DIGITAL LOGIC DESIGN

PROJECT REPORT

4-WAY TRAFFIC SIGNAL

SUBMITTED BY:

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SUBMITTED TO:

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DATE:

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Abstract

The proposed project aims to design and implement a four-way traffic light system using flip-flops and logic gates. This project leverages digital logic design principles to create an efficient and reliable traffic control system. The utilization of flip-flops and logic gates provides a structured and systematic approach to traffic signal sequencing, ensuring optimal traffic flow and safety. The project will involve simulation and software design to validate the functionality of the system before practical implementation.

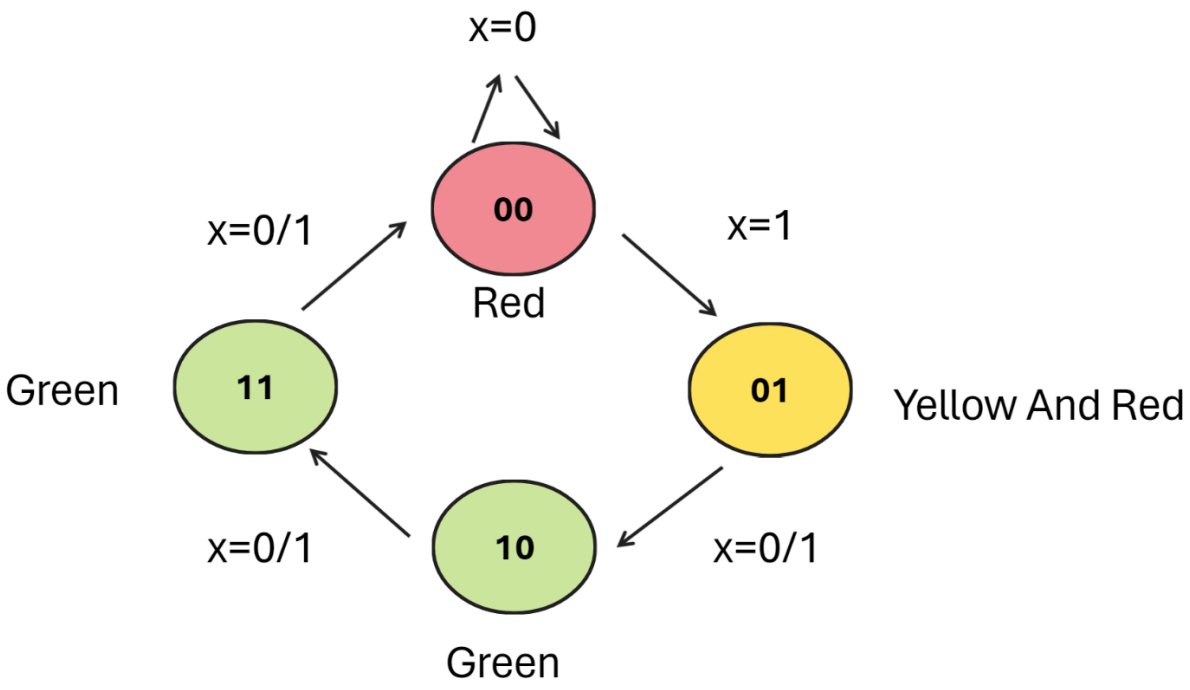
Introduction

Traffic control systems play a pivotal role in regulating vehicular movement, ensuring safety, and minimizing congestion. The conventional traffic light systems utilize basic timers and controllers. However, this project seeks to enhance the traditional approach by incorporating digital logic design elements, specifically flip-flops and logic gates, to create a more robust and adaptable four-way traffic light system.

Working Principle

The working principle of the proposed four-way traffic light system involves the sequential operation of the traffic signals at the intersection. Flip-flops and Counters will be employed to store and control the state of each signal, while logic gates will determine the transitions between different states. The system will be designed to handle the complexities of a four-way intersection, considering factors such as pedestrian crossings and emergency vehicle priority.

STATE DIAGRAM



STATE TABLE

PRESENT STATE		INPUT	NEXT STATE	
A	**B**	**X**	**A**	**B**
0	0	0	0	0
0	0	1	0	1
0	1	0	1	0
0	1	1	1	0
1	0	0	1	1
1	0	1	1	1
1	1	0	0	0
1	1	1	0	0

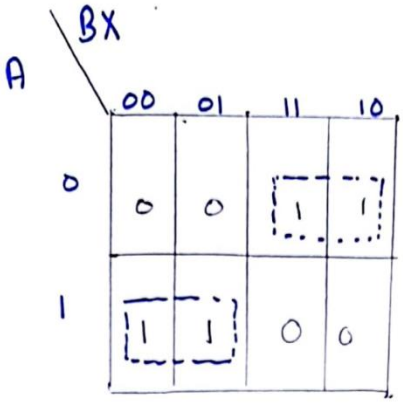
FLIP FLOP INPUT AND OUPUT EQUATION DETERMINATION

OPTIMIZATION

$$A = \Sigma m(2, 3, 4, 5)$$

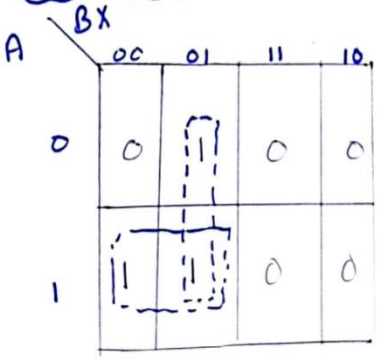
$$B = \Sigma m(1, 4, 5)$$

K-Maps:

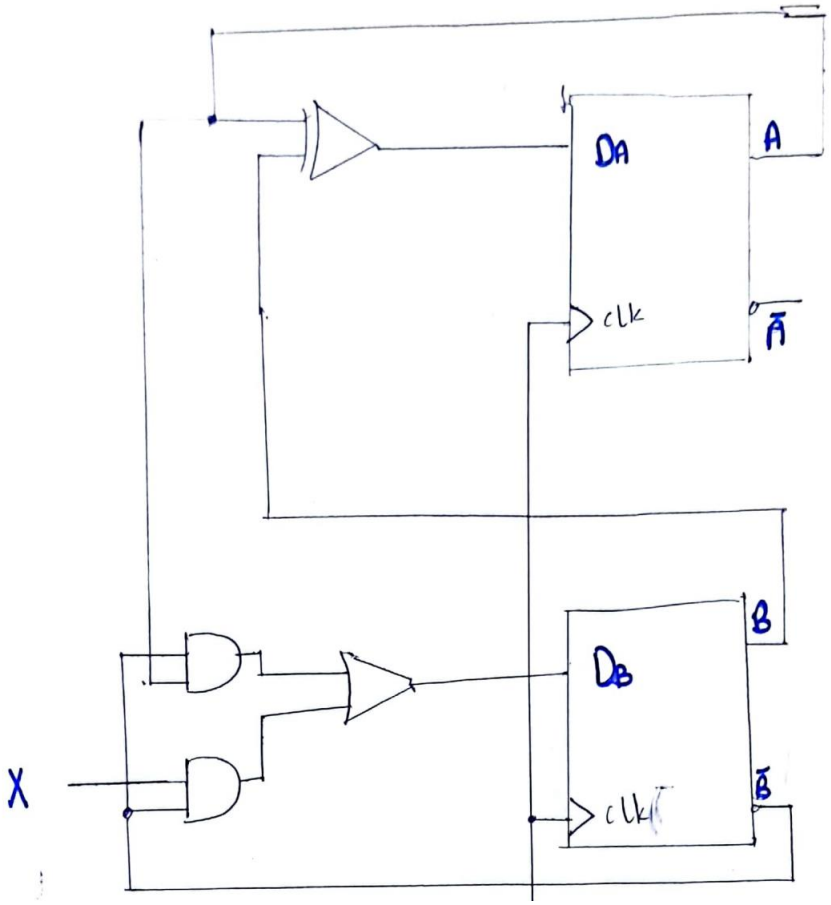


$$D_A = A\bar{B} + \bar{A}B$$

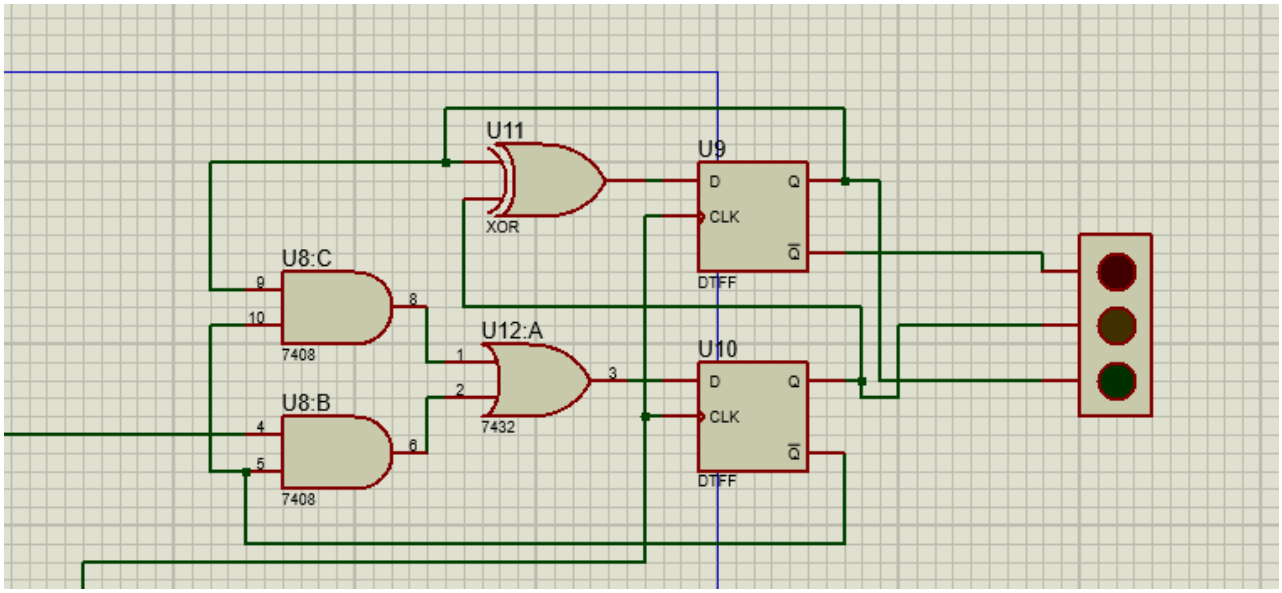
$$D_A = A \oplus B$$



$$D_B = A\bar{B} + \bar{B}X$$


DA
A
clk
$\bar{A}$
B
DB
X
clk
$\bar{B}$

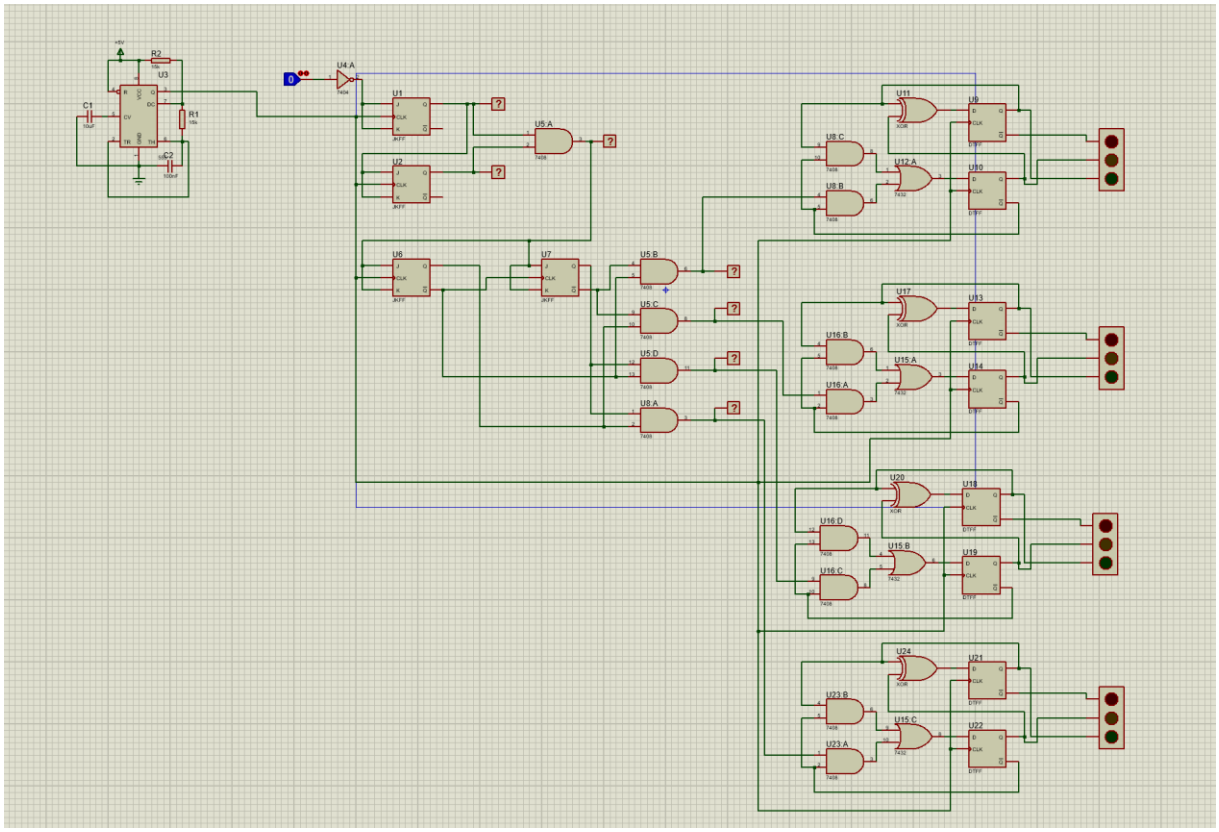
OR


U11
XOR
U9
D
Q
CLK
$\bar{Q}$
DTFF
U8:C
9
10
8
7408
U12:A
1
2
3
7432
U10
D
Q
CLK
$\bar{Q}$
DTFF
U8:B
4
5
6
7408

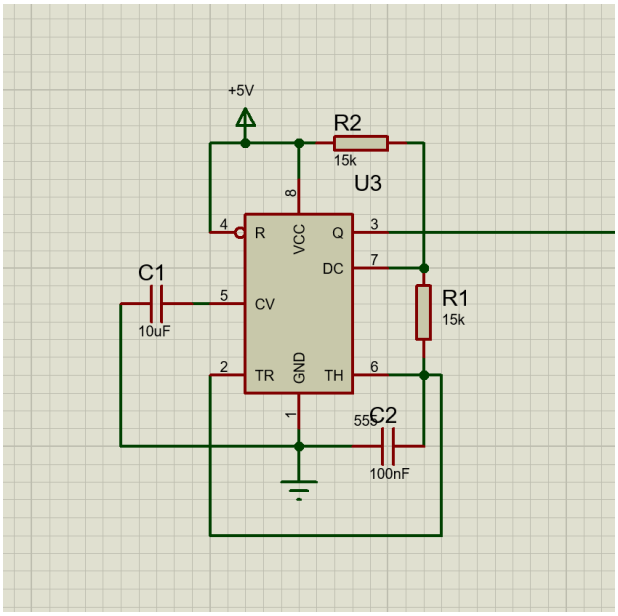
TECHNOLOGICAL MAPPING

SIMULATIONS

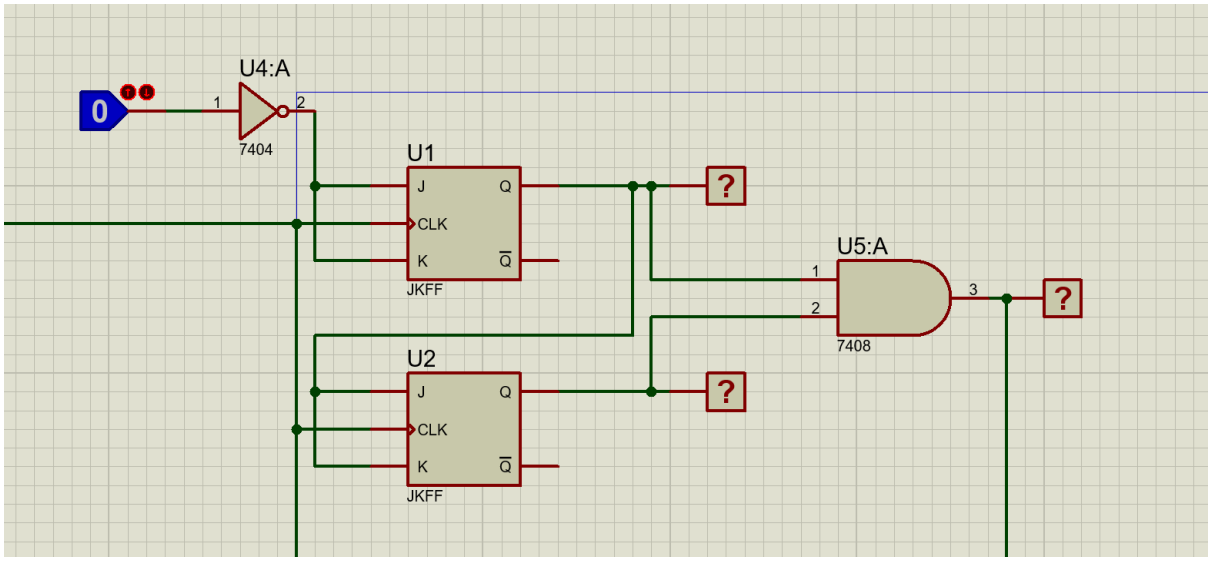
Overall Circuit

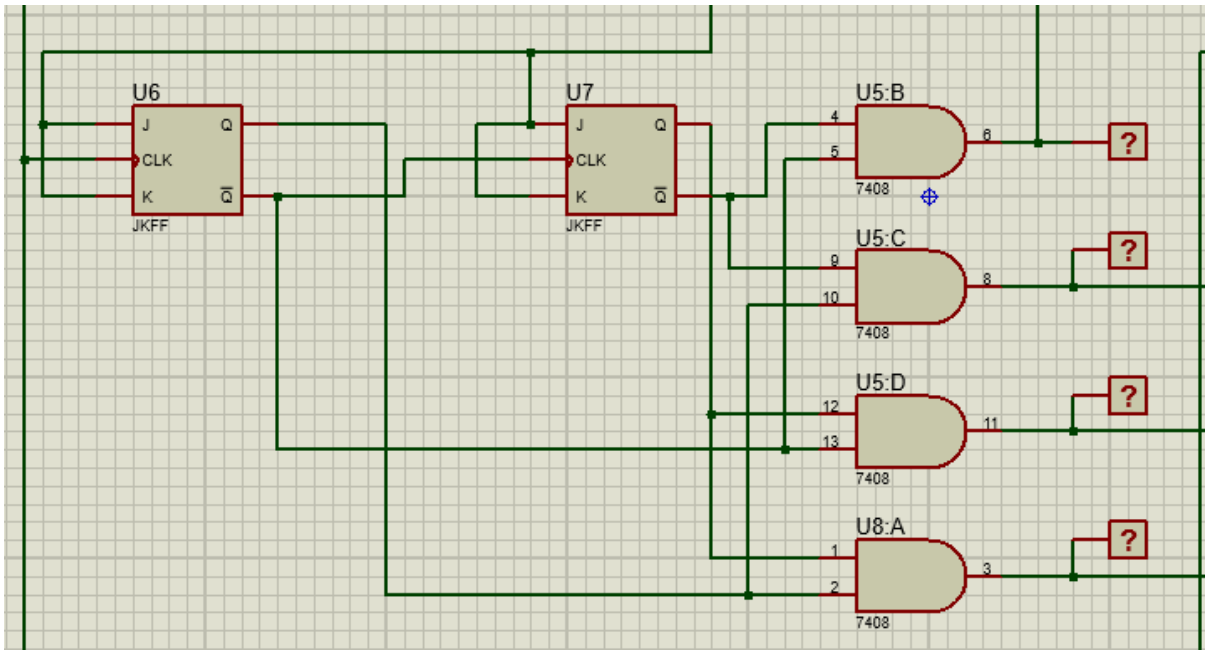


Timer Circuit:

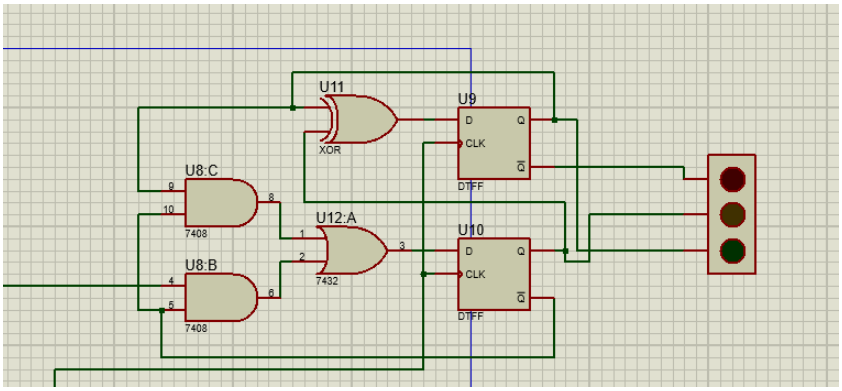


Counter And Selector:

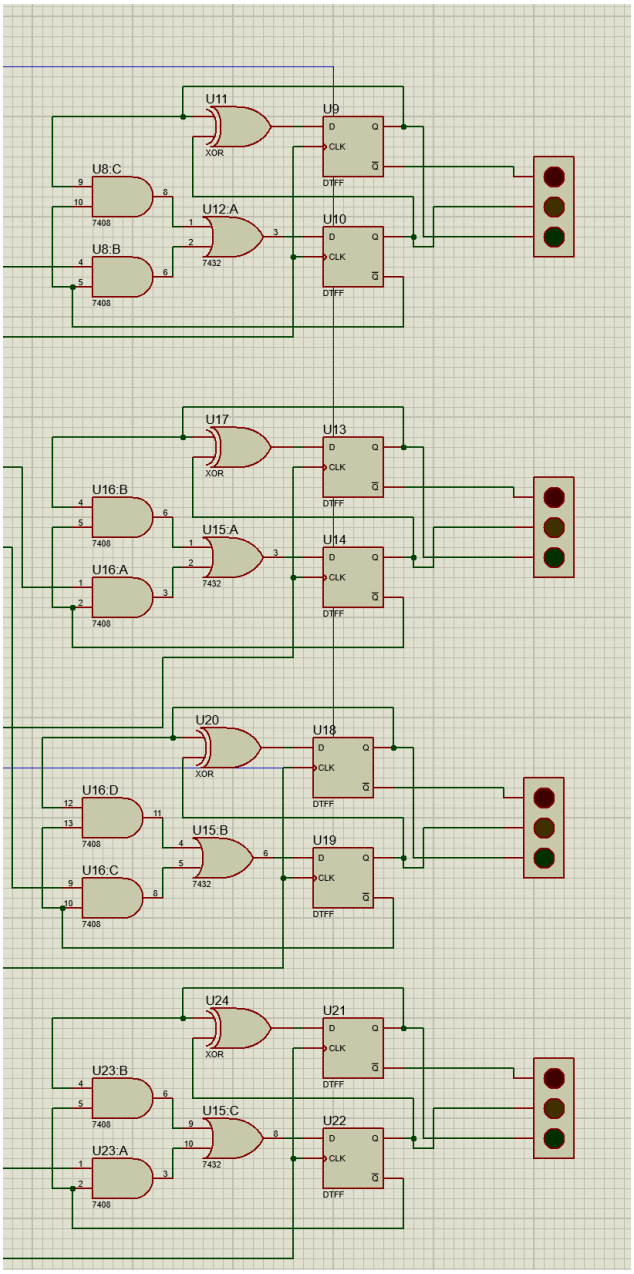




D-Flip Flop Circuit:



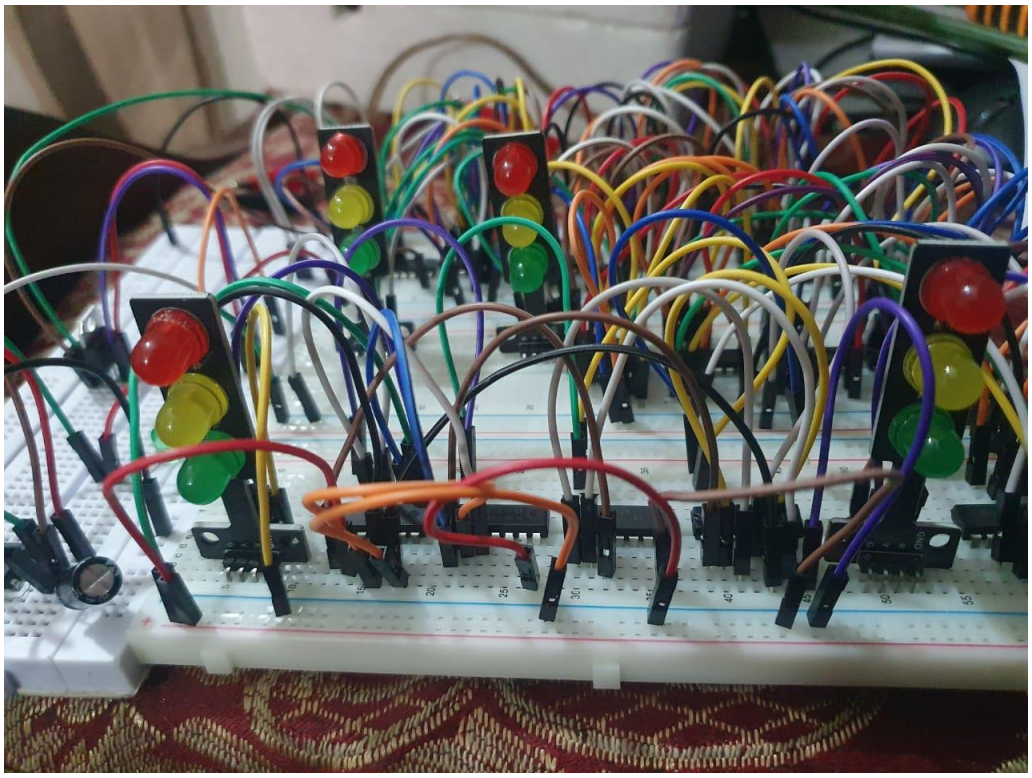
Combined Flip Flops For 4 Signal:

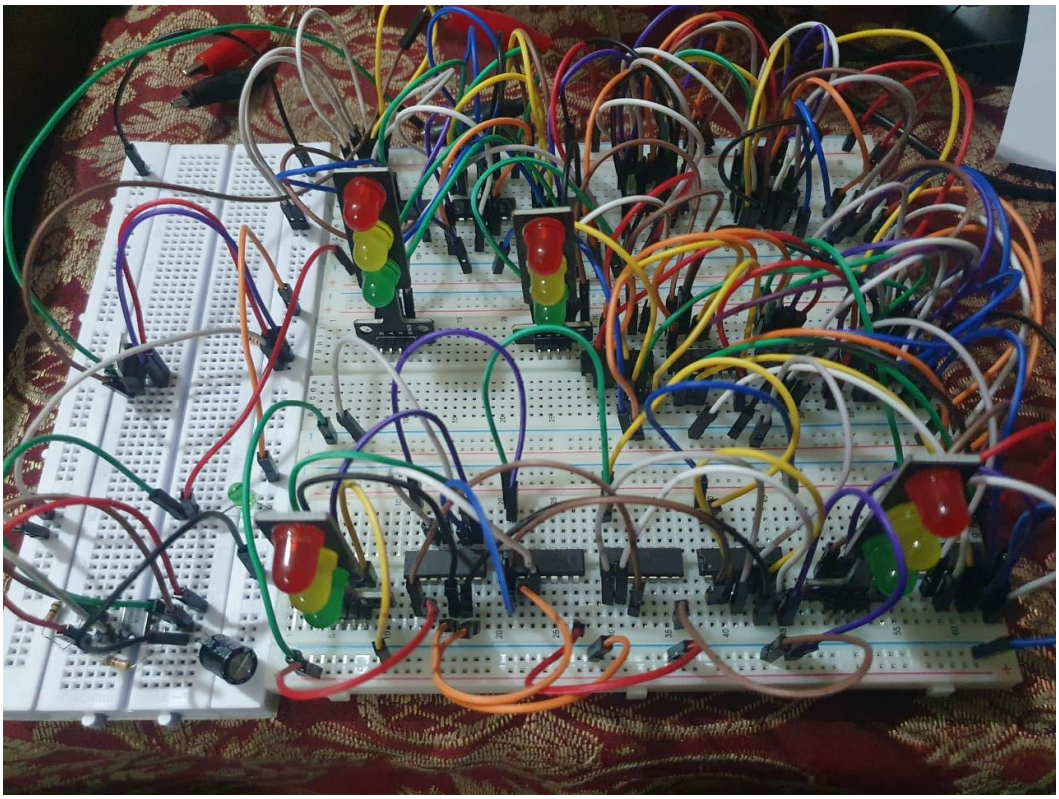


Simulation Video: [Media1.mp4]

File Link: [Project Circuit TrafficLight.pdsprj]

HARDWARE





Hardware Video: VID-20231213-WA0001.mp4

Applications

The application of this project extends to urban and suburban intersections where a four-way traffic light system is essential for efficient traffic management. The use of digital logic design elements ensures precise control over signal timings, allowing for customization based on traffic density and patterns. The system will contribute to improved traffic flow, reduced congestion, and enhanced safety for both motorists and pedestrians.

Conclusion

In conclusion, the four-way traffic light system project represents an innovative application of digital logic design principles to enhance conventional traffic control systems. By integrating flip-flops and logic gates, the project aims to create a reliable and efficient traffic management solution. The simulation and software design phases will ensure the robustness of the system before real-world implementation, offering a practical and sustainable solution to urban traffic challenges.
