $t0,$zero,0
input:
    beq $t0,$a1,end_input
    add $t2,$t0,$t0
    add $t2,$t2,$t2
    add $t3,$t2,$a0  # address of A[i] in $t3
    li $v0, 5
    syscall
    sw $v0,0($t3)
    addi $t0,$t0,1
    j input
end_input:
```

- Với bộ dữ liệu đầu vào như sau:



- Kết quả cho ra tại thanh ghi `$v1` = 16 và chỉ số tại `$v0` = 4 là kết quả đúng



Assignment 2: Selection Sort

- Code:

```
.data
    A: .word -2,5,7,-23,45,-6,34,2
    Aend: .word
    message1: .asciiz " "
    message2: .asciiz "\n"
.text
main:
    la $a0,A          #$a0 = Address(A[0])
    la $a1,Aend
    la $t7,Aend       #Use in print array
    addi $a1,$a1,-4   #$a1 = Address(A[n-1])
    j sort            #sort
```

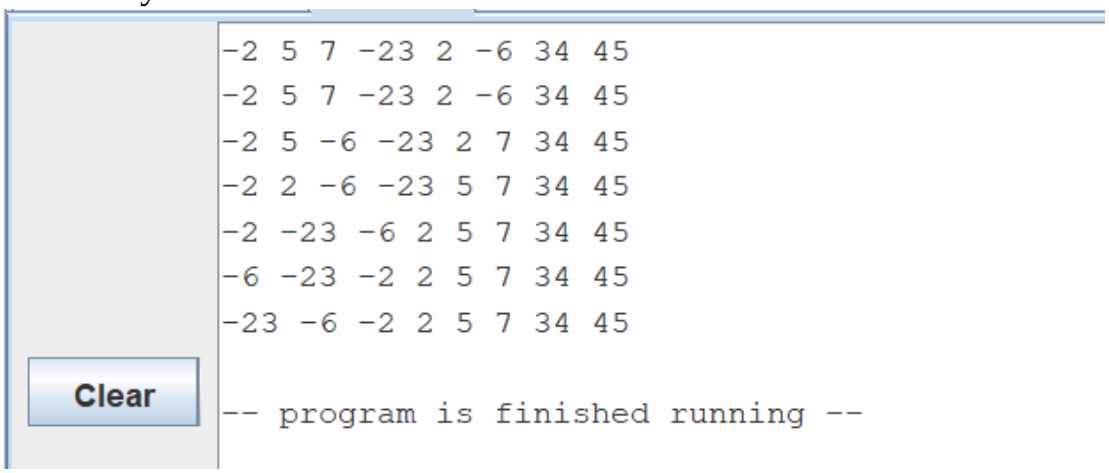
```
after_sort:
    li $v0, 10        #exit
    syscall
end_main:
sort:
    beq $a0,$a1,done #list is sorted
    j max            #call the max procedure
after_max:
    lw $t0,0($a1)    #load last element into $t0
    sw $t0,0($v0)    #copy last element to max location
    sw $v1,0($a1)    #copy max value to last element
    addi $a1,$a1,-4  #decrement pointer to last element
print_arr:
    la $t6,A
    j show_arr
end_print:
    j sort           #repeat sort for smaller list
done:
    j after_sort
max:
