Arquitetura de Computadores

PVP 4 – Capítulo 4
Módulos Combinatórios de Média Complexidade

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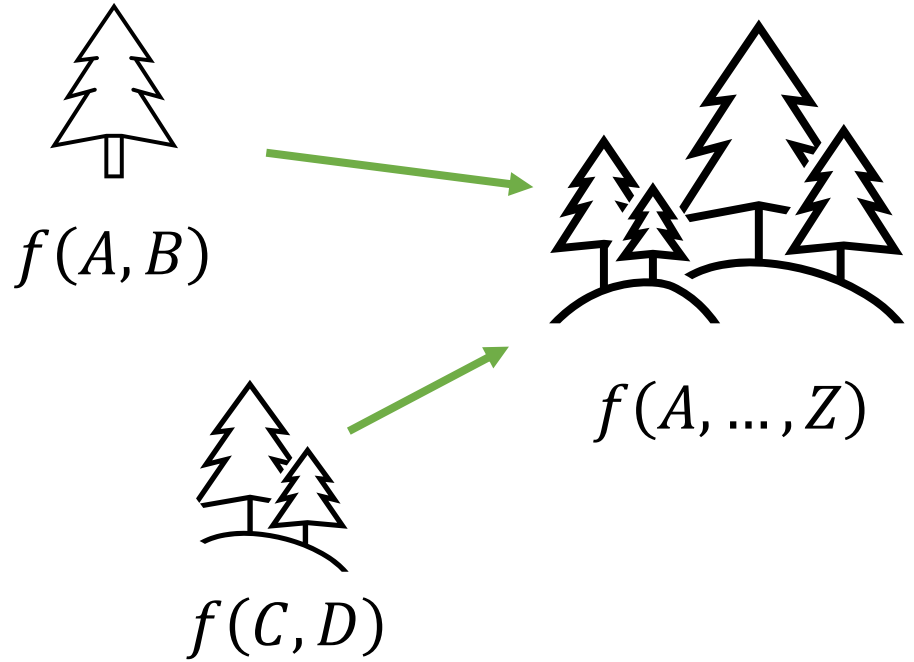
Gracinda Carvalho 2023

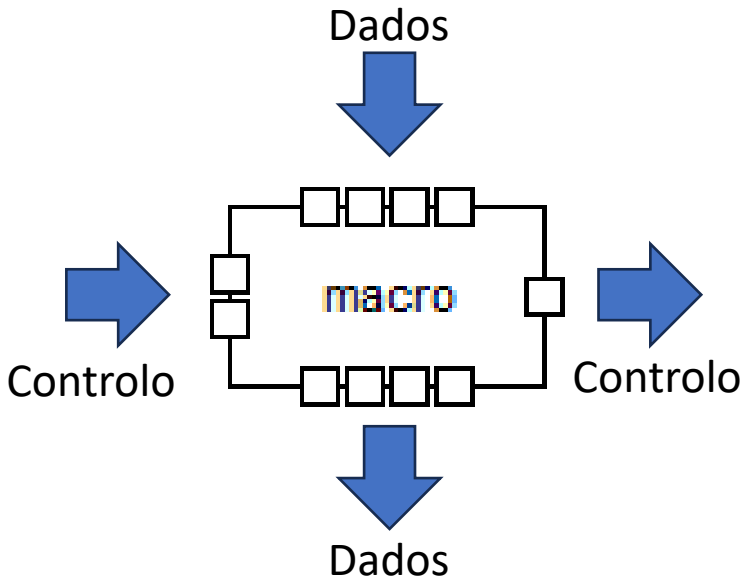
Índice

Modularidade

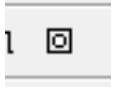
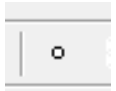
?

