BCD to GRAY CONVERSION

Navya Valmeekam

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Assignment No.1
Valmeekam Navya

Contents

Abstract

This manual explains BCD to GRAY code conversion by finding boolean equations.

1 BCD to GRAY Conversion

The BCD to GRAY code converter takes the numbers 0, 1, . . . , 9 in binary as inputs and generates the converted number as output. Make connections as shown in table 1. Gray code – also known as Cyclic Code, Reflected Binary Code (RBC), Reflected Binary (RB) or Grey code.

Problem : - Implement BCD to GRAY conversion

Connections :-

Arduino	2	3	4	5	6	7	8
Display	f	e	d	c	b	a	g

Table 1

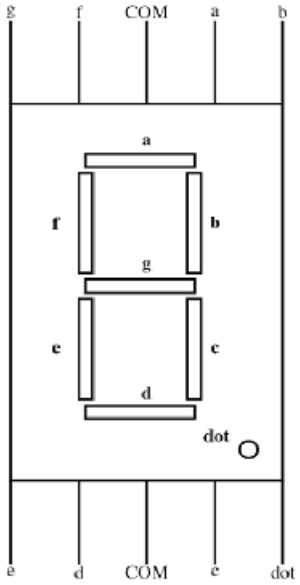


Figure 1

2 Karnaugh Map

Using Boolean logic or kmaps with dontcare conditions, G0, G1, G2, G3 in the truth table can be expressed in terms of the inputs A,B,C,D

AB \ CD	00	01	11	10
00	0	1	0	1
01	0	1	0	1
11	X	X	X	X
10	0	1	X	X

Kmap for G0

$$G0 = C'D + CD' \qquad (1)$$

AB \ CD	00	01	11	10
00	0	0	1	1
01	1	1	0	0
11	X	X	X	X
10	0	0	X	X

kmap for G1

$$G1 = B'C + BC' \qquad (2)$$

AB \ CD	00	01	11	10
00	0	0	0	0
01	1	1	1	1
11	X	X	X	X
10	1	1	X	X

kmap for G2

$$G2 = A + B \qquad (3)$$

AB \ cD	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	X	X	X	X
10	1	1	X	X

Kmap for G3

$$G3 = A \qquad (4)$$

Using Boolean logic or kmaps with dontcare conditions, a,b,c,d,e,f,g in the truth table can be expressed in terms of G0,G1,G2,G3 as:

$G0G1$ \ $G2G3$	00	01	11	10
00	0	X	0	1
01	0	X	X	0
11	1	X	X	1
10	1	X	0	0

Kmap for a

$$a = G0G1'G2' + G0'G1'G2G3' \quad (5)$$

$G0G1$ \ $G2G3$	00	01	11	10
00	0	X	1	0
01	0	X	X	1
11	0	X	X	0
10	0	X	0	1

Kmap for b

$$b = G0'G3 + G0'G1G2 + G0G1'G2G3' \quad (6)$$

$G0G1$ \ $G2G3$	00	01	11	10
00	0	X	1	0
01	1	X	X	0
11	0	X	X	0
10	0	X	0	0

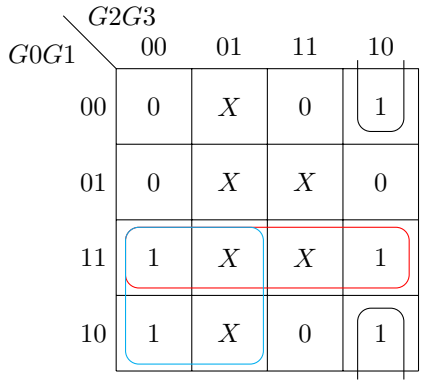
Kmap for c

$$c = G0'G3 + G0'G1G2' \quad (7)$$

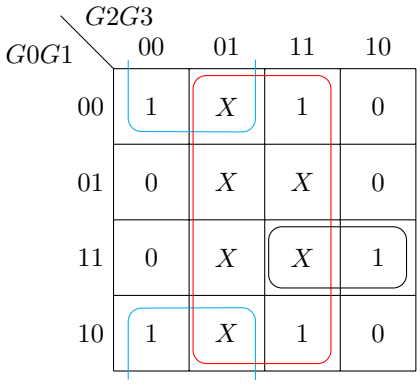
$G0G1$ \ $G2G3$	00	01	11	10
00	0	X	0	1
01	0	X	X	0
11	0	X	X	1
10	1	X	0	0

Kmap for d

$$d = G0G1'G2' + G0G1G2 + G0'G1'G2G3' \quad (8)$$



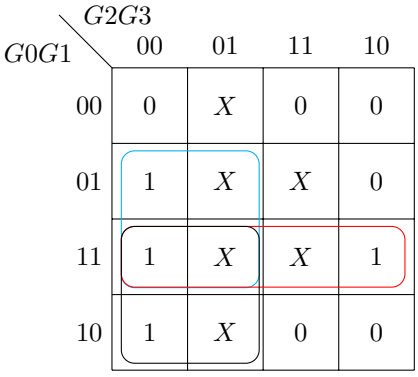
Kmap for e



Kmap for g

$$g = G3 + G1'G2' + G0G1G2 \quad (11)$$

$$e = G0G1 + G0G2' + G1'G2G3' \quad (9)$$



Kmap for f

$$f = G0G1 + G0G2' + G1G2' \quad (10)$$

Truth Table :-

A	B	C	D	G3	G2	G1	G0
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1
0	0	1	0	0	0	1	1
0	0	1	1	0	0	1	0
0	1	0	0	0	1	1	0
0	1	0	1	0	1	1	1
0	1	1	0	0	1	0	1
0	1	1	1	0	1	0	0
1	0	0	0	1	1	0	0
1	0	0	1	1	1	0	1
1	0	1	0	X	X	X	X
1	0	1	1	X	X	X	X
1	1	0	0	X	X	X	X
1	1	0	1	X	X	X	X
1	1	1	0	X	X	X	X
1	1	1	1	X	X	X	X

A	B	C	D	G3	G2	G1	G0	a	b	c	d	e	f	g
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	1	0	0	0	1	1	0	0	1	1	1	1
0	0	1	0	0	0	1	1	0	0	0	0	1	1	0
0	0	1	1	0	0	1	0	0	0	1	0	0	1	0
0	1	0	0	0	1	1	0	0	1	0	0	0	0	0
0	1	0	1	0	1	1	1	0	0	0	1	1	1	1
0	1	1	0	0	1	0	1	0	1	0	0	1	0	0
0	1	1	1	0	1	0	0	1	0	0	1	1	0	0
1	0	0	0	1	1	0	0	0	1	1	0	0	0	1
1	0	0	1	1	1	0	1	0	0	0	0	0	0	1
1	0	1	0	1	1	1	1	X	X	X	X	X	X	X
1	0	1	1	1	1	1	0	X	X	X	X	X	X	X
1	1	0	0	1	0	1	0	X	X	X	X	X	X	X
1	1	0	1	1	0	1	1	X	X	X	X	X	X	X
1	1	1	0	1	0	0	1	X	X	X	X	X	X	X
1	1	1	1	1	0	0	0	X	X	X	X	X	X	X

Make the connections and execute the following code. And verify the truth table.

https://github.com/NavyaValmeekam/FWC/blob/main/IDE-ASSIGNMENT-1/A1$_B CD-GRAY/src/main.cpp$