    addi $v0,$a0,0   #init max pointer to first element
    lw $v1,0($v0)    #init max value to first value
    addi $t0,$a0,0   #init next pointer to first
loop:
    beq $t0,$a1,ret  #if next=last, return
    addi $t0,$t0,4   #advance to next element
    lw $t1,0($t0)    #load next element into $t1
    slt $t2,$t1,$v1  #(next)<(max) ?
    bne $t2,$zero,loop    #if (next)<(max), repeat
    addi $v0,$t0,0   #next element is new max element
    addi $v1,$t1,0   #next value is new max value
    j loop           #change completed; now repeat
ret:
    j after_max
```

show_arr:

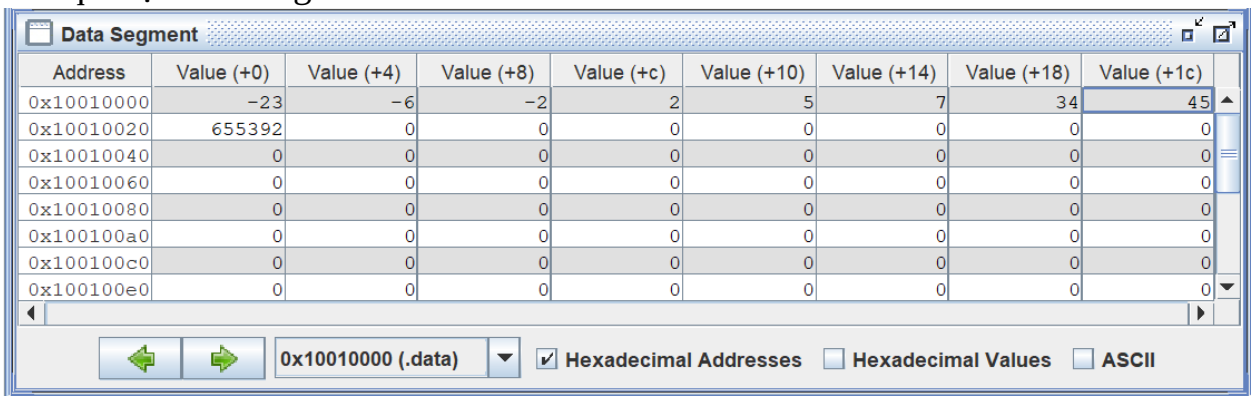
```
li $v0,1
lw $a0,0($t6)
syscall
li $v0, 4
la $a0, message1
syscall
addi $t6,$t6,4
bne $t6,$t7,show_arr
li $v0, 4
la $a0, message2
syscall
la $a0,A
j end_print
```

- Kết quả:

- In ra array sau mỗi lần đổi chỗ:



- Kết quả tại Data Segment:



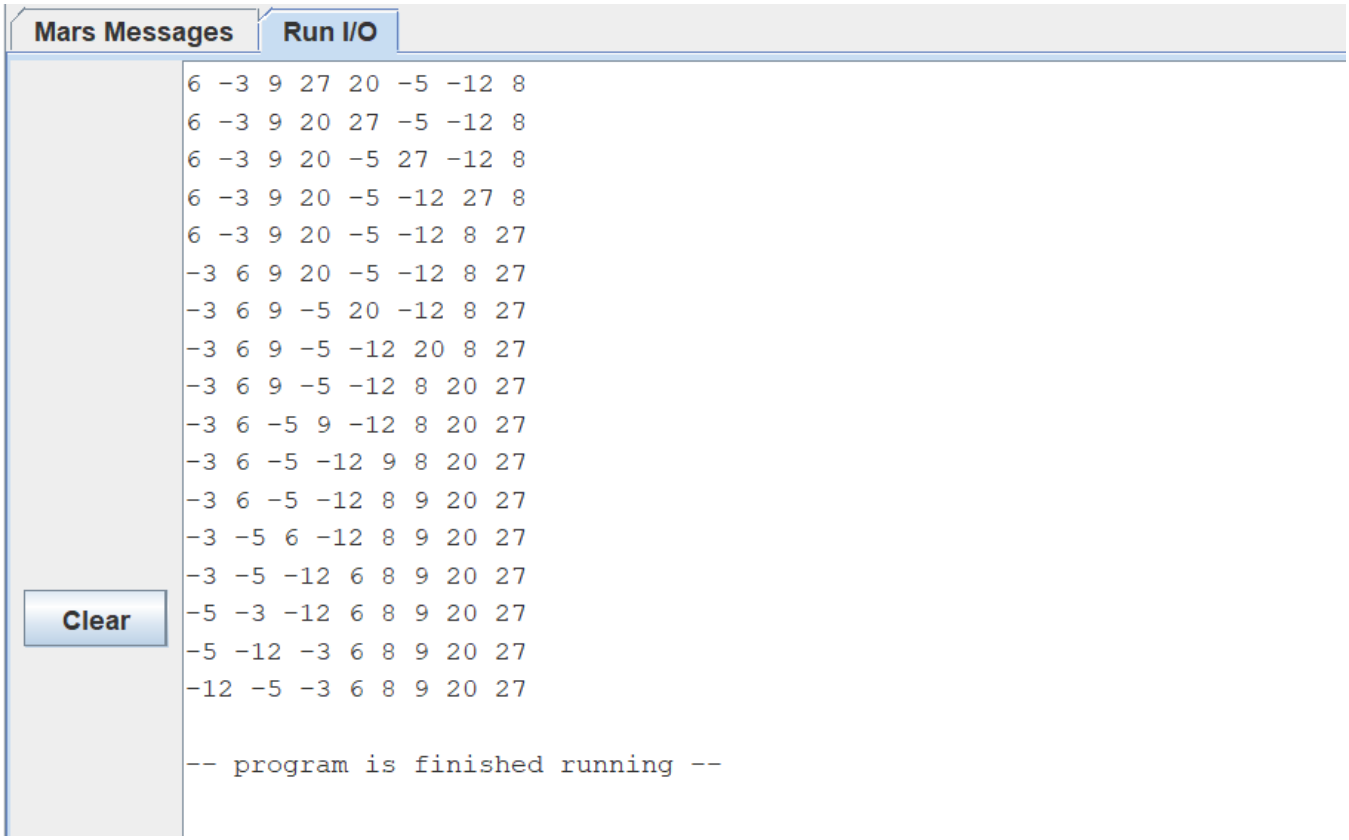
Assignment 3: Bubble Sort

- Code:

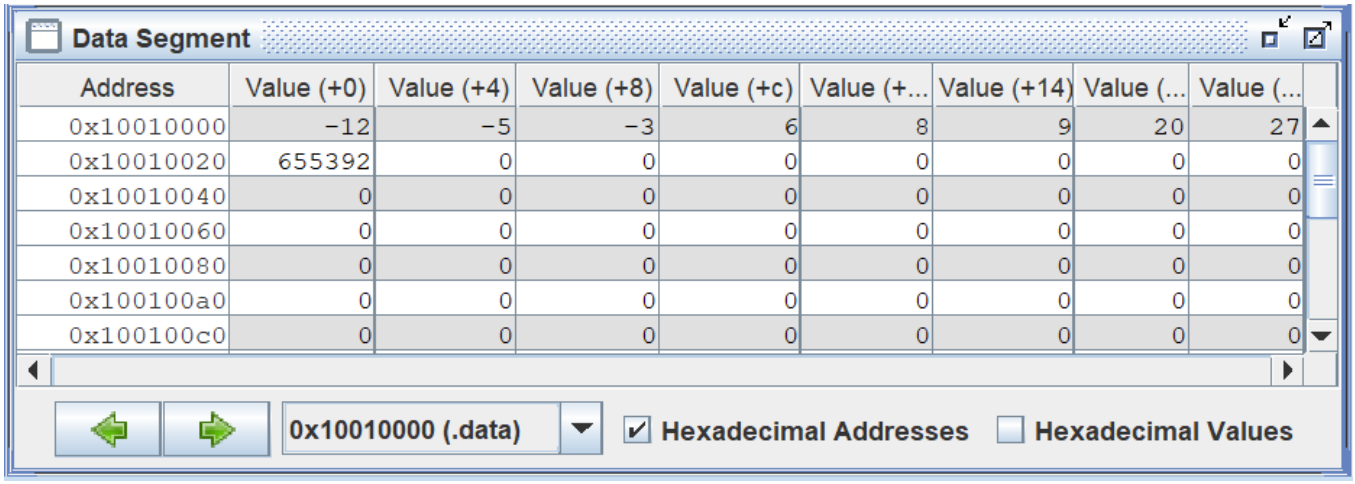
```
.data
    A: .word 6,9,-3,27,20,-5,-12,8
    Aend: .word
    message1: .asciiz " "
    message2: .asciiz "\n"
.text
    la $a0, A
    la $a1, Aend
    la $t7, Aend
    li $s0, 0          # count = 0 (count la bien dem phan tu)
    li $s1, -1         # i = -1 (i trong loopi)

