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DDS PROJECT REPORT
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ABSTRACT

Traffic light control systems are widely used to monitor and control the flow of automobiles through the junction of many roads. They aim to realize smooth motion of cars in the transportation routes. However, the synchronization of multiple traffic light systems at adjacent intersections is a complicated problem given the various parameters involved. Conventional systems do not handle variable flows approaching the junctions. In addition, the mutual interference between adjacent traffic light systems, the disparity of cars flow with time, the accidents, the passage of emergency vehicles, and the pedestrian crossing are not implemented in the existing traffic system. This leads to traffic jam and congestion. We propose a system based on PIC microcontroller that evaluates the traffic density using IR sensors and accomplishes dynamic timing slots with different levels. Moreover, a portable controller device is designed to solve the problem of emergency vehicles stuck in the overcrowded roads Smart traffic light control system.

Contents

Introduction

Introduction

Traffic lights, also known as traffic signals, traffic lamps, signal lights, robots are signaling devices positioned at or near road intersections, pedestrian crossings and other locations to control competing flows of traffic. Traffic lights were first installed in 1868 in London, United Kingdom; now used in almost every city of the world. Traffic lights alternate the right of way accorded to road users by displaying lights of a standard color (red, yellow/amber, and green) following a universal color code (and a precise sequence to enable comprehension by those who are color blind).

History

On 10 December 1868, the first traffic lights were installed outside the British Houses of Parliament in London, by the railway engineer J. P. Knight. They resembled railway signals of the time, with semaphore arms and red and green gas lamps for night use. The gas lantern was turned with a lever at its base so that the appropriate light faced traffic. It exploded on 2 January 1869, injuring or killing the policeman who was operating it. The modern electric traffic light is an American invention. As early as 1912 in Salt Lake City, Utah, policeman
Lester Wire invented the first red-green electric traffic lights. On 5 August 1914, the
American Traffic Signal Company installed a traffic signal system on the corner of East 105th Street and Euclid Avenue in Cleveland, Ohio. It had two colors, red and green, and a buzzer, based on the design of James Hoge, to provide a warning for color changes. The design by James Hoge allowed police and fire stations to control the signals in case of emergency. The first four-way, three-color traffic light was created by police officer William Potts in Detroit, Michigan in 1920. In 1922, T.E. Hayes patented his "Combination traffic guide and traffic regulating signal" (Patent # 1447659). Ashville, Ohio claims to be the location of the oldest working traffic light in the United States, used at an intersection of public roads until 1982 when it was moved to a local museum. The first interconnected traffic signal system was installed in Salt Lake City in 1917, with six connected intersections controlled simultaneously from a manual switch. Automatic

control of interconnected traffic lights was introduced March 1922 in Houston, Texas. The first automatic experimental traffic lights in England were deployed in Wolverhampton in 1927.

Figure : installation of a traffic signal in San Diego in December 1940

In 1923, Garrett Morgan patented his own version. The Morgan traffic signal was a T-shaped pole unit that featured three hand-cranked positions: Stop, go, and an all -directional stop position. This third position halted traffic in all directions to give drivers more time to stop before opposing traffic started. Its one "advantage" over others of its type was the ability to operate it from a distance using a mechanical linkage. Toronto was the first city to computerize its entire traffic signal system, which it accomplished in 1963. The color of the traffic lights representing stop and go might be derived from those used to identify port (red) and starboard (green) in maritime rules governing right of way, where the vessel on the left must stop for the one crossing on the right. Countdown timers on traffic lights were introduced in the 1990s. Though uncommon in most American urban areas, timers are used in some other Western Hemisphere countries. Timers are useful for drivers/pedestrians to plan if there is enough time to attempt to cross the intersection before the light turns red and conversely, the amount of time before the light turns green.

In the typical sequence of color phases

- Illumination of the green light allows traffic to proceed in the direction denoted, if it is safe to do so
- Illumination of the orange/amber light denoting prepare to stop short of the intersection, if it is safe to do so
- Illumination of the red signal prohibits any traffic from proceeding

Usually, the red light contains some orange in its hue, and the green light contains some blue, said to be for the benefit of people with red-green color blindness.

The three colors and their meanings

There are three colors (or traffic lights):

- **RED - personal for named recipients only**

  In the context of a meeting, for example, RED information is limited to those present at the meeting. In most circumstances, RED information will be passed verbally or in person.

