BCD to GRAY Conversion

Valmeekam Navya

FWC22039

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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.
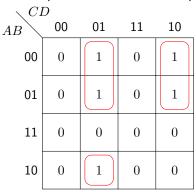
Problem : - Implement BCD to GRAY conversion

2   Implementation

Connections :-

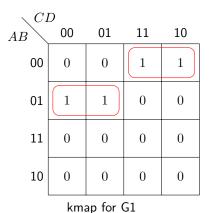| Arduino	2	3	4	5	6	7	8
Display	a	b	c	d	e	f	g

3   Karnaugh Map

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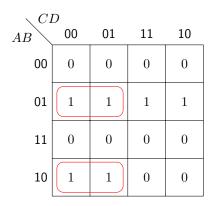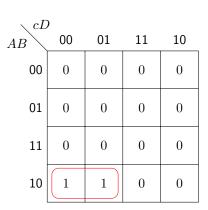

Kmap for G0

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

kmap for G1

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

kmap for G2

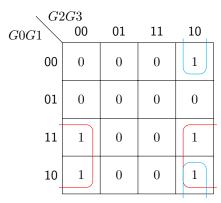$$G2 = A'B + AB'C' \qquad (3)$$

Kmap for G3

$$G3 = AB'C' \qquad (4)$$

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

$$a = G0'G1'G2G3' + G0G1'G2'G3' \qquad (5)$$
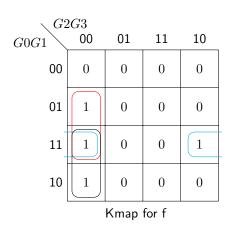
$$b = G0'G1'G2G3 + G0'G1G2G3' + G0G1'G2G3' \qquad (6)$$

$$c = G0'G1G2'G3' + G0'G1'G2G3 \qquad (7)$$

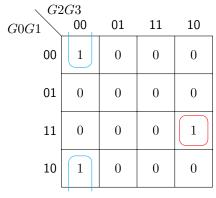$$d = G0'G1'G2G3' + G0G1G2G3' + G0G1'G2'G3' \qquad (8)$$

Kmap for e

$$e = G0G3' + G0G2G3' \qquad (9)$$

Kmap for f

$$f = G0G2'G3' + G1G2'G3' + G0G1G3' \qquad (10)$$

Kmap for g

$$g = G1'G2'G3' + G1'G2G3 + G0G1G2G3' \qquad (11)$$

3.1 The steps for implementation:

1. Connect the USB-UART pins to the Vaman ESP32 pins according to Table

VAMAN LC PINS	UART PINS
GND	GND
ENB	ENB
TXD0	RXD
RXD0	TXD
0	IO0
5V	5V

2. Flash the following setup code through USB-UART using laptop

https://github.com/NavyaValmeekam/FWC/tree/main/IOT/codes/setup/src/main.cpp

```
svn co https://github.com/NavyaValmeekam/FWC/
    tree/main/IOT/codes/setup
cd setup
pio run
pio run −t upload
```

after entering your wifi username and password (in quotes below)

```
#define STASSID "..." // Add your network
    credentials
#define STAPSK "..."
```

in src/main.cpp file

3. You can notice that vaman will be connnected to the network credentials provided above.Connect your laptop to the same network ,You should be able to find the ip address of your vaman-esp on laptop using

```
ifconfig
nmap −sn 192.168.6.1/24
```

where your computer's ip address is the output of ifconfig and given by 192.168.6.x

4. Login to termux-ubuntu on the android device and execute the following commands:

```
proot−distro login debian
cd /data/data/com.termux/files/home/
mkdir iot
svn co https://github.com/NavyaValmeekam/FWC/
    tree/main/IOT/codes/ota
cd codes
```

5. Assuming that the username is krishna and password is 123, flash the following code wirelessly

https://github.com/NavyaValmeekam/FWC/blob/main/IOT/codes/ota/src/main.cpp

through

```
pio run
pio run −t nobuild −t upload −−upload−port
    ip_addres_of_esp
```

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where you may replace the above ip address with the
ip address of your vaman-esp.

4 Truth Table

Verify the output using below truth table.

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	0	1	1	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