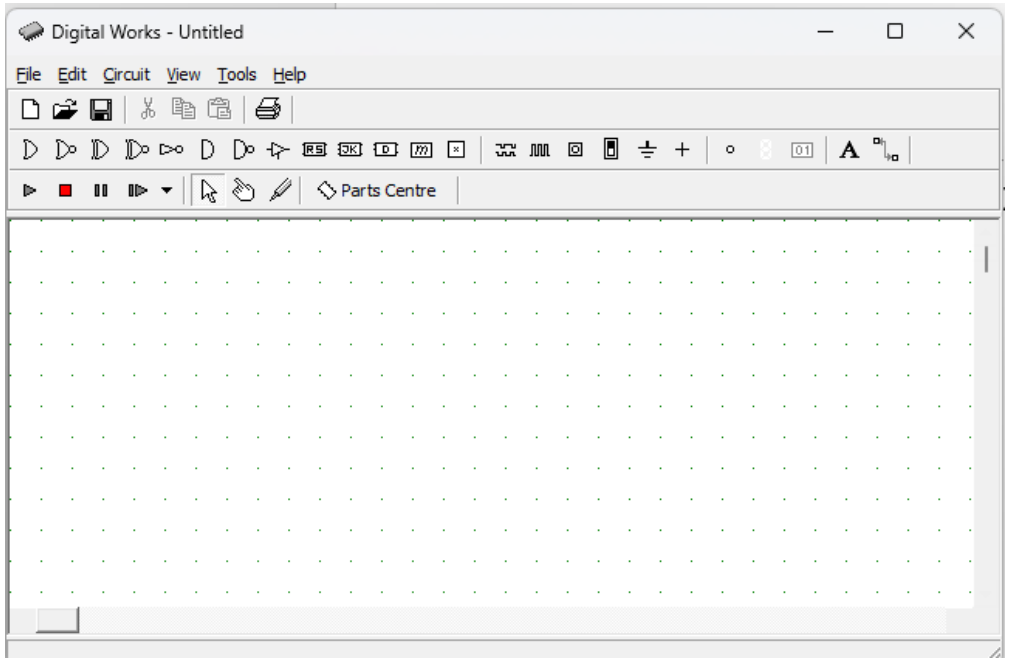
$f(A, \ldots, Z) = ?$

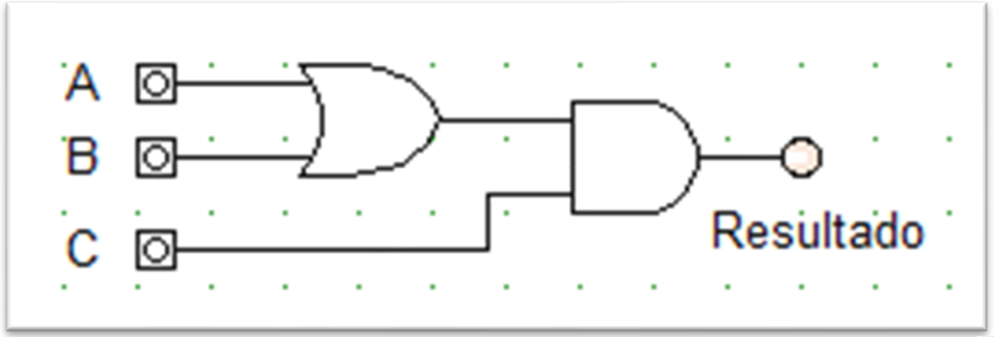


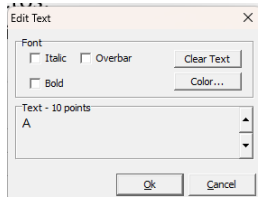


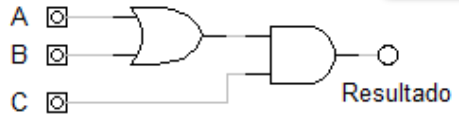
Simulador “Digital Works”

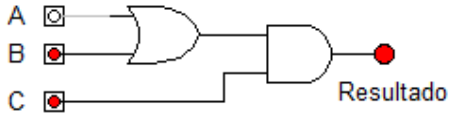
- Primeiro Circuito: $(A + B)C$
  - Colocar objetos:
    - Portas lógicas 
    - Entrada interativa 
    - Led 
  - Efetuar ligações 
  - Selecionar e mover elementos 
  - Anotações 
- Simular 
  - Interagir 
  - Medir 

