Workshop de Assembly:

; João Oliveira
; joao.ferreira.oliveira@tecnico.ulisboa.pt
; Jonyleo#8960
; https://github.com/Jonyleo/IST_Projects/tree/master/workshops/ASM1

Resumo:

; * Introdução
; * Ambiente de Desenvolvimento
; * PEPE Assembly
; * Exercicio (Live coding)
; * Periféricos
; * Exercicio (Live coding)
; * Stack
; * Exercicio (Live coding)
; * Erros comuns e Debbuging
; * Duvidas

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Introdução:

; O que é assembly?

; Cuidados a ter

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Ambiente de Desenvolvimento:

; Simulador

Ambiente de Desenvolvimento:

; IDE / Editor de texto

; https://github.com/Jonyleo/PEPEAsm/

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PEPE Assembly:

```
; Literais

1000H              ; 0000H -> 0F000H
010101b            ; 0b -> 1111111111111111b
19                 ; -32768 -> 32767
“Ola\n”            ; não é terminado em 0
NAME EQU 10        ; semelhante a #define em C
```

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PEPE Assembly:

; Labels - Identificar zonas do código

nextSlide:
    ; código ou
    ; dados

PEPE Assembly:

```
; Directiva PLACE

PLACE 1000H
; dados

PLACE 0
; codigo
```

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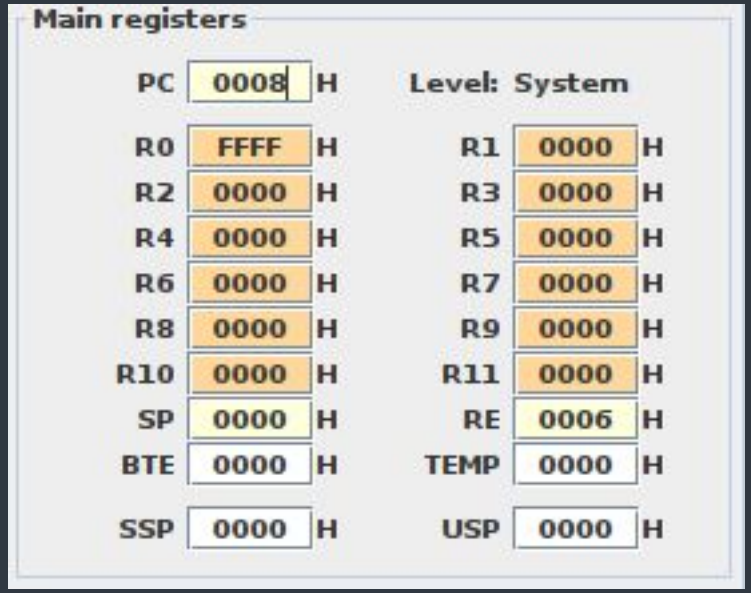
PEPE Assembly:

```
; Registos
; 16 bits
Rx          ; 0 - 15
RL          ; R11
SP          ; R12
RE          ; R13
BTE         ; R14
TEMP        ; R15
```



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PEPE Assembly:

```
; Instruções - Manipular dados, controlo de fluxo e
; configuração
MOV R0, 10
PUSH R9
ADD R4, 11b
XOR R2, R3
JMP nextSlide
```

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PEPE Assembly:

```
; Operandos

MOV R0, 10H
ADD R5, R1
NOT R0
RET
```

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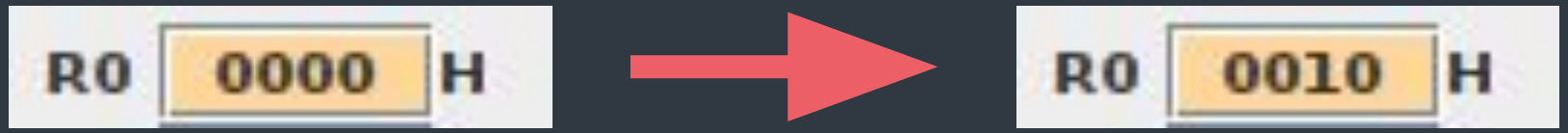
PEPE Assembly:

; Instrução fundamental

MOV R0, 10H



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PEPE Assembly:

