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1 – Multiplicação de Matrizes

```
.data
espaco: .asciiz " "
novalinha: .asciiz "\n"
entrada: .asciiz "\nInsira  #  : "
saida: .asciiz "\nLinha  # : "
matriz1: .word
.space 500
matriz2: .word
.space 500
matriz3: .word
.space 5000
.text


main:

   li $t9, 4

   la  $a0, matriz1
   jal matriz_insere

   la  $a0, matriz2
   jal matriz_insere


   la  $a2, matriz1
   la  $a1, matriz2
   la  $a0, matriz3
   jal matriz_multiplica


   la  $a0, matriz3
   jal matriz_saida

   li $v0, 10
   syscall

matriz_insere:
   li   $t0, 0
   la   $s0, entrada
   move $s1, $a0

matriz_constroi:

   beq $t0, $t9, matriz_fim
   addi $t0, $t0, 1
   addi $t1, $t0, 48
   sb $t1, 11($s0)
   la $a0, entrada
   li $v0, 4
   syscall

   li $t2,0
```

```
54
55  matriz_constroi_loop:
56      li $v0, 12
57      syscall
58
59      subi $v0, $v0, 48
60      sb $v0, 0($s1)
61
62      la $a0, espaco
63      li $v0, 4
64      syscall
65
66      addi $s1, $s1, 4
67      addi $t2, $t2, 1
68
69      beq $t2, $t9, matriz_constroi
70      j matriz_constroi_loop
71
72
73  matriz_saida:
74      li   $t0, 0
75      la   $s0, saida
76      move $s1, $a0
77
78  matriz_imprime:
79       beq $t0, $t9, matriz_fim
80
81      addi $t0, $t0, 1
82      addi $t1, $t0, 48
83      sb $t1, 5($s0)
84
85      la $a0, saida
86      li $v0, 4
87      syscall
88
89      li $t2, 0
90
91  matriz_imprime_loop:
92      lb $a0, 0($s1)
93      li $v0, 1
94      syscall
95
96      la $a0, espaco
97      li $v0, 4
98      syscall
99
100     addi $s1, $s1, 4
101     addi $t2, $t2, 1
102
```

```
103     beq $t2, $t9, matriz_imprime
104     j matriz_imprime_loop
105
106
107 matriz_fim:
108     la $a0, novalinha
109     li $v0, 4
110     syscall
111
112     jr $ra
113
114 matriz_multiplica:
115
116         li $t2, 0
117         li $t0, 0
118         li $t3, 2
119
120         add $t1, $zero $t9
121         li $s0, 0
122 L1:     li $s1, 0
123 L2:     li $s2, 0
124
125
126         mul $t2, $s0, $t1
127
128         add  $t2, $t2, $s1
129         sll  $t2, $t2, 3
130
131         div $t2, $t2, $t3
132
133
134         add $t2, $a0, $t2
135         lb   $s4, 0($t2)
136
137
138 L3:     mul $t0, $s2, $t1
139         add $t0, $t0, $s1
140         sll $t0, $t0, 3
141
142         div $t0, $t0, $t3
143
144         add $t0, $a2, $t0
145         lb $s6, 0($t0)
146
147         mul  $t0, $s0, $t1
148         add $t0, $t0, $s2
149         sll  $t0, $t0, 3
150
151         div $t0, $t0, $t3
152         add $t0, $a1, $t0
153         lb   $s7, 0($t0)
```

```
154
155         mul  $s6, $s7, $s6
156         add  $s4, $s4, $s6
157
158         addi  $s2, $s2, 1
159         bne   $s2, $t1, L3
160         sb    $s4, 0($t2)
161
162         addi  $s1, $s1, 1
163         bne    $s1, $t1, L2
164         addi  $s0, $s0, 1
165         bne    $s0, $t1, L1
166
167     j matriz_fim
```

2 – Instruções em Binário

Basic		Source	Binário
addiu $25,$0,0x00000017		li $t9, 4	10010000011001000000000000000100
lui $1,0x00001001	19	la $a0, matriz1	11110000000001000100000000000001
ori $4,$1,0x00000020			11010000100100000000000000100000
jal 0x0040004c	20	jal matriz_insere	11000001000000000000000010011
lui $1,0x00001001	22	la $a0, matriz2	11110000000001000100000000000001
ori $4,$1,0x00000214			11010000100100000001000010100
jal 0x0040004c	23	jal matriz_insere	11000001000000000000000010011
lui $1,0x00001001	26	la $a2, matriz1	11110000000001000100000000000001
ori $6,$1,0x00000020			11010000100110000000000100000
lui $1,0x00001001	27	la $a1, matriz2	11110000000001000100000000000001
ori $5,$1,0x00000214			11010000100101000001000010100
lui $1,0x00001001	28	la $a0, matriz3	11110000000001000100000000000001
ori $4,$1,0x00000408			11010000100100000010000001000
jal 0x00400128	29	jal matriz_multiplica	11000001000000000000001001010
lui $1,0x00001001	32	la $a0, matriz3	11110000000001000100000000000001
ori $4,$1,0x00000408			11010000100100000010000001000
jal 0x004000b4	33	jal matriz_saida	11000001000000000000000101101
addiu $2,$0,0x0000000a	35	li $v0, 10	10010000000100000000000001010
syscall	36	syscall	1100
addiu $8,$0,0x00000000	39	li $t0, 0	10010000010000000000000000000
lui $1,0x00001001	40	la $s0, entrada	11110000000001000100000000000001
ori $16,$1,0x00000004			11010000110000000000000000100
addu $17,$0,$4	41	move $s1, $a0	100100100000100001
beq $8,$25,0x0000002d	45	beq $t0, $t9, matriz_fim	10001000110010000000000101101
addi $8,$8,0x00000001	46	addi $t0, $t0, 1	10000100001000000000000000001
addi $9,$8,0x00000030	47	addi $t1, $t0, 48	10000100001001000000000110000
sb $9,0x0000000b($16)	48	sb $t1, 11($s0)	10100010000010010000000000001011
lui $1,0x00001001	49	la $a0, entrada	11110000000001000100000000000001
ori $4,$1,0x00000004			11010000100100000000000000100
addiu $2,$0,0x00000004	50	li $v0, 4	10010000000010000000000000100
syscall	51	syscall	1100
addiu $10,$0,0x00000000	53	li $t2,0	10010000001010000000000000000
addiu $2,$0,0x0000000c	56	li $v0, 12	10010000000010000000000001100
syscall	57	syscall	1100
addi $1,$0,0x00000030	59	subi $v0, $v0, 48	10000000000001000000000110000
sub $2,$2,$1			10000100010000000100010
sb $2,0x00000000($17)	60	sb $v0, 0($s1)	10100010001000100000000000000000
lui $1,0x00001001	62	la $a0, espaco	11110000000001000100000000000001
ori $4,$1,0x00000000			11010000100100000000000000000000
addiu $2,$0,0x00000004	63	li $v0, 4	10010000000010000000000000000100

```
syscall                64      syscall                          1100
addi $17,$17,0x00000066        addi $s1, $s1, 4                 10001000110001000000000000000100
addi $10,$10,0x00000067        addi $t2, $t2, 1                 10000101001010000000000000000001
beq $10,$25,0xfffffeb69        beq $t2, $t9, matriz_constroi    10001010110011111111111101011
j 0x00400080           70      j matriz_constroi_loop           10000001000000000000000100000
addiu $8,$0,0x0000000074       li   $t0, 0                      10010000001000000000000000000000
lui $1,0x00001001      75      la   $s0, saida                  11110000000001000100000000000001
ori $16,$1,0x00000013                                           11010000110000000000000000010011
addu $17,$0,$4         76      move $s1, $a0                    10010001000001000001
beq $8,$25,0x00000013  79       beq $t0, $t9, matriz_fim        10001000110010000000000010011
addi $8,$8,0x00000001  81      addi $t0, $t0, 1                 10000100001000000000000000000001
addi $9,$8,0x00000030  82      addi $t1, $t0, 48                10000100001001000000000000110000
sb $9,0x00000005($16)  83      sb $t1, 5($s0)                   10100010000010010000000000000101
lui $1,0x00001001      85      la $a0, saida                    11110000000001000100000000000001
ori $4,$1,0x00000013                                            11010000100100000000000000010011
addiu $2,$0,0x0000000486       li $v0, 4                        10010000000010000000000000000100
syscall                87      syscall                          1100
addiu $10,$0,0x00000089        li $t2, 0                        10010000001010000000000000000000
lb $4,0x00000000($17)  92      lb $a0, 0($s1)                   10000010001001000000000000000000
addiu $2,$0,0x0000000193       li $v0, 1                        10010000000010000000000000000001
syscall                94      syscall                          1100
lui $1,0x00001001      96      la $a0, espaco                   11110000000001000100000000000001
ori $4,$1,0x00000000                                            11010000100100000000000000000000
addiu $2,$0,0x0000000497       li $v0, 4                        10010000000010000000000000000100
syscall                98      syscall                          1100
addi $17,$17,0x0000000100      addi $s1, $s1, 4                 10001000110001000000000000000100
addi $10,$10,0x0000000101      addi $t2, $t2, 1                 10000101001010000000000000000001
beq $10,$25,0xffffffed103      beq $t2, $t9, matriz_imprime     10001010110011111111111101101
j 0x004000e8           104     j matriz_imprime_loop            10000001000000000000000111010
lui $1,0x00001001      108     la $a0, novalinha                11110000000001000100000000000001
ori $4,$1,0x00000002                                            11010000100100000000000000000010
addiu $2,$0,0x00000004109      li $v0, 4                        10010000000010000000000000000100
syscall                110     syscall                          1100
jr $31                 112     jr $ra                           11111000000000000000001000
addiu $10,$0,0x0000000116         li $t2, 0                     10010000001010000000000000000000
addiu $8,$0,0x00000000117         li $t0, 0                     10010000001000000000000000000000
addiu $11,$0,0x0000000118         li $t3, 2                     10010000001011000000000000000010
add $9,$0,$25          120        add $t1, $zero $t9            11001010010000100000
addiu $16,$0,0x0000000121         li $s0, 0                     10010000010000000000000000000000
addiu $17,$0,0x0000000122  L1:    li $s1, 0                     10010000010001000000000000000000
addiu $18,$0,0x0000000123  L2:    li $s2, 0                     10010000010010000000000000000000
mul $10,$16,$9         126        mul $t2, $s0, $t1             11100100000100101010000000000010
add $10,$10,$17        128        add  $t2, $t2, $s1            10101000101010000000100000
sll $10,$10,0x00000003129         sll  $t2, $t2, 3              10100101000011000000
bne $11,$0,0x00000001 131         div $t2, $t2, $t3             10101011000000000000000000000001
break                                                           1101
div $10,$11                                                     10100101100000000000011010
mflo $10                                                        10000000000000101011100
add $10,$4,$10         134        add $t2, $a0, $t2             10001010010100000100000
lb $20,0x00000000($10)135         lb   $s4, 0($t2)              10000001010101000000000000000000
mul $8,$18,$9          138  L3:   mul $t0, $s2, $t1             11100100100100101000000000000010
add $8,$8,$17          139        add $t0, $t0, $s1             10001000101000000000100000
sll $8,$8,0x00000003   140        sll $t0, $t0, 3               10000100000011000000

bne $11,$0,0x00000001 142         div $t0, $t0, $t3             10101011000000000000000000000001
break                                                           1101
div $8,$11                                                      10000101100000000000011010
mflo $8                                                         10000000000010010
add $8,$6,$8           144        add $t0, $a2, $t0             11001000010000000100000
lb $22,0x00000000($8)  145        lb $s6, 0($t0)                10000001000101100000000000000000
mul $8,$16,$9          147        mul  $t0, $s0, $t1            11100100000100101000000000000010
add $8,$8,$18          148        add $t0, $t0, $s2             10001001001000000000100000
sll $8,$8,0x00000003   149        sll  $t0, $t0, 3              10000100000011000000
bne $11,$0,0x00000001 151         div $t0, $t0, $t3             10101011000000000000000000000001
break                                                           1101
```

```
div $8,$11                                                  10000101100000000000011010
mflo $8                                                     100000000010010
add $8,$5,$8          152       add $t0, $a1, $t0           10101000010000000100000
lb $23,0x00000000($8) 153       lb   $s7, 0($t0)            10000001000101110000000000000000
mul $22,$23,$22       155       mul  $s6, $s7, $s6          11100101111011010110000000000010
add $20,$20,$22       156       add  $s4, $s4, $s6          10100101101010000000100000
addi $18,$18,0x0000000158       addi  $s2, $s2, 1           10001001010010000000000000000001
bne $18,$9,0xfffffffea 159      bne   $s2, $t1, L3          10110010010011111111111101010
sb $20,0x00000000($10)160       sb    $s4, 0($t2)           10100001010101000000000000000000
addi $17,$17,0x0000000162       addi  $s1, $s1, 1           10001000110001000000000000000001
bne $17,$9,0xfffffffdd 163      bne    $s1, $t1, L2         10110001010011111111111011101
addi $16,$16,0x0000000164       addi  $s0, $s0, 1           10001000010000000000000000000001
bne $16,$9,0xfffffffda 165      bne    $s0, $t1, L1         10110000010011111111111011010
j 0x00400114          167     j matriz_fim                  10000001000000000000001000101
```