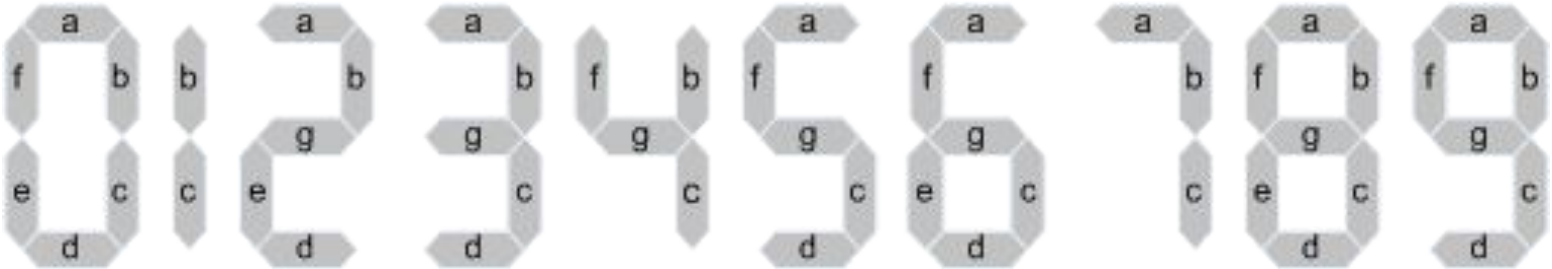
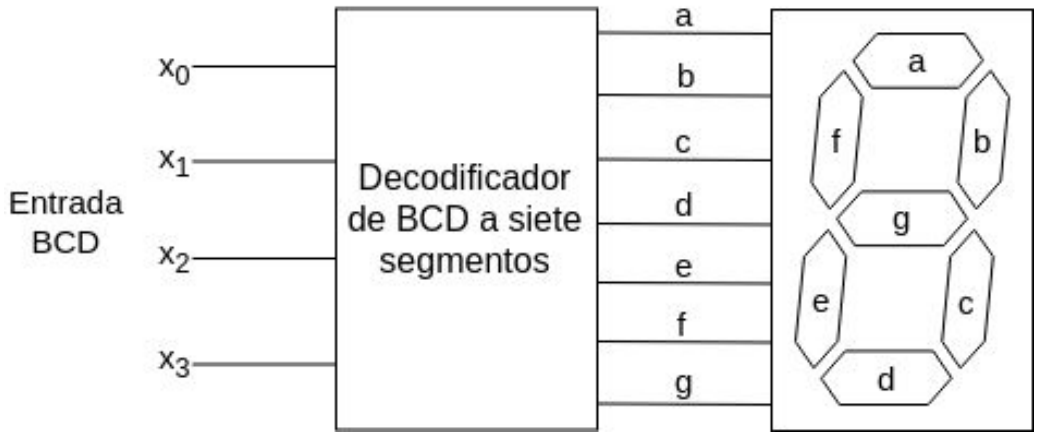
Auxiliar 1:
Logisim - Mapas de Karnaugh

CC4301 - Arquitectura de Computadores
Profesor: Luis Mateu
Auxiliar: José Astorga
20 Marzo 2020

P1: Conversor BCD a Display de 7 Segmentos

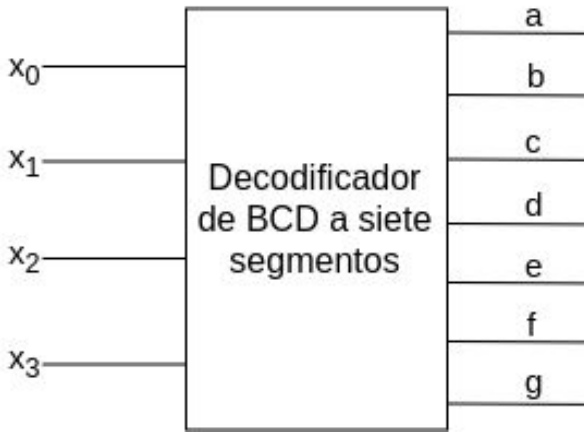


P1: Conversor BCD a Display de 7 Segmentos

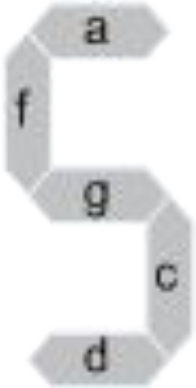


- 4 Entradas: x3, x2, x1, x0
- 7 Salidas: a, b, c, d, e, f, g, h

$x_3x_2x_1x_0$
0101



1
0
1
1
0
1
1



Pasos a Seguir

1. Construir tabla de verdad del decodificador
2. Mapa de Karnaugh para cada salida
3. Obtener fórmula para cada salida
4. Crear circuito en logisim

n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0							
1	0	0	0	1							
2	0	0	1	0							
3	0	0	1	1							
4	0	1	0	0							
5	0	1	0	1							
6	0	1	1	0							
7	0	1	1	1							
8	1	0	0	0							
9	1	0	0	1							
-	1	0	1	0							
-	1	0	1	1							
-	1	1	0	0							
-	1	1	0	1							
-	1	1	1	0							
-	1	1	1	1							

Lo haremos para el segmento d

n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0							
1	0	0	0	1							
2	0	0	1	0							
3	0	0	1	1							
4	0	1	0	0							
5	0	1	0	1							
6	0	1	1	0							
7	0	1	1	1							
8	1	0	0	0							
9	1	0	0	1							
-	1	0	1	0							
-	1	0	1	1							
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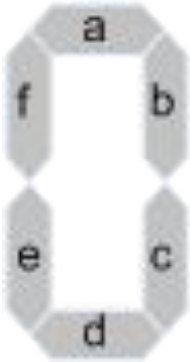
-	1	1	0	1							
-	1	1	1	0							
-	1	1	1	1							



n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0				1			
1	0	0	0	1							
2	0	0	1	0							
3	0	0	1	1							
4	0	1	0	0							
5	0	1	0	1							
6	0	1	1	0							
7	0	1	1	1							
8	1	0	0	0							
9	1	0	0	1							
-	1	0	1	0							
-	1	0	1	1							
-	1	1	0	0							
-	1	1	0	1							
-	1	1	1	0							
-	1	1	1	1							

n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0				1			
1	0	0	0	1				0			
2	0	0	1	0							
3	0	0	1	1							
4	0	1	0	0							
5	0	1	0	1							
6	0	1	1	0							
7	0	1	1	1							
8	1	0	0	0							
9	1	0	0	1							
-	1	0	1	0							
-	1	0	1	1							
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-	1	1	0	1							
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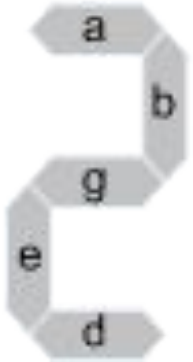

n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0				1			
1	0	0	0	1				0			
2	0	0	1	0				1			
3	0	0	1	1							
4	0	1	0	0							
5	0	1	0	1							
6	0	1	1	0							
7	0	1	1	1							
8	1	0	0	0							
9	1	0	0	1							
-	1	0	1	0							
-	1	0	1	1							
-	1	1	0	0							
-	1	1	0	1							
-	1	1	1	0							
-	1	1	1	1							

n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0				1			
1	0	0	0	1				0			
2	0	0	1	0				1			
3	0	0	1	1				1			
4	0	1	0	0							
5	0	1	0	1							
6	0	1	1	0							
7	0	1	1	1							
8	1	0	0	0							
9	1	0	0	1							
-	1	0	1	0							
-	1	0	1	1							
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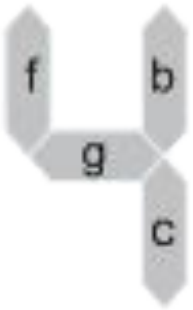

n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0				1			
1	0	0	0	1				0			
2	0	0	1	0				1			
3	0	0	1	1				1			
4	0	1	0	0				0			
5	0	1	0	1							
6	0	1	1	0							
7	0	1	1	1							
8	1	0	0	0							
9	1	0	0	1							
-	1	0	1	0							
-	1	0	1	1							
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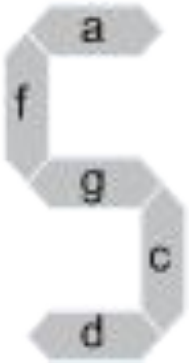
-	1	1	0	1							
-	1	1	1	0							
-	1	1	1	1							



n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0				1			
1	0	0	0	1				0			
2	0	0	1	0				1			
3	0	0	1	1				1			
4	0	1	0	0				0			
5	0	1	0	1				1			
6	0	1	1	0							
7	0	1	1	1							
8	1	0	0	0							
9	1	0	0	1							
-	1	0	1	0							
-	1	0	1	1							
-	1	1	0	0							
-	1	1	0	1							
-	1	1	1	0							
-	1	1	1	1							