; Instruções aritméticas e lógicas

```
ADD Rx, Rx      MUL Rx, Rx
SUB Rx, Rx      DIV Rx, Rx
CMP Rx, Rx      MOD Rx, Rx
ADD Rx, C       AND Rx, Rx
SUB Rx, C       OR Rx, Rx
CMP Rx, C       XOR Rx, Rx
```

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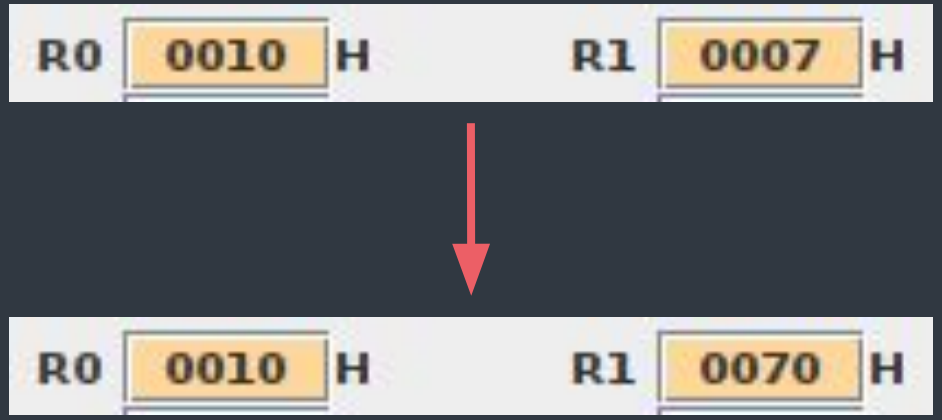
PEPE Assembly:

; Instruções aritméticas e lógicas

```
MOV R0, 10H
MOV R1, 7H
MUL R1, R0
```



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PEPE Assembly:

; Instruções aritméticas e lógicas

INC Rx
DEC Rx
NEG Rx
NOT Rx

SHL Rx, C
SHR Rx, C
ROL Rx, C
ROR Rx, C

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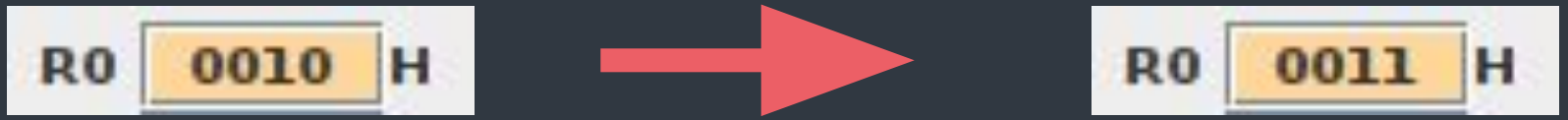
PEPE Assembly:

; Instruções aritméticas e lógicas

```
MOV R0, 10H
INC R0
```



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PEPE Assembly:

; Instruções controlo de fluxo

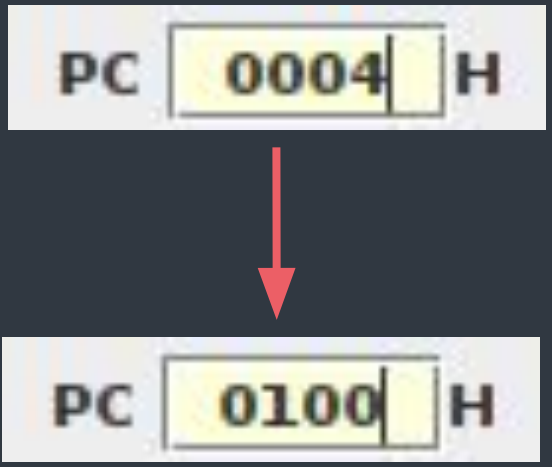
```
CALL label
JMP label
RET
```

PEPE Assembly:

; Instruções controlo de fluxo

JMP label

PLACE 100H
label:
    ; código



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PEPE Assembly:

; Saltos condicionais - Dependem do RE

JZ label
JNZ label
JN label
JNN label
JP label
JNP label

JLT label
JLE label
JGT label
JGE label
JC label
JNC label

JEQ label
JNE label

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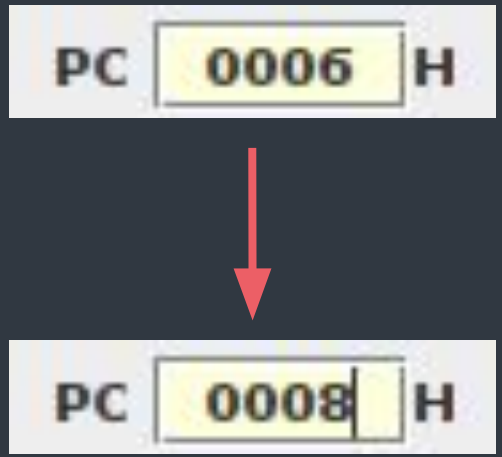
PEPE Assembly:

; Saltos condicionais - Dependem do RE

```
MOV R0, 10H
MOV R1, 7H
MUL R1, R0
JZ label
```



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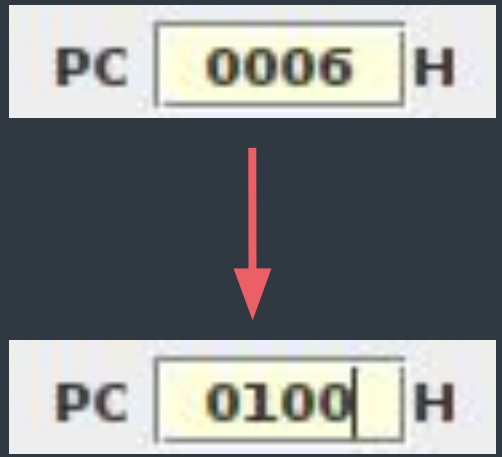
PEPE Assembly:

; Saltos condicionais - Dependem do RE

```
MOV R0, 10H
MOV R1, 0H
MUL R1, R0
JZ label
```



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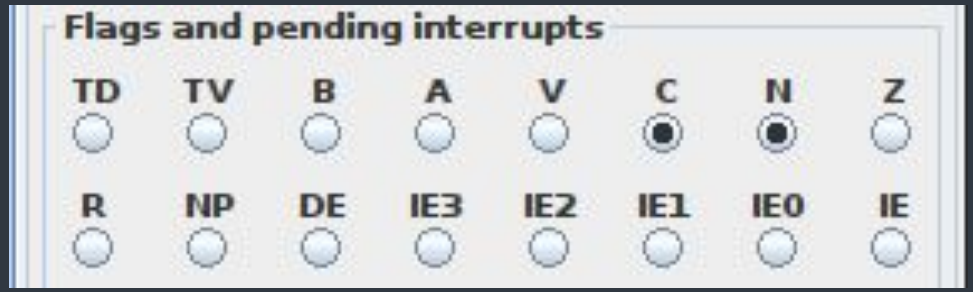
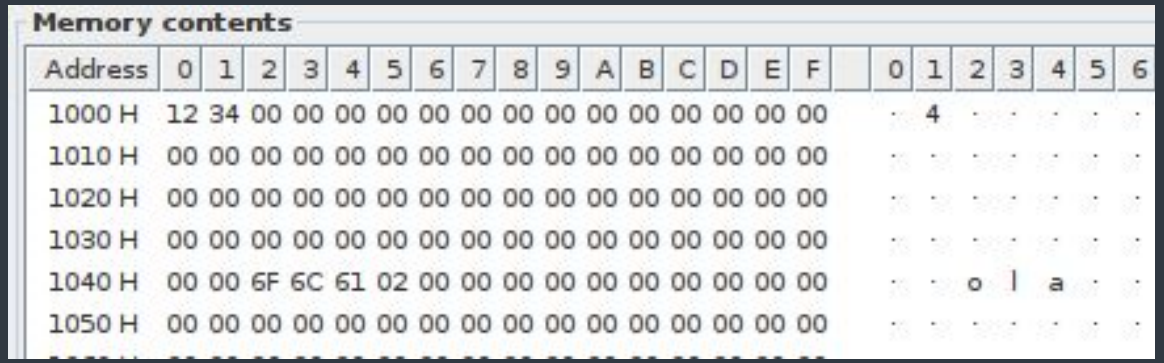
PEPE Assembly:

