East West University

Digital Logic Design

Course Name: Digital Logic Design

Course Code: CSE-345

Section No: 01

Projects Name: Four Way Traffic Light Controller System.

Submitted To.

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` Abstract

The project topic is designed on a 4 ways traffic light controller system using 555 timer IC and counter IC CD4017. We chose this topic because traffic control is very essential for the transportation way and conducts the road signal of automobiles. The lights basically control the flow of vehicles by the direct signal of color. The color represents red light on top for stopping vehicle movement, yellow light in the middle for slow down, and green light in bottom indicates go ahead. In the present day, using traffic lights to control congestion in the roadway and prevent vehicle collisions has been shown to be a truly excellent invention.

Introduction

Traffic signals played a significant role for all of the people by avoiding road accidents and vehicle bottleneck. The systems of traffic light control are often used for monitoring and controlling the movement of cars through the intersection of different roads. One of the essential public services that is significant to the passengers of the roads is the traffic light. John Peake Knight, a British railway engineer, developed the first traffic light in 1868 with red and green lights. But the signal occurs manually. Later in 1914, James Hoge, an American developer of an electrical control device created it. but modern traffic three signal light was invented by Garrett Morgan, an African-American inventor in 1920 with three color concept. three common colors are used in traffic signals green, yellow, and red. The green signal permits traffic to move forward in the direction indicated, while the yellow signal alerts drivers to a temporary stop and red light for stop car movements for a while. the optimal management of the large traffic jam is still a significant issue to be dealt with, especially with many junction nodes due to the rapid increase in the number of vehicles and a continuing rise of road users. this project's goal is to use the 555 timer ic to develop and create a discrete crossroad traffic signaling system. The control signals are 3-lights designed by a 4 way road system. in order to address

various flaws and enhance traffic management, this research indicates a simple, affordable, and real-time smart traffic light control system.

Objective

1. To monitor and control traffic and automobiles on roadways having massive traffic levels.
2.By giving the proper signals to different directions for a set period of time, avoid car accidents and ensure driver safety.
3. Optimizing Traffic Flow and decrease interruptions.
4. Reducing Congestion and Travel Time.
5. Enhancing Pedestrian and Cyclist Safety.
6. Sustainability and Environmental Impact.
7. To increase vehicle safety and environmental advantages.

Flowchart

The flowchart determines the color of signals maintaining the logic behind traffic rules.