- **AMBER - limited distribution**

  The recipient may share AMBER information with others within their organization, but only on a „need-to-know" basis. The originator may be expected to specify the intended limits of that sharing.

- **GREEN - community wide**

  Information in this category can be circulated widely within a particular community. However, the information may not be published or posted publicly on the Internet, nor released outside of the community.

Operation and Working Principle of Traffic Controller

Working principle

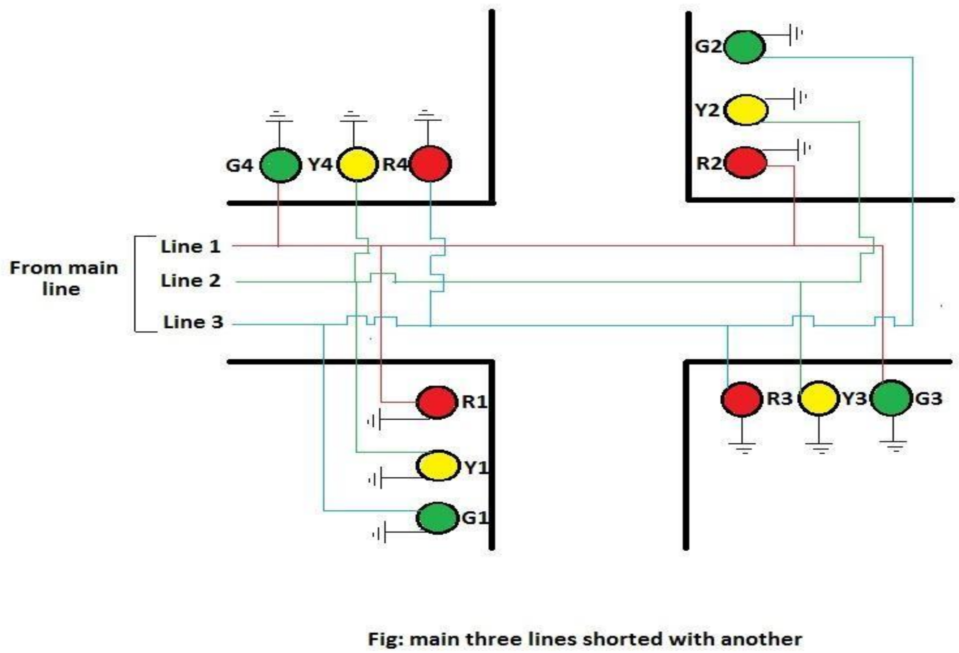


Figure : main three line shorted with another

At first main power is stepped down by transformer X1 to deliver a secondary output of 9v, 300 mA. The transformer out put is rectified by a full-wave bridge rectifier comprising diodes D1 through D4. Filtered by capacitor C1 and regulated by voltage regulator IC1 7805.

IC2 is wired as a multivibrator with „ON‟ and „OFF‟ periods of 35 and 30 seconds. As soon as main power is switched on, pin 3 of IC2 goes high for 35 seconds. This in turn energies relay RL1 its normally-open(N/O) contact through transistor T1 then the red lamp R1, R2 glows for stopping Road1 and Road2‟s vehicle also green lamp G3, G4 glows through its normally-open contact to running Road3 and Road4‟s vehicle for 35 seconds shown in figure.

