

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
- ; * Exercício (Live coding)
- ; * Periféricos
- ; * Exercício (Live coding)
- ; * Stack
- ; * Exercício (Live coding)
- ; * Erros comuns e Debugging
- ; * Duvidas

Introdução:

; O que é assembly?

; Cuidados a ter

Ambiente de Desenvolvimento:

; Simulador



Ambiente de Desenvolvimento:

; IDE / Editor de texto



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

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

PEPE Assembly:

; Labels - Identificar zonas do código

nextSlide:

; código ou

; dados

PEPE Assembly:

; Directiva PLACE

PLACE 1000H

; dados

PLACE 0

; codigo

PEPE Assembly:

; Registos

; 16 bits

Rx ; 0 - 15

RL ; R11

SP ; R12

RE ; R13

BTE ; R14

TEMP ; R15

Main registers			Level: System		
PC	0008	H			
R0	FFFF	H	R1	0000	H
R2	0000	H	R3	0000	H
R4	0000	H	R5	0000	H
R6	0000	H	R7	0000	H
R8	0000	H	R9	0000	H
R10	0000	H	R11	0000	H
SP	0000	H	RE	0006	H
BTE	0000	H	TEMP	0000	H
SSP	0000	H	USP	0000	H

PEPE Assembly:

; Instruções - Manipular dados, controlo de fluxo e
; configuração

MOV R0, 10

PUSH R9

ADD R4, 11b

XOR R2, R3

JMP nextSlide

PEPE Assembly:

; Operandos

MOV R0, 10H

ADD R5, R1

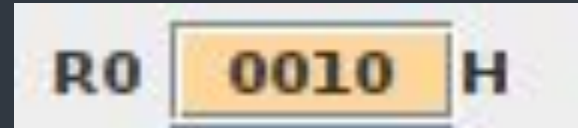
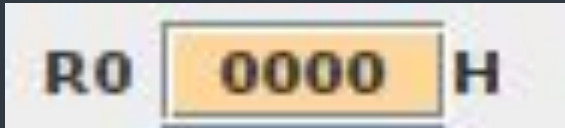
NOT R0

RET

PEPE Assembly:

; Instrução fundamental

MOV R0, 10H



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

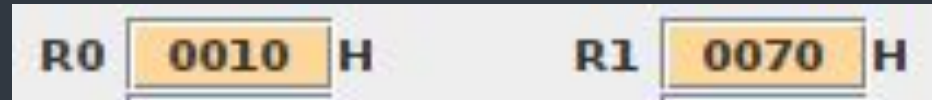
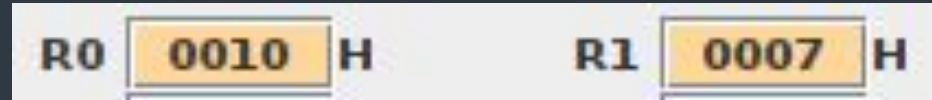
PEPE Assembly:

; Instruções aritméticas e lógicas

MOV R0, 10H

MOV R1, 7H

MUL R1, R0



PEPE Assembly:

; Instruções aritméticas e lógicas

INC Rx

DEC Rx

NEG Rx

NOT Rx

SHL Rx, C

SHR Rx, C

ROL Rx, C

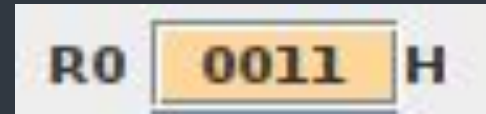
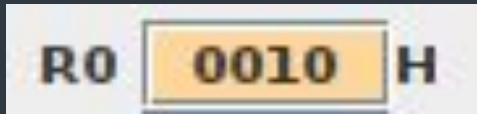
ROR Rx, C

PEPE Assembly:

; Instruções aritméticas e lógicas

MOV R0, 10H

INC R0



PEPE Assembly:

; Instruções controlo de fluxo

CALL label

JMP label

RET

PEPE Assembly:

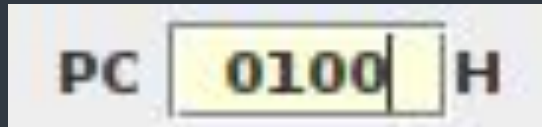
; Instruções controlo de fluxo

JMP label

PLACE 100H

label:

