Lab4 实验报告

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算法部分：

由实验 4 要求，考虑设计三个字符串，通过读取地址指针所在位置进行输出,设计 R4 作为 counter，每有一行在游戏过程中被取完就+1，并做一次判断，如果 R4 等于 3，则游戏结束，根据 R0 判断当前最一次操作由谁来完成，0 为 player2,1 为 player1，谁完成对方赢。根据 lc3 代码改写 riscv 代码，由此思路编写算法如下：

编写部分：

根据书中学过的汇编语言，依据算法写出如下代码:

```
    .equ        Newline   0x0000000A
.equ        SAVE        0x0000000B
.equ        SaveR0      0x0000000C
.equ        SaveR00   0x00000000
.equ  SAVE0       0x00000000
.equ        ASCIIA      0x00000041
.equ        LastA       0x0000000E
.equ        LastB       0x0000000F
.equ        LastC       0x00000010

li x8,0
li x4,0
li x5,0
addi x5,x5,3
sw x5,LastA(x8)
addi x5,x5,2
sw x5,LastB(x8)
addi x5,x5,3
sw x5,LastC(x8)

CHECKA la x2,Prompt1
        lw x3,6(x2)
        bnez x3,START
        addi x4,x4,1
        addi x3,x4,-3
        beqz x3,JUDGE

CHECKB la x2,Prompt2
        lw x3,6(x2)
        bnez x3,START
        addi x4,x4,1
        addi x3,x4,-3
```

```
            beqz x3,JUDGE

CHECKC la x2,Prompt3
            lw x3,6(x2)
            bnez x3,START
            addi x4,x4,1
            addi x3,x4,-3
            beqz x3,JUDGE

START la x0,Prompt1
          call Init
          la x0,Prompt2
          call Init
          la x0,Prompt3
          call Init

          la x0,SaveR00
          not x0,x0
          addi x0,x0,1
          addi x0,x0,1
          sw x0,SaveR00(x8)
again la x0,SaveR00
          bgtz x0,player1
          beqz x0,player2
player1 la x0,Prompt4
            j L
Player2 la x0,Prompt5
            j L
L           sw x0,SaveR0
            lw x0,0(x0)
            beqz x0,Loop
            call printf
            la x0,SaveR0
            addi x0,x0,1
            bnez x0,L
Loop        call scanf
            call printf
            li x1,0
            add x1,x1,x0
            call scanf
            sw x0,SAVE
            call printf
            la x0,Newline
            call printf
```

```
        la x0,SAVE
        la x2,ASCIIA
        sub x2,x1,x2
        bltz x2,fail
        beqz x2,A
        addi x3,x2,-1
        beqz x3,B
        addi x3,x2,-2
        beqz x3,C
        bgtz x3,fail

A       la x2,Prompt1
        lw x5,6(x2)
        beqz fail
        addi x1,x0,-48
        blez x1,fail
        addi x3,x1,0
        la x5,LastA
        sub x3,x5,x3
        bltz x3,fail
        la x2,Prompt1
        sub x5,x5,x1
        sw x5,LastA(x0)
        addi x5,x5,6
        add x2,x2,x5
        la x0,SAVE
        sw x0,0(x2)
        j CHECKA
B       la x2,Prompt2
        lw x5,6(x2)
        beqz fail
        addi x1,x0,-48
        blez x1,fail
        addi x3,x1,0
        la x5,LastB
        sub x3,x5,x3
        bltz x3,fail
        la x2,Prompt2
        sub x5,x5,x1
        sw x5,LastB(x0)
        addi x5,x5,6
        add x2,x2,x5
        la x0,SAVE
        sw x0,0(x2)
```

```
            j CHECKB
C           la x2,Prompt3
            lw x5,6(x2)
            beqz fail
            addi x1,x0,-48
            blez x1,fail
            addi x3,x1,0
            la x5,LastC
            sub x3,x5,x3
            bltz x3,fail
            la x2,Prompt3
            sub x5,x5,x1
            sw x5,LastC(x0)
            addi x5,x5,6
            add x2,x2,x5
            la x0,SAVE
            sw x0,0(x2)
            j CHECKC

JUDGE       la x0,SaveR00
            bgtz x0,Player_2_Wins
            beqz x0,Player_1_Wins
Player_2_Wins       la x0,Prompt8
                    call Init
Player_1_Wins       la x0,Prompt7
                    call Init
Init   sw x0,SaveR0(x8)
            lw x0,0(x0)
            beqz OK
            auipc ra,0x0
            la x0,SaveR0
            addi x0,x0,1
            bnez x0,Init
OK          la x0,Newline
            auipc ra,0x0
            ret
fail   la x0,Prompt6
            call Init
            j again
Prompt1 .STRINGZ "ROW A:ooo"
Prompt2 .STRINGZ "ROW B:ooooo"
Prompt3 .STRINGZ "ROW C:oooooooo"
Prompt4 .STRINGZ "Player1, choose a row and number of rocks:"
Prompt5 .STRINGZ "Player2, choose a row and number of rocks:"
```

```
Prompt6 .STRINGZ "Invalid move. Try again."
Prompt7 .STRINGZ "Player1 Wins."
Prompt8 .STRINGZ "Player2 Wins."
```

测试部分：
经输入，测试无误，代码正确！