Lab 2 Report

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Contents

1 Part A

1.1 Create Quad 4-1 MUX

1.1.1 Summary

For this task we had to create a multiplexer to as only one LED segment can be powered at any given time. The multiplexer allows switching between a given input using a number of selection lines. This then had to be done four times, one for each binary input of a hexadecimal number.

1.1.2 Difficulties

This is very well explained in the lab slides and I had previously completed this part of the subject. Although when compiling the waveform with bus implementation I did have some naming errors and had to take a video and pause it to read the errors. SupportingVideo/BugFixing

1.1.3 Proof

Here I hard coded four numbers and had the MUX switch between them: SupportingVideo/MUXWorking QuartusFiles/MultiplexerQuad4-1

1.2 Create 3-8 Decoder

1.2.1 Summary

This was another simple task with good documentation. A decoder is the opposite of the MUX as it takes a few inputs and creates multiple options. The number of outputs is at maximum 2^x were x is the number of input lines. For the purposes of making the LED display work only a 2-¿4 decoder was needed.

1.2.2 Difficulties

None encountered, everything worked first time (for once)

1.2.3 Proof

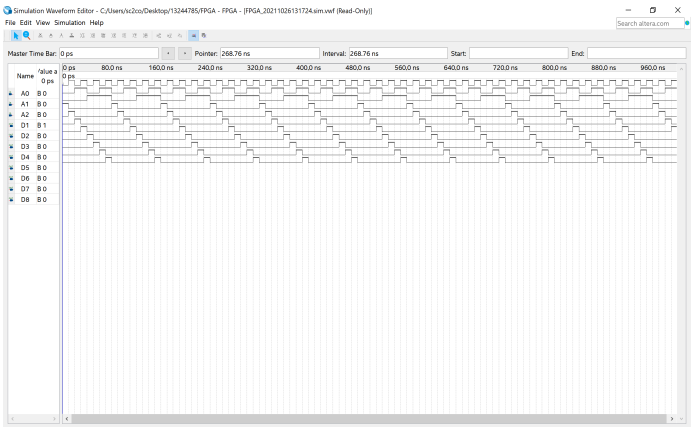

Figure 1: Waveform

QuartusFiles/Decoder3to8

2 Part B

2.1 Create Top Level

2.1.1 Summary

Once this was completed a top level containing the MUX, 2-¿4 Decoder and Hex to SSD converter need to be combined in a top level entry. Additionally, the FPGA board is active low so all inputs and outputs had to be adjusted accordingly. To implement something that would allow me to test the functionality implemented in Lab 2 I choose to bind the select lines to the buttons and hard code the hexadecimal inputs by binding them to either ground or VCC.

2.1.2 Difficulties

This process was iterative as instead of using waveform testing I decided to just load onto the board and interpreting that many inputs and outputs for every given number is impractical without bus implementation.

2.1.3 Proof

QuartusFiles/FPGA

2.2 Program Board

2.2.1 Summary

Take the full version and apply it to the board and check all functionality.

2.2.2 Difficulties

As this process was iterative it wasn't as quick as Labs 0 and 1, but it was good to be working with something physical the whole time I was designing the top level instead of just at the end.

2.2.3 Proof

To test I simply hard coded the inputs and then had the MUX switch between them based on the button I pressed: SupportingVideo/MUXWorkingHardCoded

3 System I/O

Parameter	Min	Typical	Max	Units	Description
VDD	4.5	5	5.5	V	Power
In0	-	0	-	V/logic	Select Button
In1	-	0	-	V/logic	Select Button
LED[0..6]	-	0	-	V/logic	Number to selected display

Table 1: System Inputs and Outputs

4 Use Case

This system displays a predetermined number to a single LED seven segment display determined by the state of the two left most buttons. The system needs to be powered by 5V via the USB connection or a battery. The default state is the right most display active.