; código



PEPE Assembly:

; Saltos condicionais - Dependem do RE

JZ label

JLT label

JEQ label

JNZ label

JLE label

JNE label

JN label

JGT label

JNN label

JGE label

JP label

JC label

JNP label

JNC label

PEPE Assembly:

; Saltos condicionais - Dependem do RE

MOV R0, 10H

MOV R1, 7H

MUL R1, R0

JZ label

PC 0006 H



PC 0008 H

PEPE Assembly:

; Saltos condicionais - Dependem do RE

MOV R0, 10H

MOV R1, 0H

MUL R1, R0

JZ label

PC 0006 H



PC 0100 H

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]

PEPE Assembly:

; Escrita

MOV [1000H], R0

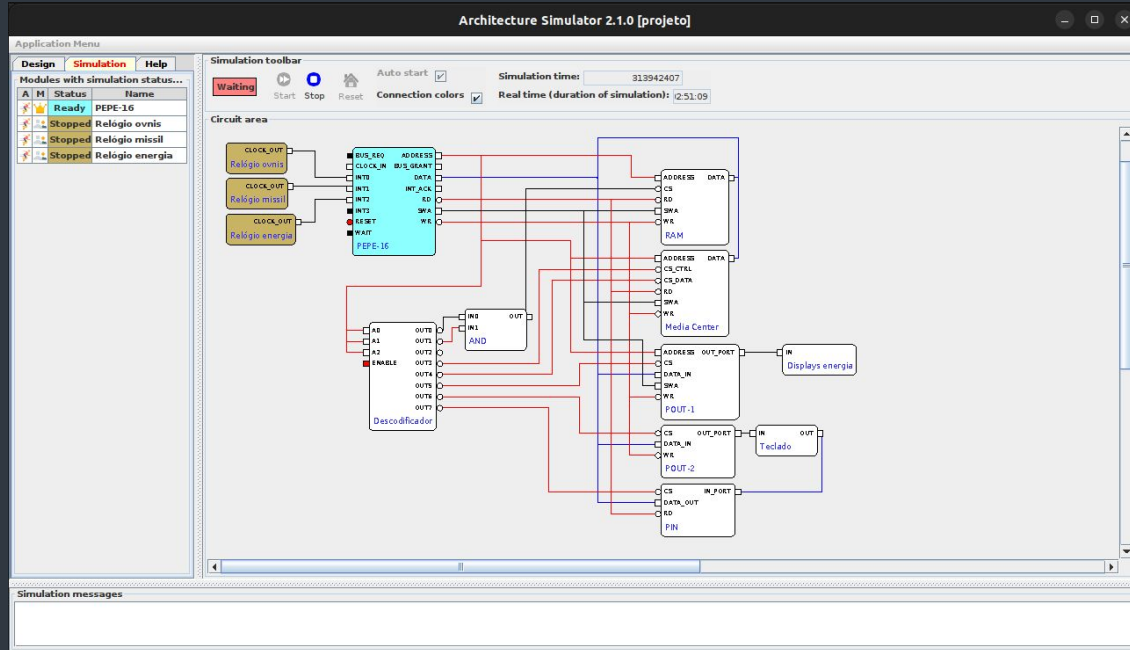
MOV R0, 1000H

MOV [R0], R1

MOV [R0 + R2], R1

MOVB [R0], R1

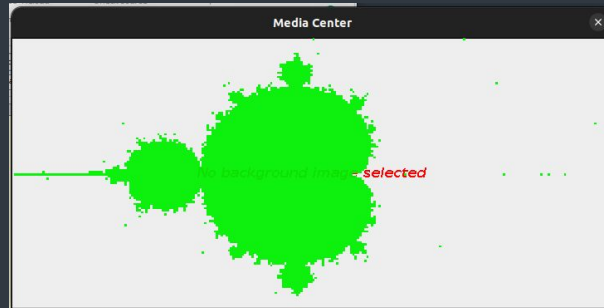
Exercicio (Live coding):



Periféricos:

; Pixel Screen / Media Center

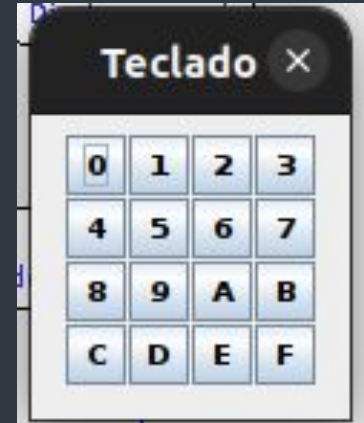
```
PXL_SCREEN_CTRL EQU 6000H  
PXL_SCREEN_DATA EQU 8000H
```



Periféricos:

; Teclado

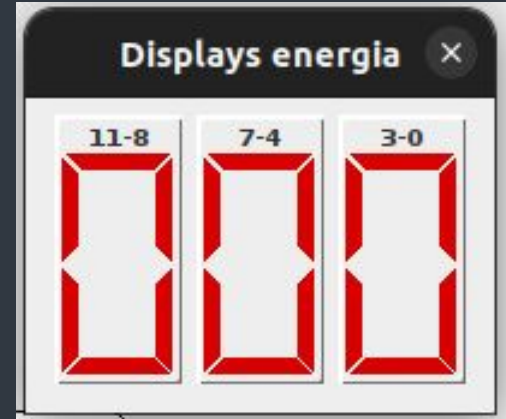
```
TEC_LIN EQU 0C000H  
TEC_COL EQU 0E000H
```



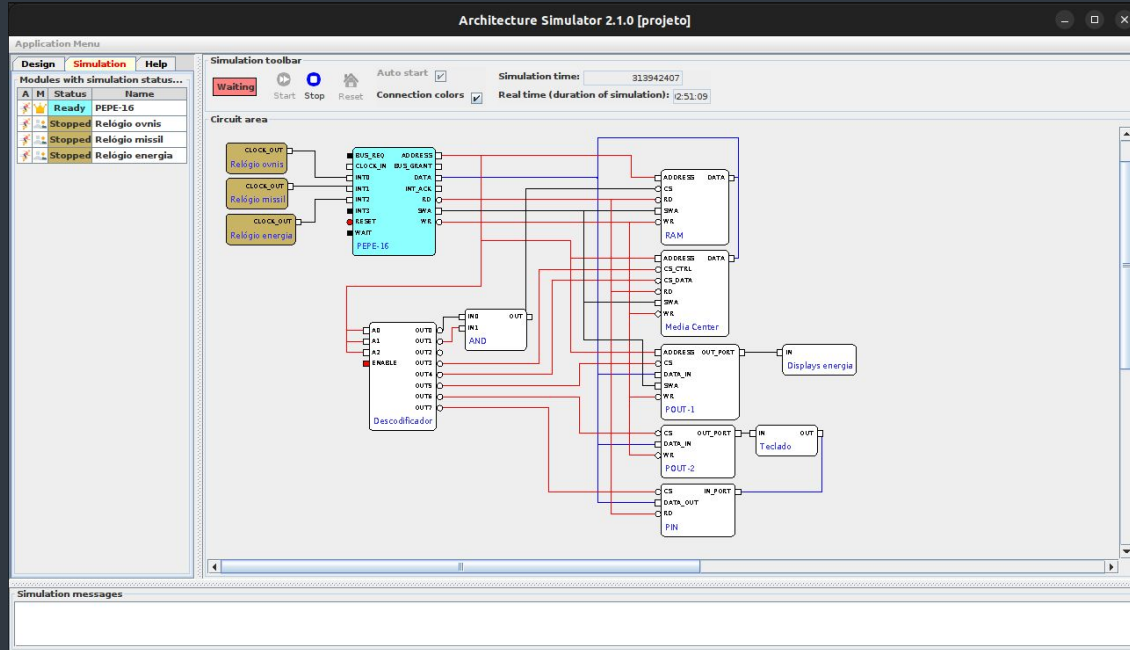
Periféricos:

; Displays

DISPLAYS EQU 0A000H



Exercicio (Live coding):



Rotinas:

; O que é e para que serve

Stack:

; Declaração e Stack pointer

PLACE 1000H

STACK 100H

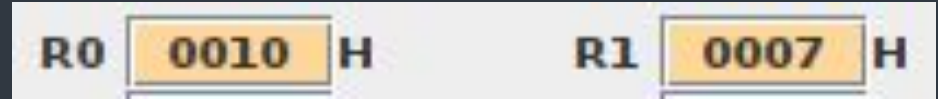
SP_init:

PLACE 0

MOV SP, SP_init

Stack:

; Utilização



```
10H    CALL rotina
12H    MOV R0, 10H
...    ...
```

rotina:

```
100H    PUSH R0
100H    PUSH R1
```

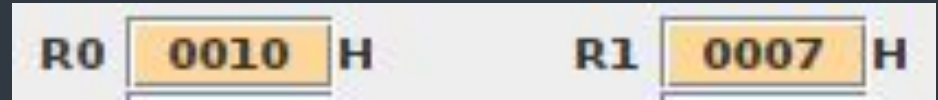
Stack:

; Utilização

10H CALL rotina
12H MOV R0, 10H
...

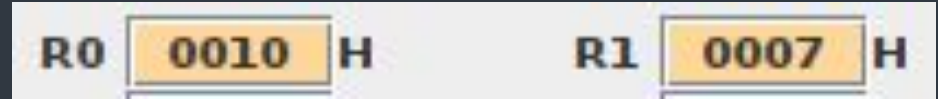
rotina:

100H PUSH R0
100H PUSH R1



Stack:

; Utilização



10H CALL rotina
12H MOV R0, 10H
...



rotina:

100H PUSH R0
100H PUSH R1



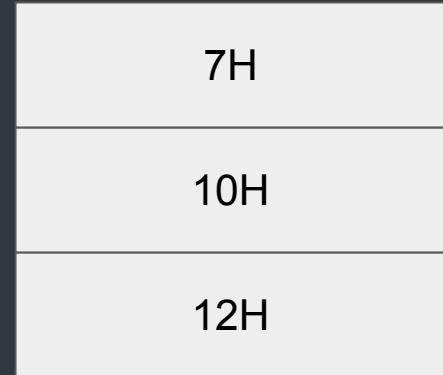
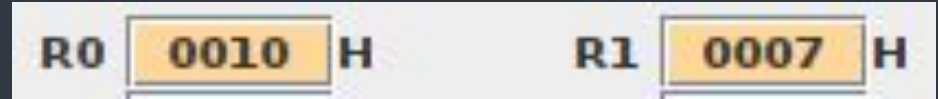
Stack:

; Utilização

```
10H  CALL rotina
12H  MOV R0, 10H
...
```

rotina:

```
100H  PUSH R0
100H  PUSH R1
```

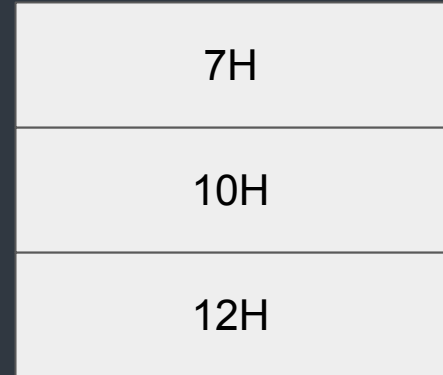
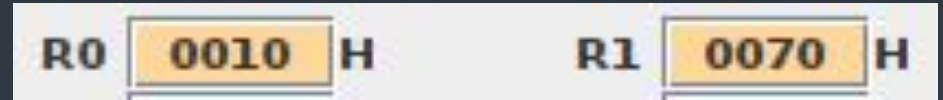


Stack:

; Utilização

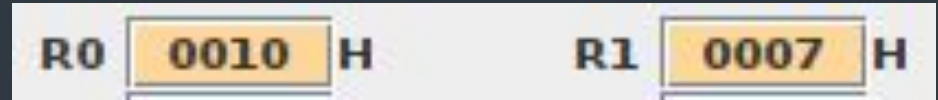
rotina:

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



Stack:

; Utilização

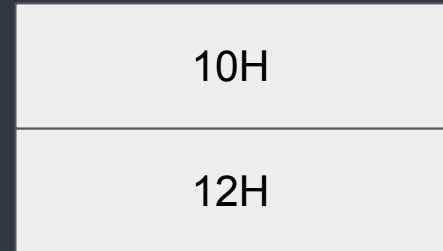


rotina:

120H
122H
124H

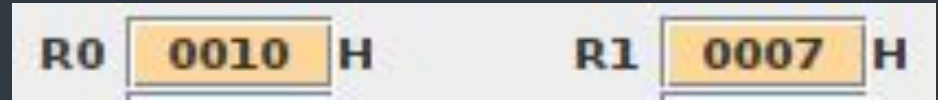
...