; Registo de estado



PEPE Assembly:

```
; Memória
PLACE 1000H
WORD 1234H
STACK 10H
TABLE 10H
STRING “ola”, 10b
```



Memory contents

Address	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	0	1	2	3	4	5	6
1000 H	12	34	00	00	00	00	00	00	00	00	00	00	00	00	00	00	·	4	·	·	·	·	·
1010 H	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	·	·	·	·	·	·	·
1020 H	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	·	·	·	·	·	·	·
1030 H	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	·	·	·	·	·	·	·
1040 H	00	00	6F	6C	61	02	00	00	00	00	00	00	00	00	00	00	·	·	o	l	a	·	·
1050 H	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	·	·	·	·	·	·	·

PEPE Assembly:

```
; Leitura
MOV R0, [1000H]

MOV R0, 1000H
MOV R1, [R0]
MOV R1, [R0 + R2]
MOVB R1, [R0]
```

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PEPE Assembly:

```
; Escrita
MOV [1000H], R0

MOV R0, 1000H
MOV [R0], R1
MOV [R0 + R2], R1
MOVB [R0], R1
```

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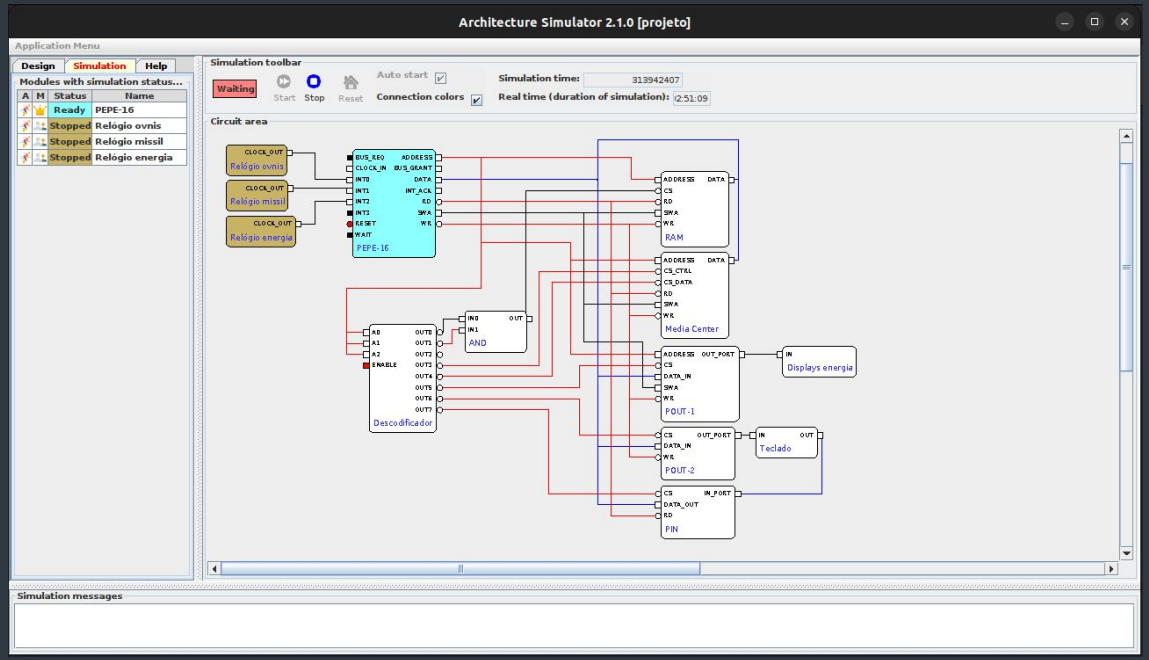
Exercicio (Live coding):