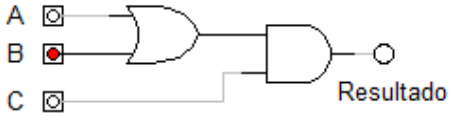


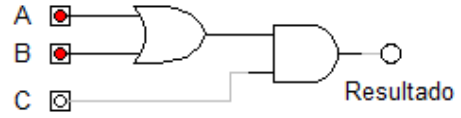


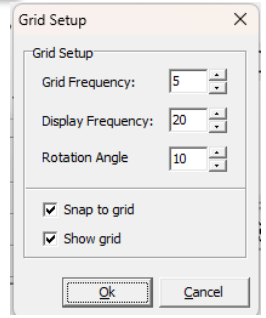






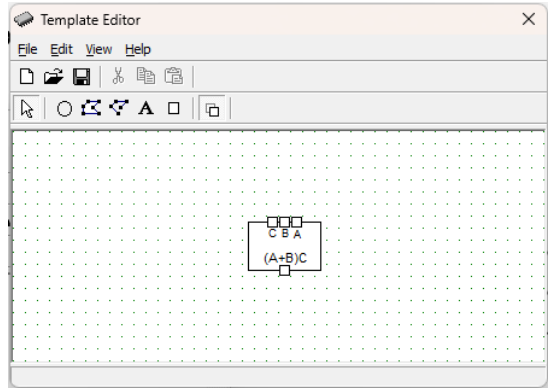


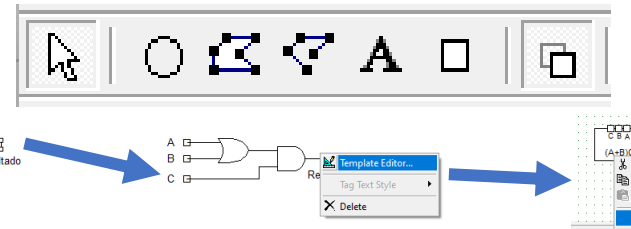


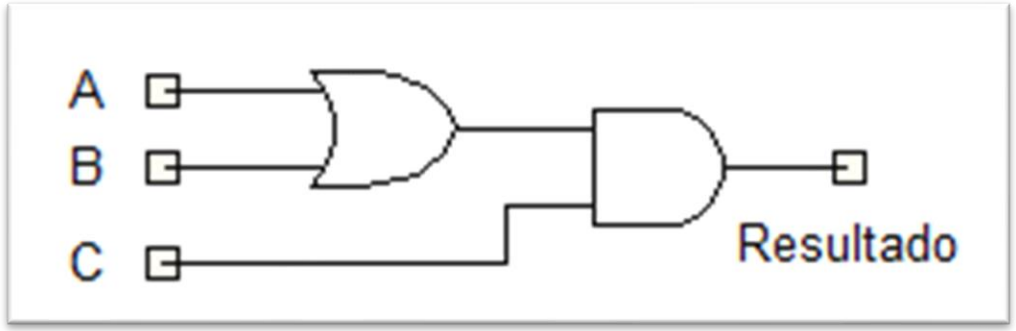


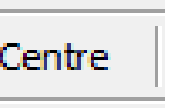
Modularidade com Macros

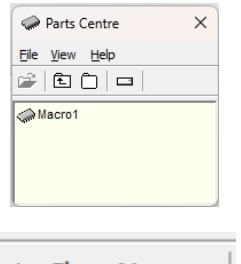
- Converter o circuito para macro
  - Entradas/saídas > pins
  - Desenhar macro:
    - Caixa / Pins / Textos
  - Associar pins
  - Gravar Circuito
    - DigitalWorks
      - Parts Centre
- Utilizar macro
  - Arrastar e soltar
  - Terminar circuito
  - Testar
- Editar Macro



