Implementation of finite state machine using vaman

GUNA VARDHAN
gunavardhan.nagamalla@gmail.com - FWC22123
IIT Hyderabad-Future Wireless Communication

Contents

1 Problem

(GATE EC-2020)
Q.No.39. The state diagram of a sequence detector is shown below.State S_0 is the initial state of the sequence detector.If the output is 1,then

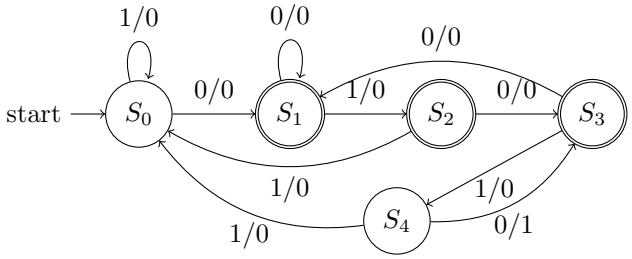


Figure 1: State diagram

1. the sequence 01010 is detected
2. the sequence 01011 is detected
3. the sequence 01110 is detected
4. the sequence 01001 is detected

2 Introduction

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 and non-overlap. In a sequence detector that allows overlap, the final bits of one sequence can be the start of another sequence.

3 Components

Components	Value	Quantity
Vaman		1
Resistor	220 Ohm	1
Seven Segment Display		1
Decoder	7447	1
Flip Flop	7474	2
Bread Board		1
Jumper Wires		30

4 State Table

From state diagram,state table can be generated in Table 1.

Present State	Input	Next state	Output
S_0	0	S_1	0
S_0	1	S_0	0
S_1	0	S_1	0
S_1	1	S_2	0
S_2	0	S_3	0
S_2	1	S_0	0
S_3	0	S_1	0
S_3	1	S_4	0
S_4	0	S_3	1
S_4	1	S_0	0

Table 1: State Table

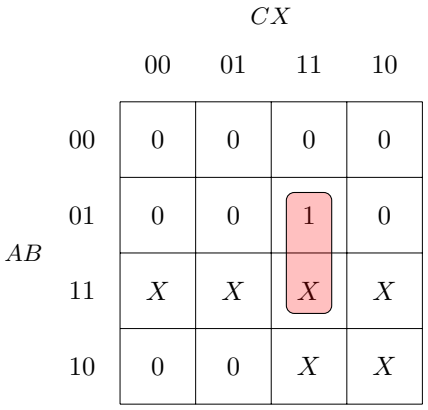
4.1 Truth Table

Present State	Input	Next state	Output
A B C	X	P Q R	Y
0 0 0	0	0 0 1	0
0 0 0	1	0 0 0	0
0 0 1	0	0 0 1	0
0 0 1	1	0 1 0	0
0 1 0	0	0 1 1	0
0 1 0	1	0 0 0	0
0 1 1	0	0 0 1	0
0 1 1	1	1 0 0	0
1 0 0	0	0 1 1	1
1 0 0	1	0 0 0	0

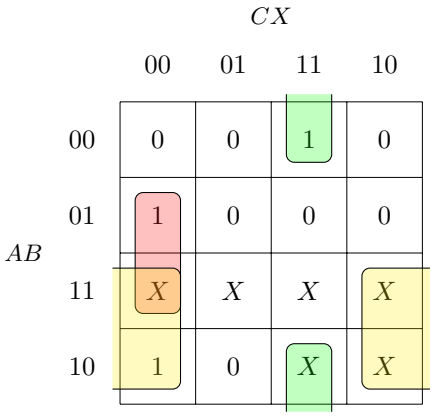
Table 2: Truth Table

5 Karnaugh Map

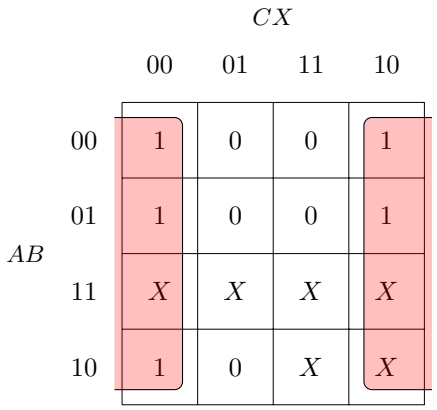
The karnaugh maps for the above truth table are given below



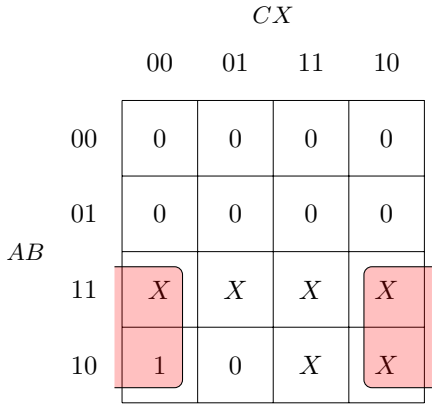
$$P = BCX \tag{1}$$



$$Q = BC'X' + B'CX + AX' \tag{2}$$



$$R = X' \tag{3}$$



$$Y = AX' \tag{4}$$

6 Connections

Connect the Vaman, 7447 ,two 7474 ICs and seven segment according to table 3.

	INPUT				OUTPUT						5V			
	A	B	C	X	P	Q	R	Y	CLOCK					
Vaman	IO16	IO17	IO18	IO19	IO12	IO13	IO14	IO15	IO22					
7474	5	9			2	12			CLK1	CLK2	1	4	10	13
7474			5				2		CLK1	CLK2	1	4	10	13
7447					7	1	2	6			16			

Table 3: Connection Table

7 Software

The arduino code for the given sequence detector is given below

https://github.com/GUNA5801/FWC/blob/main/vaman/IOT/CODES/MAIN/main.cpp