n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0				1			
1	0	0	0	1				0			
2	0	0	1	0				1			
3	0	0	1	1				1			
4	0	1	0	0				0			
5	0	1	0	1				1			
6	0	1	1	0				1			
7	0	1	1	1							
8	1	0	0	0							
9	1	0	0	1							
-	1	0	1	0							
-	1	0	1	1							
-	1	1	0	0							
-	1	1	0	1							
-	1	1	1	0							
-	1	1	1	1							

n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0				1			
1	0	0	0	1				0			
2	0	0	1	0				1			
3	0	0	1	1				1			
4	0	1	0	0				0			
5	0	1	0	1				1			
6	0	1	1	0				1			
7	0	1	1	1				0			
8	1	0	0	0							
9	1	0	0	1							
-	1	0	1	0							
-	1	0	1	1							
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-	1	1	0	1							
-	1	1	1	0							
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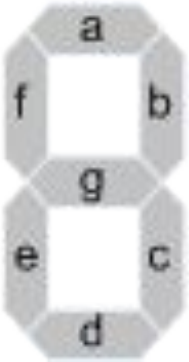
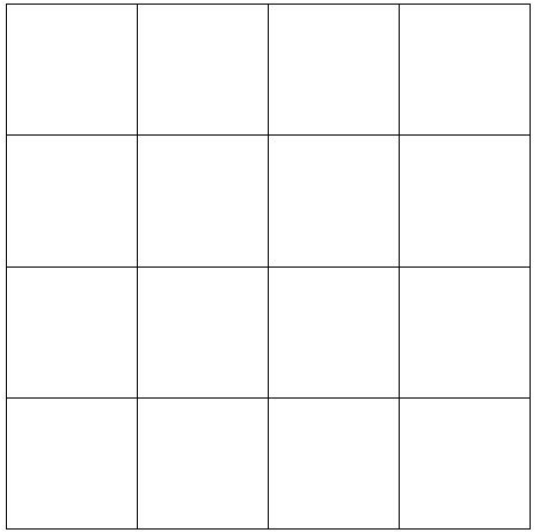


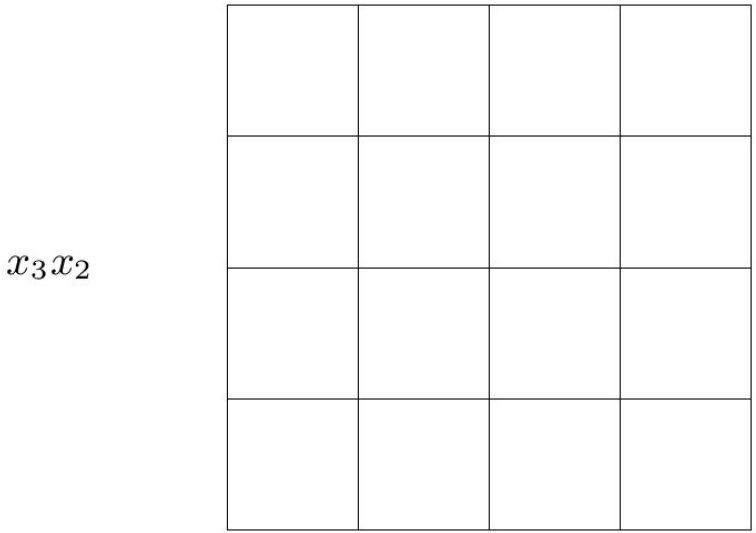
n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0				1			
1	0	0	0	1				0			
2	0	0	1	0				1			
3	0	0	1	1				1			
4	0	1	0	0				0			
5	0	1	0	1				1			
6	0	1	1	0				1			
7	0	1	1	1				0			
8	1	0	0	0				1			
9	1	0	0	1							
-	1	0	1	0							
-	1	0	1	1							
-	1	1	0	0							
-	1	1	0	1							
-	1	1	1	0							
-	1	1	1	1							

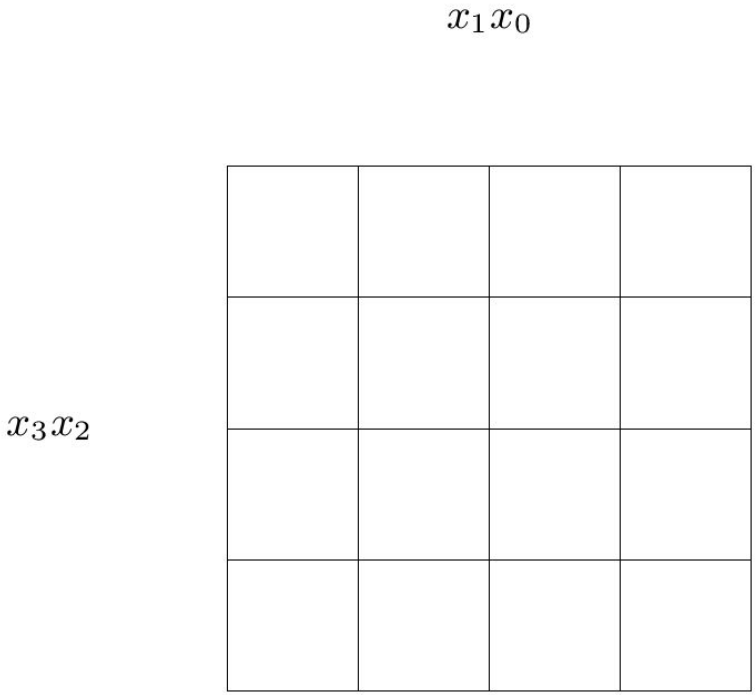
n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0				1			
1	0	0	0	1				0			
2	0	0	1	0				1			
3	0	0	1	1				1			
4	0	1	0	0				0			
5	0	1	0	1				1			
6	0	1	1	0				1			
7	0	1	1	1				0			
8	1	0	0	0				1			
9	1	0	0	1				1			
-	1	0	1	0							
-	1	0	1	1							
-	1	1	0	0							
-	1	1	0	1							
-	1	1	1	0							
-	1	1	1	1							

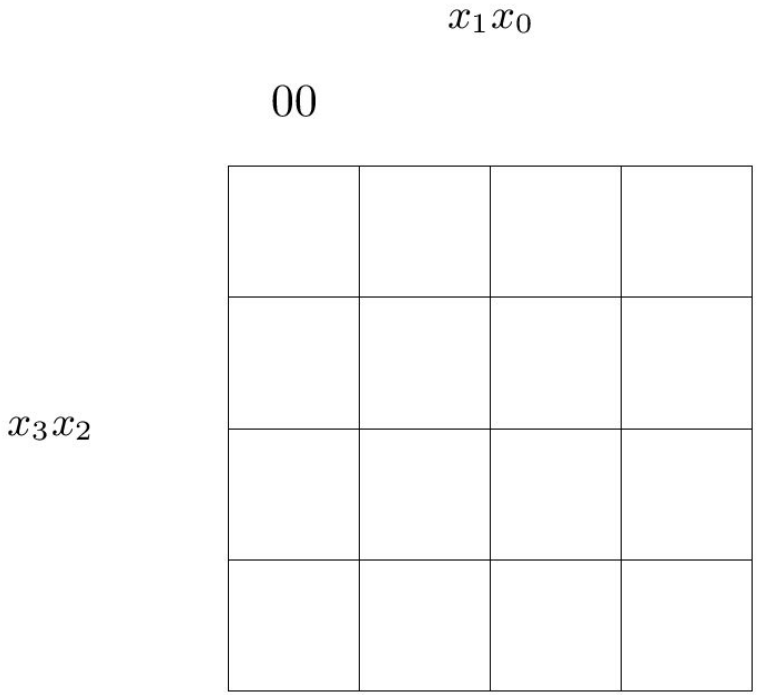
n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0				1			
1	0	0	0	1				0			
2	0	0	1	0				1			
3	0	0	1	1				1			
4	0	1	0	0				0			
5	0	1	0	1				1			
6	0	1	1	0				1			
7	0	1	1	1				0			
8	1	0	0	0				1			
9	1	0	0	1				1			
-	1	0	1	0				X			
-	1	0	1	1				X			
-	1	1	0	0				X			
-	1	1	0	1				X			
-	1	1	1	0				X			
-	1	1	1	1				X			

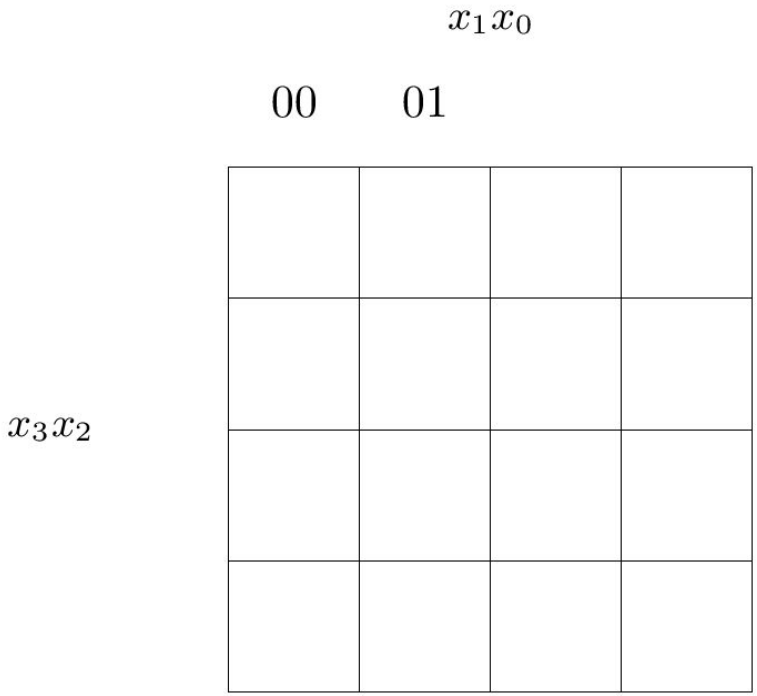
n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0	1	1	1	1	1	1	0
1	0	0	0	1	0	1	1	0	0	0	0
2	0	0	1	0	1	1	0	1	1	0	1
3	0	0	1	1	1	1	1	1	0	0	1
4	0	1	0	0	0	1	1	0	0	1	1
5	0	1	0	1	1	0	1	1	0	1	1
6	0	1	1	0	0	0	1	1	1	1	1
7	0	1	1	1	1	1	1	0	0	0	0
8	1	0	0	0	1	1	1	1	1	1	1
9	1	0	0	1	1	1	1	1	0	1	1
-	1	0	1	0	X	X	X	X	X	X	X
-	1	0	1	1	X	X	X	X	X	X	X
-	1	1	0	0	X	X	X	X	X	X	X
-	1	1	0	1	X	X	X	X	X	X	X
-	1	1	1	0	X	X	X	X	X	X	X
-	1	1	1	1	X	X	X	X	X	X	X

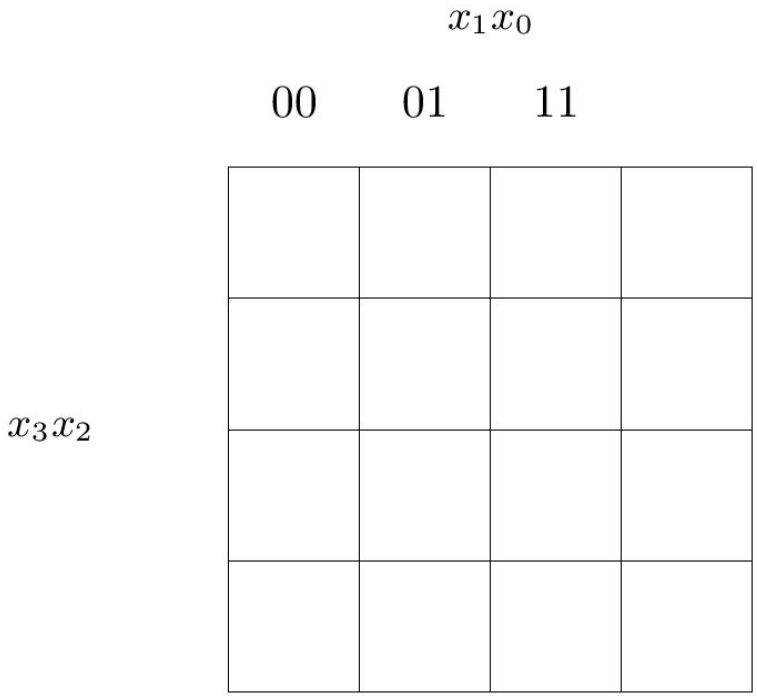


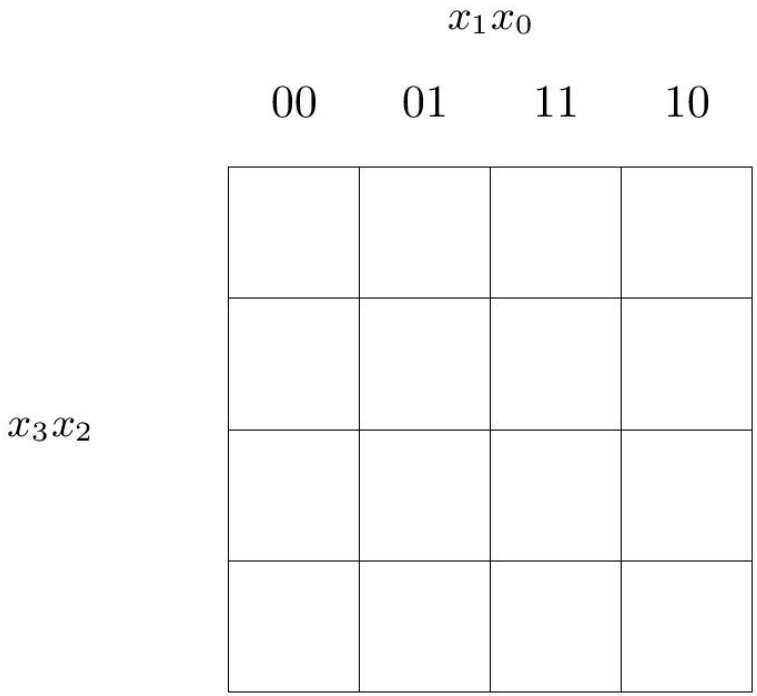

$x_3 x_2$

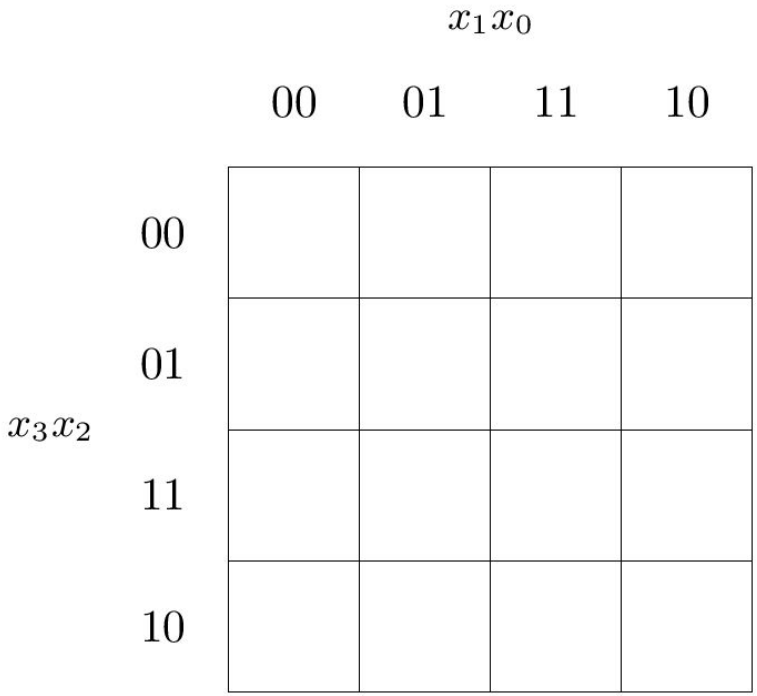

$x_1 x_0$
$x_3 x_2$


$x_1 x_0$
00
$x_3 x_2$

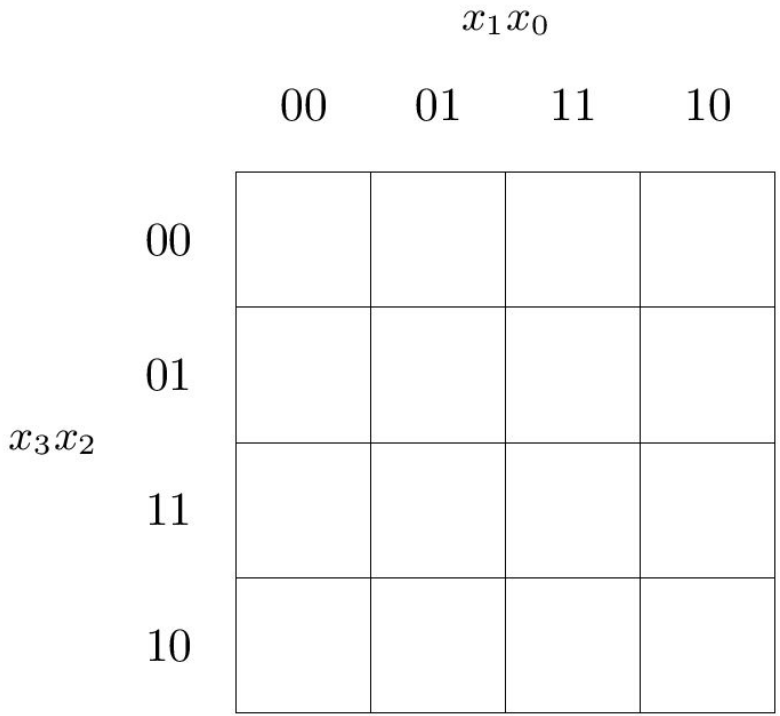

$x_1 x_0$
00
01
$x_3 x_2$


$x_1 x_0$
00
01
11
$x_3 x_2$


$x_1 x_0$
00
01
11
10
$x_3 x_2$


$x_1 x_0$
00
01
11
10
$x_3 x_2$
00
01
11
10

n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0				1			
1	0	0	0	1				0			
2	0	0	1	0				1			
3	0	0	1	1				1			
4	0	1	0	0				0			
5	0	1	0	1				1			
6	0	1	1	0				1			
7	0	1	1	1				0			
8	1	0	0	0				1			
9	1	0	0	1				1			
-	1	0	1	0				X			
-	1	0	1	1				X			
-	1	1	0	0				X			
-	1	1	0	1				X			
-	1	1	1	0				X			
-	1	1	1	1				X			



