CSE 232 SPRING 2020

PROJECT 1

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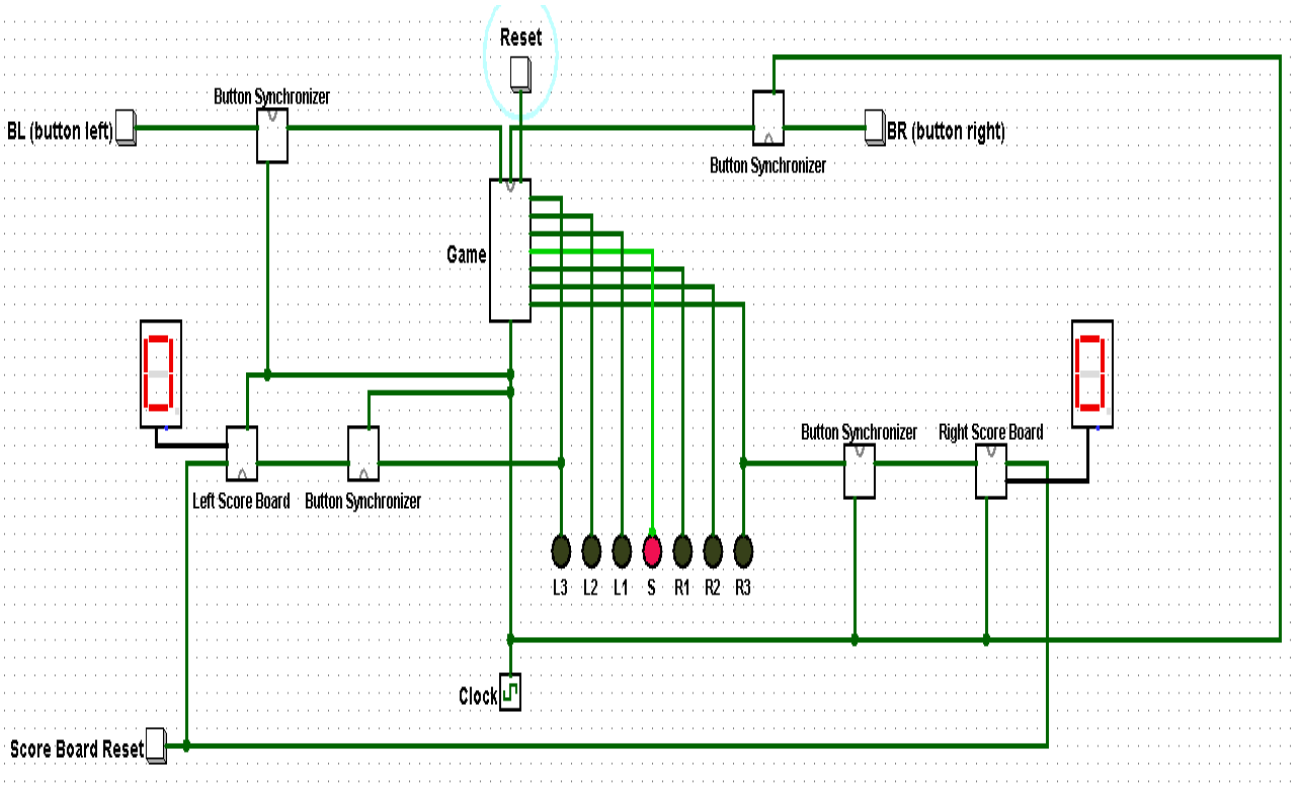
There is 3 FSM in this Project. Button Synchronizer , Turn Leds, Score Board .

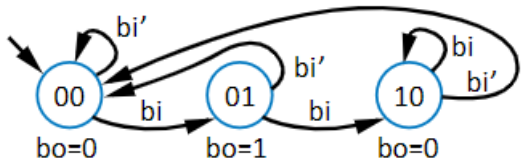
In this Project, everything asked for is handled like pressing button all the time doesnt has an effect etc.

GENERAL CIRCUIT



Button Synchronizer

State diagram



From book

Truth Table

s1	s0	bi	n1	n0	bo
0	0	0	0	0	0
0	0	1	0	1	0
0	1	0	0	0	1
0	1	1	1	0	1
1	0	0	0	0	0
1	0	1	1	0	0
1	1	0	0	0	0
1	1	1	0	0	0

From book

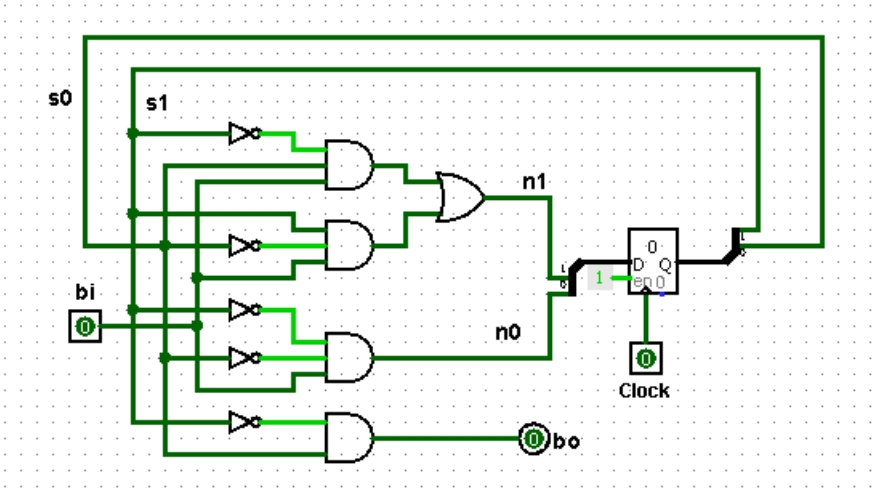
Boolean Expressions

n1 = s1's0bi + s1s0bi

n0 = s1's0'bi

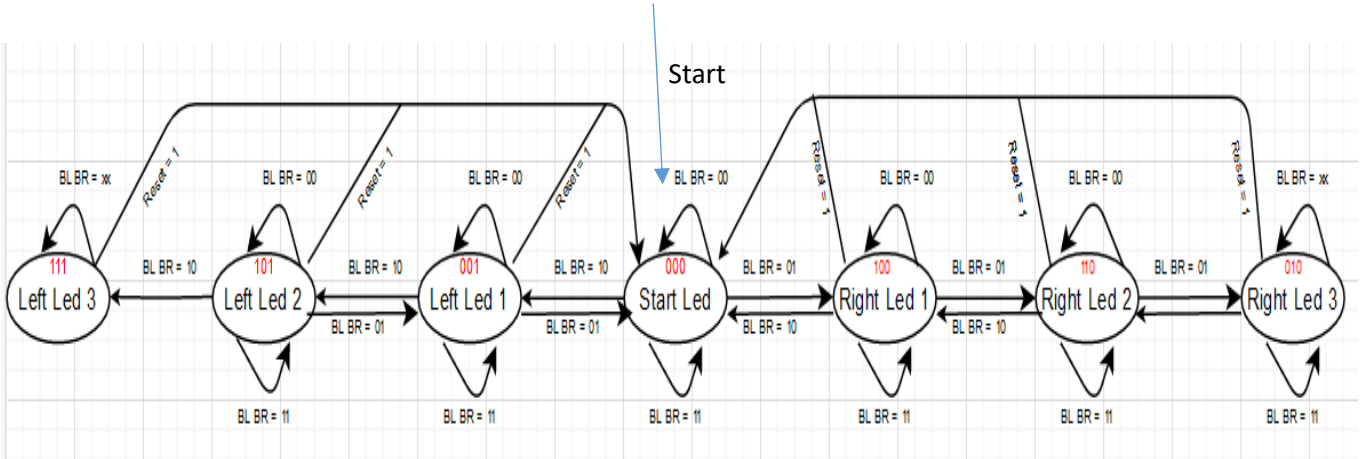
bo = s1's0bi' + s1's0bi

Circuit



Turn Leds

State Diagram



Truth Table

Q3	Q2	Q1	BL	BR	D3	D2	D1	L3	L2	L1	S	R1	R2	R3
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	1	1	0	0	0	0	0	1	0	0	0
0	0	0	1	0	0	0	1	0	0	0	1	0	0	0
0	0	0	1	1	0	0	0	0	0	0	1	0	0	0
0	0	1	0	0	0	0	1	0	0	1	0	0	0	0
0	0	1	0	1	0	0	0	0	0	1	0	0	0	0
0	0	1	1	0	1	0	1	0	0	1	0	0	0	0
0	0	1	1	1	0	0	1	0	0	1	0	0	0	0
0	1	0	0	0	0	1	0	0	0	0	0	0	0	1
0	1	0	0	1	0	1	0	0	0	0	0	0	0	1
0	1	0	1	0	0	1	0	0	0	0	0	0	0	1
0	1	0	1	1	0	1	0	0	0	0	0	0	0	1
0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
0	1	1	0	1	0	0	0	0	0	0	0	0	0	0
0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
0	1	1	1	1	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	1	0	0	0	0	0	0	1	0	0
1	0	0	0	1	1	1	0	0	0	0	0	1	0	0
1	0	0	1	0	0	0	0	0	0	0	0	1	0	0
1	0	0	1	1	1	0	0	0	0	0	0	1	0	0
1	0	1	0	0	1	0	1	0	1	0	0	0	0	0
1	0	1	0	1	0	0	1	0	1	0	0	0	0	0
1	0	1	1	0	1	1	1	0	1	0	0	0	0	0
1	0	1	1	1	1	0	1	0	1	0	0	0	0	0
1	1	0	0	0	1	1	0	0	0	0	0	0	1	0
1	1	0	0	1	0	1	0	0	0	0	0	0	1	0
1	1	0	1	0	1	0	0	0	0	0	0	0	1	0
1	1	0	1	1	1	1	0	0	0	0	0	0	1	0
1	1	1	0	0	1	1	1	1	0	0	0	0	0	0
1	1	1	0	1	1	1	1	1	0	0	0	0	0	0
1	1	1	1	0	1	1	1	1	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	0	0	0	0	0	0

Reset is directly wired to register's reset so I do not put it to table

Boolean Expression

D3 = Q2' Q1' BL' BR + Q2' Q1 BL BR' + Q3 BL' BR' + Q3 BL BR + Q3 Q2 BR' + Q3 Q2 Q1

D2 = Q3' Q2 Q1' + Q3 Q1' BL' BR + Q3 Q1 BL BR' + Q3 Q2 BL' + Q3 Q2 BR

D1 = Q3' Q2' BL BR' + Q2' Q1 BR' + Q2' Q1 BL + Q3 Q1

L3 = Q3 Q2 Q1

L2 = Q3 Q2' Q1

L1 = Q3’ Q2’ Q1

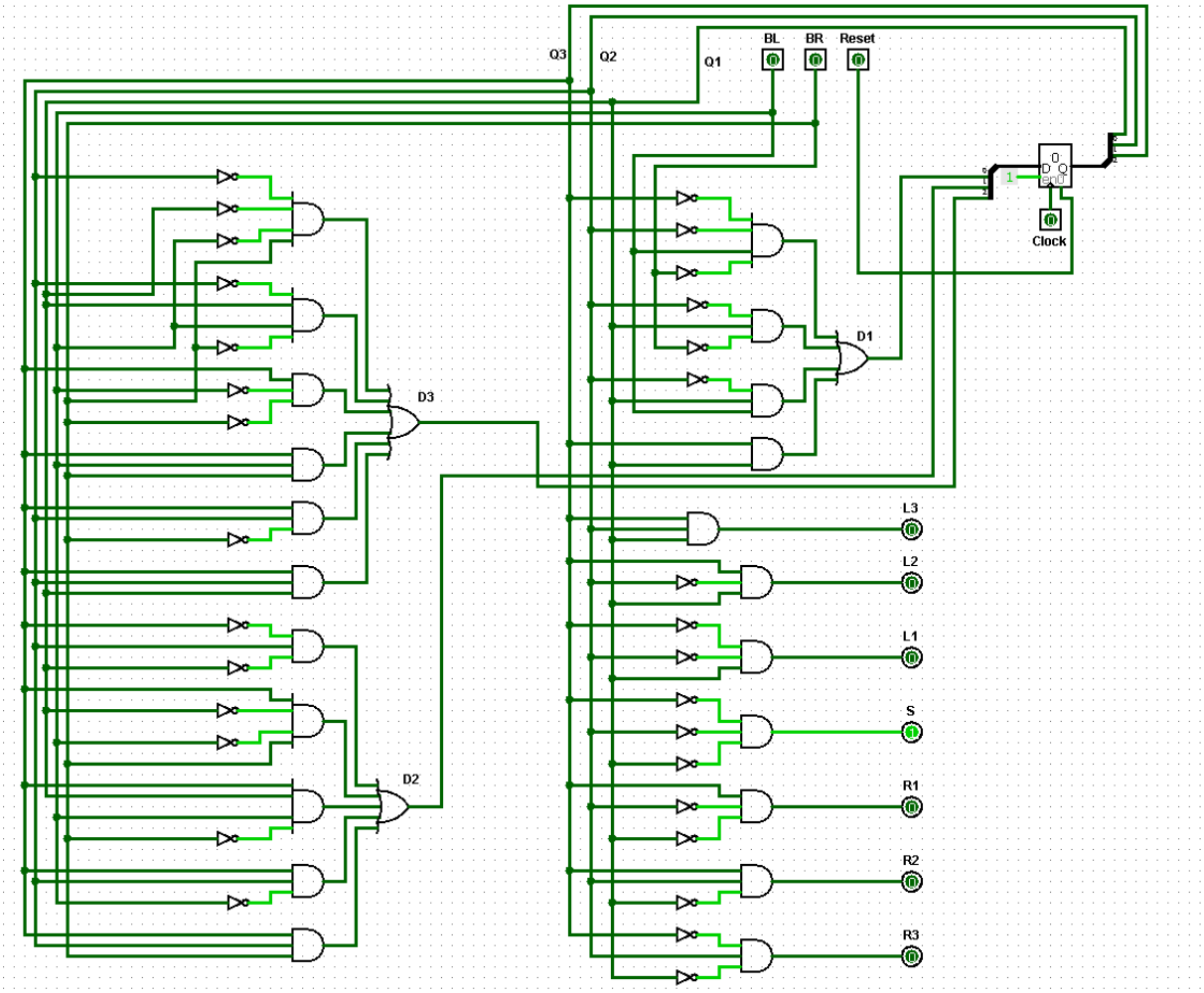
S = Q3’ Q2’ Q1’

R1 = Q3 Q2’ Q1’

R2 = Q3 Q2 Q1’

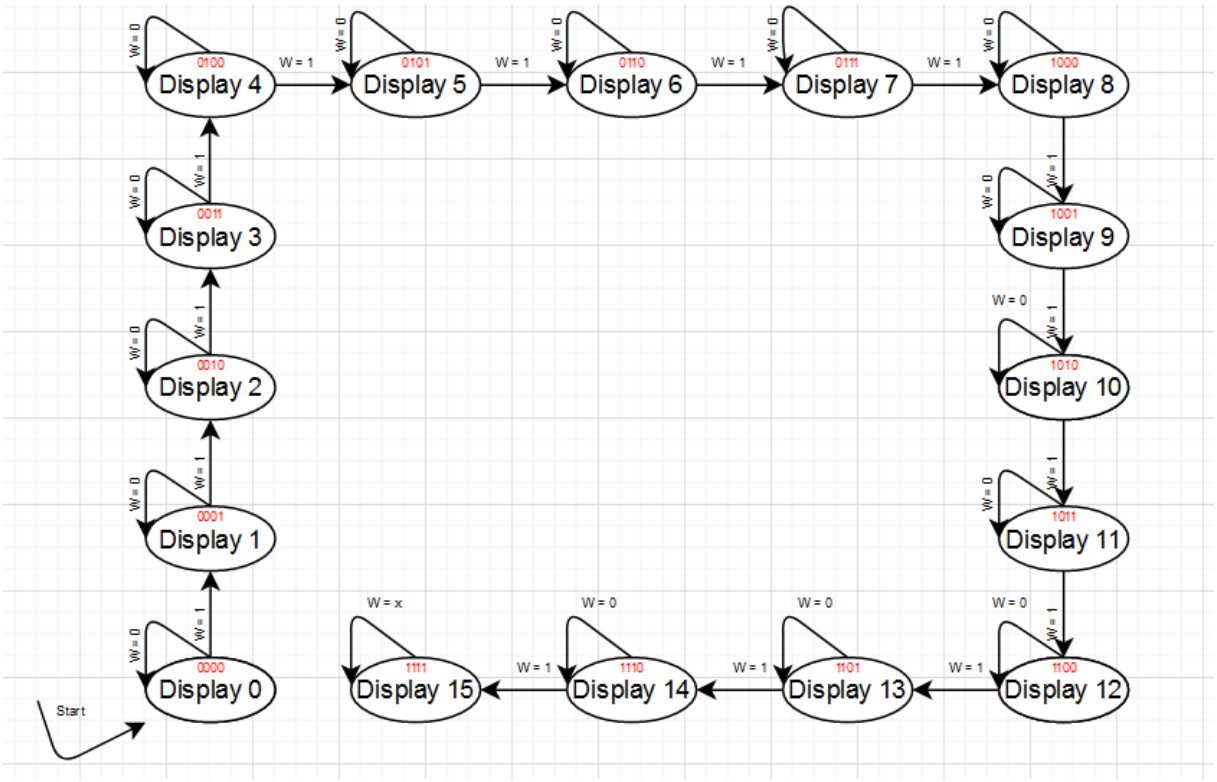
R3 = Q3’ Q2 Q1’

Circuit



Score Board

State Diagram



Truth Table

S3	S2	S1	S0	W	N3	N2	N1	N0
0	0	0	0	0	0	0	0	0
0	0	0	0	1	0	0	0	1
0	0	0	1	0	0	0	0	1
0	0	0	1	1	0	0	1	0
0	0	1	0	0	0	0	1	0
0	0	1	0	1	0	0	1	1
0	0	1	1	0	0	0	1	1
0	0	1	1	1	0	1	0	0
0	1	0	0	0	0	1	0	0
0	1	0	0	1	0	1	0	1
0	1	0	1	0	0	1	0	1
0	1	0	1	1	0	1	1	0
0	1	1	0	0	0	1	1	0
0	1	1	0	1	0	1	1	1
0	1	1	1	0	0	1	1	1
0	1	1	1	1	1	0	0	0
1	0	0	0	0	1	0	0	0
1	0	0	0	1	1	0	0	1
1	0	0	1	0	1	0	0	1
1	0	0	1	1	1	0	1	0
1	0	1	0	0	1	0	1	0
1	0	1	0	1	1	0	1	1
1	0	1	1	0	1	0	1	1
1	0	1	1	1	1	1	0	0
1	1	0	0	0	1	1	0	0
1	1	0	0	1	1	1	0	1
1	1	0	1	0	1	1	0	1
1	1	0	1	1	1	1	1	0
1	1	1	0	0	1	1	1	0
1	1	1	0	1	1	1	1	1
1	1	1	1	0	1	1	1	1
1	1	1	1	1	1	1	1	1

Boolean Expression

N3 = S2 S1 S0 W + S3

N2 = S2’ S1 S0 W + S2 S1’ + S2 S0’ + S2 W’ + S3 S2

N1 = S1’ S0 W + S1 S0’ + S1 W’ + S3 S2 S1

N0 = S0’ W + S0 W’ + S3 S2 S1 S0

Circuit