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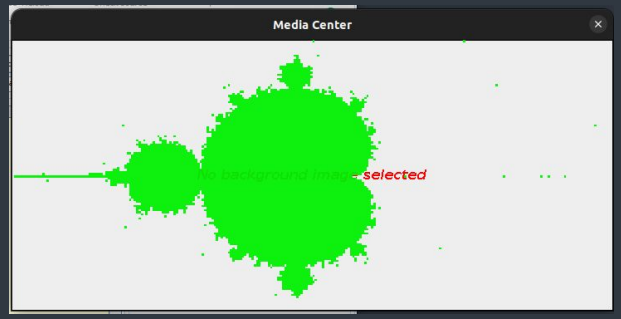
Periféricos:

```
; Pixel Screen / Media Center

PXL_SCREEN_CTRL  EQU 6000H
PXL_SCREEN_DATA  EQU 8000H
```



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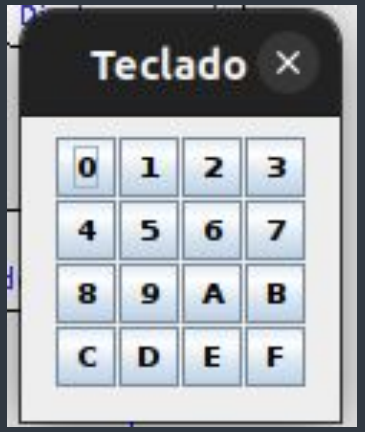
Periféricos:

```
; Teclado

TEC_LIN   EQU 0C000H
TEC_COL   EQU 0E000H
```



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Periféricos:

; Displays

```
DISPLAYS EQU 0A000H
```

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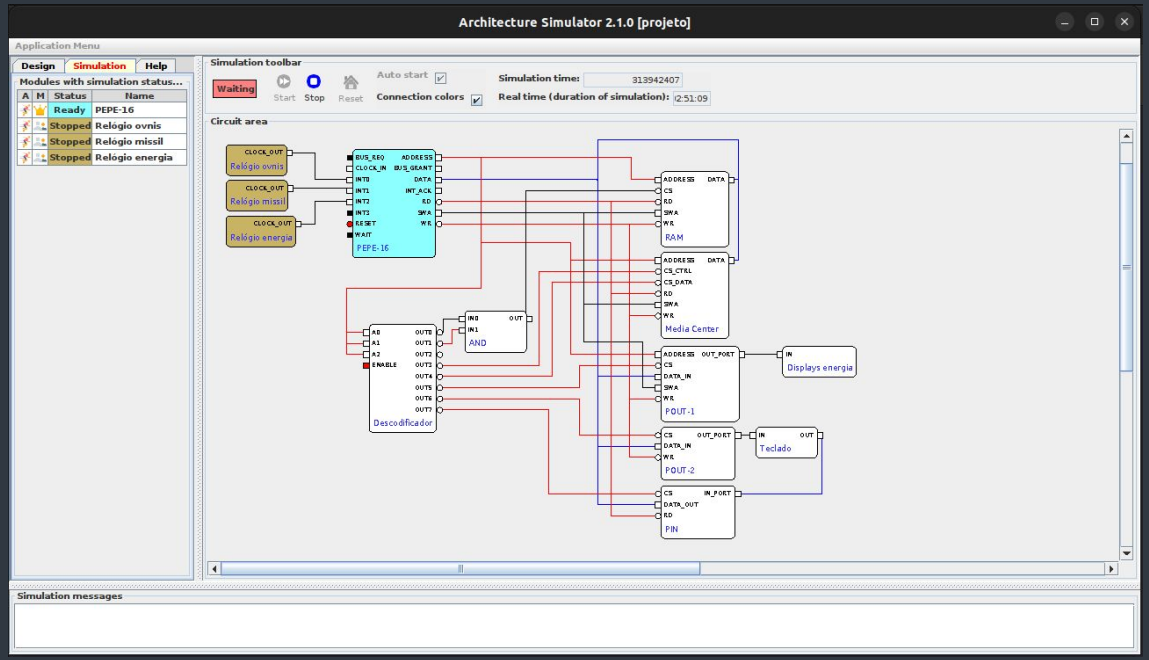
Exercicio (Live coding):



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Stack:

```
; Declaração e Stack pointer

PLACE 1000H
    STACK 100H
    SP_init:
PLACE 0
MOV SP, SP_init
```

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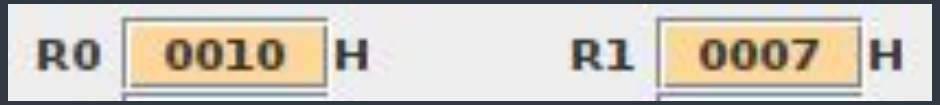
Stack:



