Lab Report 7: Finite State Machine
EE 102
Section 02
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Purpose of the Experiment
The main purpose of this laboratory task was to design a finite state machine (FSM) of our choice on our breadboards.

Methodology
Before starting anything, I decided that it would be a good idea to imagine a scenario in which I could design a circuit with. Following this, I gathered the necessary logic gates and some jumper wires. I put them together on the breadboard and tested the whether the output was correct or not by changing the inputs.

Design Specifications
In my design, I decided to represent a reminder for a patient who has take their medicine once every morning, and optionally an extra at night depending on their aches. For example, if c (current state) is 0, that means the patient has not taken their medicine for the morning yet. For $(i_1, i_0) = ((0,0),(0,1),(1,1))$, the LED blinks because for the first two options, the patient has not taken their medicine in the morning, whereas for the last one the LED just stays on since they have taken an extra dose. When c is 1, it is now assumed that the person has had their medicine in the morning.

i_1	i_0	c	n	o
0	0	0	1	1
0	1	0	1	1
1	0	0	0	0
1	1	0	1	1
0	0	1	0	0
0	1	1	0	0
1	0	1	0	0
1	1	1	1	1

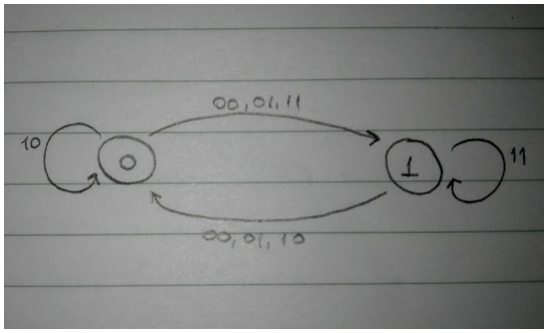


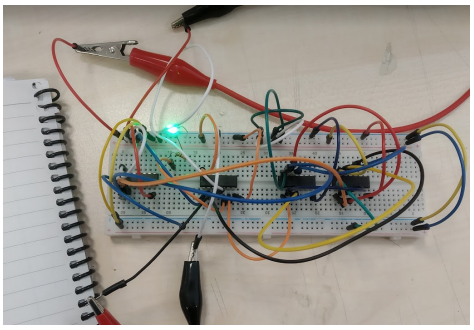
Figure 1: The Transition Table and Diagram

According to these, I have tried to design my circuit. The final product can be seen in the Results part.

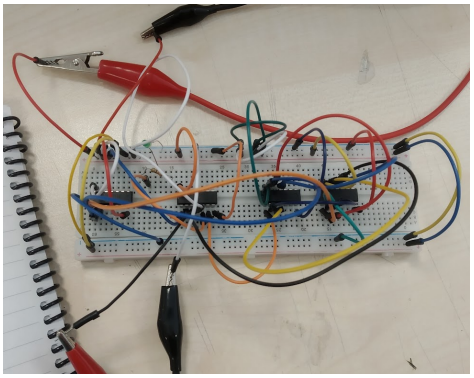
Results

Finishing the design of my circuit, I tried to see the results by trying out different combinations. All of them were as expected. Examples are shown below where c represents the state, i_1 and i_0 are the inputs, o is the output.

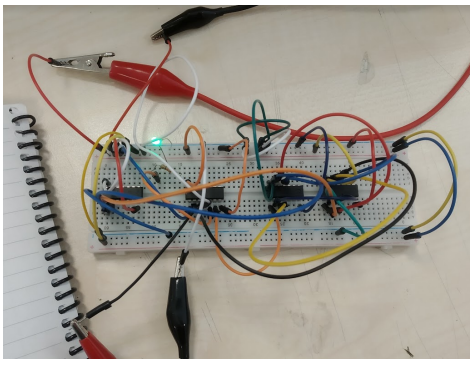
Example Case 1:
$c : 0$
$i_1 : 1$
$i_0 : 1$
$o : 1$



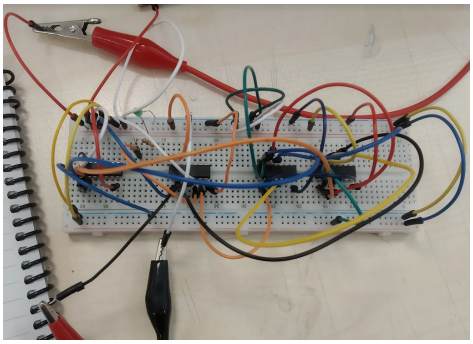
Example Case 2:
$c : 1$
$i_1 : 0$
$i_0 : 0$
$o : 0$



Example Case 3:
$c : 0$
$i_1 : 0$
$i_0 : 0$
$o : 1$



Example Case 4:
$c : 1$
$i_1 : 0$
$i_0 : 1$
$o : 0$



Conclusions

In this last lab, we tried to design a simple finite state machine using our breadboards. My truth table and the experimental data that I have obtained from the circuit were consistent with each other. I picked a Moore Machine because it was easier to understand and required me to use less gates for the implementation. I first planned to make an ”alarm” type of a design with 2 inputs indicating whether the person is awake or not, and 4 states that changed by the alarm signal accordingly. However, it did not take me long to realize that designing such a thing would take me more than I would prefer, so I decided to do this one instead for a cleaner implementation. I faced some minor errors during this process though. The first one, which made me stress out a lot, was because the LED was broken. I thought I designed the whole circuit wrong. I replaced the LED and the problem was solved. After replacing the LED, I had difficulties with the states because of loose contact between the jumper cables and the breadboard. Nevertheless, I was able to solve that issue as well by pushing the cables a little. Overall, this laboratory was a success and I am proud of myself since I have managed to complete all labs.