Lab 7: Finite State Machine (FSM)

Date: 27.11.2023

Name: Şevval ERBAY

Section: 2

Purpose:

The purpose of this lab is to design a finite state machine (FSM) on a breadboard by using buttons, LEDs and logic gates.

Methodology:

In this lab, an automatic sliding door design is implemented. The door can be opened by both sides and only one person is enough to open the door. There are two states, two inputs and one output. This FSM is specifically a Moore machine with 2 different states because the output does not depend on the inputs. 2 buttons are used for inputs and a green LED is used to show the output. The state is preserved in the D Flip-Flop. The state transition diagram and the output table is constructed. The design includes a 2-input OR-gate (SN74HC32N) and a positive-edge triggered D Flip-Flop (SN74HC74N). CLK frequency is 1 Hz. The inputs, states and output are as follows:

- State 1: (door is) **OPEN := "1"**
- State 2: (door is) **CLOSED := "0"**
- Input 1: **Person 1**
- Input 2: **Person 2**
- Output

Input combinations are as follows:

- **"00"** := Person 1 and Person 2 are not near the door
- **"01"** := Person 1 is not near and Person 2 is near the door
- **"10"** := Person 1 is near and Person 2 is not near the door
- **"11"** := Person 1 and Person 2 are near the door

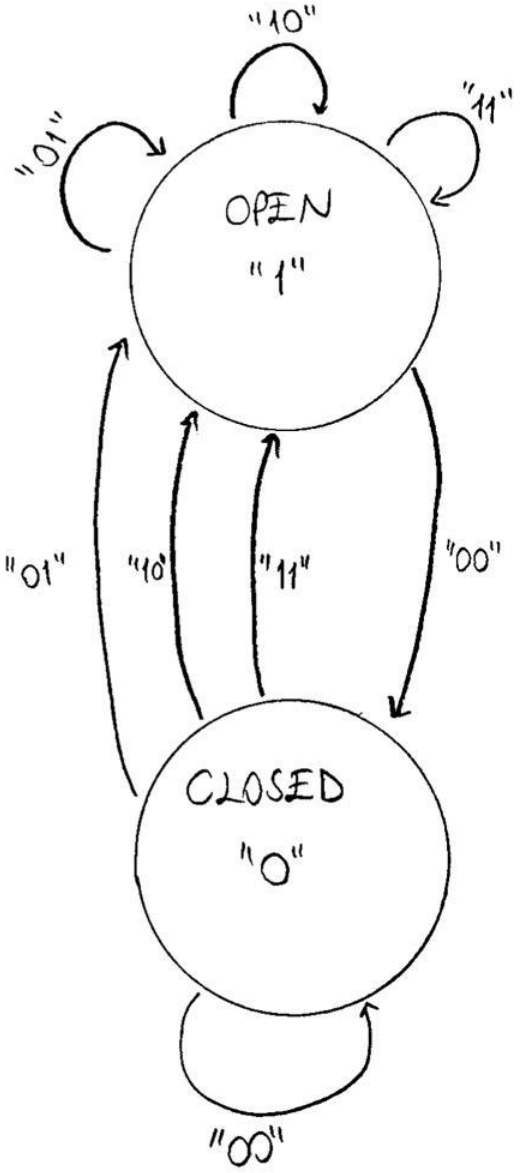


Figure.1: State transition diagram

Current State	Input 1	Input 2	Next State	Output
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	1	1
1	0	0	0	0
1	0	1	1	1
1	1	0	1	1
1	1	1	1	1

Table.1: The output table

Results:

The following combinations are shown on the breadboard. The circuit is successful.

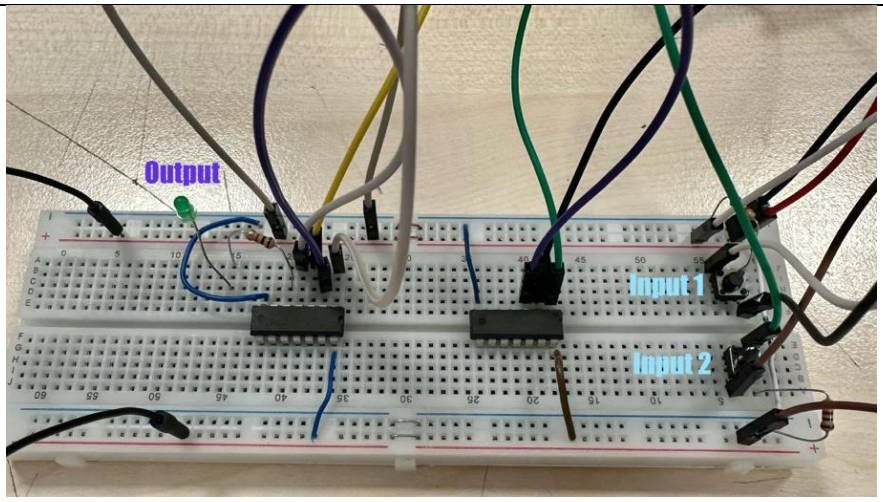


Figure.2 Case 1

current state: "0"
input 1: 0
input 2: 0
output: "0"

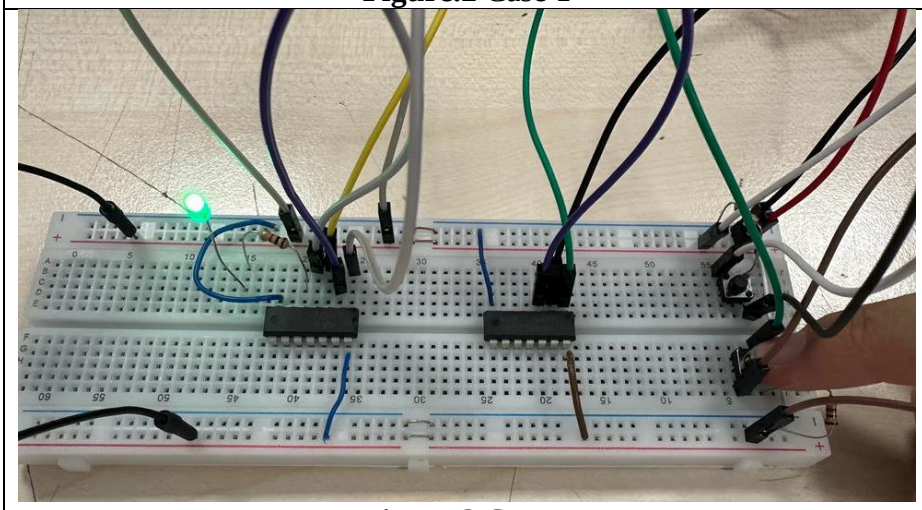


Figure.3 Case 2

current state: "0"
input 1: 0
input 2: 1
output: "1"

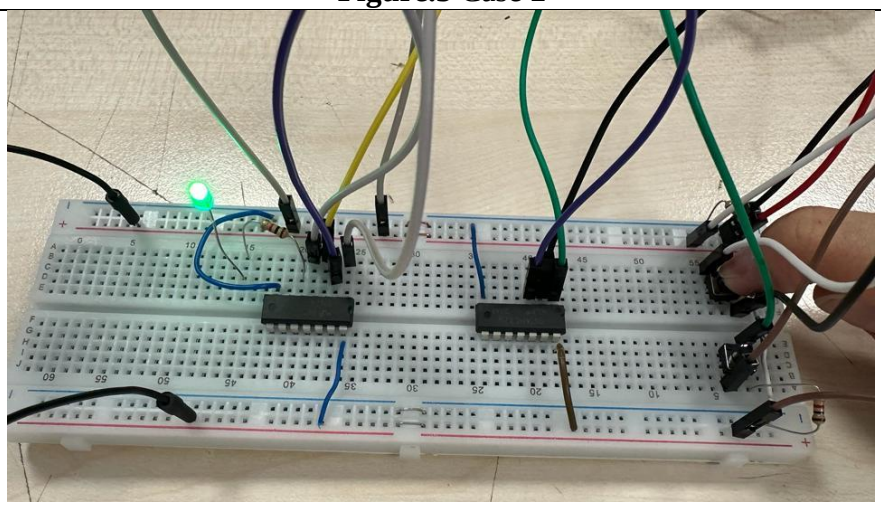
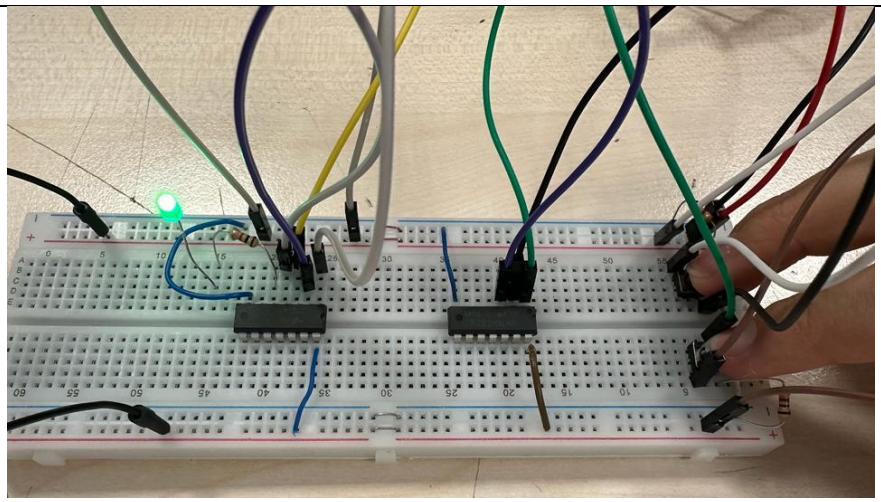
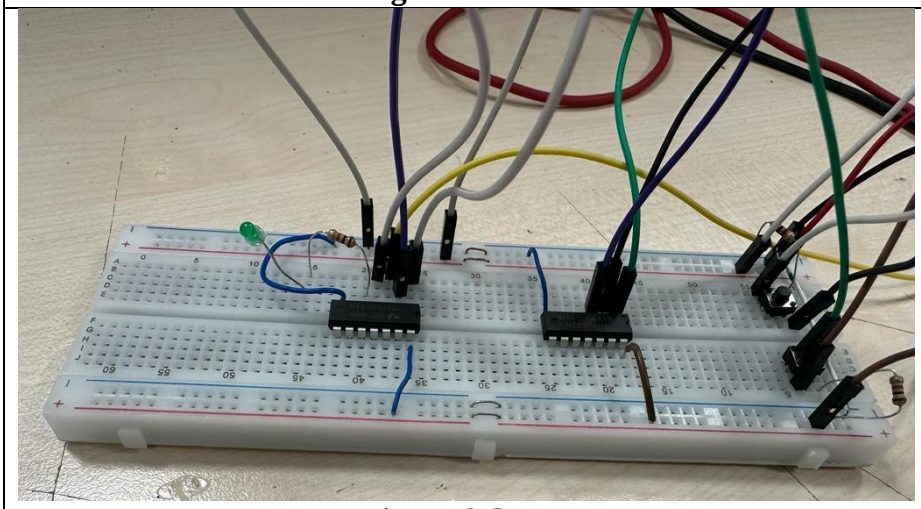


Figure.4 Case 3

current state: "0"
input 1: 1
input 2: 0
output: "1"

 **Figure.5** Case 4	**current state:** “0” **input 1:** 1 **input 2:** 1 **output:** “1”
 **Figure.6** Case 5	**current state:** “1” **input 1:** 0 **input 2:** 0 **output:** “0”

Conclusion:

The purpose of this lab was to teach us how to design and implement a FSM on a breadboard. One of the jumper cables was faulty and was not acting right. After measuring the voltages at different stages, we found the faulty cable and changed it. After this step, the experiment was successful.