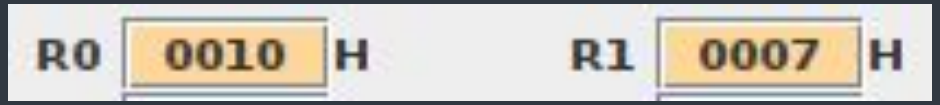

```
      ; Utilização

10H       CALL rotina
12H       MOV R0, 10H
...       ...
          rotina:
100H          PUSH R0
100H          PUSH R1
```

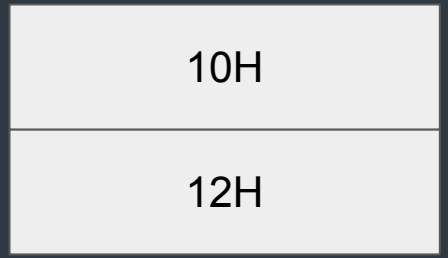
Stack:


```
    ; Utilização
10H     CALL rotina
12H     MOV R0, 10H
...     ...
        rotina:
100H        PUSH R0
100H        PUSH R1
```

Stack:




```
      ; Utilização
10H   CALL rotina
12H   MOV R0, 10H
...   ...
      rotina:
100H      PUSH R0
100H      PUSH R1
```



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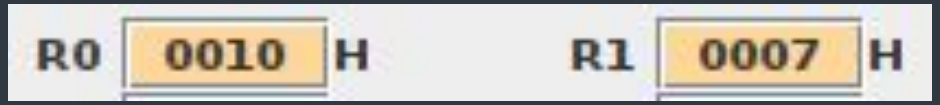
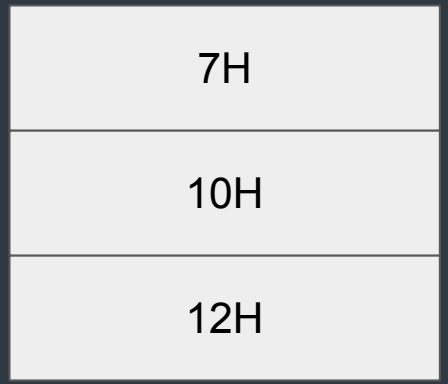
Stack:




```
    ; Utilização

10H     CALL rotina
12H     MOV R0, 10H
...     ...
        rotina:
100H        PUSH R0
100H        PUSH R1
```



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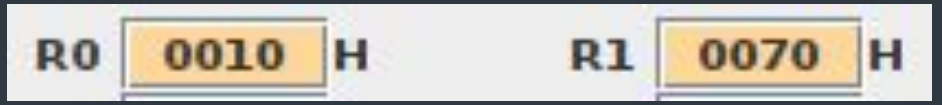
Stack:

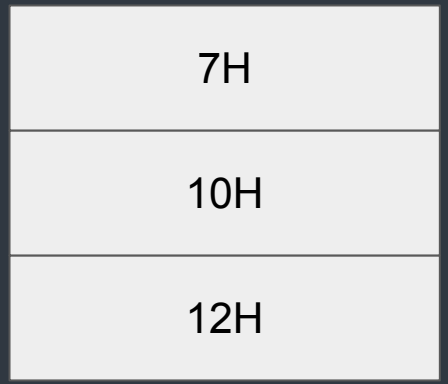
; Utilização

rotina:

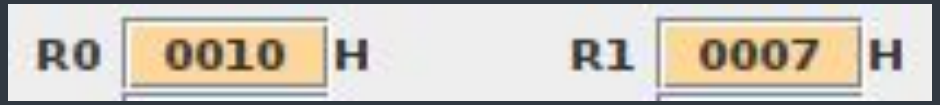
...

```
120H    POP R1
122H    POP R0
124H    RET
```





Stack:



; Utilização

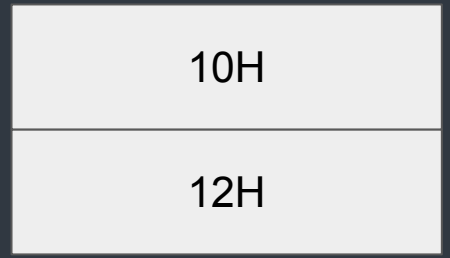
rotina:

...

