

# Praktikum Rechnerstrukturen 01

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## 1.2c i

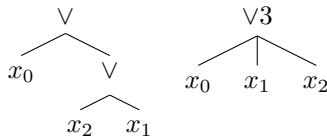
Gesucht:  $x_3 \wedge x_2 \wedge x_1 \wedge x_0$  (4AND)

$(x_3 \wedge x_2) \wedge (x_1 \wedge x_0)$  (Assoziativität)  
 $\Leftrightarrow x_3 \wedge x_2 \wedge (x_1 \wedge x_0)$  (Assoziativität)  
 $\Leftrightarrow x_3 \wedge x_2 \wedge x_1 \wedge x_0$

Gesucht:  $x_2 \wedge x_1 \wedge x_0$  (3AND)

$(x_2 \wedge x_1) \wedge x_0$  (Assoziativität)  
 $\Leftrightarrow x_2 \wedge x_1 \wedge x_0$

## 1.2c ii



Die Tiefe des Ausdrucks verändert sich nicht, da ein normaler Operatorbaum mit einem erweiterten Operatorbaum nicht verglichen werden kann.

### 1.2d

$$f: \mathbb{B}^4 \rightarrow \mathbb{B}^1$$

$$\begin{aligned} f(x_3, x_2, x_1, x_0) = \\ (\neg x_2 \wedge x_1 \wedge x_0) \vee (\neg x_3 \wedge x_1 \wedge x_0) \vee (\neg x_3 \wedge x_2 \wedge x_0) \vee (x_2 \wedge \neg x_1 \wedge x_0) \end{aligned}$$

### 1.2e

$$f: \mathbb{B}^4 \rightarrow \mathbb{B}^1$$

$$\begin{aligned} f(x_3, x_2, x_1, x_0) = \\ (\neg x_2 \wedge x_1 \wedge x_0) \vee (\neg x_3 \wedge x_1 \wedge x_0) \vee (\neg x_3 \wedge x_2 \wedge x_0) \vee (x_2 \wedge \neg x_1 \wedge x_0) \\ \vee (\neg x_3 \wedge \neg x_2 \wedge x_1 \wedge \neg x_0) \end{aligned}$$

### 1.3

Beschreibung der Funktion:

Ein Volladdierer, aufgebaut aus zwei Halbaddierern.

1.4a i

| $x_3$ | $x_2$ | $x_1$ | $x_0$ | $y$ |
|-------|-------|-------|-------|-----|
| 0     | 0     | 0     | 0     | 0   |
| 0     | 0     | 0     | 1     | 0   |
| 0     | 0     | 1     | 0     | 0   |
| 0     | 0     | 1     | 1     | 1   |
| 0     | 1     | 0     | 0     | 0   |
| 0     | 1     | 0     | 1     | 1   |
| 0     | 1     | 1     | 0     | 1   |
| 0     | 1     | 1     | 1     | 0   |
| 1     | 0     | 0     | 0     | 0   |
| 1     | 0     | 0     | 1     | 1   |
| 1     | 0     | 1     | 0     | 1   |
| 1     | 0     | 1     | 1     | 0   |
| 1     | 1     | 0     | 0     | 1   |
| 1     | 1     | 0     | 1     | 0   |
| 1     | 1     | 1     | 0     | 0   |
| 1     | 1     | 1     | 1     | 0   |

1.4a ii

$$f: \mathbb{B}^4 \rightarrow \mathbb{B}^1$$

$$f(x_3, x_2, x_1, x_0) = (x_3 \wedge x_2 \wedge \overline{x_1} \wedge \overline{x_0}) \vee (x_3 \wedge \overline{x_2} \wedge x_1 \wedge \overline{x_0}) \vee (x_3 \wedge \overline{x_2} \wedge \overline{x_1} \wedge x_0) \vee (\overline{x_3} \wedge x_2 \wedge x_1 \wedge \overline{x_0}) \vee (\overline{x_3} \wedge x_2 \wedge \overline{x_1} \wedge x_0) \vee (x_3 \wedge \overline{x_2} \wedge x_1 \wedge x_0)$$

The diagram illustrates the construction of a 4x4 matrix  $K$  from a 2x2 matrix  $V$ . The matrix  $V$  is shown as a 2x2 grid of blocks, each of size 2x2. The blocks are labeled 0, 1, 5, and 4. The matrix  $K$  is shown as a 4x4 grid of blocks, each of size 2x2. The blocks are labeled 0, 1, 5, and 4. The matrix  $K$  is constructed by interleaving the blocks of  $V$ . The diagram shows the mapping from  $V$  to  $K$ , with labels  $x_0$ ,  $x_1$ ,  $x_2$ , and  $x_3$  indicating the dimensions of the blocks.