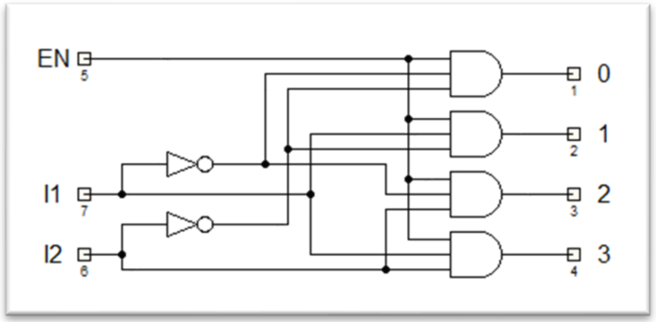


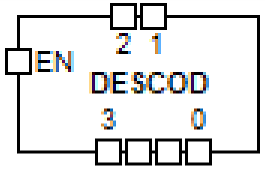


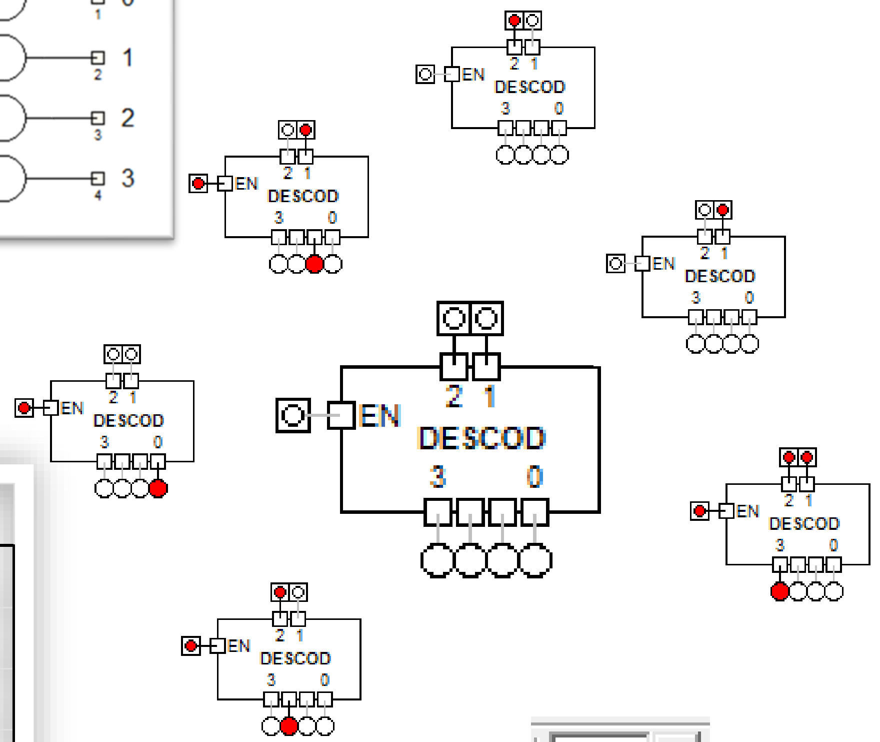




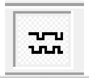
Descodificador 2b

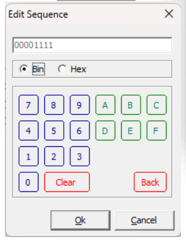






- Funcionalidade
  - Identificar o objeto
  - Código 2 bits -> 4 objetos
  - EN – enable
- Tabela de Verdade
- Logigrama
- Macro de alta utilização!
- Teste
  - Manual
  - Sequência de dados



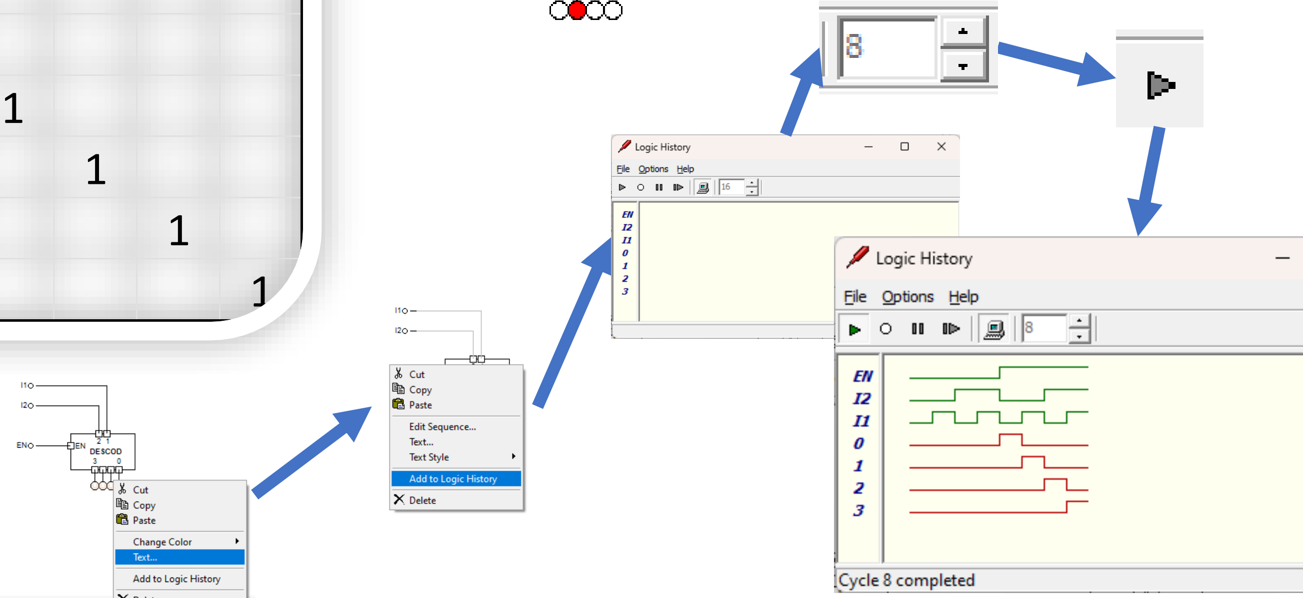


    - EN
    - 2

    - 1

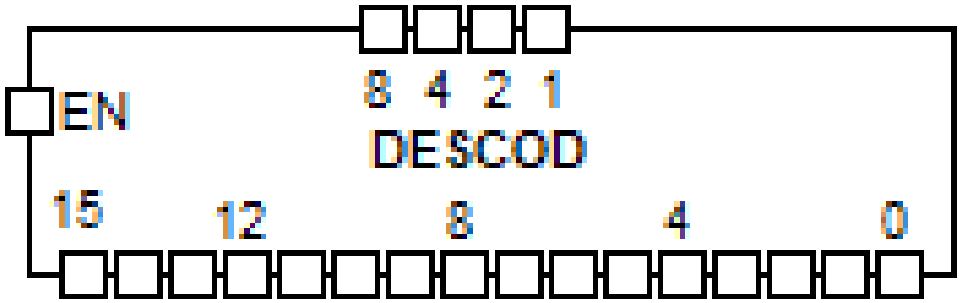
- Histórico lógico

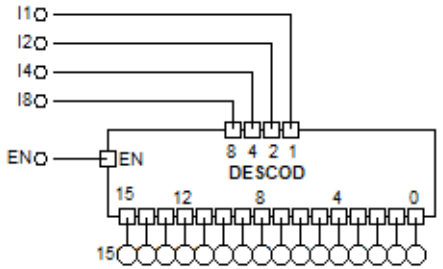
EN	I2	I1	F0	F1	F2	F3
0	0	0				
0	0	1				
0	1	0				
0	1	1				
1	0	0	1			
1	0	1		1		
1	1	0			1	
1	1	1				1