DemPhanTu:
    beq  $a1, $a0, Size
    addi $a1, $a1, -4
    addi $s0, $s0, 1
    j DemPhanTu
Size:
    addi $t0, $s0, -1      # t0 = So luong phan tu mang A - 1
loop1:
    addi $s1, $s1, 1       # i++
    li $s2, 0              # j = 0 (j trong loop2)
    beq $s1, $t0, Exit     # Neu i = size - 1 thì thoát
loop2:
    sub $t2, $t0, $s1      # t2 = (size - 1) - i
    beq $s2, $t2, loop1    # Neu j = (size - 1) - i thì nhay loop1
if_swap:
    sll $t3, $s2, 2
    add $s3, $a0, $t3
    lw $v0, 0($s3)
    addi $s3, $s3, 4
    lw $v1, 0($s3)
    sle $t4, $v0, $v1
```

```
        beq $t4, $zero, swap
        addi $s2, $s2, 1
        j loop2
swap:
        sw $v0, 0($s3)
        addi $s3, $s3, -4
        sw $v1, 0($s3)
        addi $s2, $s2, 1

print_arr:
        la $t6,A
        j show_arr
end_print:
        j loop2

show_arr:
        li $v0,1
        lw $a0,0($t6)
        syscall
        li $v0, 4
        la $a0, message1
        syscall
        addi $t6,$t6,4
        bne $t6,$t7,show_arr
        li $v0, 4
        la $a0, message2
        syscall
        la $a0,A
        j end_print
Exit:
        li $v0, 10
        syscall
```

- Kết quả chạy:
- Hiển thị array sau mỗi lần swap:



- Kết quả tại Data Segment:



Assignment 4: Insertion Sort

- Code:

.data