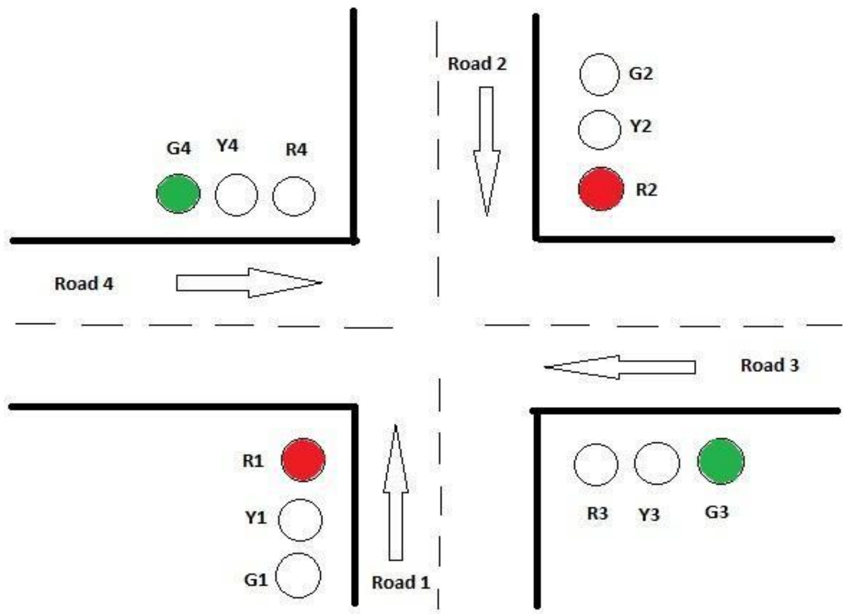


Fig: using traffic contriller with four way

Figure: first step of traffic controller

At the same time main power is disconnected from the pole of relay RL2. As the on time of IC2, a pulse at its pin 3 triggers IC3 through C5. IC3 is configured as a monostable with „ON‟ time of about 5 second. which means pin 3 of IC3 will remain high for this period and energies relay RL2 through driver transistor T2. The yellow lamps Y1,Y2,Y3 and Y4 lights up for 5 seconds shown in figure.

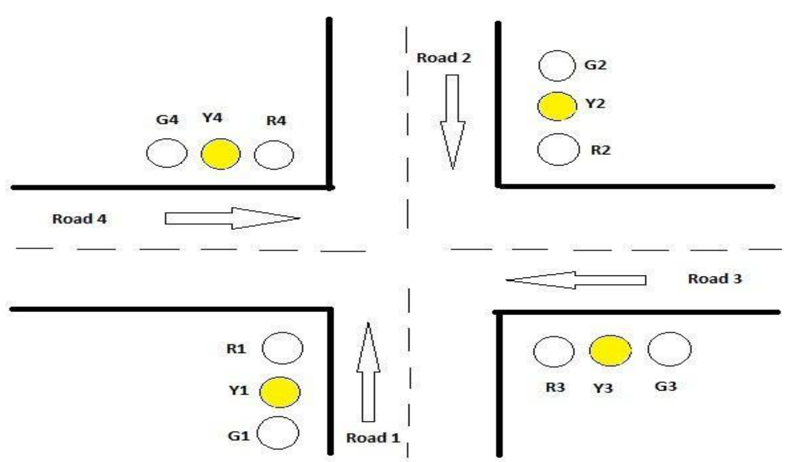


Fig: using traffic contriller with four way second step of traffic controller

As soon as 5 second time period of timer IC3 at pin 3 lapses, relay RL2 de-energies and finally the red lamp R3, R4 glows for stopping Road3 and Road4‟s vehicle also green lamp G1,G2 glows through its normally-closed (N/C)contact to running Road1 and Road2‟s vehicles for 30 seconds shown in figure.

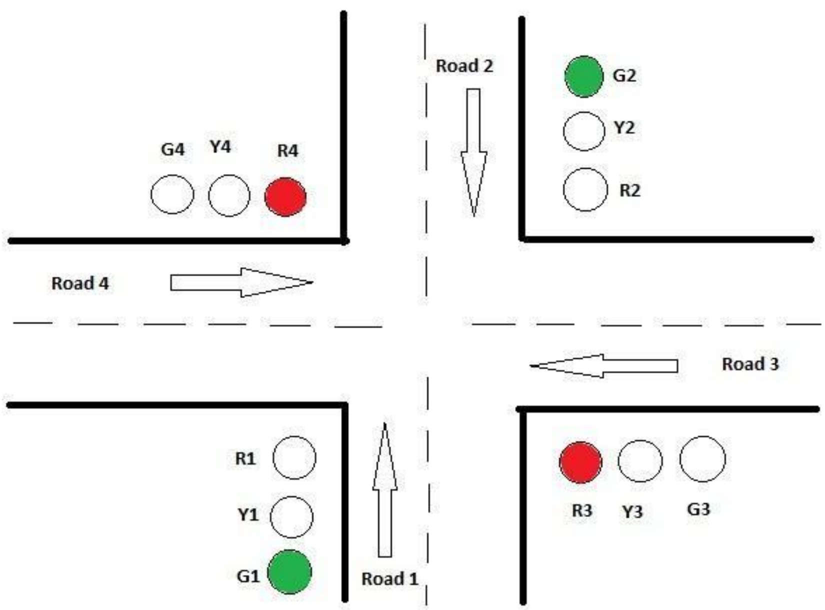


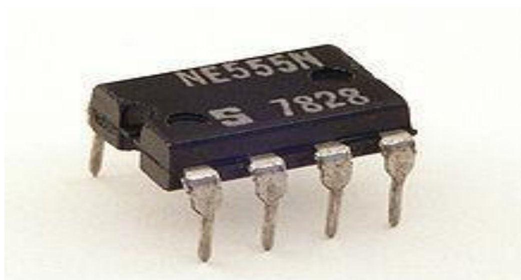
Fig: using traffic contriller with four way