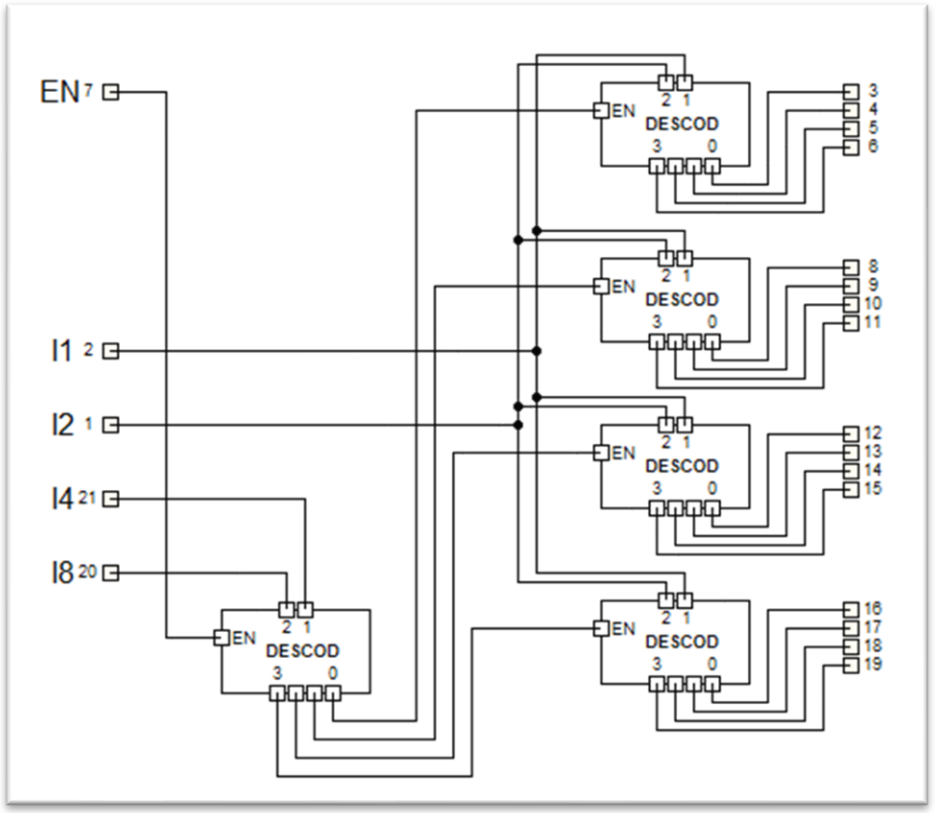


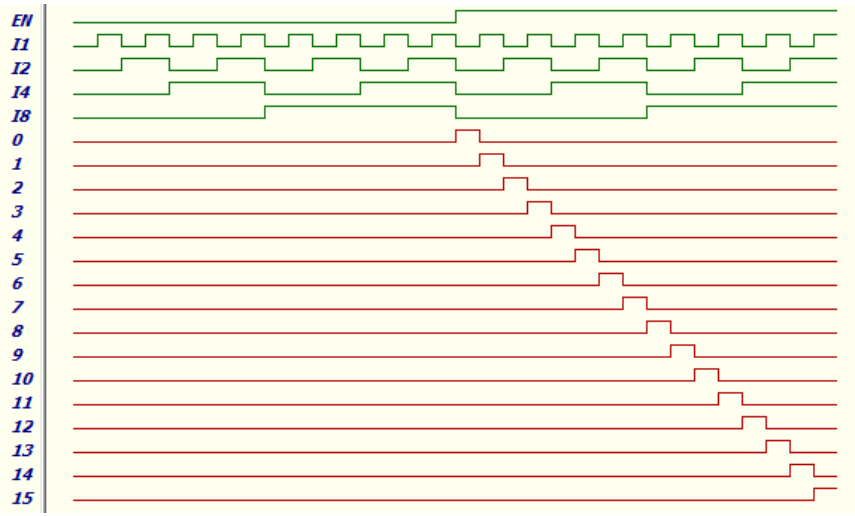
Descodificador 4b

- Utilização da modularidade:
  - Fazer um descodificador de 4 bits
  - Utilizar descodificadores de 2 bits!



