

Lab 2 Problem 2

February 20, 2017

7-Segment Display Truth Table

Digits	w	x	y	z	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	1	0	1	1	1	1	1
x	x	x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x	x	x

Encoder

w: 01234567

x: 4 + 5 + 6

y: 2 + 3 + 6

z: 1 + 3 + 5

Decoder

$$a = y + wz + (x \odot z)$$

$$b = (y \odot z) + x'$$

$$c = w' * (y + (x \oplus z))$$

$$d = (x \odot z) + y * (w'x' + z')$$

$$\begin{aligned}
e &= z' * (x' + y) \\
f &= y'z' + x * (y' + yz') + w \\
g &= w + xy' + y * (z' + w'x')
\end{aligned}$$

Activities to do

1) Identify the following design parameters –

a. Number of switches that will be required.

7 switches (cars 0 - 6)

b. Number of the bits/wires required in the data bus.

4 bits/wires for encoder output w, x, y, z

c. Size of the encoder and decoder.

Encoder size:

16 x 4 (only 7 are used for the input, therefore 9 are ignored)

Decoder size: 4 x 16

4 x 16 (only 7 are used for the output, therefore 9 are ignored)

4) Submit your design with a brief text explanation/description on how it will actually work. You must explain the working of your system to get full credit.

There are seven switches located at the left side of the logism project (Lab2_prob2.circ) labeled from car_0 to car_6. To enable the 7-segment display, the user must be in poke mode. Once the user is in poke mode, click on the individual switches. Each switch should correspond to a certain 7-segment display representation, for which the default is the value 0. Each button must be pressed individually in order for the output to be correct. If two or more switches equal to 1 at the same time, the results may be unexpected. If done correctly, the 7-segment display should output the correct values just on top-left corner of the logism project (Lab2_prob2.circ).