final step of traffic controller

LM555C Timer IC

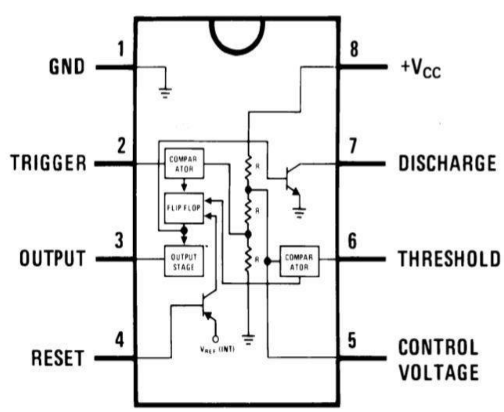
The 555 timer IC is an integrated circuit (chip) used in a variety of timer, pulse generation, and oscillator applications. The 555 can be used to provide time delays, as an oscillator, and as a flip-flop element. Derivatives provide up to four timing circuits in one package.

Introduced in 1972 by Signetics, the 555 is still in widespread use, thanks to its ease of use, low price, and good stability. It is now made by many companies in the original bipolar and also in low-power CMOS types. As of 2003, it was estimated that 1 billion units are manufactured every years.



555Timer IC

Pinout Diagram Of Timer IC



Top View

Pin Diagram of 555

The connection of the pins for a DIP package is as follows:

Pin	Name	Purpose
1	GND	Ground reference voltage, low level (0 V)
2	TRIG	The OUT pin goes high and a timing interval starts when this input falls below 1/2 of CTRL voltage (which is typically 1/3 of V_{CC}, when CTRL is open).
3	OUT	This output is driven to approximately 1.7V below $+V_{CC}$ or GND.
4	RESET	A timing interval may be reset by driving this input to GND, but the timing does not begin again until RESET rises above approximately 0.7 volts. Overrides TRIG which overrides THR.
5	CTRL	Provides "control" access to the internal voltage divider (by default, 2/3 V_{CC}).
6	THR	The timing (OUT high) interval ends when the voltage at THR is greater than that at CTRL.
7	DIS	Open collector output which may discharge a capacitor between intervals. In phase with output.
8	V_{CC}	Positive supply voltage, which is usually between 3 and 15 V depending on the variation.

Pin 5 is also sometimes called the CONTROL VOLTAGE pin. By applying a voltage to the CONTROL VOLTAGE input one can alter the timing characteristics of the device. In most applications, the CONTROL VOLTAGE input is not used. It is usual to connect a 10 nF capacitor between pin 5 and 0 V to prevent interference. The CONTROL VOLTAGE input can be used to build an astable with a frequency modulated output.

LM555 Circuit Schematic:

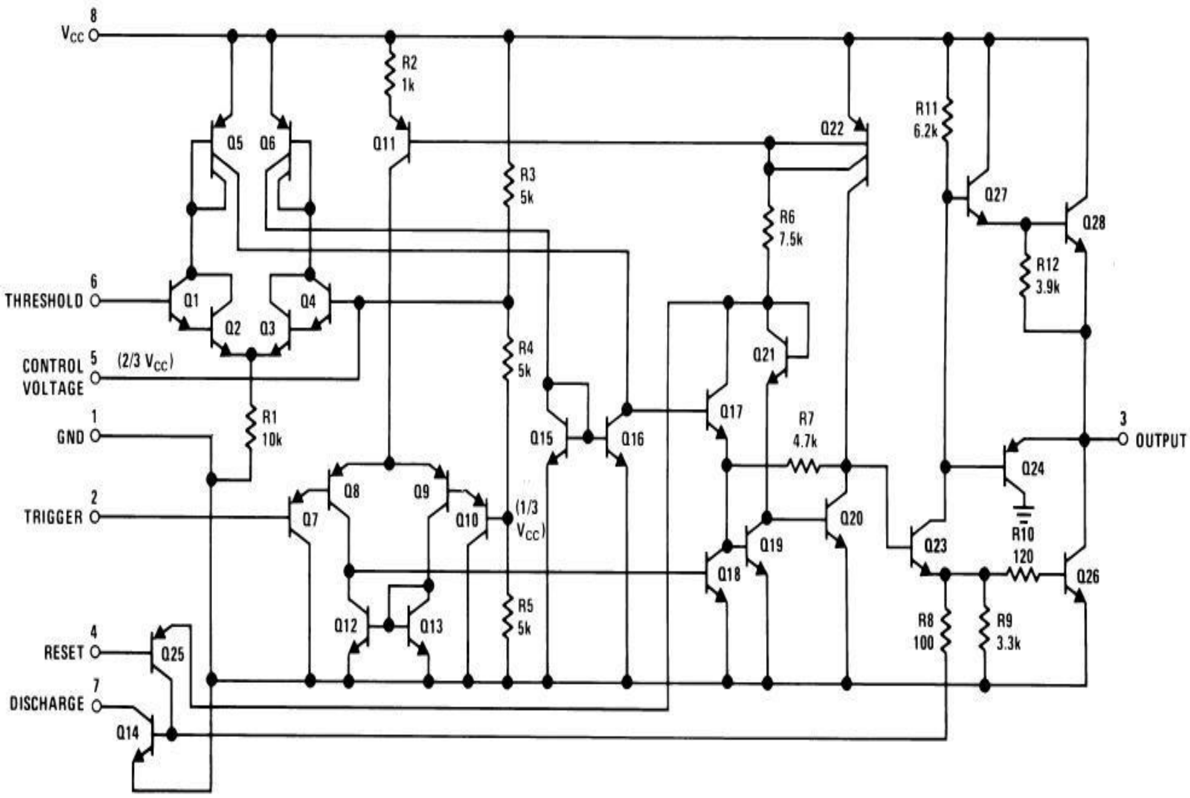
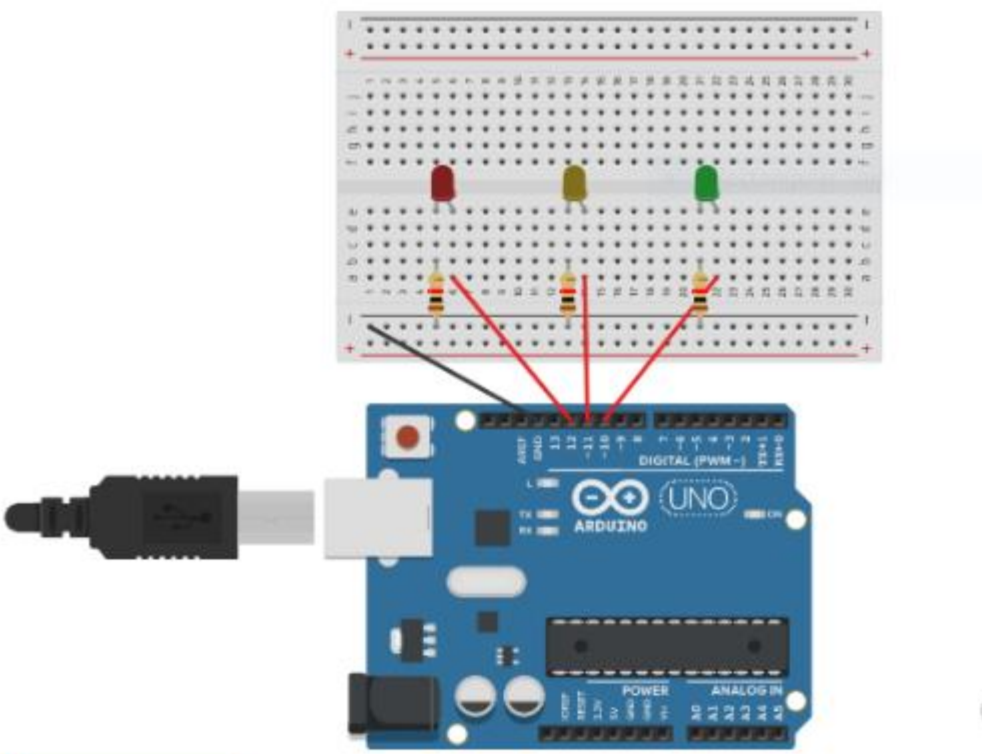


Figure : Schematic diagram of 555Timer IC

COMPONENTS USED:

Name	Quantity	Component
R1 R2 R3	3	1 kohm Resistor
D1	1	Red LED
D2	1	Green LED
D3	1	Yellow LED
U1	1	Arduino Uno R3

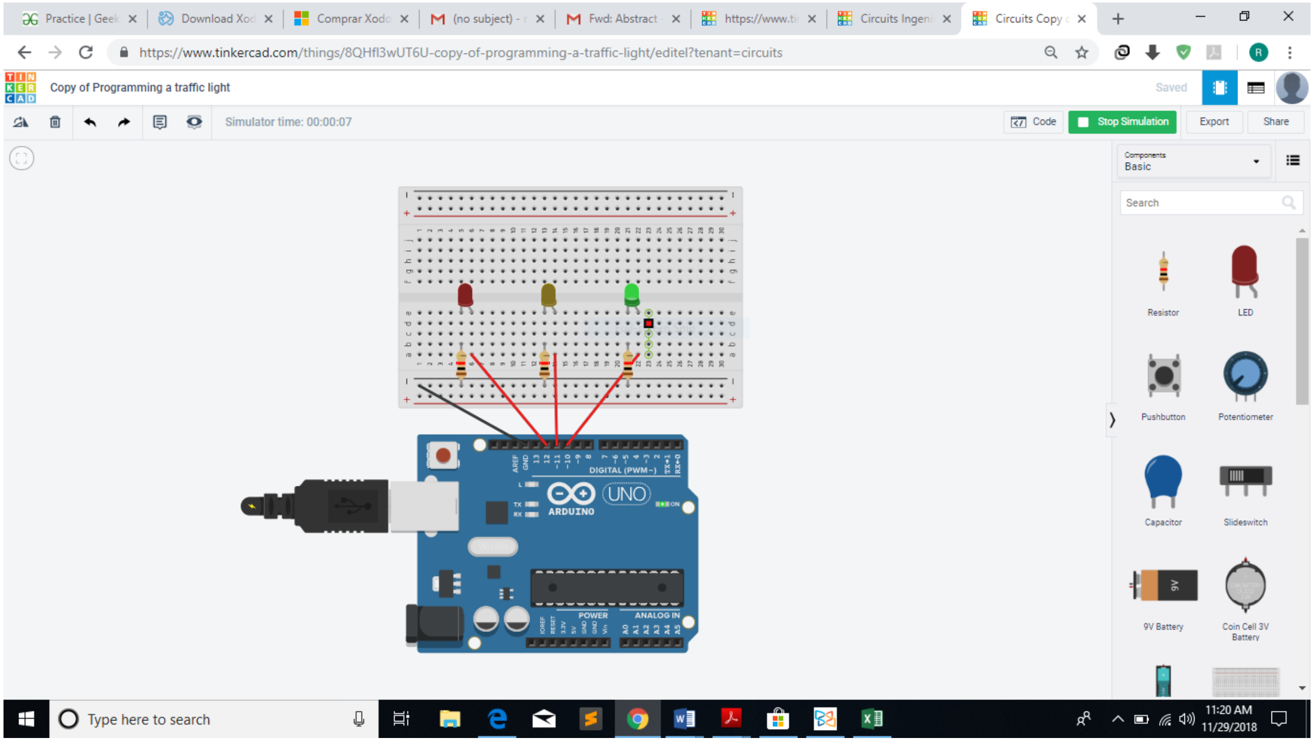
CIRCUIT ON SIMULATOR:

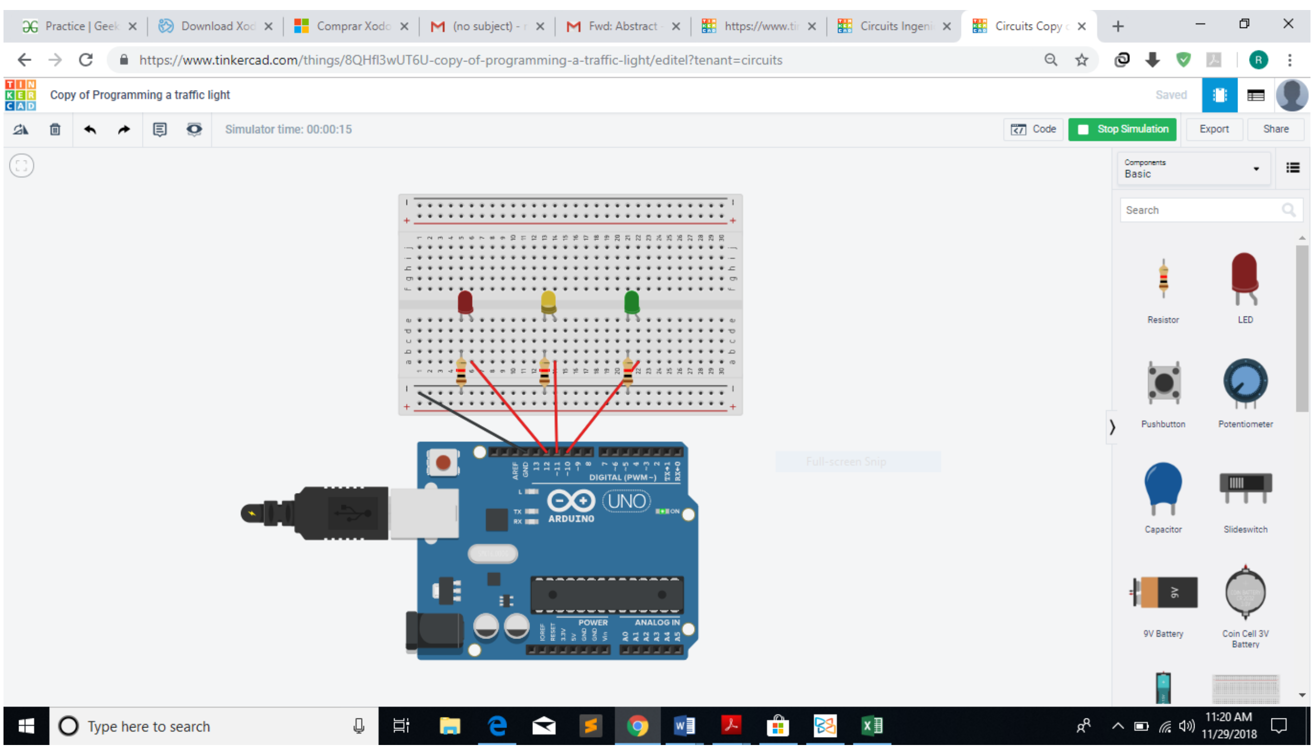


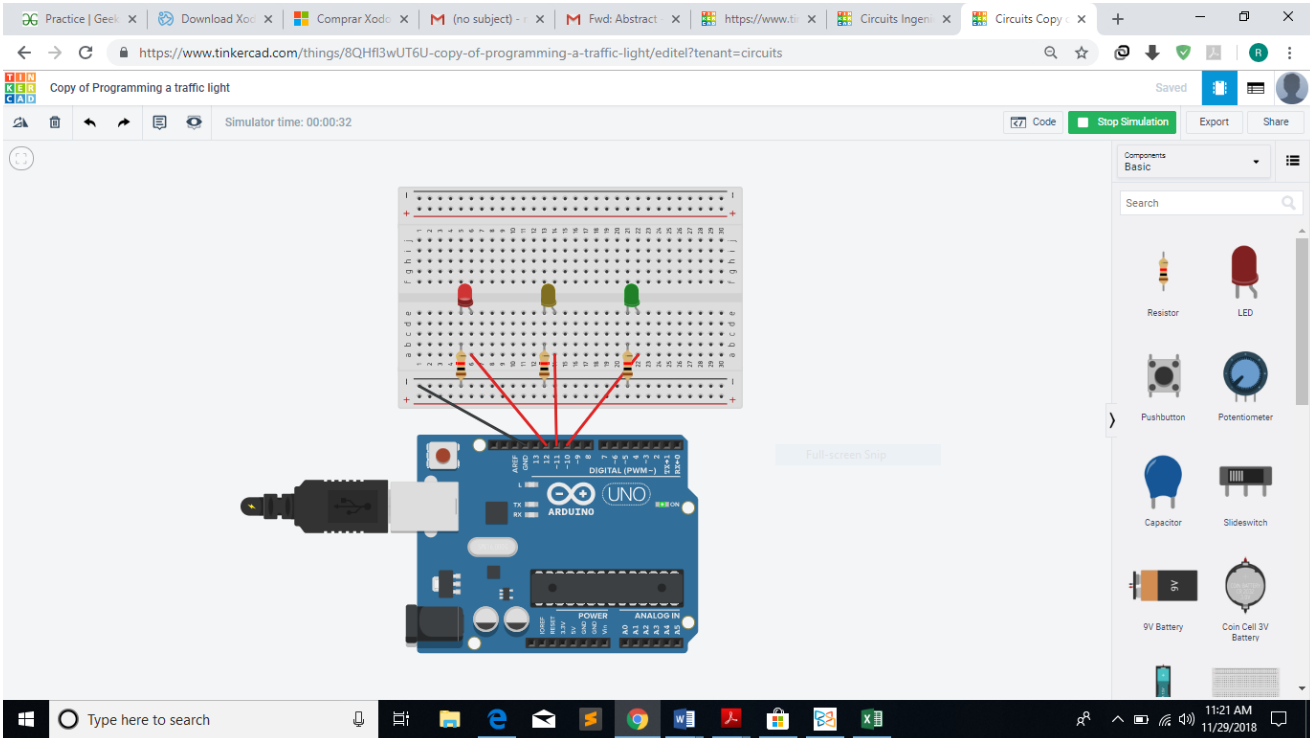
CODE TO RUN:

```
/**************/
/* TRAFFIC LIGHT */
/**************/


/*** David Lobo Martínez ***/


//** Definitions **//
int rojo=12; //It defines the value of the pin for the red led
int amarillo=11; //It defines the value of the pin for the yellow led
int verde=10; //It defines the value of the pin for the green led

//** Programa **//


void setup() { //declarations
pinMode(verde,OUTPUT); //It declares the green pin as output
pinMode(amarillo,OUTPUT);//It declares the yellow pin as output
pinMode(rojo,OUTPUT); //It declares the red pin as output
}


void loop() { //repeat loop continuously
digitalWrite(verde,HIGH); //It turns on the green led
delay(15000); //wait 15 seconds
digitalWrite(verde,LOW); //It turns off the green led
delay(250); //wait 0.25 seconds


digitalWrite(amarillo,HIGH); //It turns on the yellow led
delay(3000); //wait 3 seconds
digitalWrite(amarillo,LOW); //It turns off the yellow led
delay(250); //wait 0.25 seconds


digitalWrite(rojo,HIGH); //It turns the red led
delay(15000); //wait 15 seconds
digitalWrite(rojo,LOW); //It turns off the red led
delay(250); //wait 0.25 seconds
}
```

SCREENSHOTS DURING IMPLEMENTATION







Project Figure and Result:

Introduction:

This simple traffic controller can be used to teach children rudiments of traffic rules. The circuit shown in Figure uses readily available components. It mainly comprises rectifier diodes (1N4001), a 5V regulator 7805, two timers IC 555, two relays (5V, singlechangeover), three 15W, 230V bulbs and some discrete