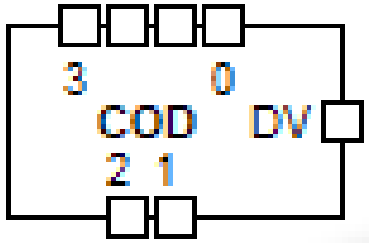


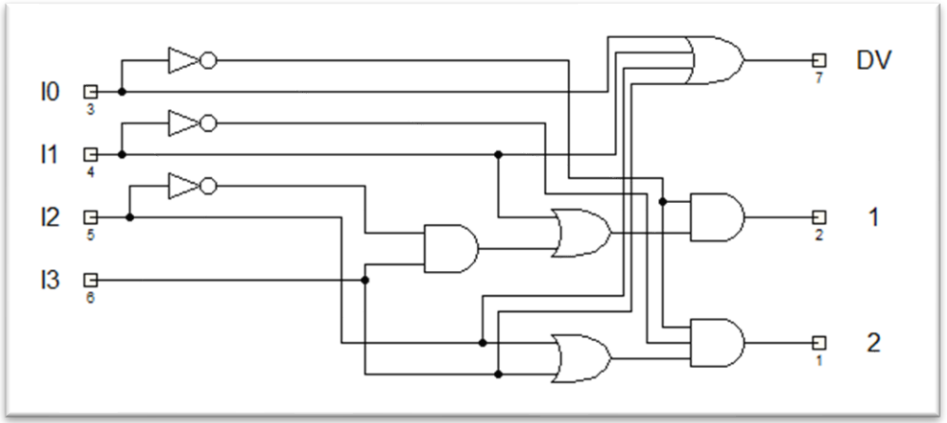




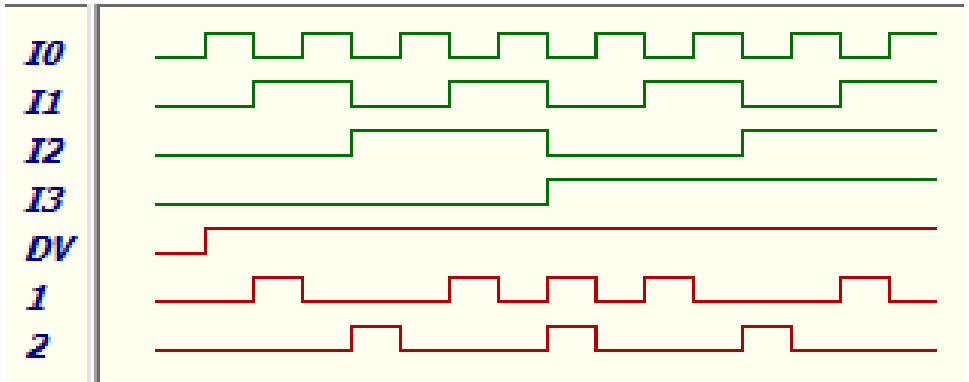
Codificador 2b

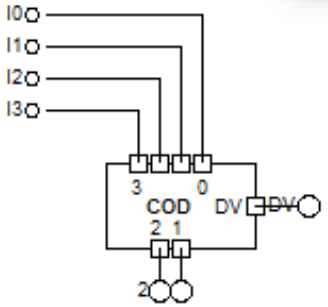
- Funcionalidade
  - Codificar um objeto
  - 4 objetos -> código 2 bits
  - DV – dados válidos
- Tabela de Verdade
- Expressão lógica
- Logigrama
- Macro de alta utilização!
- Teste





I0	I1	I2	I3	O1	O2	DV
1	X	X	X	0	0	1
0	1	X	X	1	0	1
0	0	1	X	0	1	1
0	0	0	1	1	1	1
0	0	0	0	0	0	0





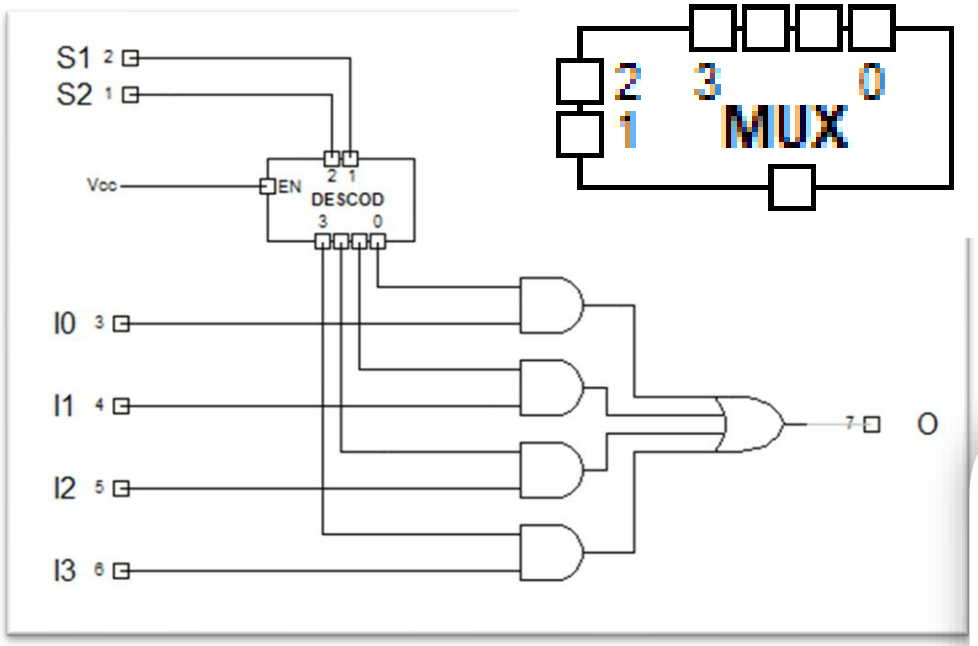
$$O_1 = (I_1 + I_3\overline{I_2})\overline{I_0}$$

