

Praktikum Rechnerstrukturen 01

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1.2c i

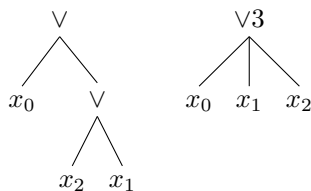
Gesucht: $x_3 \wedge x_2 \wedge x_1 \wedge x_0$ (4AND)

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

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

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

The diagram shows a 4x4 grid of squares. The top-left square is labeled KV . Above the grid, there are two horizontal dimension lines: one labeled x_1 spanning the width of the top two squares, and another labeled x_0 spanning the width of the top four squares. To the left of the grid, there are two vertical dimension lines: one labeled x_2 spanning the height of the top two rows, and another labeled x_3 spanning the height of the entire grid. The grid cells are labeled with numbers in their corners: the top row has 0 (top-left), 0 (top-right), 1 (bottom-left), and 0 (bottom-right); the second row has 0 (top-left), 1 (top-right), 0 (bottom-left), and 1 (bottom-right); the third row has 1 (top-left), 0 (top-right), 0 (bottom-left), and 0 (bottom-right); the bottom row has 0 (top-left), 1 (top-right), 0 (bottom-left), and 1 (bottom-right). Additionally, there are small numbers in the corners of the grid: 0 (top-left), 1 (top-right), 5 (bottom-left), and 4 (bottom-right) for the top row; 2 (top-left), 3 (top-right), 7 (bottom-left), and 6 (bottom-right) for the second row; 10 (top-left), 11 (top-right), 15 (bottom-left), and 14 (bottom-right) for the third row; and 8 (top-left), 9 (top-right), 13 (bottom-left), and 12 (bottom-right) for the bottom row.

Aus diesem Diagramm lässt sich ablesen, dass eine Minimierung nicht möglich ist.

1.4a iii

1.4d

Bei der Verwendung von zweier Ungattern anstatt vierer Undgatter ist es möglich sich doppelt vorkommende Gatter zu sparen z.B. kommt der Teiltherm $\overline{x_3} \wedge \overline{x_2}$ zweimal in der Booleschen Formel vor, somit braucht man den Therm nur einmal in der Schaltung implimentieren.