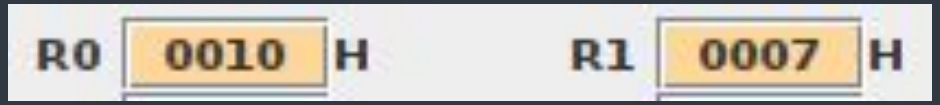
120H POP R1

122H POP R0

124H RET



Stack:



; Utilização

rotina:

...

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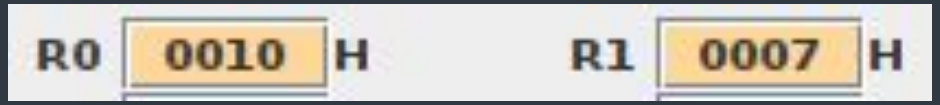
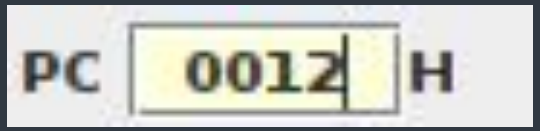
Stack:





; Utilização

rotina:

...

120H POP R1

122H POP R0

124H RET

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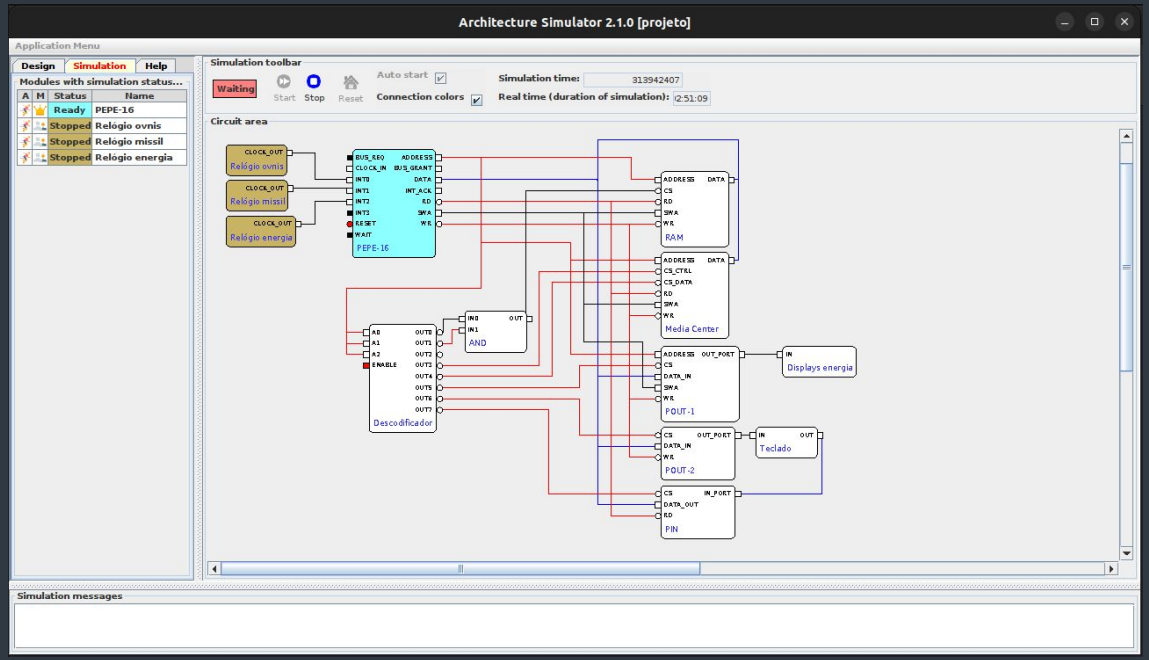
Exercicio (Live coding):



