
1. Matrix addition in MAL

Program:

#MAL program to add two matrices

```
.data
m1:      .word    0:6      # Matrix 1 (6 elements) initialized to 0
m2:      .word    0:6      # Matrix 2 (6 elements) initialized to 0
addr1:   .word    0
addr2:   .word    0
num:     .word    0
result:  .word    0

str:     .asciiz  "Elements of Matrix "
i_str:   .asciiz  "Enter an Integer : "
r_str:   .asciiz  "The Result Matrix after addition is : "
end_str: .asciiz  "Program is terminated !!"
newline: .byte    '\n'
sp:      .byte    ' '

.text

__start:  la      $8, m1      # $8 - Address of Matrix 1
          li      $24, 2      # $24 - No. of Rows in the matrix
          li      $25, 3      # $25 - No. of Columns in the matrix
          li      $15, 2      # $15 - loop variable

          # Input is being done here
input:    blez     $15, end_input

          la      $13, str
          puts    $13
          lbu     $13, newline
          putc    $13

          move     $9, $0      # $9 contains the current location
          li      $11, 1      # $11 - current row index
outerloop: bgt     $11, $24, end_cur_input
          sub     $9, $11, 1
          mul     $9, $9, $25
          mul     $9, $9, 4
          add     $9, $9, $8
          li      $12, 1      # $12 - Current Column index
innerloop: bgt     $12, $25, end_row
          la      $13, i_str
          puts    $13
          get     num          # SAL Instruction
          lw      $10, num
          sw      $10, 0($9)

          lbu     $13, newline
          putc    $13
```

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                                add    $9, $9, 4
                                add    $12, $12, 1
                                b      innerloop
end_row:                       add    $11, $11, 1
                                b      outerloop
end_cur_input:                 la     $8, m2
                                sub    $15, $15, 1
                                b      input

end_input:                     la     $13, r_str
                                puts   $13
                                lbu    $13, newline
                                putc   $13

                                # Addition is performed here
                                la     $8, m1
                                la     $9, m2
                                move   $14, $0          # $14 - Current location in matrix 1
                                move   $15, $0          # $15 - Current location in matrix 2
                                li     $11, 1

outerloop_2:                   bgt    $11, $24, terminate
                                sub    $10, $11, 1
                                mul    $10, $10, $25
                                mul    $10, $10, 4
                                add    $14, $8, $10
                                add    $15, $9, $10
                                li     $12, 1

innerloop_2:                   bgt    $12, $25, end_row_2
                                sw     $14, addr1
                                sw     $15, addr2
                                lw     $14, 0($14)
                                lw     $15, 0($15)
                                add    $13, $14, $15
                                sw     $13, result
                                put    result          # SAL Instruction
                                lbu    $13, sp
                                putc   $13
                                lw     $14, addr1
                                lw     $15, addr2
                                add    $14, $14, 4
                                add    $15, $15, 4
                                add    $12, $12, 1
                                b      innerloop_2

end_row_2:                     add    $11, $11, 1

                                lbu    $13, newline
                                putc   $13
                                b      outerloop_2

```

```
terminate:    la      $13, end_str
              puts    $13
              lbu     $13, newline
              putc    $13
              done
```

Output:

Elements of Matrix

Enter an Integer : 2

Enter an Integer : -1

Enter an Integer : 3

Enter an Integer : 6

Enter an Integer : 1

Enter an Integer : 7

Elements of Matrix

Enter an Integer : 1

Enter an Integer : 6

Enter an Integer : -2

Enter an Integer : 4

Enter an Integer : -5

Enter an Integer : 9

The Result Matrix after addition is :

3 5 1

10 -4 16

Program is terminated !!