Lab 7: Finite State Machine

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102-2

Sait Sarper Özaslan

ID: 22002861

Purpose: The purpose of this lab was to learn how to implement a finite state machine on breadboard

Methodology and Design Specifications: The FSM I made is essentially a 2-state Moore machine. After drawing a few samples of FSMs, drawing their output table, Karnaugh map and schematic to see how the designs look I decided to use the FSM that consists of a XOR gate and a D flip-flop. After deciding on the design all there was left to do was to implement the design on breadboard with logic gates, jumper cables and LEDs.

As the first step of this lab was to pick a design I decided to make a 2 state machine which consisted of 1input(w) and 1 main output (Y= m). In the design I connected the input w and inverse output of the D flip-flop (Y') on a XOR gate. I connected this gates output to the flip flop According to the state I am in the output was "0" or "1".

In State S1, Output m = 0

In State S2, Output m = 1

If the input is 0 the state changes, however it stays the same when the input is 1.

I will include the design I made to the results part.

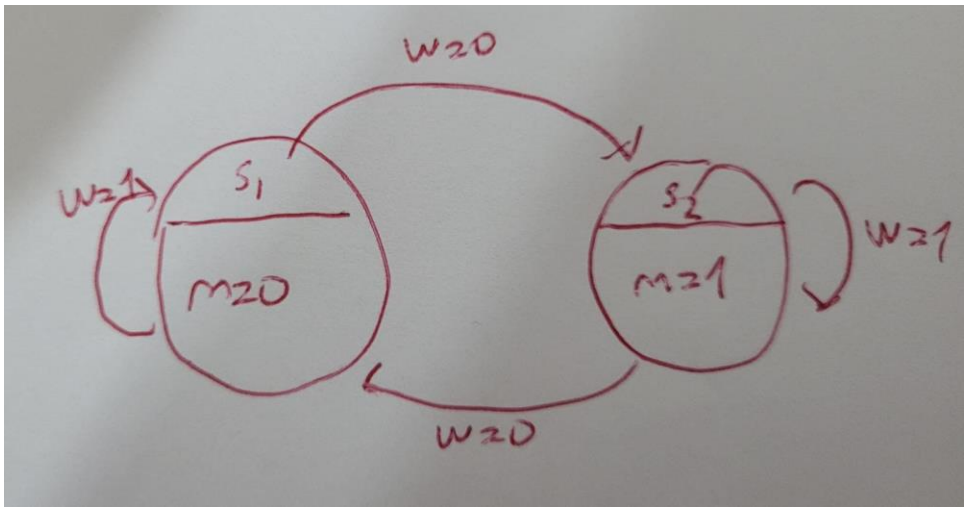

Figure 1: State Transition Diagram

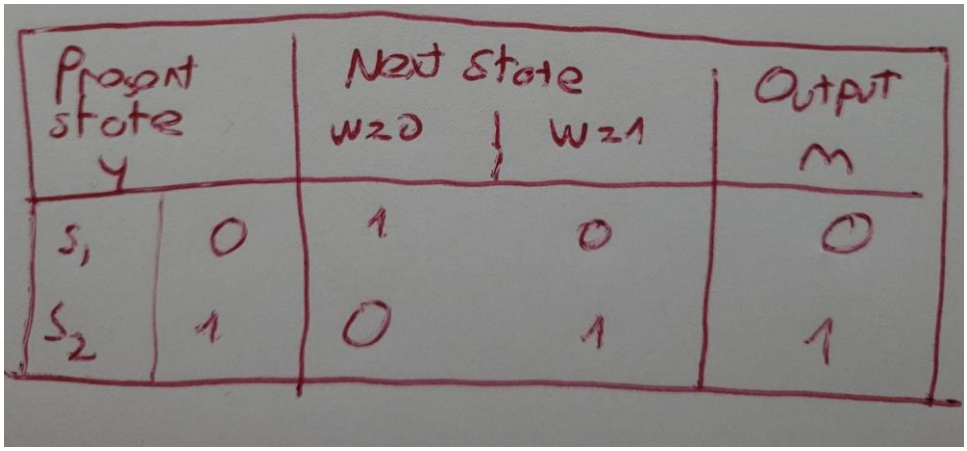

Figure 2: Output Table

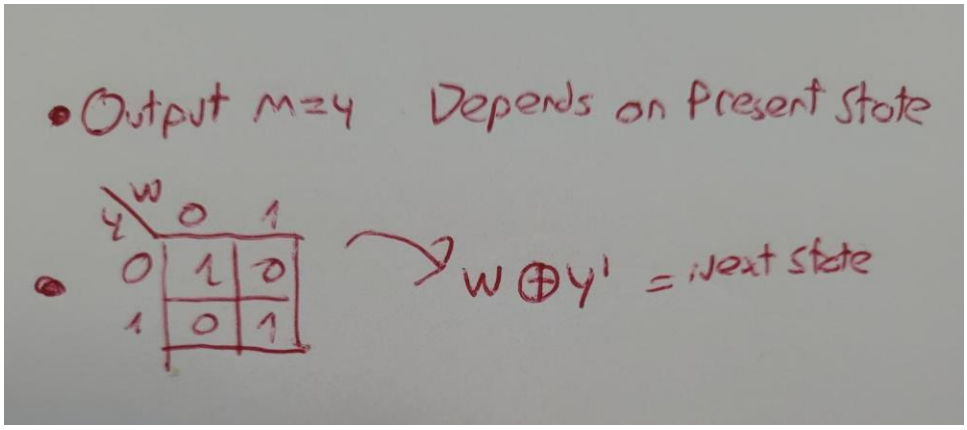

Figure 3: Karnaugh Map of Next State and Output

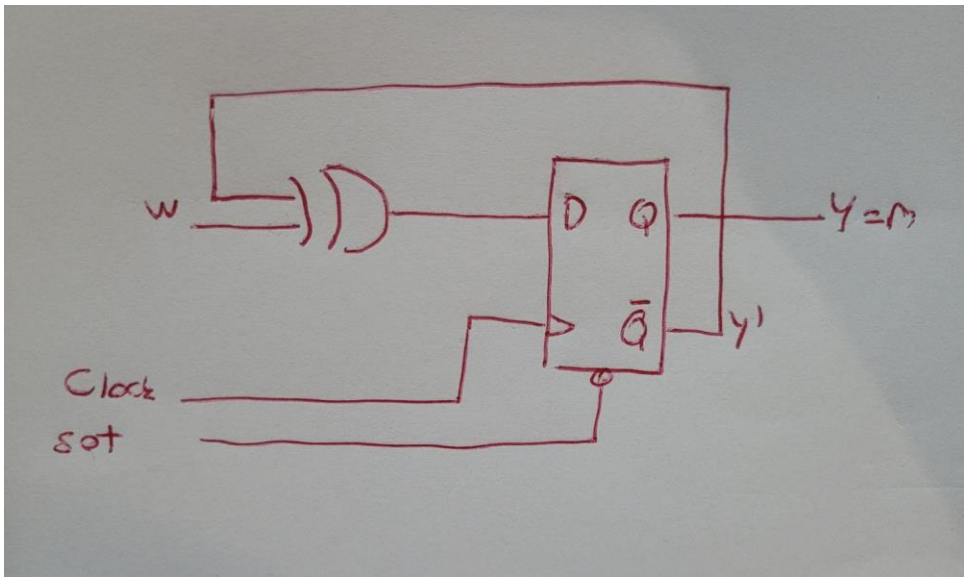

Figure 4: Schematic of the Design

Results: Here is some examples from the design I have made, the LED in the bottom is Y and The one at the top is Y'.

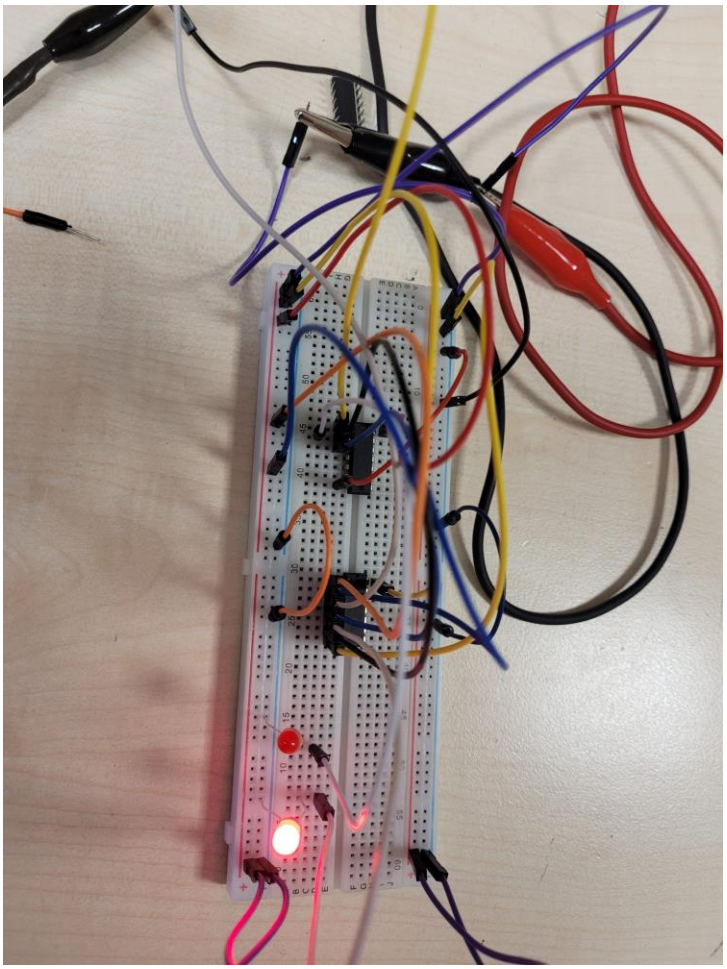

Figure 5: Y = 1 , S2 State

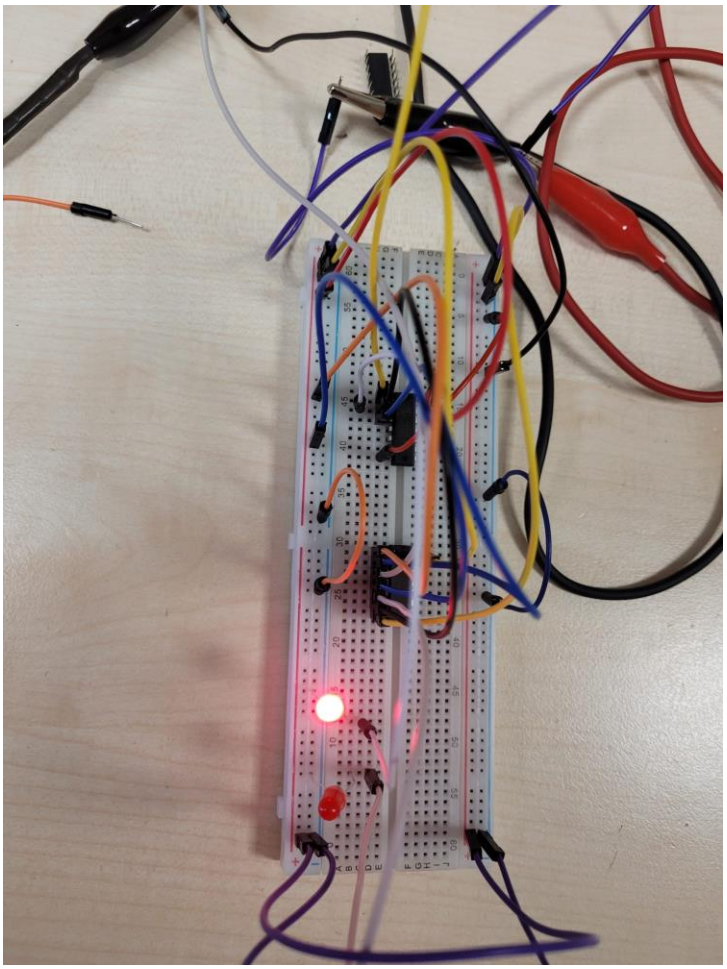

Figure 6: Y’ = 1, S1 state

Conclusion: Through this lab I figured how to implement a FSM into a breadboard and there were some challenges throughout this lab. One of which was to decide on a suitable design that wouldn’t look too complex in the breadboard. As the number of gates increased it became harder to spot errors in my design. There were also errors as some gates I used didn’t work and there were some disconnections in the jumper wires themselves. However, changing these parts with a new part and repeating this procedure as I went on worked in the end. The result was within expectations.