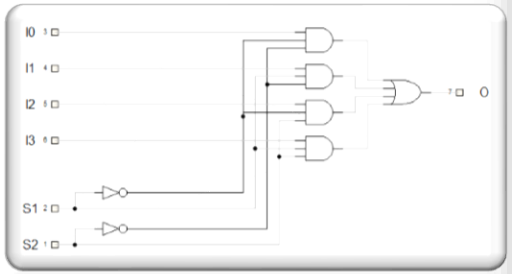
$$O_2 = (I_2 + I_3)\overline{I_0}\,\overline{I_1}$$

$$DV = I_0 + I_1 + I_2 + I_3$$

Multiplexer 1b2s

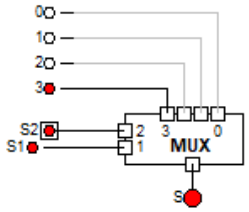
- Funcionalidade
  - Selecionar uma das variáveis
  - Significado 1b2s:
    - variáveis de 1bit
    - 2 variáveis de seleção
- Tabela de Verdade
- Expressão lógica
- Logigrama
- Macro de alta utilização!
- Teste

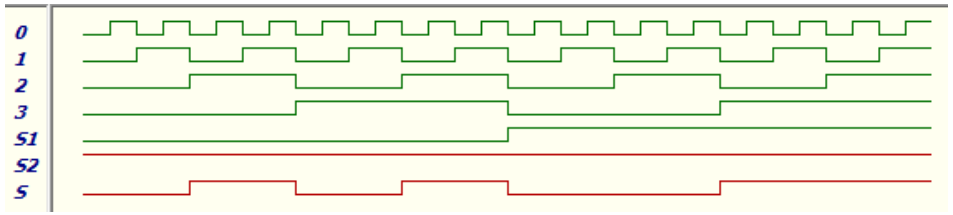


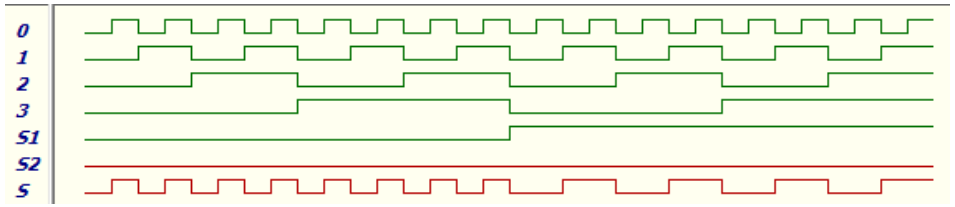


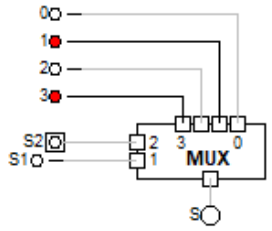
S1	S2	O
0	0	I0
1	0	I1
0	1	I2
1	1	I3

$$O = \overline{S_1}\,\overline{S_2} I_0 + S_1 \overline{S_2} I_1 + \overline{S_1} S_2 I_2 + S_1 S_2 I_3$$