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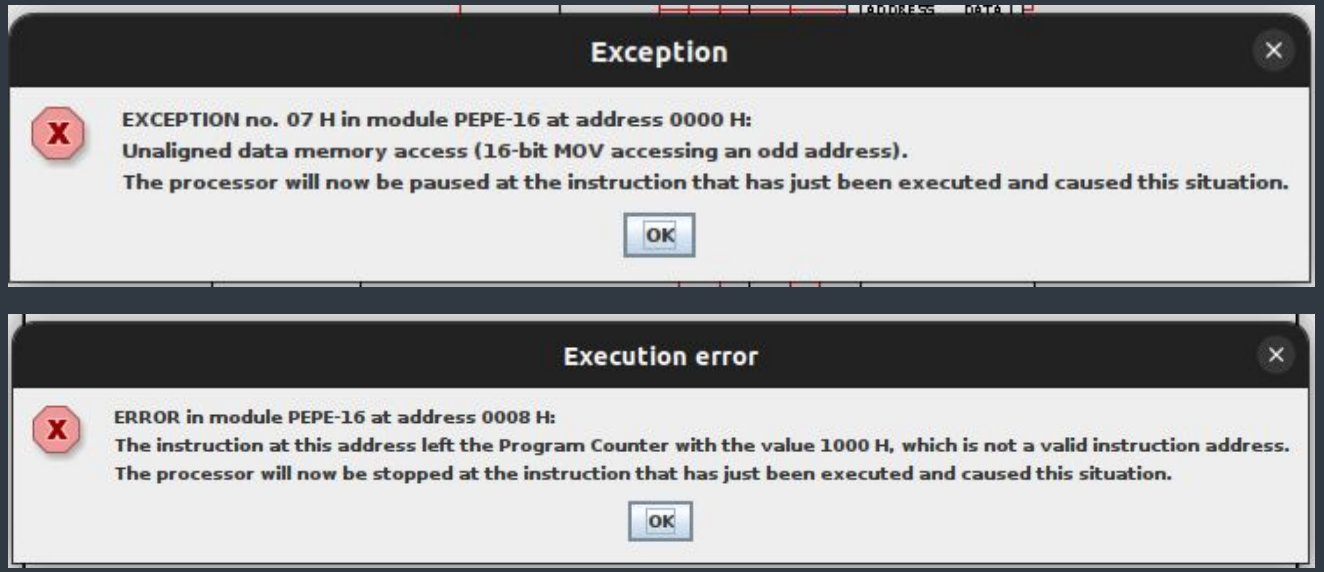
Erros Comuns e Debbuging:



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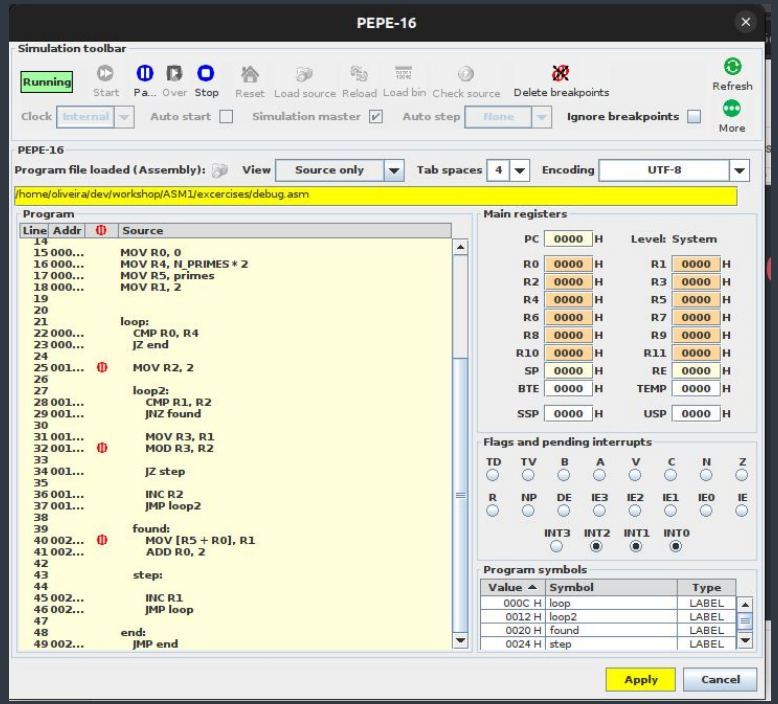
Exercicio (Live debugging):



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Duvidas: