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EECS 443

Stop Light

Final Project Report

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**Objective:**

The goal was to design a 4 way stop light by implementing a finite state machine with d-flip-flops and inputs for car pressure plates.

**Description:**

The project suggestion stated that it wanted the default state to be green for north south and red for east west. And the outputs to be 4 sets of a three segment light display representing a red, yellow, and green light, for the directions north, south, east, and west.

The changes I made to the project specifications were that I added 2 led outputs( one for north-south directions and one for east-west directions) for demoing the project or to allow more freedom to the customers. I also added a function based on an additional binary input known as Am\_12am\_6am, that when activated will flash all of the red lights to make the intersection a four way stop. I also changed the default state to be red all ways as to provide a safer intersection. For example if the state was green for east west and red for north south and the system glitches, it would be safer for the lights to turn red than for it to rapidly switch to north south green and east west red. I also added a display to show the system clock and cross walk signals/ countdowns for both directions.

**Results:**

The design started out with a synchronous counter flip flop, asynchronous next state and next count logic process, and an asynchronous state logic. This resulted in undesired results mainly the device would skip states entirely or immediately cycle through them. This was solved by making everything synchronized to the rising edge of the clock-divided clock. However this led to undesired racing conditions that would prematurely change the state to the next state. To combat this I made the state change on the falling edge of the clock and the state logic implement on the rising edge of the clock. I then added the crosswalk features where the display will display “E” for clear to cross, a countdown to let the person know how long they have to cross before the light changes to yellow, which the countdown will display “0” until red when the display will turn off to signify to the pedestrian not to cross. I also added logic to turn off specific displays so there would be less clutter on the board. I also changed my state logic from nested if statements to a case statement based on the current state. A demo run through is shown in the file folder. This demo does not include the Am\_12am\_6am mode and the cars waiting on east-west and north-south is set to on. This is to show the basic functionality of the states.

**Improvements:**

The Device could have left turn signals added, or the period of the flashing cycle could be shortened as to make it closer to a real stop light. The left turn feature could be added with additional states and output lights. The flashing cycle improvement could be implemented by making the flashing state be set on as long as AM\_12am\_6am mode was set to on and have the red lights set to the 1hz clock.