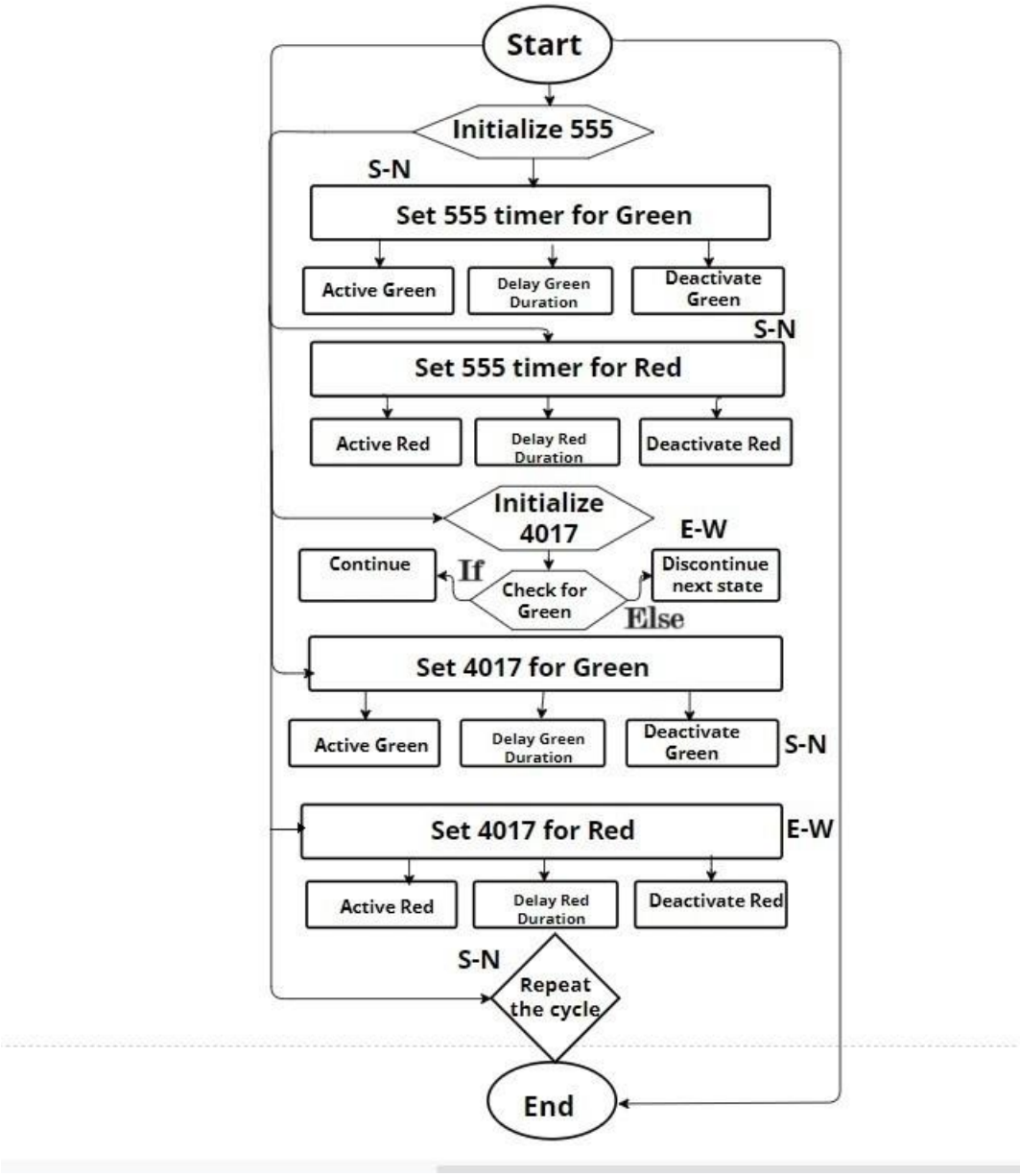

Figure:01

In this flowchart, set 555 timer IC for green initially, activing green then after deactivate red will active in South-North direction. Also set 4017 IC the condition applied in East-West direction of signal transform will flow.

4 way traffic direction

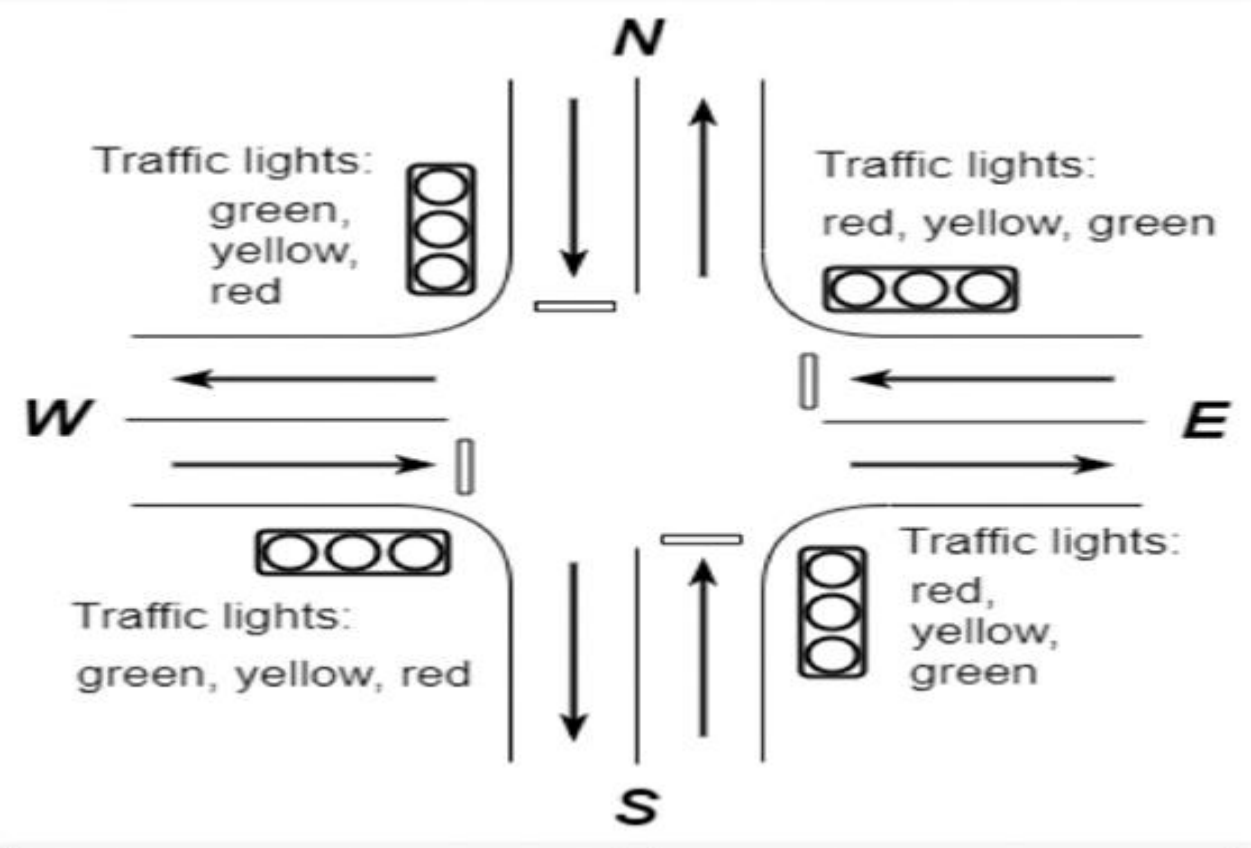

Figure:02

In the following diagram, there is a 4 way path North, South and East, West direction by maintaining the signal of traffic transform.

Components

Here we used some of the hardware components to implement the circuit.

Serial no	Components	Value	Quantity
1	Breadboard	---------	1
2	IC	555 Timer IC	1
3	Decade Counter IC	IC CD4017	1
4	Diode	1N4007	8
5	Resistor	1KΩ, 10KΩ and 220Ω	3
6	Capacitor	10uF and 100uF	2
7	LED	Green, Yellow, Red	12
8	Battery	9 Volt	1
9	Jumping wires	-------	---------

Table:01

Circuit Diagram

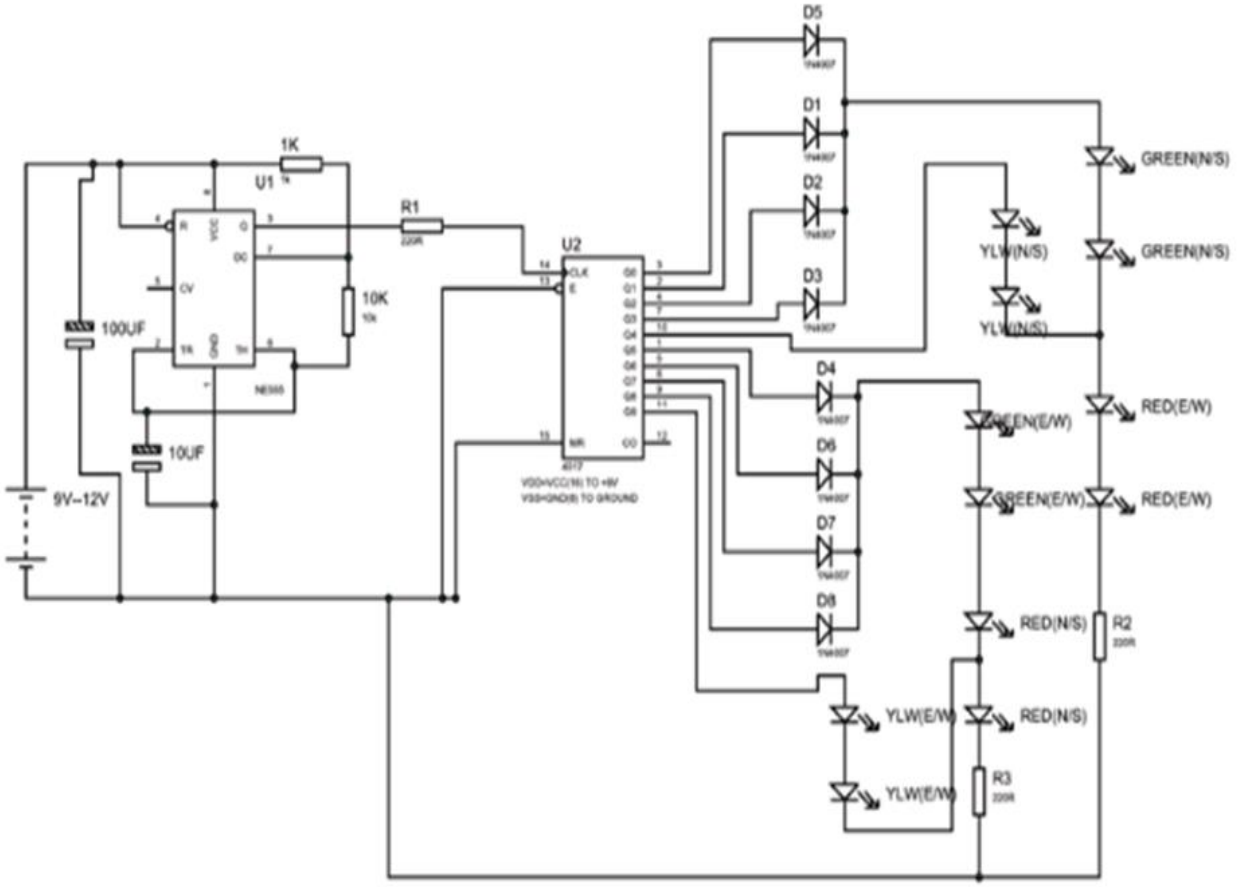

Figure:03

Circuit Implementation

Four way traffic light circuit diagram using 555 Timer IC and 4017 Timer IC is shown in the above diagram. The timer here generates pulses of time period 100ms approximately. So, the ON time is 50ms and OFF time is 50ms. This time duration can be changed by changing the capacitor value. Although street lights have a shift time for 2 minutes, here we are reducing the time for testing the circuit.

The time shift for a four way traffic light can be achieved in this circuit by replacing the 10uF capacitor with a 100uF one. Once the power is tune ON, the timer acts as a square wave generator and generates clock, this clock is fed to the Decade Binary Counter. Now the decade binary counter counts the number of pulses given at the clock and lets the corresponding pin output go high, for example, if the event count is 3 then Q2 pin of counter will be high and if 5 is count the pin Q4 will be high. So, for every 100ms there will be a peak, with this peak the counter memory gains by one and so is the output.

The diodes here prevent the shorting of counter outputs, say if the count is two with this the Q1 will be high (since Q1 is high all other outputs will be low including Q0, Q2) in the absence of diodes with positive voltage gets hardly pulled down to LOW by Q0 (as Q0 voltage be +0V when Q1 is high), as they are connected together. with this short circuit takes place, Q1.

So, during Q0, Q1, Q2, Q3 high the Green Led on North and South will be ON along with Red Led on East and West. So, if we assume clock is of 1Hz, the North and South side are signaled Green to go for four sec and also the East and West side are signaled Red to Stop during this time.

When Q4 goes high, the Yellow Led on North and South will be ON along with Red Led on East and West. So, if we assume clock is of 1Hz, the North and South side are signaled Yellow to slow down for 1sec and also the East and West side are signaled Red to Stop during this time.

When Q5, Q6, Q7, Q7 high the Green Led on East and West will be ON along with Red Led on North and South. So, if we assume clock is of 1Hz, the East and West side are signaled Green to go for four sec and also the North and South side are signaled Red to Stop during this time.

When Q4 goes high, the Yellow Led on East and West will be ON along with Red Led on North and South. So, if we assume clock is of 1Hz, the East and West side are signaled Yellow to slow down for 1sec and also the North and South side are signaled Red to Stop during this time.

These above four stages form a continuous cycle, to control the traffic light on a four way.

Pin Diagram of 555 IC

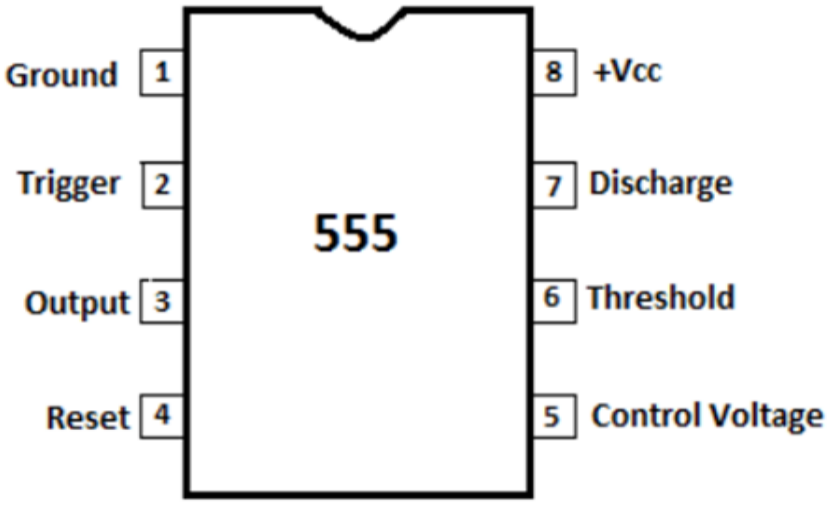

Figure:04

Generally, pin 1 determines ground voltage (0V). when the trigger is low, pin 2 out is high. The magnitude of the external trigger voltage connected to this pin determines the timer's output. The output is driven to GND, or a voltage of near 1.7 V above +Vcc in pin 3. There pin no 4 is reset by supplying this input to ground, but timing doesn't start up again until reset goes over 0.7 volts or such. exceeds which above threshold. Pin 5 gives users access to control the internal voltage divider 2 and 3 respectively in +Vcc. Pin 7 is an open collector discharge output that has the potential to periodically discharge a capacitor. in sync with the output.Vcc positive Supply Voltage in Pin 8 is typically 1

Pin Diagram of 4017 IC

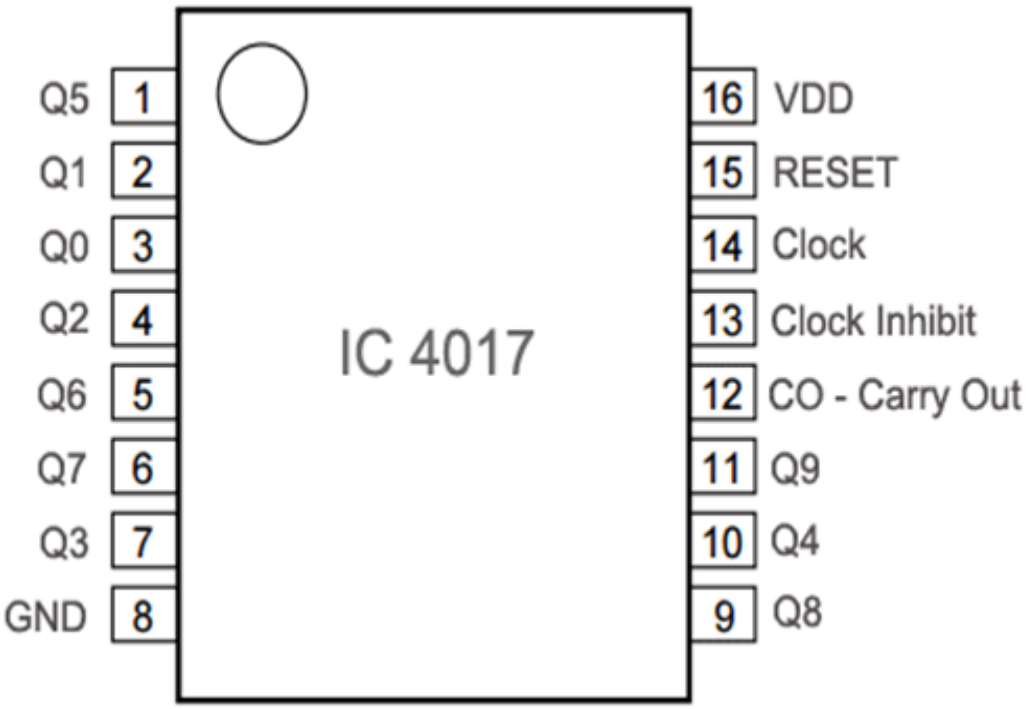

Figure:05

The supply pin for the CD4017 is pin number 16, which must be attached to positive voltage supply, and pin number 8 acts as the ground and must be connected to negative supply voltage. The carry out signal is delivered to pin 12. Each ten clock cycles, it completes one full cycle. This is done to 'ripple' the IC which delays counting operations power and supply Voltage is the potential difference between two places, while supply is the input provided to make a system function. The input voltage is a source voltage introduced into the circuit to enable operation and is known as supply voltage 9V.

Truth Table

Count	North-Red	North-Yellow	North-Green	South-Red	South-Yellow	South-Green	East-Red	East-Yellow	East-Green	West-Red	West-Yellow	West-Green
0	1	0	0	0	0	1	0	0	0	0	0	1
1	1	0	0	0	1	0	0	0	0	0	0	1
2	0	0	1	0	1	0	0	0	0	0	0	1
3	0	0	1	0	0	0	0	0	0	0	0	1
4	0	0	0	1	0	0	0	0	0	0	0	1
5	0	0	0	1	0	0	0	0	0	0	0	1
6	0	0	0	1	0	0	0	0	0	0	0	1
7	0	0	0	1	0	0	0	0	0	0	0	1
8	0	0	0	0	0	0	1	0	0	0	0	1
9	0	0	0	0	0	0	1	0	0	0	0	1

Table:02

We have determined the truth table in 4017 Decade counter which counts 0 to 9 BCD counter and make the logic for three color of signals light in 4 different directions.

Future Step of Four Way Traffic Light Control

Emergency Management Lane: This feature prioritizes lanes for emergency vehicles during critical situations, ensuring swift passage and potentially saving lives.

Remote Monitoring and Control: By enabling remote supervision, authorities can make instant adjustments to signal timings and respond to incidents efficiently, enhancing overall traffic management.

Pedestrian and Cyclist-Friendly Signals: Implementing signals designed for pedestrians and cyclists, such as countdown timers and dedicated crossing phases, promotes safety and encourages alternative modes of transportation.

Feedback Mechanism: A feedback system allows the public to report issues or provide suggestions, fostering community engagement and enabling continuous improvements in traffic management.

Implementation of Smart Traffic Management using Real-time Data and Sensors: Integrating real-time data from sensors enables dynamic adjustments to traffic signals based on actual traffic conditions, reducing congestion and improving the flow of vehicles.

Conclusion

To conclude, traffic jams are a typical occurrence that inhibit transactions while also wasting valuable time. Unauthorized parking is another factor in traffic congestion. Almost everywhere there is parking for cars, trucks, buses and other vehicles. Poor traffic signaling systems, a lack of staff, congested roads, and drivers' propensity for passing one other all contribute to protracted traffic jams, which make it impossible for people to move and suffocate the streets. Additionally, some bus terminals operate in violation of traffic regulations, and some drivers disregard the rules of the road. Another factor contributing to street congestion and divider issues in major cities is the upkeep of VIP protocol. overall, the current traffic system has to be modified to solve the severe traffic congestion, relieve transportation concerns, reduce traffic volume and delays, minimize commute times, maximize vehicle safety and efficiency, and enhance environmental benefits.

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