POP R1
POP R0
RET



Stack:

; Utilização



rotina:

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

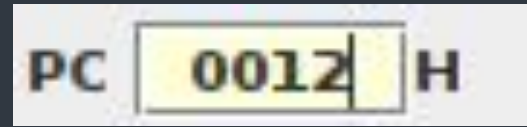
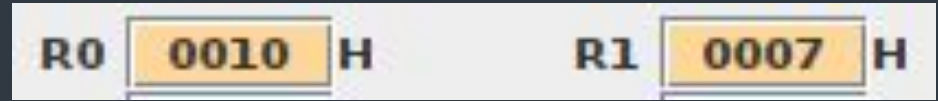


Stack:

; Utilização

rotina:

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



Stack:

CALL rotina



JMP rotina



Stack:

rotina:
RET



rotina:
...
JMP fora



Stack:

rotina:



PUSH R0

rotina_ciclo:

JZ rotina_conversao

...

JMP rotina_ciclo

rotina_conversao:

...

POP R0

RET

rotina:



PUSH R0

ciclo27:

JZ conversao__3

...

JMP ciclo27

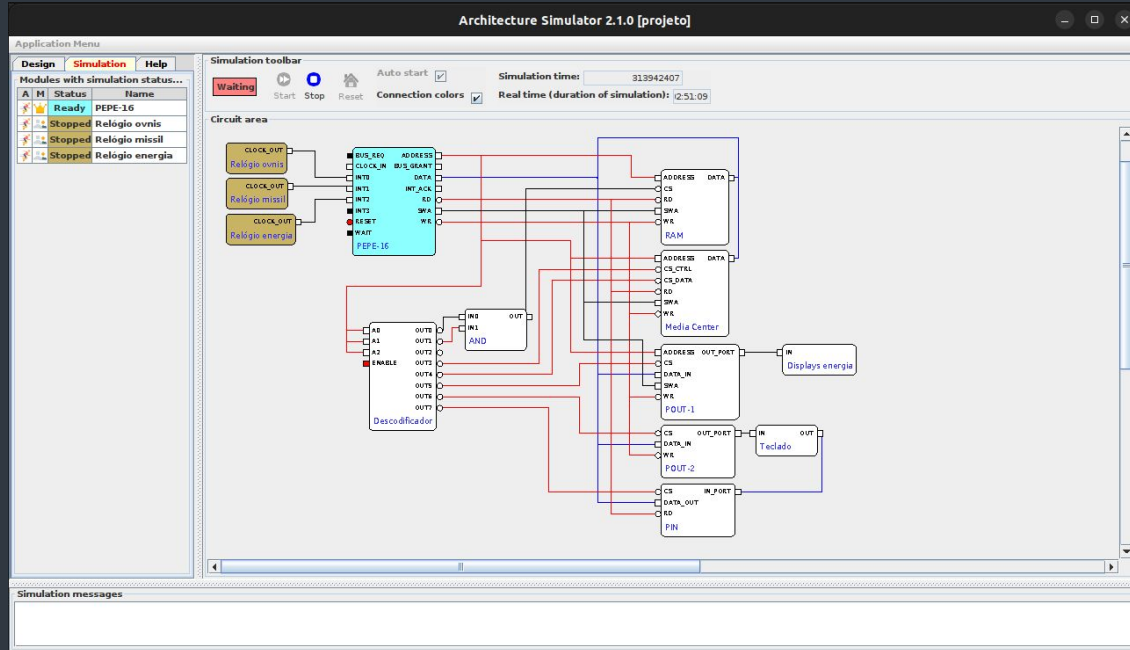
conversao__3:

...

