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ASSIGNMENT-1

Roll No. : FWC22053

Sequence Detector

A sequence detector is a sequential state machine that takes an input string of bits and generates an output 1 whenever the target sequence has been detected. In a Mealy machine, output depends on the present state and the external input (x).

Working

A sequence detector accepts as input a string of bits: either 0 or 1. Its output goes to 1 when a target sequence has been detected.

There are two basic types:

- Overlap
- Non-overlap.

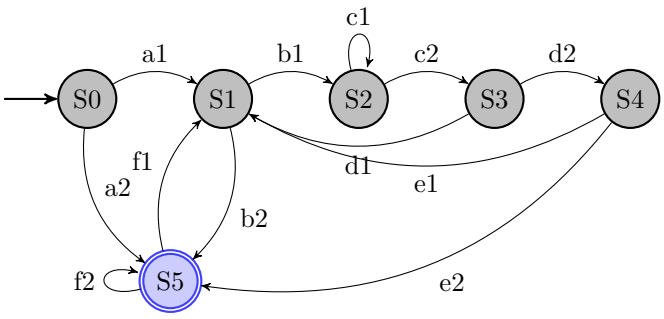
Problem Statement:

Using Platformio CLI wite a programm to identify if the Sequence is either 11 or 00110 .

SOLUTION: Steps for using State Diagram:

1.To detect 00110 and 11 . first input is given to SO . if the first bit i/p is 0 it will go to next state i.e S1 and o/p will be 0 (LED=OFF) .
2.If the i/p is 1 it will go to state S5. o/p will be 0 (LED=OFF)
3.Same steps will be repeated for all states .
4.when it detects 00110 the o/p will be 1 (LED=ON)
5.Same as above if it detects 11 o/p will be 1 (LED=ON)
6.Again it repeats as it is overlapping.

State Diagram



State Diagram -Input and Outputs

values	Input	output	states	Next state
a1	0	0	S0	S1
a2	1	0	S0	S5
b1	0	0	S1	S2
b2	1	0	S1	S5
c1	0	0	S2	S2
c2	1	0	S2	S3
d1	0	0	S3	S1
d2	1	0	S3	S4
e1	0	1	S4	S1
e2	1	1	S4	S5
f1	0	0	S5	S1
f2	1	1	S5	S5

Components

Component	Value	Quantity
Breadboard	-	1
Resistor	220 ohms	1
Arduino	Uno	1
Led	5v	1
Flip Flop	7474	2
Jumper Wires	-	20

Truth table

q2	q1	q0	x	d2	d1	d0	y
0	0	0	0	0	0	1	0
0	0	0	1	1	0	1	0
0	0	1	0	0	1	0	0
0	0	1	1	1	0	1	0
0	1	0	0	0	1	0	0
0	1	0	1	0	1	1	0
0	1	1	0	0	0	1	0
0	1	1	1	1	0	0	0
1	0	0	0	0	0	1	1
1	0	0	1	1	0	1	1
1	0	1	0	0	0	1	0
1	0	1	1	1	0	1	1
1	1	0	0	x	x	x	x
1	1	0	1	x	x	x	x
1	1	1	0	x	x	x	x
1	1	1	1	x	x	x	x
1	1	1	1	x	x	x	x

Boolean expressions

The boolean expressions for **d** and **x** are:

With don't care(X):

d2 = q1'x + q0x

d1 = q1q0' + q2'q1'q0x'

d0 = q2 + q1'q0' + q1'x + q0'x + q1q0x'

y = q2q0' + q2x + q1q0x

Without don't care(X):

d2 = q1'x + q2'q0x

d1 = q2'q1q0' + q2'q1'q0x'

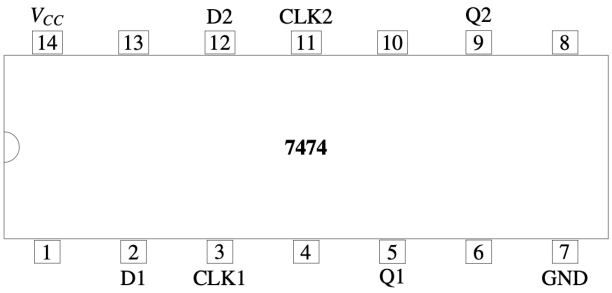
d0 = q1'q0'+ q1'x + q2q1' + q2'q0'x + q2'q1q0x'

y = q2q1'q0' + q2q1'q0x + q2'q1q0x

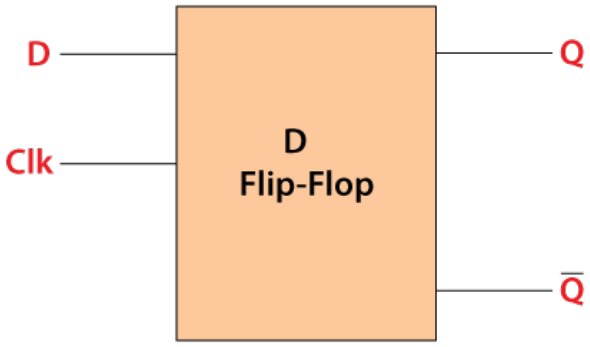
SOLUTION

The above truth table can be verified in arduino.
1.consider 4 digital pins 6,7,8,9 as inputs D9 is given to +vcc or ground.
2.Consider 4 digital pins 2,3,4,5 as Outputs. Here D5 is given to LED .
3. D13 acts as clock signal.
4. The connections are given in the Hardware Connection table.

7474 IC Pin details



D Flip-Flop



Working of D Flip-Flop

CLK	D	Q	$\overline{Q}$
0	0	Q	$\overline{Q}$
0	1	Q	$\overline{Q}$
1	0	0	1
1	1	1	0

The D flip-flop is a clocked flip-flop with a single digital input 'D'.
Each time a D flip-flop is clocked, its output follows the state of 'D'.

Hardware Connections

Arduino pins	D6	D7	D8	D9	D2	D3	D4	D5	D13
7474 (2-FF)	5	9			2	12			CLK
7474 (1-FF)			5				2		CLK
I/P				5v/GND					
Detector								LED	

Download the code from the link below and upload into the arduino
Github link: Assignment-1.