Controller-Datapath in Verilog BCD-to Binary Conversion

Leonardo Aviles, *tue51778@temple.edu*

***Abstract*—A project that will convert a BCD number, which is three four, bit numbers to a single 8 bit binary number. The device used is the Zybo board. Each BCD number is inputted through eh switches located on the Zybo board and the corresponding button will place the values into their respective register. The three most significant buttons will be used to determine which digit is the first, second or third. While the button zero is used to signal the program that all digits have been entered.**

I. INTRODUCTION

In the BCD to Binary Conversion lab in order to convert the BCD digits to binary each digit must be multiplied by a different number. For the Most significant digit will be multiplied by 100 in order to convert it to an 8-bit number. For the middle digit a value of 10 is used in order to convert the digit into binary and for the least significant digit the digit will not be multiplied by any number.

The specifications of the project are as follows.

- Using the four switches located on the board the values are used in order to input a 4 digit number ranging from 0-9.
- When the value is entered either BTN3, BTN2, BTN1 are used to signify that which digit will be the most significant digit, middle digit and least significant digit.
- After the value is placed the LEDs will turn on depending on which switches are pressed.
- The data is then processed by pressing BTN0, which will start the FSM to convert the digits. Using BTN3 to display the most significant nibble on the LEDs or BTN2 for the least significant nibble.
- In order to reset the FSM btn0 must be pressed and then all switches should be activated.

In addition to complete the project, code needs the following modules implemented.

- "GenData" which will generate the switch data and convert the digit.
- A clk module is used to create a lower frequency clock
- The multiply IP is used in order to multiply the different digits.

II. DISCUSSION

A. *Top Module: "multi"*

This module will only contain the instantiations of clk,genData and have wires for the mult_gen_0 module

B. *Generating data: "genMultdata.v"*

In this module the data is received from the switches and converted into binary. The data is also placed into LEDDATA and placed into LED for the digits to be displayed.

C. *Multiplying the different numbers using IP multiplier.*

This module was used in order to multiply the two numbers to receive a binary converted number. For this module the inputs were clk, a, b, and the output was p. A and B were the two numbers to be multiplied and P was the product of the two numbers. For this instance the width size was determined to be 8 bits wide.

III. CONCLUSION

The project was successfully implemented into the zybo board. Allowing the user to input three numbers ranging between 0-255 BCD and converted into a binary digit. The digits were successfully showing by being multiplexed using the btn3 and btn2. The switches allowed the user to input the different numbers and using the buttons the data was sent to the respective data variable.

IV. APPENDIX

Figure 1: Shows the controller and data path and the different signals and data received