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| Exercício 06 |

**Objetivo:**

Consolidar o aprendizado da interface do RARS e aprender como executam as instruções de desvio do RISC-V executando o sexto exemplo de programação na linguagem de montagem do RISC-V no livro texto.

**Instruções:**

1. Inicie o RARS.
2. No editor de texto do RARS, transcreva o código abaixo e salve o arquivo com o nome **exercicio\_06**.

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# Exercício 06 -

# Mostra a compilação de um laço For

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# Trecho em C:

#

# for (i==0; i<10; i++)

# j++;

#

.text # segmento de código (programa)

main:

addi s0, zero, 0 # i=0

Loop: slti t0, s0, 10 # se i<10 então $t0=1 senão $t0=0

beq t0, zero, Exit # se $t0=0 então goto Exit

addi s1, s1, 1 # j++

addi s0, s0, 1 # i++ (do laço for)

jal zero, Loop # goto Loop

Exit: nop

1. Para iniciar a montagem do código vá ao menu **Run** e selecione a opção **Assemble** ou pressione **F3**.
2. Faça a execução passo-a-passo do programa e, a cada instrução, preencha a tabela abaixo cada vez que o valor de um registrador ou posição da memória de dados for modificado. Observe que, devido ao laço de repetição, o mesmo bloco de código será percorrido várias vezes.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Antes da execução da instrução** | | **Depois da execução da  instrução** | | |
| **PC** | **Instrução** |  | **i** | **j** |
| **R5** | **R8** | **R9** |
| **(t0)** | **(s0)** | **(s1)** |
|  |  | 00000000 | 00000000 | 00000000 |
| 00400000 | addi s0, zero, 0 | 00000000 | 00000000 | 00000000 |
| 00400004 | slti t0, s0, 10 | 00000001 | 00000000 | 00000000 |
| 00400008 | beq t0, zero, Exit | 00000001 | 00000000 | 00000000 |
| 0040000c | addi s1, s1, 1 | 00000001 | 00000000 | 00000001 |
| 00400010 | addi s0, s0, 1 | 00000001 | 00000001 | 00000001 |
| 00400014 | jal zero, Loop | 00000001 | 00000001 | 00000001 |
| 00400004 | slti t0, s0, 10 | 00000001 | 00000001 | 00000001 |
| 00400008 | beq t0, zero, Exit | 00000001 | 00000001 | 00000001 |
| 0040000c | addi s1, s1, 1 | 00000001 | 00000001 | 00000002 |
| 00400010 | addi s0, s0, 1 | 00000001 | 00000002 | 00000002 |
| 00400014 | jal zero, Loop | 00000001 | 00000002 | 00000002 |
| 00400004 | slti t0, s0, 10 | 00000001 | 00000002 | 00000002 |
| 00400008 | beq t0, zero, Exit | 00000001 | 00000002 | 00000002 |
| 0040000c | addi s1, s1, 1 | 00000001 | 00000002 | 00000003 |
| 00400010 | addi s0, s0, 1 | 00000001 | 00000003 | 00000003 |
| 00400014 | jal zero, Loop | 00000001 | 00000003 | 00000003 |
| 00400004 | slti t0, s0, 10 | 00000001 | 00000003 | 00000003 |
| 00400008 | beq t0, zero, Exit | 00000001 | 00000003 | 00000003 |
| 0040000c | addi s1, s1, 1 | 00000001 | 00000003 | 00000004 |
| 00400010 | addi s0, s0, 1 | 00000001 | 00000004 | 00000004 |
| 00400014 | jal zero, Loop | 00000001 | 00000004 | 00000004 |
| 00400004 | slti t0, s0, 10 | 00000001 | 00000004 | 00000004 |
| 00400008 | beq t0, zero, Exit | 00000001 | 00000004 | 00000004 |
| 0040000c | addi s1, s1, 1 | 00000001 | 00000004 | 00000005 |
| 00400010 | addi s0, s0, 1 | 00000001 | 00000005 | 00000005 |
| 00400014 | jal zero, Loop | 00000001 | 00000005 | 00000005 |
| 00400004 | slti t0, s0, 10 | 00000001 | 00000005 | 00000005 |
| 00400008 | beq t0, zero, Exit | 00000001 | 00000005 | 00000005 |
| 0040000c | addi s1, s1, 1 | 00000001 | 00000005 | 00000006 |
| 00400010 | addi s0, s0, 1 | 00000001 | 00000006 | 00000006 |
| 00400014 | jal zero, Loop | 00000001 | 00000006 | 00000006 |
| 00400004 | slti t0, s0, 10 | 00000001 | 00000006 | 00000006 |
| 00400008 | beq t0, zero, Exit | 00000001 | 00000006 | 00000006 |
| 0040000c | addi s1, s1, 1 | 00000001 | 00000006 | 00000007 |
| 00400010 | addi s0, s0, 1 | 00000001 | 00000007 | 00000007 |
| 00400014 | jal zero, Loop | 00000001 | 00000007 | 00000007 |
| 00400004 | slti t0, s0, 10 | 00000001 | 00000007 | 00000007 |
| 00400008 | beq t0, zero, Exit | 00000001 | 00000007 | 00000007 |
| 0040000c | addi s1, s1, 1 | 00000001 | 00000007 | 00000008 |
| 00400010 | addi s0, s0, 1 | 00000001 | 00000008 | 00000008 |
| 00400014 | jal zero, Loop | 00000001 | 00000008 | 00000008 |
| 00400004 | slti t0, s0, 10 | 00000001 | 00000008 | 00000008 |
| 00400008 | beq t0, zero, Exit | 00000001 | 00000008 | 00000008 |
| 0040000c | addi s1, s1, 1 | 00000001 | 00000008 | 00000009 |
| 00400010 | addi s0, s0, 1 | 00000001 | 00000009 | 00000009 |
| 00400014 | jal zero, Loop | 00000001 | 00000009 | 00000009 |
| 00400004 | slti t0, s0, 10 | 00000001 | 00000009 | 00000009 |
| 00400008 | beq t0, zero, Exit | 00000001 | 00000009 | 00000009 |
| 0040000c | addi s1, s1, 1 | 00000001 | 00000009 | 0000000a |
| 00400010 | addi s0, s0, 1 | 00000001 | 0000000a | 0000000a |
| 00400014 | jal zero, Loop | 00000001 | 0000000a | 0000000a |
| 00400004 | slti t0, s0, 10 | 00000000 | 0000000a | 0000000a |
| 00400008 | beq t0, zero, Exit | 00000000 | 0000000a | 0000000a |
| 00400018 | addi x0, x0, 0 | 00000000 | 0000000a | 0000000a |

OBS: acrescente as linhas adicionais que forem necessárias.