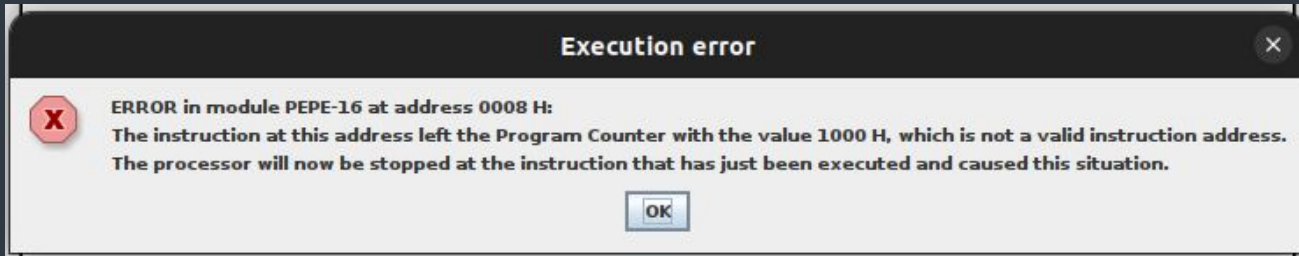
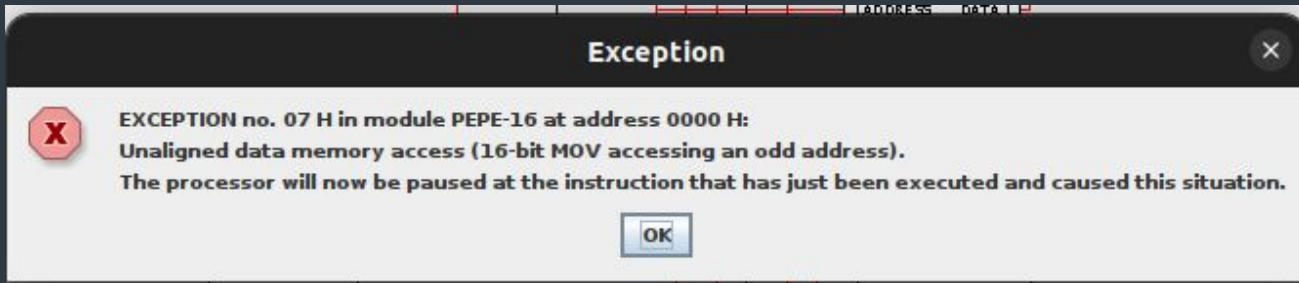
POP R0

RET

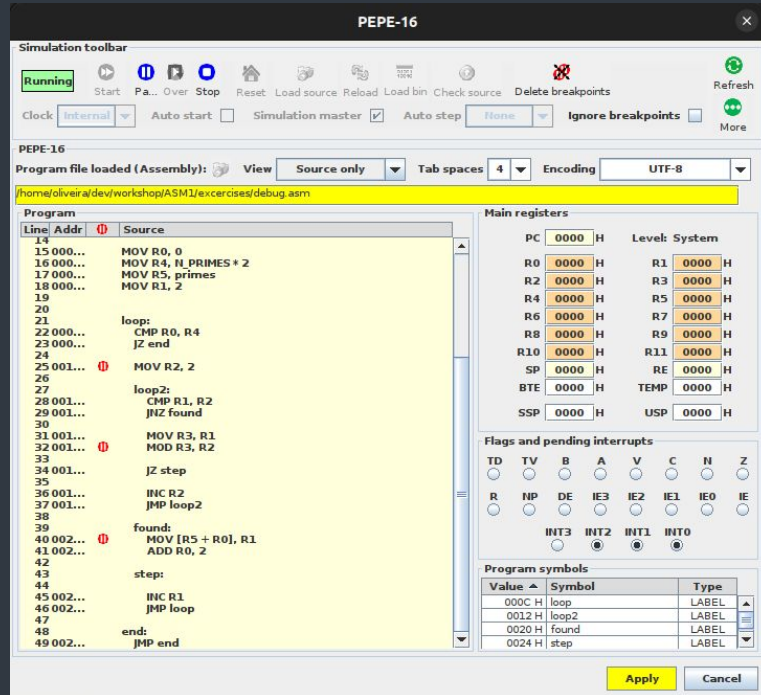
Exercicio (Live coding):



Erros Comuns e Debugging:



Exercicio (Live debugging):



Duvidas: