

DLD PROJECT

MCTE 2332

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SECTION : 1

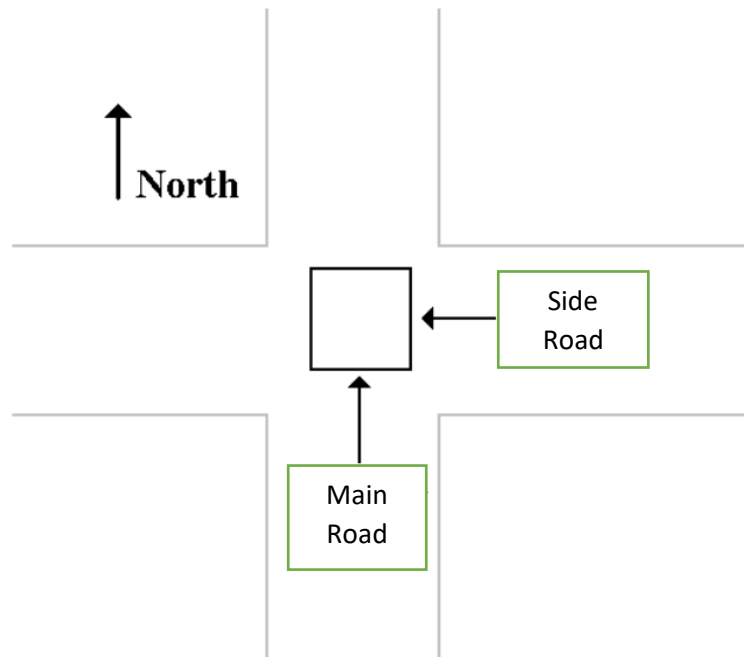
TOPIC : TRAFFIC LIGHT

OBJECTIVES

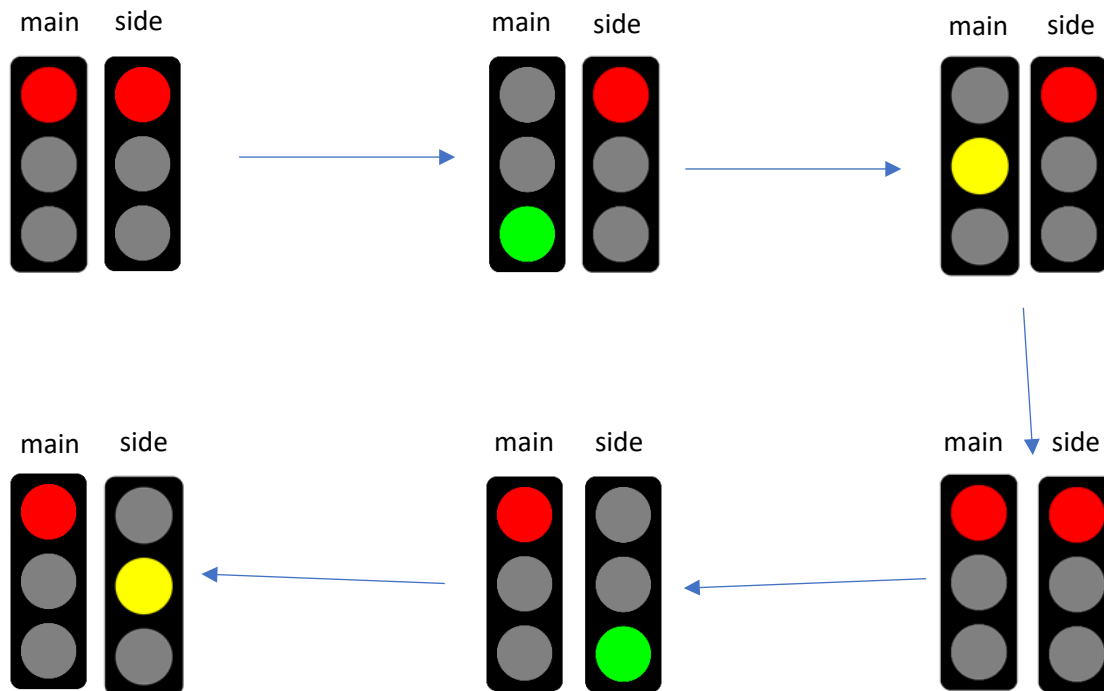
- To implement the knowledge that have learned in Digital System Design Topics.
- To make simple traffic light system that can be applied in daily life.

DESIGN PROCESS

Assumption: two link pairs of traffic light.



If the main road is Green, the side road must be red.

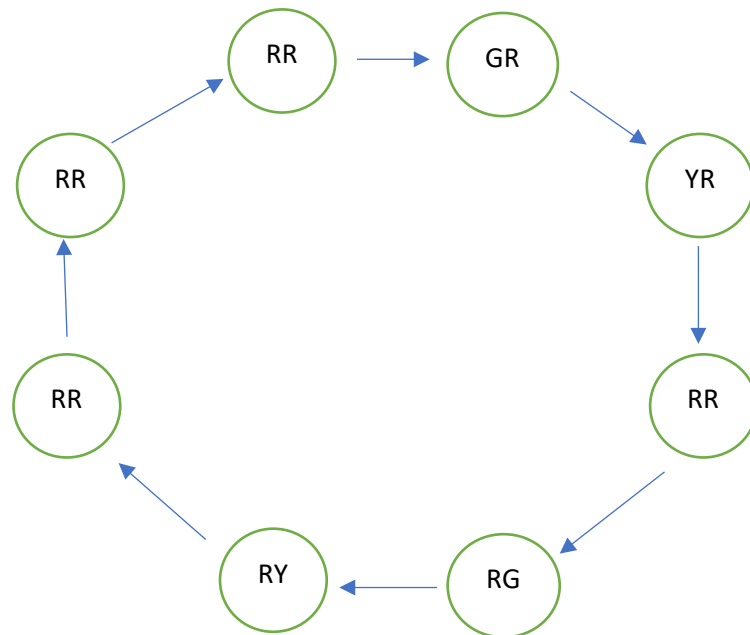


Name the state.

State	Main	Side	Short form	Comment
0	Red	Red	RR	Both light red for a second
1	Green	Red	GR	Main road is green. Traffic moving on one street
2	Yellow	Red	YR	Traffic on side road must wait for this light to turn red.
3	Red	Red	RR	Both light red for a second
4	Red	Green	RG	Side road is green. Traffic moving on one street
5	Red	Yellow	RY	Traffic on main road must wait for this light to turn red.
6	Red	Red	RR	Both light red for a second
7	Red	Red	RR	Both light red for a second, for safety purpose.

DETAIL DESIGN

STEP 1: STATE DIAGRAM



STEP 2: ASSIGN 3-BIT BINARY NUMBER

STATE	Q2	Q1	Q0	SHORT FORM
0	0	0	0	RR
1	0	0	1	GR
2	0	1	0	YR
3	0	1	1	RR
4	1	0	0	RG
5	1	0	1	RY
6	1	1	0	RR
7	1	1	1	RR

STEP 3 : DERIVE THE OUTPUT EQUATION

STATE	S.F	Q2 Q1 Q0	R1	G1	Y1	R2	G2	Y2
0	RR	0 0 0	1	0	0	1	0	0
1	GR	0 0 1	0	1	0	1	0	0
2	YR	0 1 0	0	0	1	1	0	0
3	RR	0 1 1	1	0	0	1	0	0
4	RG	1 0 0	1	0	0	0	1	0
5	RY	1 0 1	1	0	0	0	0	1
6	RR	1 1 0	1	0	0	1	0	0
7	RR	1 1 1	1	0	0	1	0	0

The output equation:

$$G1 = Q2' Q1' Q0'$$

$$Y1 = Q2' Q1 Q0'$$

$$R1 = (G1 + Y1)'$$

$$G2 = Q2 Q1' Q0'$$

$$Y2 = Q2 Q1' Q0$$

$$R2 = (G2 + Y2)'$$

STEP 4 : DERIVE THE STATE TABLE

STATE	PRESENT STATE			NEXT STATE		
	Q2	Q1	Q0	Q2	Q1	Q0
0	0	0	0	0	0	1
1	0	0	1	0	1	0
2	0	1	0	0	1	1
3	0	1	1	1	0	0
4	1	0	0	1	0	1
5	1	0	1	0	0	0
6	1	1	0	0	0	0
7	1	1	1	0	0	0

STEP 5: SELECT THE FLIP FLIP

Use **D flip flop**.

Table 1

Present State			Next State			Excitation		
Q_2	Q_1	Q_0	Q_2^+	Q_1^+	Q_0^+	D_2	D_1	D_0
0	0	1	0	1	0	0	1	0
0	1	0	0	1	1	0	1	1
0	1	1	1	0	0	1	0	0
1	0	0	1	0	1	1	0	1
1	0	1	1	1	0	1	1	0
1	1	0	0	0	1	0	0	1

D flip flop transition table.

STEP 6: DERIVE THE INPUT TABLE

STATE	PRESENT STATE			NEXT STATE			D FLIP FLOP		
	S.F	Q2	Q1	Q0	S.F	Q2	Q1	Q0	
0	RR	0	0	0	GR	0	0	1	
1	GR	0	0	1	YR	0	1	0	
2	YR	0	1	0	RR	0	1	1	
3	RR	0	1	1	RG	1	0	0	
4	RG	1	0	0	RY	1	0	1	
5	RY	1	0	1	RR	0	0	0	
6	RR	1	1	0	RR	0	0	0	
7	RR	1	1	1	RR	0	0	0	

The equation from the present:

$$D_2 = Q_2' Q_1 Q_0 + Q_2 Q_1' Q_0'$$

$$D_1 = Q_2' Q_1' Q_0 + Q_2' Q_1 Q_0'$$

$$D_0 = Q_2' Q_1' Q_0' + Q_2' Q_1 Q_0' + Q_2 Q_1' Q_0'$$

$$= Q_1' Q_0' (Q_2 + Q_2') + Q_2' Q_1 Q_0'$$

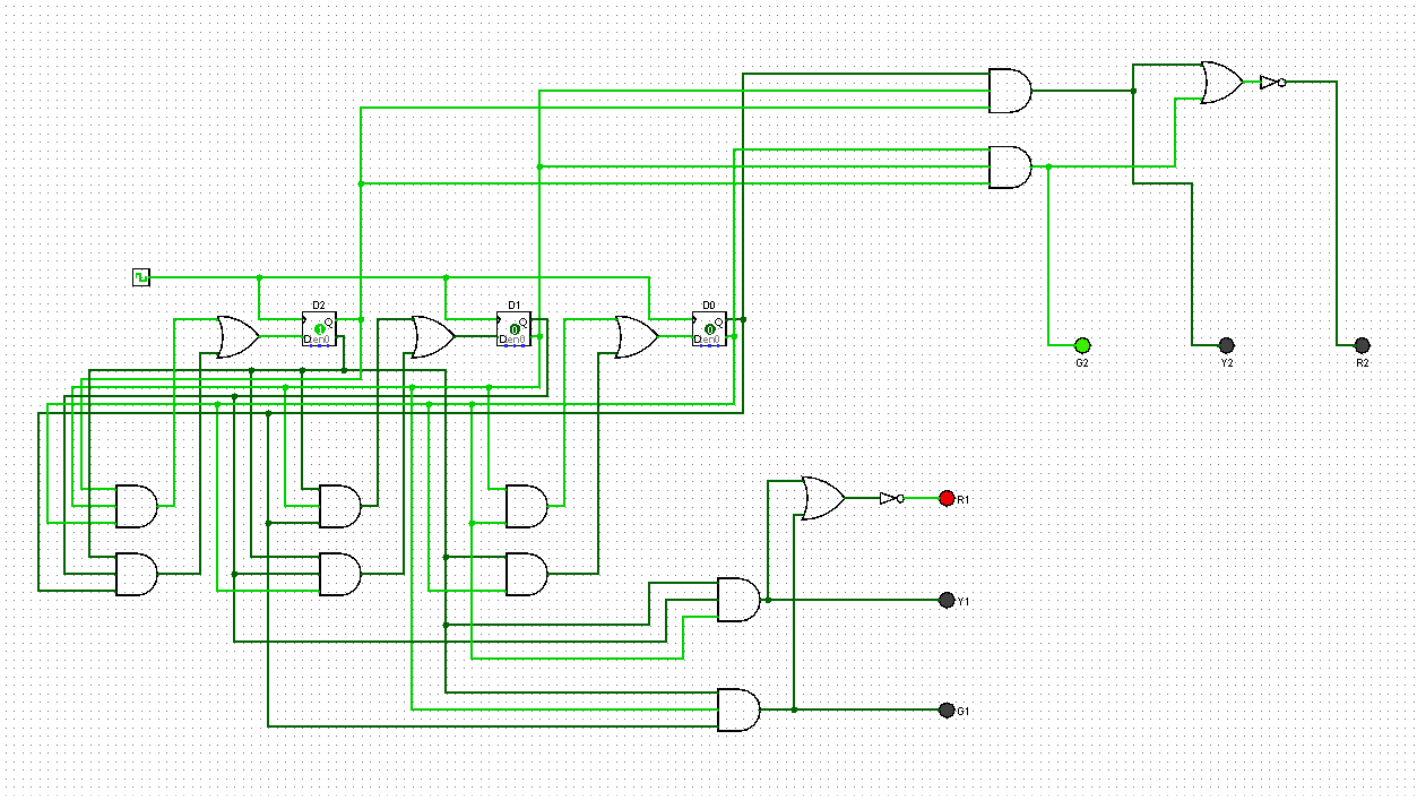
$$= Q_1' Q_0' + Q_2' Q_1 Q_0'$$

$$= Q_0' (Q_1' + Q_1 Q_2')$$

$$= Q_0' (Q_1' + Q_2')$$

$$= Q_0' Q_1' + Q_2' Q_0'$$

STEP 7: DRAW THE CIRCUIT.



CONCLUSION

From this project it can be concluded that there are 7 steps that must be followed to make a simple traffic light system. In addition, we can use the same method to make three or more ways of traffic light road but the process might be more challenging as we have to deal with more than 3-bit of binary number. Furthermore, instead of using D flip flop as the input for the traffic light, JK flip flop and T flip flop also can be used in this project. Just follow these steps and change the D flip flop to others.