```
A: .word 6,9,-3,27,20,-5,-12,8
Aend: .word
message1: .asciiz " "
message2: .asciiz "\n"
```

.text

```
la $a0, A
la $a1, Aend
la $t7, Aend      #Use to Print Array
li $s0, 0         # count = 0 (dem phan tu)
li $s1, 0         # key = 0
li $s2, 0         # j = 0
li $s3, 1         # i = 1
```

DemPhanTu:

```
beq  $a1, $a0, Loop
addi $a1, $a1, -4
addi $s0, $s0, 1
j DemPhanTu
```

Loop:

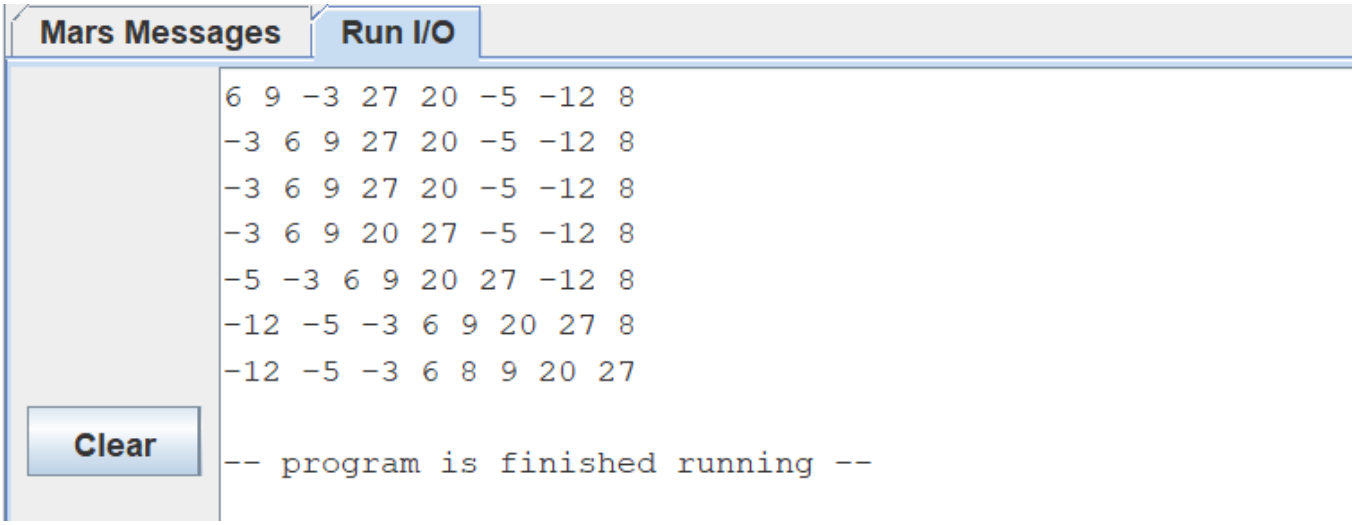
```
beq $s3, $s0, Exit
sll $t0, $s3, 2
add $s4, $a0, $t0
lw $s1, 0($s4)
addi $s2, $s3, -1
```

While:

```
slt $t1, $s2, $zero
sll $t0, $s2, 2
add $s5, $a0, $t0
lw $t3, 0($s5)
sle $t4, $t3, $s1
add $t1, $t1, $t4
bne $t1, $zero,  loop_continue
addi $s5, $s5, 4
```

```
        sw $t3, 0($s5)
        addi $s2, $s2, -1
        j While
loop_continue:
        addi $s5, $s5, 4
        sw $s1, 0($s5)
        addi $s3, $s3, 1
print_arr:
        la $t6,A
        j show_arr
end_print:
        j Loop
show_arr:
        li $v0,1
        lw $a0,0($t6)
        syscall
        li $v0, 4
        la $a0, message1
        syscall
        addi $t6,$t6,4
        bne $t6,$t7,show_arr
        li $v0, 4
        la $a0, message2
        syscall
        la $a0,A
        j end_print
Exit:
        li $v0, 10
        syscall
```

- Kết quả chạy:
- Hiển thị Array sau mỗi vòng:



- Kết quả tại cửa sổ Data Segment: