BÁO CÁO TUẦN 10 PHẦN 2
THỰC HÀNH KIẾN TRÚC MÁY TÍNH

Vũ Tuấn Kiệt

Assignment 1:

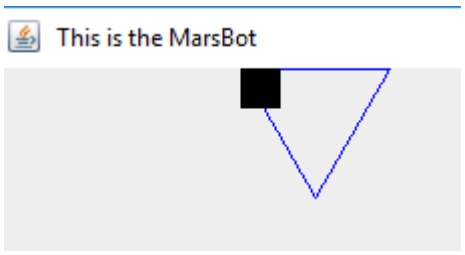
Tam giác:

```
.eqv  HEADING          0xffff8010        # Integer: Goc quay tu 0 den 359
                                         # 0 : Tren
                                         # 90: Phai
                                         # 180: Duoi
                                         # 270: Trai
.eqv  MOVING           0xffff8050        # Boolean: Co di chuyen hay khong
.eqv  LEAVETRACK       0xffff8020        # Boolean (0 hoac !0):
                                         # Co track hay khong
.eqv  WHEREX           0xffff8030        # Integer: Doc gia tri X hien tai cua con bot
.eqv  WHEREY           0xffff8040        # Integer: Doc gia tri Y hien tai cua con bot


.text
main:
        addi  $a0, $0, 90                # Quay sang trai de bat dau chay
        jal     ROTATE
        jal     GO
sleep0:
```

```
        addi    $v0, $zero, 32          # De no chay trong 3000ms
        li      $a0, 5000
        syscall
        jal     STOP
        jal     TRACK                   # Danh dau dia diem hien tai
        addi    $a0, $0, 150            # Quay sang trai de bat dau
chay
        jal     ROTATE
        jal     GO
sleep1:
        addi    $v0, $zero, 32          # De no chay trong 3000ms
        li      $a0, 3000
        syscall
        jal     UNTRACK                 # Ve duong thang tu
diem hien tai toi TRACK cu
        jal     TRACK                   # Danh dau TRACK
        addi    $a0, $0, 30             # Quay goc
        jal     ROTATE
sleep2:
        addi    $v0, $zero, 32          # De no chay trong 3000ms
        li      $a0, 3000
        syscall
        jal     UNTRACK                 # Ve duong thang tu
diem hien tai toi TRACK cu
        jal     TRACK                   # Danh dau TRACK
        addi    $a0, $0, 270            # Quay goc
```

```
        jal     ROTATE
sleep3:
        addi    $v0, $zero, 32          # De no chay trong 3000ms
        li      $a0, 3000
        syscall

        jal     UNTRACK                 # Ve duong thang tu
diem hien tai toi TRACK cu
        #jal    TRACK                   # Danh dau TRACK
        jal     STOP
endmain:
        li      $v0, 10
        syscall
GO:
        li      $at, MOVING             # Thay doi cong MOVING
        addi    $k0, $0, 1              # logic 1
        sb      $k0, ($at)              # Bat dau chay
        jr      $ra

STOP:
        li      $at, MOVING             # Thay doi cong MOVING
        sb      $0, ($at)               # Dung chay
        jr      $ra

TRACK:
```

```
        li      $at, LEAVETRACK         # Thay doi cong LEAVETRACK
        addi    $k0, $0, 1              # logic 1
        sb      $k0, 0($at)             # bat dau tracking
        jr      $ra

UNTRACK:
        li      $at, LEAVETRACK         # Thay doi cong LEAVETRACK
        sb      $0, 0($at)              # dung ve
        jr      $ra
ROTATE:
        li      $at, HEADING            # Thay doi cong HEAD
        sw      $a0, ($at)              # Xoay robot
        jr      $ra
```



Hình vuông:

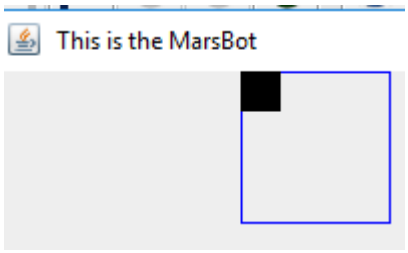
```
.eqv  HEADING           0xffff8010      # Integer: Goc quay tu 0 den 359
                                        # 0 : Tren
                                        # 90: Phai
                                        # 180: Duoi
```

```
                                    # 270: Trai
.eqv  MOVING        0xffff8050      # Boolean: Co di chuyen hay
khong
.eqv  LEAVETRACK    0xffff8020      # Boolean (0 hoac !0):
                                    # Co track hay khong
.eqv  WHEREX        0xffff8030      # Integer: Doc gia tri X hien
tai cua con bot
.eqv  WHEREY        0xffff8040      # Integer: Doc gia tri Y hien
tai cua con bot


.text
main:
        addi  $a0, $0, 90           # Quay sang trai de bat dau chay
        jal     ROTATE
        jal     GO
sleep0:
        addi    $v0, $zero, 32          # De no chay trong 3000ms
        li      $a0, 5000
        syscall
        jal     STOP
        jal     TRACK               # Danh dau dia diem hien tai
        addi  $a0, $0, 90           # Quay sang trai de bat dau chay
        jal     ROTATE
        jal     GO
sleep1:
        addi    $v0, $zero, 32          # De no chay trong 3000ms
```

```
        li      $a0, 3000
        syscall
        jal     UNTRACK                 # Ve duong thang tu
diem hien tai toi TRACK cu
        jal     TRACK                   # Danh dau TRACK
        addi    $a0, $0, 180            # Quay goc
        jal     ROTATE
sleep2:
        addi    $v0, $zero, 32          # De no chay trong 3000ms
        li      $a0, 3000
        syscall
        jal     UNTRACK                 # Ve duong thang tu
diem hien tai toi TRACK cu
        jal     TRACK                   # Danh dau TRACK
        addi    $a0, $0, 270            # Quay goc
        jal     ROTATE
sleep3:
        addi    $v0, $zero, 32          # De no chay trong 3000ms
        li      $a0, 3000
        syscall

        jal     UNTRACK                 # Ve duong thang tu
diem hien tai toi TRACK cu
        jal     TRACK                   # Danh dau TRACK
        addi    $a0, $0, 0              # Quay goc
        jal     ROTATE
```

```
sleep4:
        addi    $v0, $zero, 32          # De no chay trong 3000ms
        li      $a0, 3000
        syscall

        jal     UNTRACK                 # Ve duong thang tu
diem hien tai toi TRACK cu
        jal     STOP
endmain:
        li      $v0, 10
        syscall
GO:
        li      $at, MOVING             # Thay doi cong MOVING
        addi    $k0, $0, 1              # logic 1
        sb      $k0, ($at)              # Bat dau chay
        jr      $ra

STOP:
        li      $at, MOVING             # Thay doi cong MOVING
        sb      $0, ($at)               # Dung chay
        jr      $ra

TRACK:
        li      $at, LEAVETRACK         # Thay doi cong
LEAVETRACK
```

```
        addi  $k0, $0, 1          # logic 1
        sb    $k0, 0($at)         # bat dau tracking
        jr    $ra

UNTRACK:
        li    $at, LEAVETRACK     # Thay doi cong LEAVETRACK
        sb    $0, 0($at)          # dung ve
        jr    $ra
ROTATE:
        li    $at, HEADING        # Thay doi cong HEAD
        sw    $a0, ($at)          # Xoay robot
        jr    $ra
```



Hình ngôi sao:

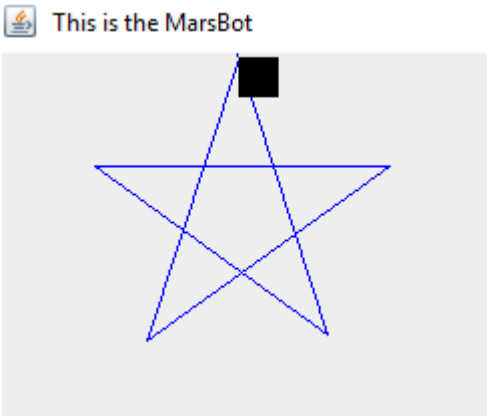
```
.eqv  HEADING          0xffff8010     # Integer: Goc quay tu 0 den 359
                                      # 0 : Tren
                                      # 90: Phai
                                      # 180: Duoi
                                      # 270: Trai
.eqv  MOVING           0xffff8050     # Boolean: Co di chuyen hay khong
```

```
.eqv  LEAVETRACK 0xffff8020        # Boolean (0 hoac !0):
                                   # Co track hay khong
.eqv  WHEREX     0xffff8030        # Integer: Doc gia tri X hien
tai cua con bot
.eqv  WHEREY     0xffff8040        # Integer: Doc gia tri Y hien
tai cua con bot


.text
main:
        addi  $a0, $0, 90          # Quay sang trai de bat dau chay
        jal   ROTATE
        jal   GO
sleep0:
        addi   $v0, $zero, 32      # De no chay trong 3000ms
        li     $a0, 5000
        syscall
        jal   STOP


        jal   TRACK                # Danh dau dia diem hien tai
        addi  $a0, $0, 162         # Quay sang trai de bat dau
chay
        jal   ROTATE
        jal   GO
sleep1:
        addi   $v0, $zero, 32      # De no chay trong 3000ms
        li     $a0, 6000
```

```
        syscall
        jal     UNTRACK                 # Ve duong thang tu
diem hien tai toi TRACK cu

        jal     TRACK                   # Danh dau TRACK
        addi    $a0, $0, 306            # Quay goc
        jal     ROTATE
sleep2:
        addi    $v0, $zero, 32          # De no chay trong 3000ms
        li      $a0,6000
        syscall
        jal     UNTRACK                 # Ve duong thang tu
diem hien tai toi TRACK cu

        jal     TRACK                   # Danh dau TRACK
        addi    $a0, $0, 90             # Quay goc
        jal     ROTATE
sleep3:
        addi    $v0, $zero, 32          # De no chay trong 3000ms
        li      $a0, 6000
        syscall

        jal     UNTRACK                 # Ve duong thang tu
diem hien tai toi TRACK cu

        jal     TRACK                   # Danh dau TRACK
```

```
        addi  $a0, $0, 234              # Quay goc
        jal     ROTATE
sleep4:
        addi    $v0, $zero, 32          # De no chay trong 3000ms
        li      $a0, 6000
        syscall

        jal     UNTRACK                 # Ve duong thang tu
diem hien tai toi TRACK cu
        jal     TRACK                   # Danh dau TRACK
        addi  $a0, $0, 18           # Quay goc
        jal     ROTATE
sleep5:
        addi    $v0, $zero, 32          # De no chay trong 3000ms
        li      $a0, 6000
        syscall

        jal     UNTRACK                 # Ve duong thang tu
diem hien tai toi TRACK cu
        jal     STOP
endmain:
        li      $v0, 10
        syscall
GO:
        li      $at, MOVING             # Thay doi cong MOVING
```

```
        addi  $k0, $0, 1            # logic 1
        sb    $k0, ($at)            # Bat dau chay
        jr    $ra

STOP:
        li    $at, MOVING           # Thay doi cong MOVING
        sb    $0, ($at)             # Dung chay
        jr    $ra

TRACK:
        li    $at, LEAVETRACK       # Thay doi cong
LEAVETRACK
        addi  $k0, $0, 1            # logic 1
        sb    $k0, 0($at)           # bat dau tracking
        jr    $ra

UNTRACK:
        li    $at, LEAVETRACK       # Thay doi cong
LEAVETRACK
        sb    $0, 0($at)            # dung ve
        jr    $ra
ROTATE:
        li    $at, HEADING          # Thay doi cong HEAD
        sw    $a0, ($at)            # Xoay robot
        jr    $ra
```



Assginment 2:

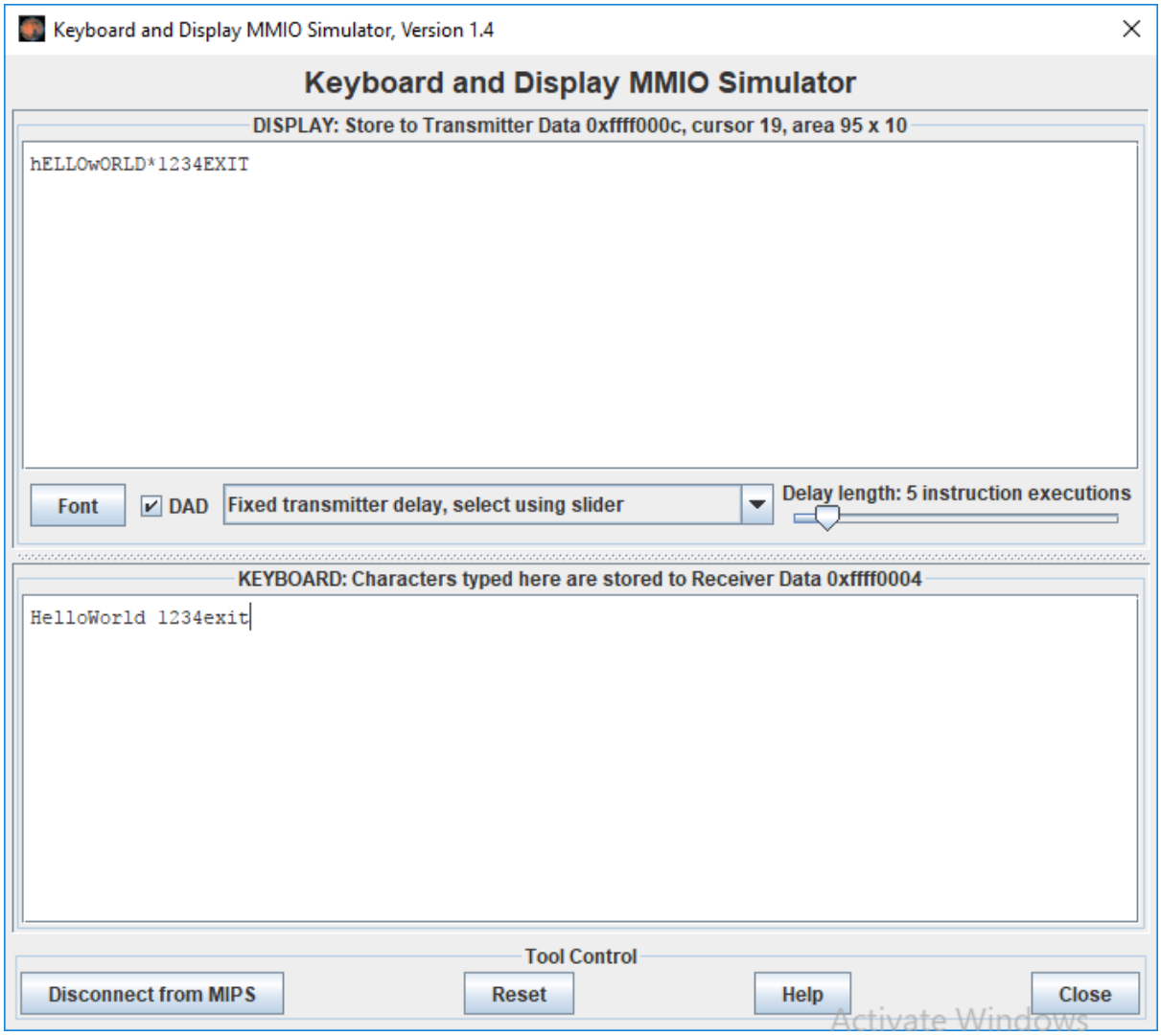
```
.eqv  KEY_CODE      0xffff0004        # ASCII tu ban phim, 1 byte
.eqv  KEY_READY     0xffff0000        # =1 neu ma co ky tu moi
                                      # tu dong clear sau lw
.eqv  DISPLAY_CODE      0xffff000c        # ASCII de show, 1 byte
.eqv  DISPLAY_READY     0xffff0008        # = 1 neu ma san sang
ghi, clear sau sw


.text
        li      $k0, KEY_CODE
        li      $k1, KEY_READY
        li      $s0, DISPLAY_CODE
        li      $s1, DISPLAY_READY
        li      $s2, 64
        li      $s3, 91
        li      $s4, 96
        li      $s5, 123
        li      $t5, 1
        li      $t6, 2
```

```
        li      $t7, 3
        li      $t8, 47
        li      $t9, 58
        li      $s7, 0
loop:
        nop
WaitForKey:
        lw      $t1, ($k1)              # t1 = [k1] = KEY_READY
        beq     $t1, $0, WaitForKey         # key == 0 => wait
ReadKey:
        lw      $t0, ($k0)              # Doc ky tu

WaitForDis:
        lw      $t2, ($s1)
        beq     $t2, $0, WaitForDis
ToLower:
        sgt     $t2, $t0, $s2               # if t0 >= 65 && t0 <= 90
        slt     $t3, $t0, $s3
        and     $t4, $t2, $t3
        beqz    $t4, ToUpper                # If true => tolower
        addi    $t0, $t0, 32
        j       ShowKey
ToUpper:
        sgt     $t2, $t0, $s4               # if t0 >= 65 && t0 <= 90
        slt     $t3, $t0, $s5
```

```
        and   $t4, $t2, $t3
        beqz  $t4, Number               # If true => toupper
        subi  $t0, $t0, 32
        j     ShowKey
Number:
        sgt   $t2, $t0, $t8             # if t0 >= 65 && t0 <= 90
        slt   $t3, $t0, $t9
        and   $t4, $t2, $t3
        beqz  $t4, Null             # If true => do nothing
        j     ShowKey
Null:
        addi  $t0, $0, 42
ShowKey:
        sw    $t0, ($s0)
        addi  $t1, $0, 69           # ky tu e
        addi  $t2, $0, 88           # ky tu x
        addi  $t3, $0, 73           # ky tu i
        addi  $t4, $0, 84           # ky tu t
        beq   $s7, $0, put_1
        beq   $s7, $t5, put_2
        beq   $s7, $t6, put_3
        beq   $s7, $t7, put_4
next:
        lw    $t0, 12($sp)
        seq   $t1, $t0, $t1
```

```
        lw      $t0, 8($sp)
        seq     $t2, $t0, $t2
        lw      $t0, 4($sp)
        seq     $t3, $t0, $t3
        lw      $t0, 0($sp)
        seq     $t4, $t0, $t4
        and     $t1, $t1, $t2
        and     $t1, $t1, $t3
        and     $t1, $t1, $t4
        bnez    $t1, exit
        j       loop

put_1:
        addi    $s7, $s7, 1
        lw      $s6, 12($sp)
        beq     $s6, $t1, put_2
        add     $s7, $0, $0
        sw      $t0, 12($sp)
        addi    $s6, $s6, 1
        j       next
put_2:
        addi    $s7, $s7, 1
        lw      $s6, 8($sp)
        beq     $s6, $t2, put_3
        add     $s7, $0, $0
```

```
        sw    $t0, 8($sp)
        addi  $s6, $s6, 1
        j     next
put_3:
        addi  $s7, $s7, 1
        lw    $s6, 4($sp)
        beq   $s6, $t3, put_4
        add   $s7, $0, $0
        sw    $t0, 4($sp)
        addi  $s6, $s6, 1
        j     next
put_4:
        add   $s7, $0, $0
        lw    $s6, 0($sp)
        beq   $s6, $t4, exit
        sw    $t0, 0($sp)
        add   $s6, $0, $0
        j     next
exit:
        li    $v0, 10
        syscall
```



Assginment 3:

.eqv KEY_CODE 0xffff0004 # ASCII tu ban phim, 1 byte

.eqv KEY_READY 0xffff0000 # =1 neu ma co ky tu moi

tu dong clear sau lw

.eqv DISPLAY_CODE 0xffff000c # ASCII de show, 1 byte

.eqv DISPLAY_READY 0xffff0008 # = 1 neu ma san sang ghi, clear sau sw

.eqv HEADING 0xffff8010 # Integer: Goc quay tu 0 den 359

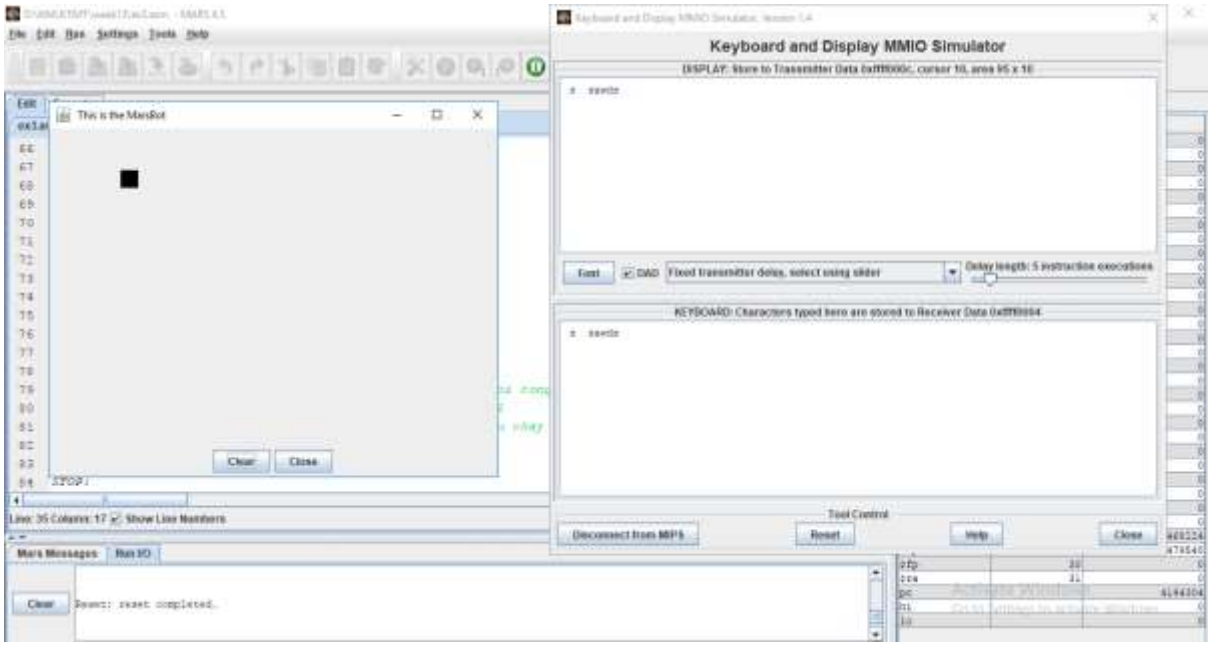
0 : Tren

```
                                    # 90: Phai
                                    # 180: Duoi
                                    # 270: Trai
.eqv  MOVING        0xffff8050      # Boolean: Co di chuyen hay
khong
.eqv  LEAVETRACK    0xffff8020      # Boolean (0 hoac !0):
                                    # Co track hay khong
.eqv  WHEREX        0xffff8030      # Integer: Doc gia tri X hien
tai cua con bot
.eqv  WHEREY        0xffff8040      # Integer: Doc gia tri Y hien
tai cua con bot


.text
    li  $a2, KEY_CODE
    li  $a3, KEY_READY
    li  $s0, DISPLAY_CODE
    li  $s1, DISPLAY_READY
    li  $t8, 0                      # Check xem co dang chay
hay khong
    li  $t3, 32                     # dau cach
    li  $t4, 119                # w
    li  $t5, 97                     # a
    li  $t6, 115                # s
    li  $t7, 100                # d
loop:
    nop
```

```
WaitForKey:
        lw    $t1, ($a3)              # t1 = [k1] = KEY_READY
        beq   $t1, $0, WaitForKey          # key == 0 => wait
ReadKey:
        lw    $t0, 0($a2)             # Doc ky tu

WaitForDis:
        lw    $t2, ($s1)
        beq   $t2, $0, WaitForDis
ShowKey:
        sw    $t0, ($s0)
        beq   $t0, $t4, UP
        beq   $t0, $t5, LEFT
        beq   $t0, $t6, DOWN
        beq   $t0, $t7, RIGHT
        beq   $t0, $t3, RUN_STOP
next:
        nop
        j     loop

UP:
        addi  $a0, $0, 0
        jal   ROTATE
        j     next
LEFT:
```

```
        addi  $a0, $0, 270
        jal   ROTATE
        j     next
DOWN:
        addi  $a0, $0, 180
        jal   ROTATE
        j     next
RIGHT:
        addi  $a0, $0, 90
        jal   ROTATE
        j     next
RUN_STOP:
        beq   $t8, $0, RUN
        jal   STOP
        addi  $t8, $0, 0
        j     next
RUN:
        jal   GO
        addi  $a0, $0, 90
        jal   ROTATE
        addi  $t8, $0, 1
        j     next
GO:
        li    $at, MOVING              # Thay doi cong MOVING
        addi  $k0, $0, 1            # logic 1
```

```
    sb      $k0, ($at)              # Bat dau chay
    jr      $ra

STOP:
    li      $at, MOVING             # Thay doi cong MOVING
    sb      $0, ($at)               # Dung chay
    jr      $ra

TRACK:
    li      $at, LEAVETRACK         # Thay doi cong
LEAVETRACK
    addi    $k0, $0, 1              # logic 1
    sb      $k0, 0($at)             # bat dau tracking
    jr      $ra

UNTRACK:
    li      $at, LEAVETRACK         # Thay doi cong
LEAVETRACK
    sb      $0, 0($at)              # dung ve
    jr      $ra
ROTATE:
    li      $at, HEADING            # Thay doi cong HEAD
    sw      $a0, ($at)              # Xoay robot
    jr      $ra
```


Keyboard and Display MMIO Simulator
This is the MarsBot
Clear
Close
Fast
DAD
Delay length: 5 instruction executions
Disconnect from MIPS
Reset
Help
Close
Clear
Reset: reset completed.