Project 3
1965 Thunderbird Lights
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Objectives:

- Using Quartus Prime to program the FPGA board, program the controls to mimic the taillights of a 1965 Ford Thunderbird to better understand state machines

IDLE:

- Default state or occurs when switch 0 is on
- All LEDs are off
- HEX display shows “IDLE”

LEFT:

- State occurs when switch 1 is on
- Turns on LEDs 5-9 in that order
- HEX display shows “LEFT”

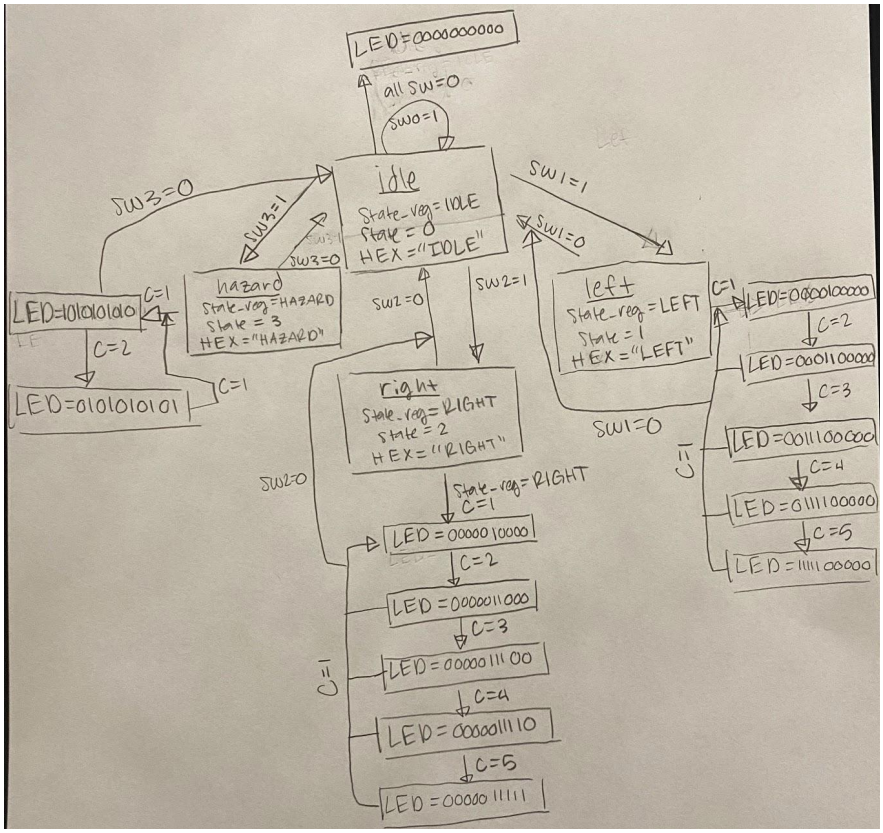
RIGHT:

- State occurs when switch 2 is on
- Turns on LEDs 4-0 in that order
- HEX display shows “RIGHT”

HAZARD:

- State occurs when switch 3 is on
- LEDs are alternating flashing
- HEX display shows “HAZARD”

State Machine Diagram:



The diagram above is the state machine diagram of my code. The main part of the diagram is determining which state the FPGA is in(idle, left, right, hazard). Depending on which switch is flipped on, the hex will display the word associated with the state. This is the various if-else statements in the Project32 file. The code then goes to the TbirdLight file and assigns the HEX values depending on the state. After declaring the state, it is then sent to another mini state machine to determine how the LEDs will be displayed. The default state for when switches are off, is the idle state. All parts of the code (shown in the diagram) default to idle.

Challenges:

- Improper Configuration:

The first problem I had was the way my project was initially configured. It caused the HEX display to show very weird values that didn't match my code and I was unable to manipulate my code to change this output. I created a new project and learned I was configuring an SDC file instead of a v file. With the help of Dr. M, I was able to configure it properly and make progress.

- State Machine for HEX Display

I tried using the state machine that was used in the reaction timer code that uses case statements. For determining the state for the HEX display, this method did not work and was only able to display 2 states rather than the 4. Instead of using case statements, I simply used if else statements and that worked great. I was able to use case statements for the LEDs.