n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0				1			
1	0	0	0	1				0			
2	0	0	1	0				1			
3	0	0	1	1				1			
4	0	1	0	0				0			
5	0	1	0	1				1			
6	0	1	1	0				1			
7	0	1	1	1				0			
8	1	0	0	0				1			
9	1	0	0	1				1			
-	1	0	1	0				X			
-	1	0	1	1				X			
-	1	1	0	0				X			
-	1	1	0	1				X			
-	1	1	1	0				X			
-	1	1	1	1				X			

x_3x_2 \ x_1x_0	00	01	11	10
00	1		1	1
01		1		1
11				
10	1	1		

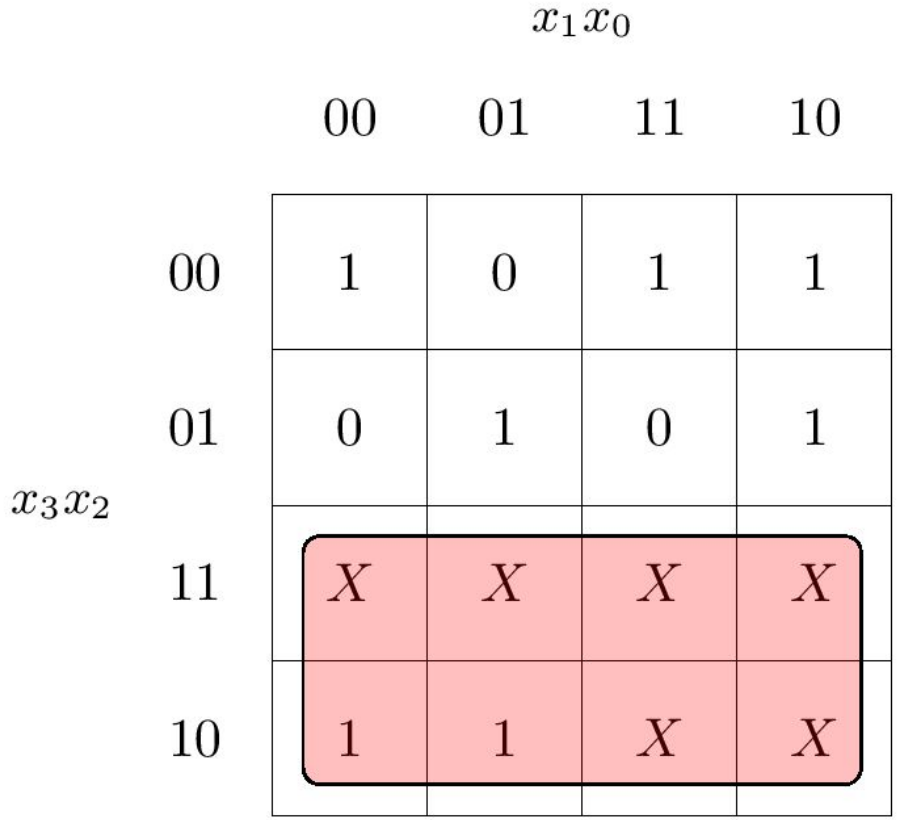
n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0				1			
1	0	0	0	1				0			
2	0	0	1	0				1			
3	0	0	1	1				1			
4	0	1	0	0				0			
5	0	1	0	1				1			
6	0	1	1	0				1			
7	0	1	1	1				0			
8	1	0	0	0				1			
9	1	0	0	1				1			
-	1	0	1	0				X			
-	1	0	1	1				X			
-	1	1	0	0				X			
-	1	1	0	1				X			
-	1	1	1	0				X			
-	1	1	1	1				X			

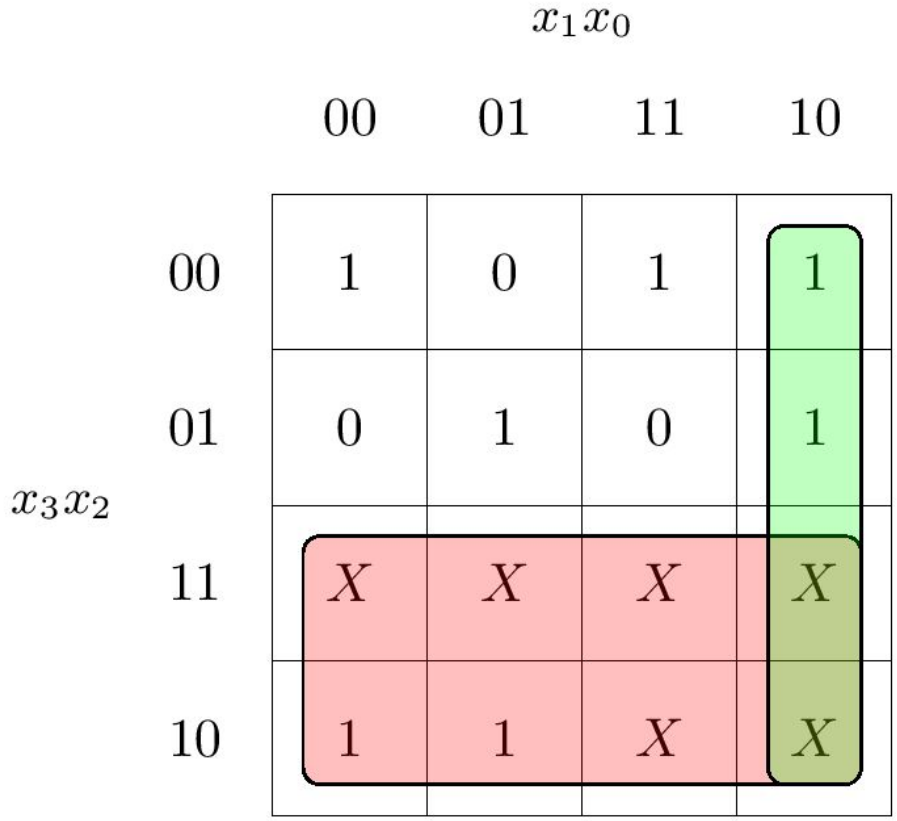
x_3x_2 \ x_1x_0	00	01	11	10
00	1	0	1	1
01	0	1	0	1
11				
10	1	1		

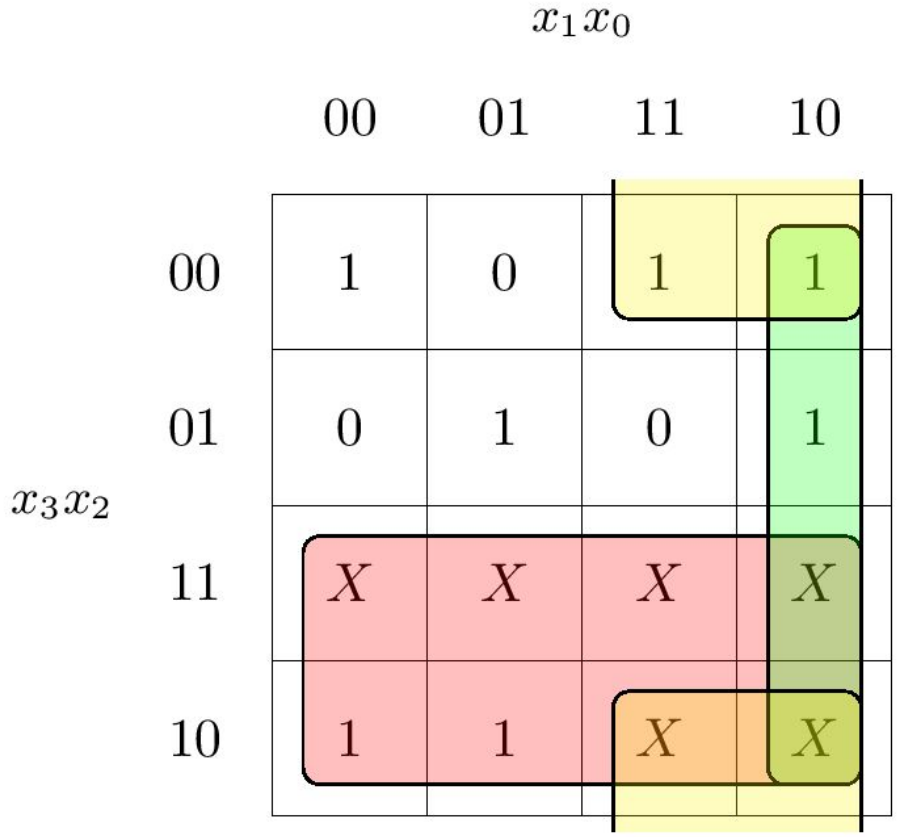
n	$x3$	$x2$	$x1$	$x0$	a	b	c	d	e	f	g
0	0	0	0	0				1			
1	0	0	0	1				0			
2	0	0	1	0				1			
3	0	0	1	1				1			
4	0	1	0	0				0			
5	0	1	0	1				1			
6	0	1	1	0				1			
7	0	1	1	1				0			
8	1	0	0	0				1			
9	1	0	0	1				1			
-	1	0	1	0				X			
-	1	0	1	1				X			
-	1	1	0	0				X			
-	1	1	0	1				X			
-	1	1	1	0				X			
-	1	1	1	1				X			

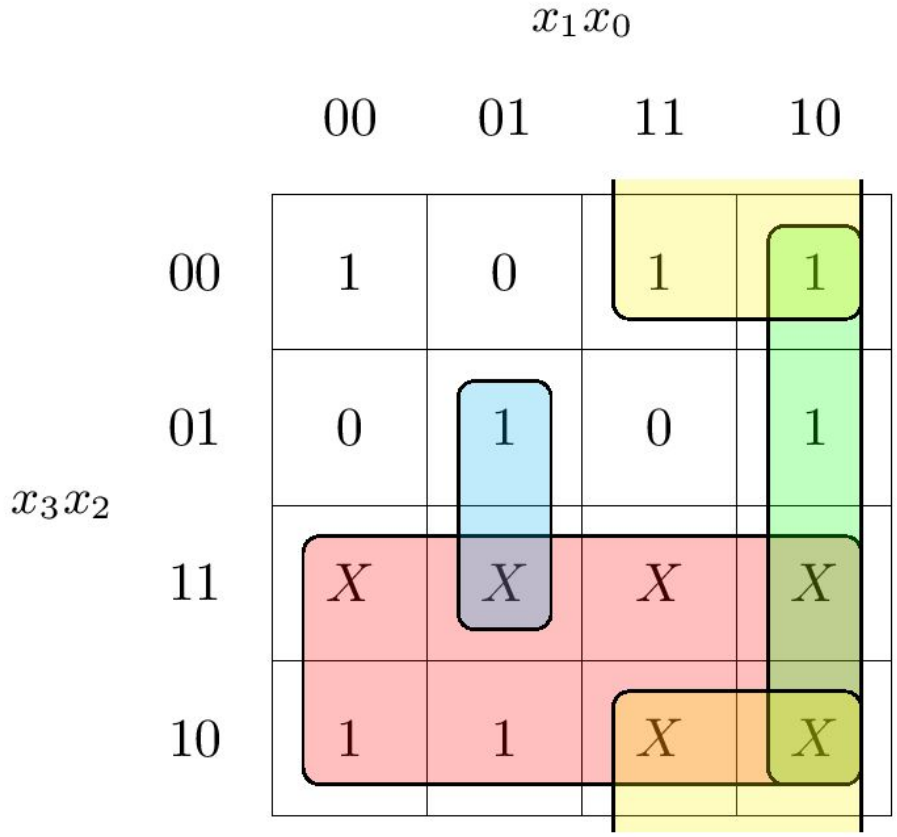
x_3x_2 \ x_1x_0	00	01	11	10
00	1	0	1	1
01	0	1	0	1
11	X	X	X	X
10	1	1	X	X

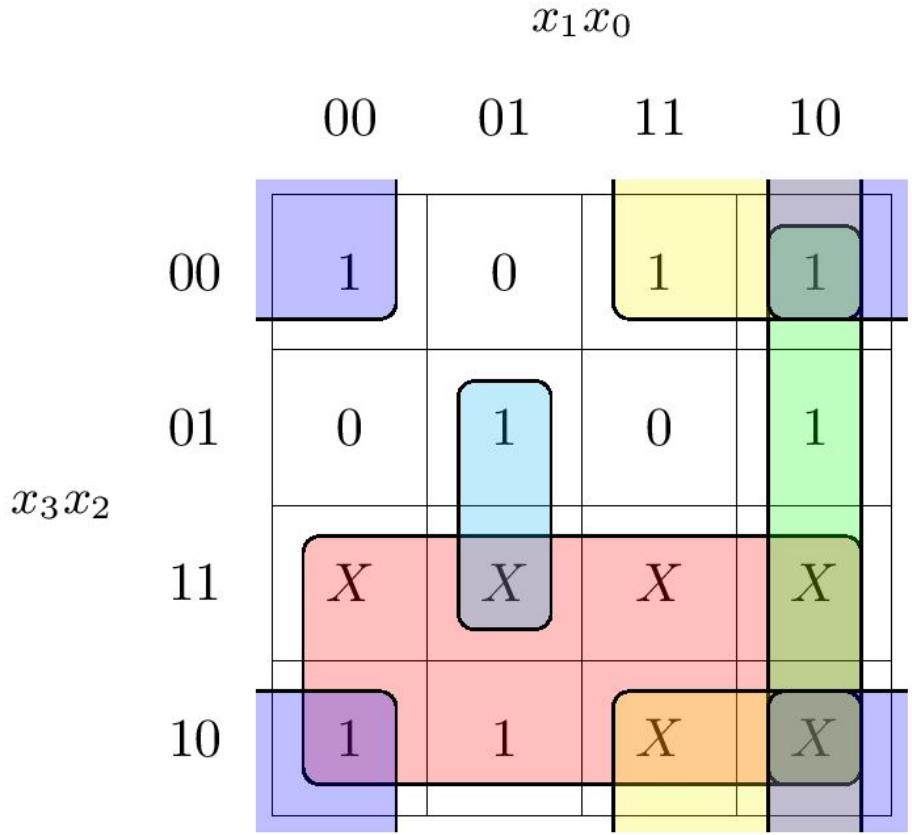
x_3x_2 \ x_1x_0	00	01	11	10
00	1	0	1	1
01	0	1	0	1
11	X	X	X	X
10	1	1	X	X

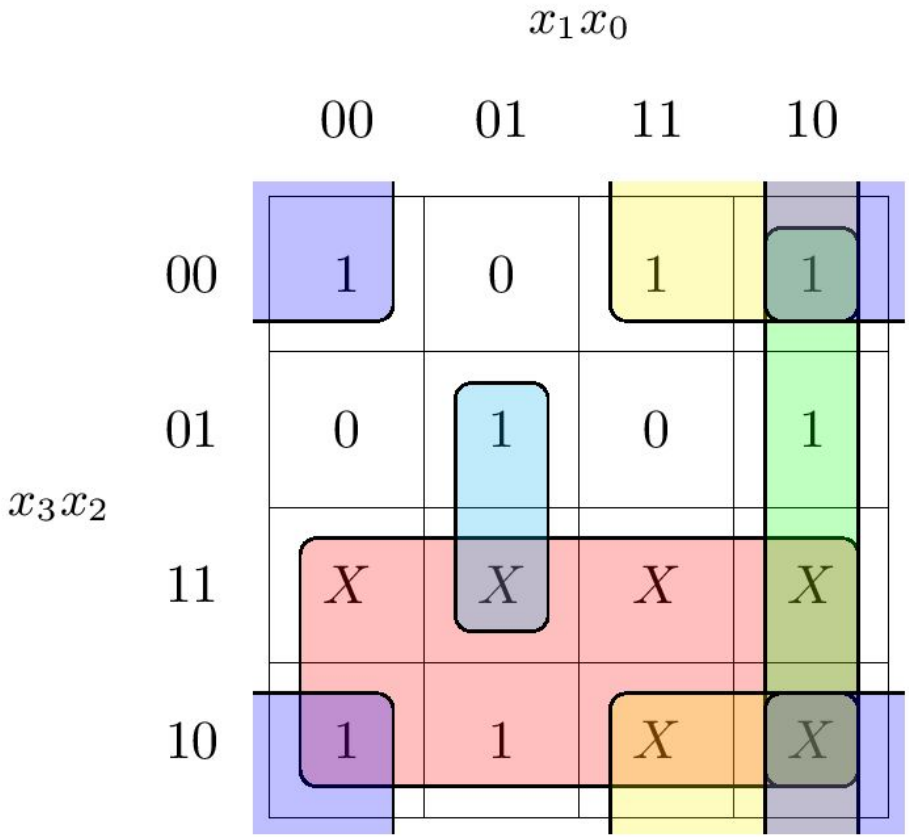

$x_1 x_0$
00
01
11
10
$x_3 x_2$
00
01
11
10
1
0
1
1
0
1
0
1
X
X
X
X
1
1
X
X


$x_1 x_0$
00
01
11
10
$x_3 x_2$
00
01
11
10
1
0
1
1
0
1
0
1
X
X
X
X
1
1
X
X

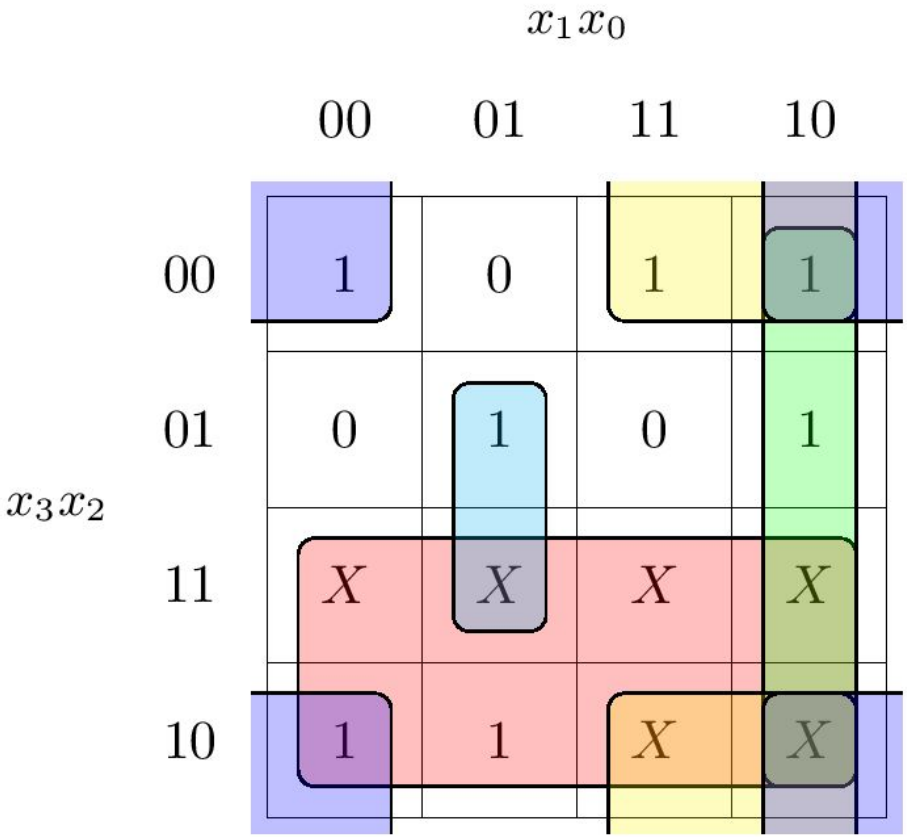

x_1x_0
00
01
11
10
x_3x_2
00
01
11
10
1
0
1
1
0
1
0
1
X
X
X
X
1
1
X
X


x_1x_0
00
01
11
10
x_3x_2
00
01
11
10
1
0
1
1
0
1
0
1
X
X
X
X
1
1
X
X

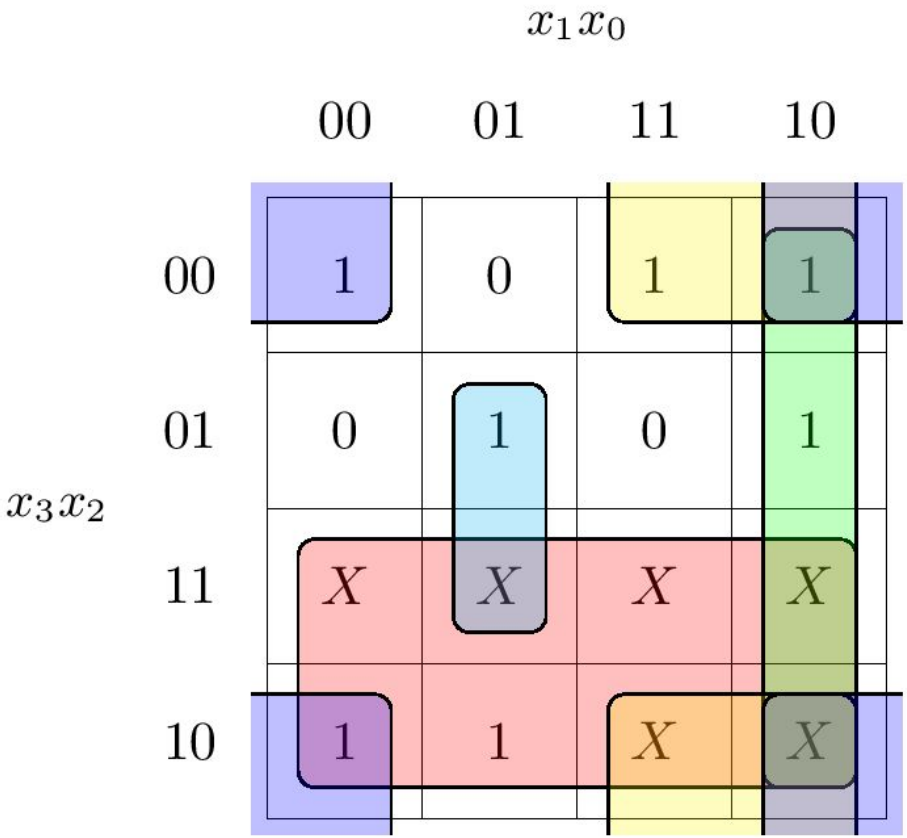

x_1x_0
00
01
11
10
x_3x_2
00
01
11
10
1
0
1
1
0
1
0
1
X
X
X
X
1
1
X
X



d =

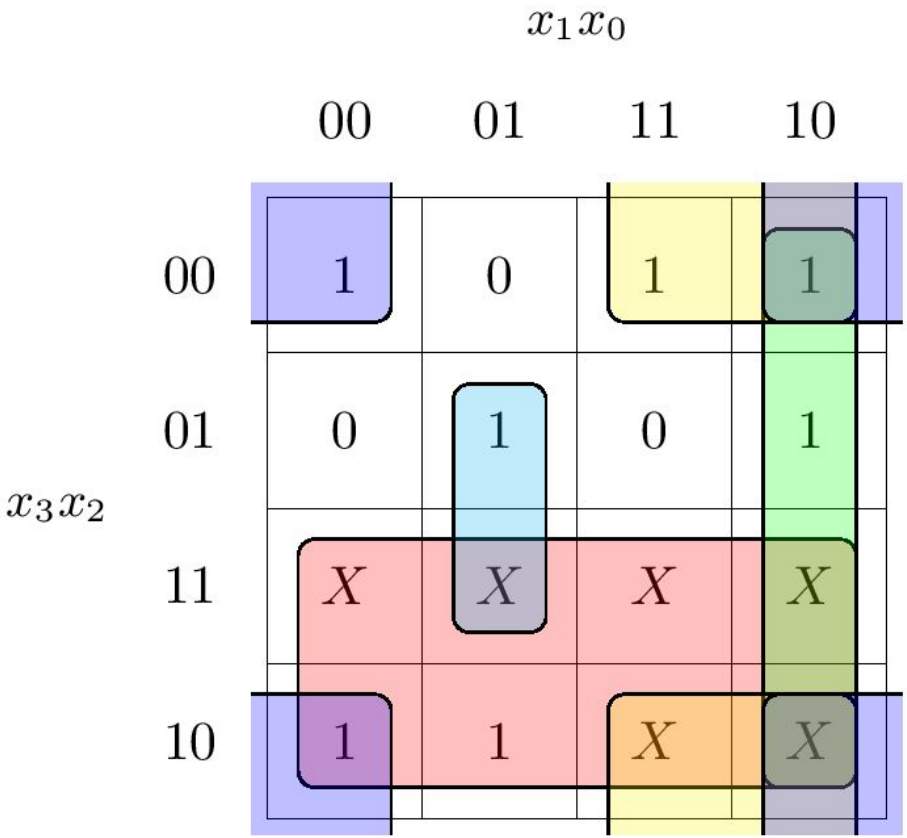


d = $x_2 \neg x_1 x_0 \vee$



d = $x_2 \neg x_1 x_0 \vee$

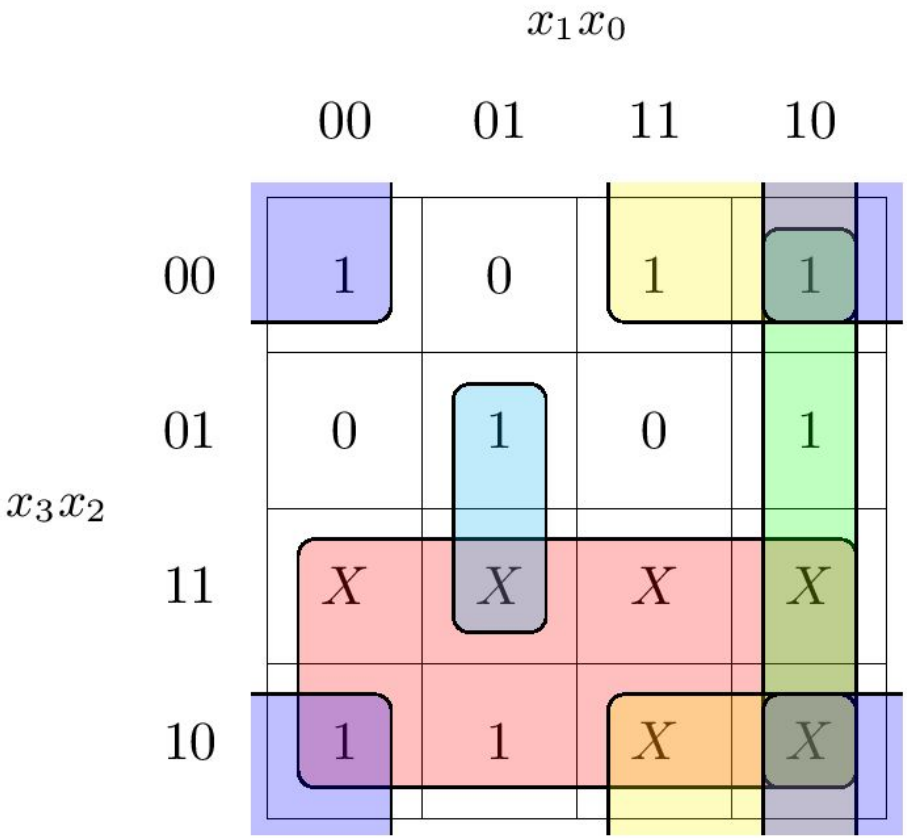
$\neg x_2 x_1 \vee$



d = $x_2 \neg x_1 x_0 \vee$

$\neg x_2 x_1 \vee$

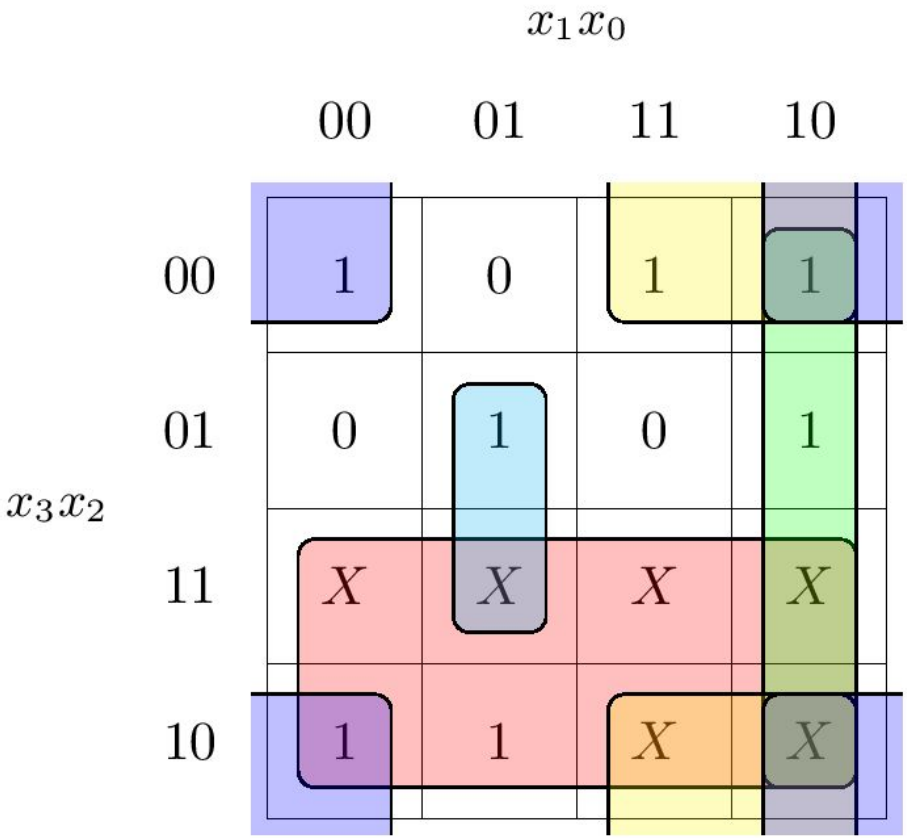
$x_1 \neg x_0$



d = $x_2 \neg x_1 x_0 \vee$

$\neg x_2 x_1 \vee$

$x_1 \neg x_0 \vee x_3$



d = $x_2 \neg x_1 x_0 \vee$

$\neg x_2 x_1 \vee$

$x_1 \neg x_0 \vee x_3 \vee$

$\neg x_2 \neg x_0$

Ahora en Logisim ...

P2: Mapa de Karnaugh 5 Variables

xy/zwv	000	001	011	010	110	111	101	100
00	0	0	0	0	0	0	0	0
01	0	1	0	0	0	0	1	0
11	0	0	0	1	1	1	1	0
10	0	0	0	1	1	1	1	0

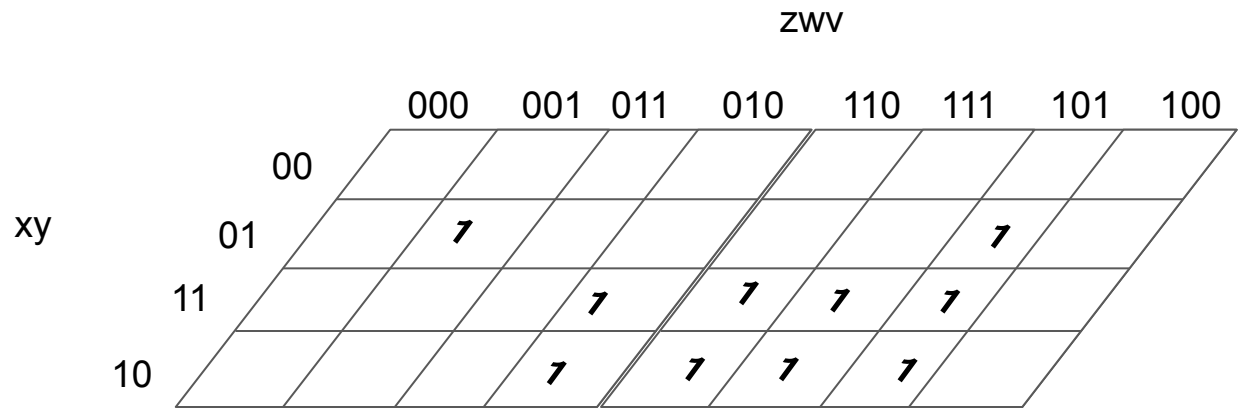
xy/zwv	00	01	11	10				
00	0	0	0	0	0	0	0	0
01	0	1	0	0	0	0	1	0
11	0	0	0	1	1	1	1	0
10	0	0	0	1	1	1	1	0

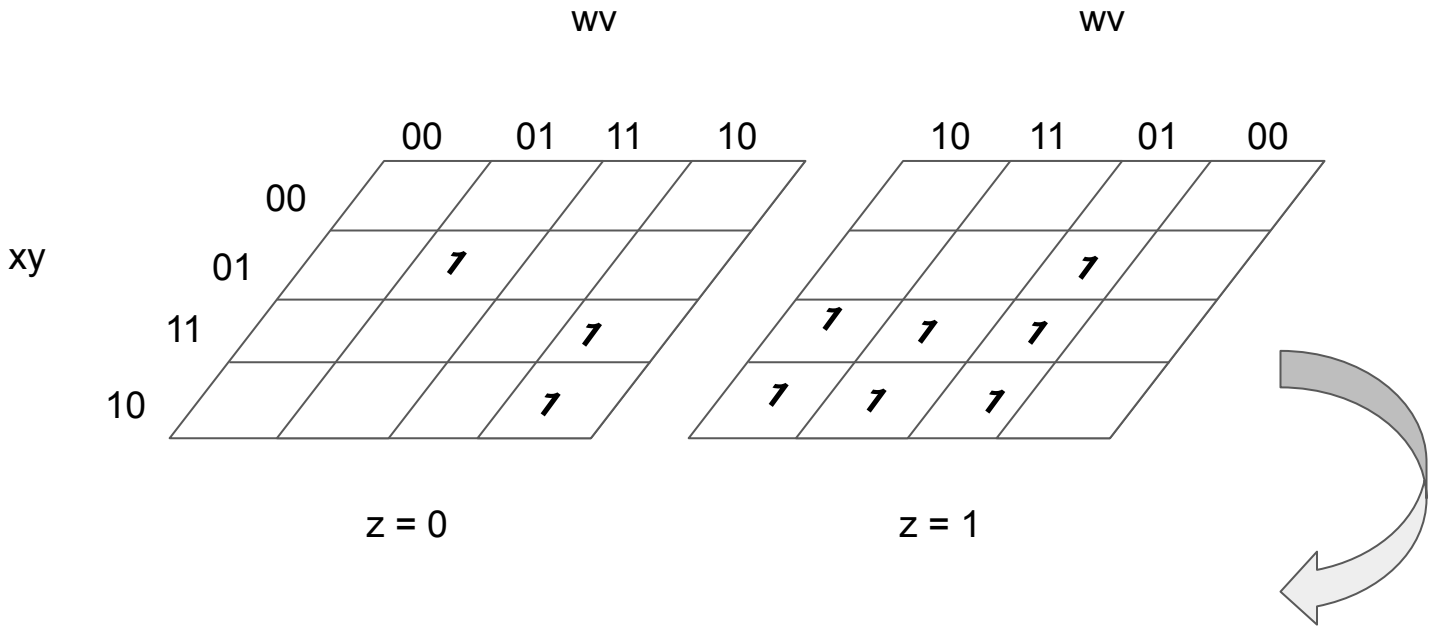
xy/zwv	00	01	11	10	10	11	01	00
00	0	0	0	0	0	0	0	0
01	0	1	0	0	0	0	1	0
11	0	0	0	1	1	1	1	0
10	0	0	0	1	1	1	1	0

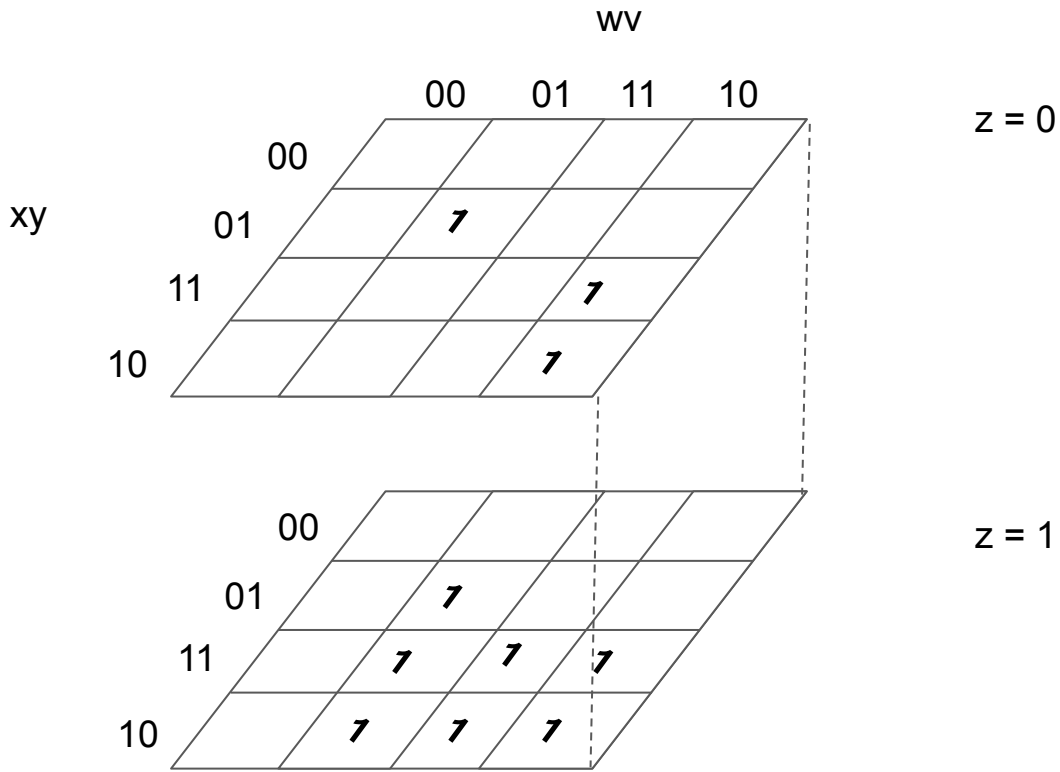
xy/zwv	000	001	011	010	10	11	01	00
00	0	0	0	0	0	0	0	0
01	0	1	0	0	0	0	1	0
11	0	0	0	1	1	1	1	0
10	0	0	0	1	1	1	1	0

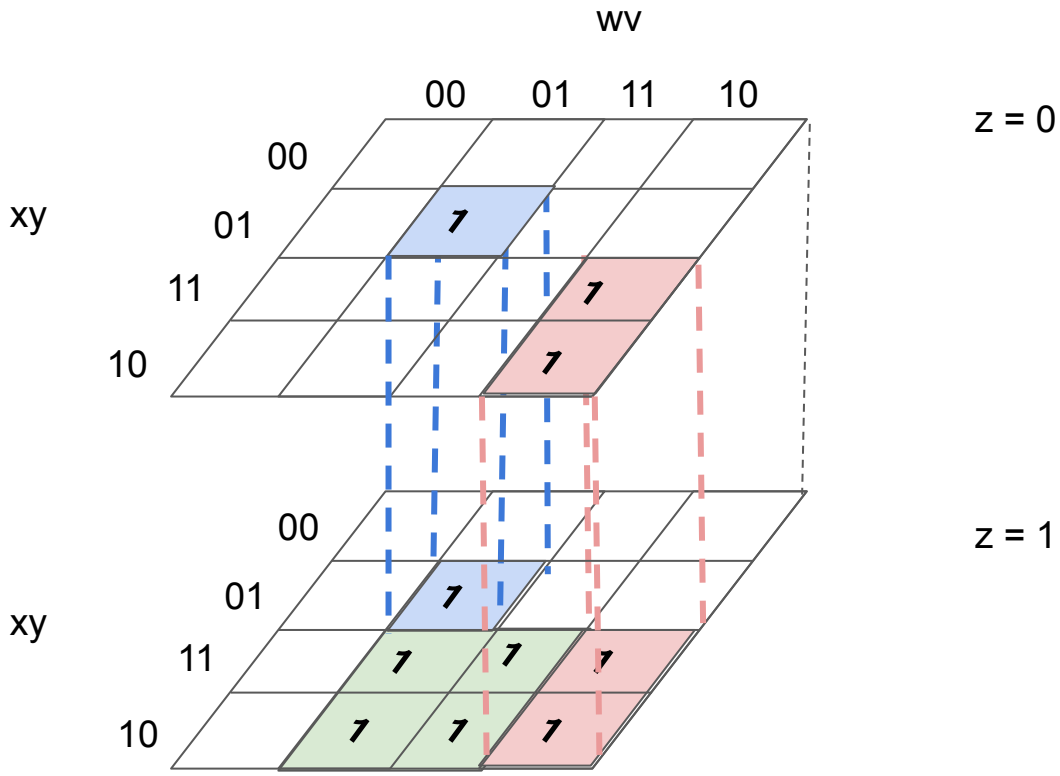
xy/zwv	000	001	011	010	110	111	101	100
00	0	0	0	0	0	0	0	0
01	0	1	0	0	0	0	1	0
11	0	0	0	1	1	1	1	0
10	0	0	0	1	1	1	1	0

xy/zwv	000	001	011	010	110	111	101	100
00	0	0	0	0	0	0	0	0
01	0	1	0	0	0	0	1	0
11	0	0	0	1	1	1	1	0
10	0	0	0	1	1	1	1	0


zwv
000
001
011
010
110
111
101
100
xy
00
01
11
10
1
1
1
1
1
1
1
1
1
1


wv
wv
00 01 11 10
10 11 01 00
xy
00
01
11
10
1
z = 0
z = 1


wv
00
01
11
10
xy
00
01
11
10
1
z = 0
z = 1


wv
00
01
11
10
xy
00
01
11
10
1
z = 0
xy
00
01
11
10
1
z = 1

P2: Mapa de Karnaugh 5 Variables

xy/zwv	000	001	011	010	110	111	101	100
00	0	0	0	0	0	0	0	0
01	0	1	0	0	0	0	1	0
11	0	0	0	1	1	1	1	0
10	0	0	0	1	1	1	1	0