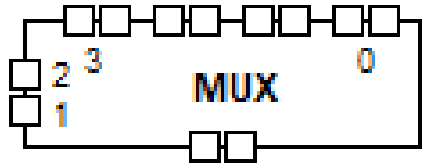


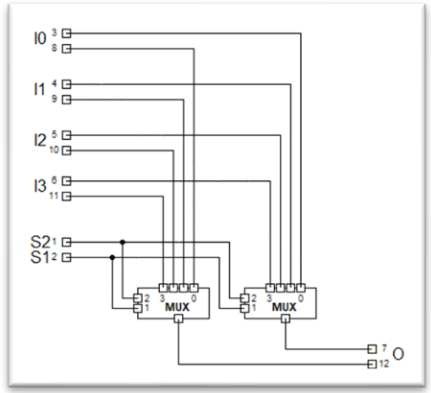


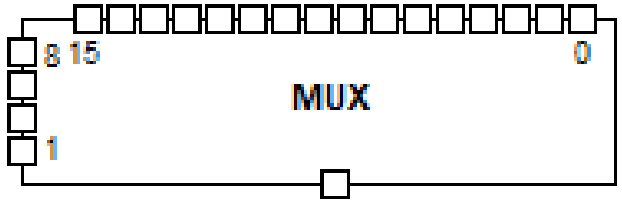


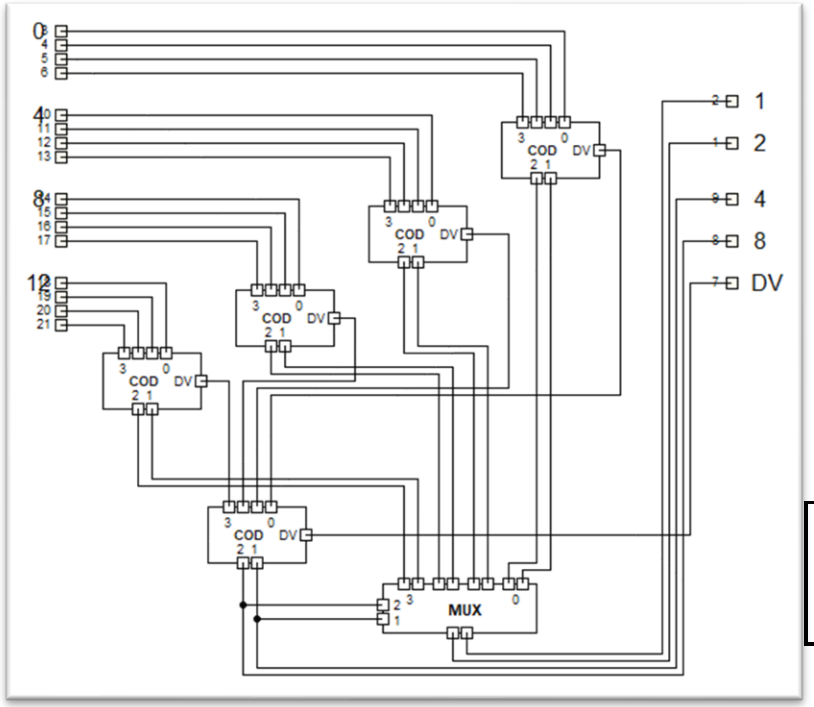
MUX 2b2s/1b4s + COD 4b

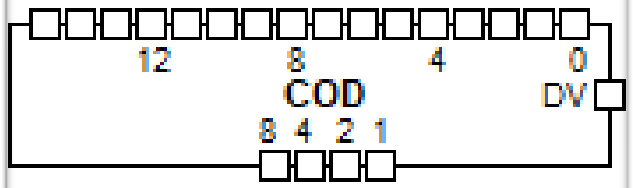
- Mais reutilização:
  - Multiplexer 2b2s (MUX 1b2s)
  - Multiplexer 1b4s (MUX 1b2s)
  - Codificador 4b (COD 2b + MUX 2b2s)

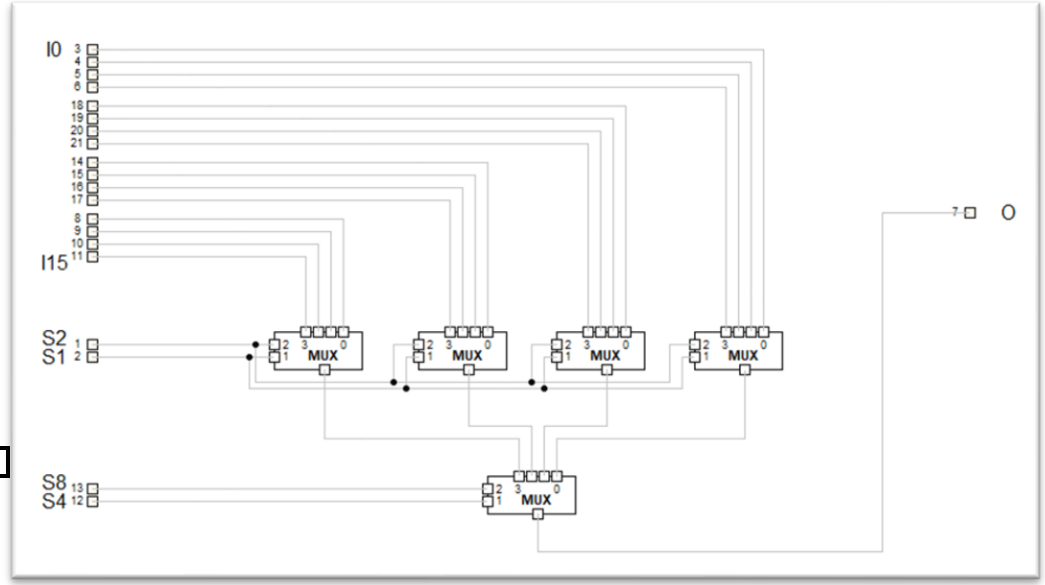












Recursos utilizados

- Microsoft Power Point
- Clipchamp, voz de síntese Fernanda
- Vimeo
- G. Arroz, J. Monteiro, A. Oliveira (2020). Arquitectura de Computadores: dos Sistemas Digitais aos Microprocessadores (5ª edição). IST Press