CSE100 Lab 1 – 7-Segment Display

Contents

1 Submission

- Due: Thursday 6/27/2024 end of lab section.
- Submit your files to Gradescope. (You have unlimited submittion attempts).
- Demonstrate your implementation to a TA.

2 Goals

You will implement a 7 Segment Display Decoder in Verilog.

Write a decoder that will display a 4-bit hex nibble onto the on-board 7-Segment Display.

Once you finish your implementation, you will program it to a Basys 3 FPGA Board.

3 Prelab (ungraded)

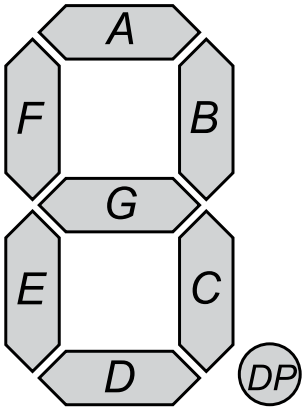

Figure 1: 7 Segment Display with Labeled Segments (By Uln2003 - Own work, CC0, https://commons.wikimedia.org/w/index.php?curid=69807877)

Create a truth table for the 7 Segment Display Circuit.

Display	d3	d2	d1	d0	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	1	1	1	1	1	1	1
9	1	0	0	1							
A	1	0	1	0							
B	1	0	1	1							
C	1	1	0	0							
D	1	1	0	1							
E	1	1	1	0							
F	1	1	1	1							

4 Lab

You need to complete and submit the following files:

- `"rtl/hex7seg.sv"`
- `"synth/basys3/Basys3_Master.xdc"`
- `"synth/basys3/basys3.sv"`

Read about the 7-Segment Displays in the Basys3 Board Reference Manual. The FPGA pin names used for the 7-segment display controls in this manual are A, B, C, D, E, F, G, dp, an[3], an[2], an[1], an[0].

1. Complete the `hex7seg` module. Use the truth table from the prelab to enter the equations for A, B, C, D, E, F, G.
2. Complete the `basys3` module. You need to figure out what the values should be for dp, an[3], an[2], an[1], an[0] using the Basys3 Board Reference Manual: https://reference.digilentinc.com/reference/programmable-logic/basys-3/reference-manual. The decimal point should not be lit.
3. You are provided a Basys3 constraints file `"synth/basys3/Basys3_Master.xdc"`. It was downloaded from from Digilent's GitHub: https://github.com/Digilent/Basys3/blob/master/Resources/XDC/Basys3_Master.xdc. Complete it as specifed.
4. Simulate, syntheize, and program your design. Observe the `"README.md"`.