components. Mains power is stepped down by transformer X1 to deliver a secondary output of 9V, 300 mA. The transformer output is rectified by a full-wave bridge rectifier comprising diodes D1 through D4, filtered by capacitor C1 and regulated by IC 7805 (IC1). IC2 is wired as a multivibrator with „on‟ and „off‟ periods of approximately 30 seconds each with the component values selected. As soon as mains power is switched on, pin 3 of IC2 goes high for 35 seconds. This, in turn, energises relay RL1 through transistor T1 and the red lamp (B1) glows through its normally-open (N/O) contact. At the same time, mains power is disconnected from the pole of relay RL2. As the „on‟ time of IC2 ends, a high-to-low pulse at its pin 3 triggers IC3 through C5. IC3 is configured as a monostable with „on‟ time of about 5 seconds, which means pin 3 of IC3 will remain high for this period and energise relay RL2 through driver transistor T2. The amber lamp (B2) thus lights up for 4 seconds. As soon as 4-second time period o f timer IC3 at pin 3 lapses, relay RL2 de-energises and the green lamp (B3) lights up for the rest of „off‟ period of IC2, which is about 26 seconds. The green lamp is activated through the normally closed (N/C) contacts of relay RL2. So when mains power is switched on, red light glows for 30 seconds, amber for 5 seconds and green for 30 seconds. We can assemble this circuit on a general-purpose PCB and enclose in an insulated box. The box should have enough space for mounting transformer X1 and two relays. It can be fixed near 230V AC, 50Hz power supply.

Schematic Diagram of Traffic Controller

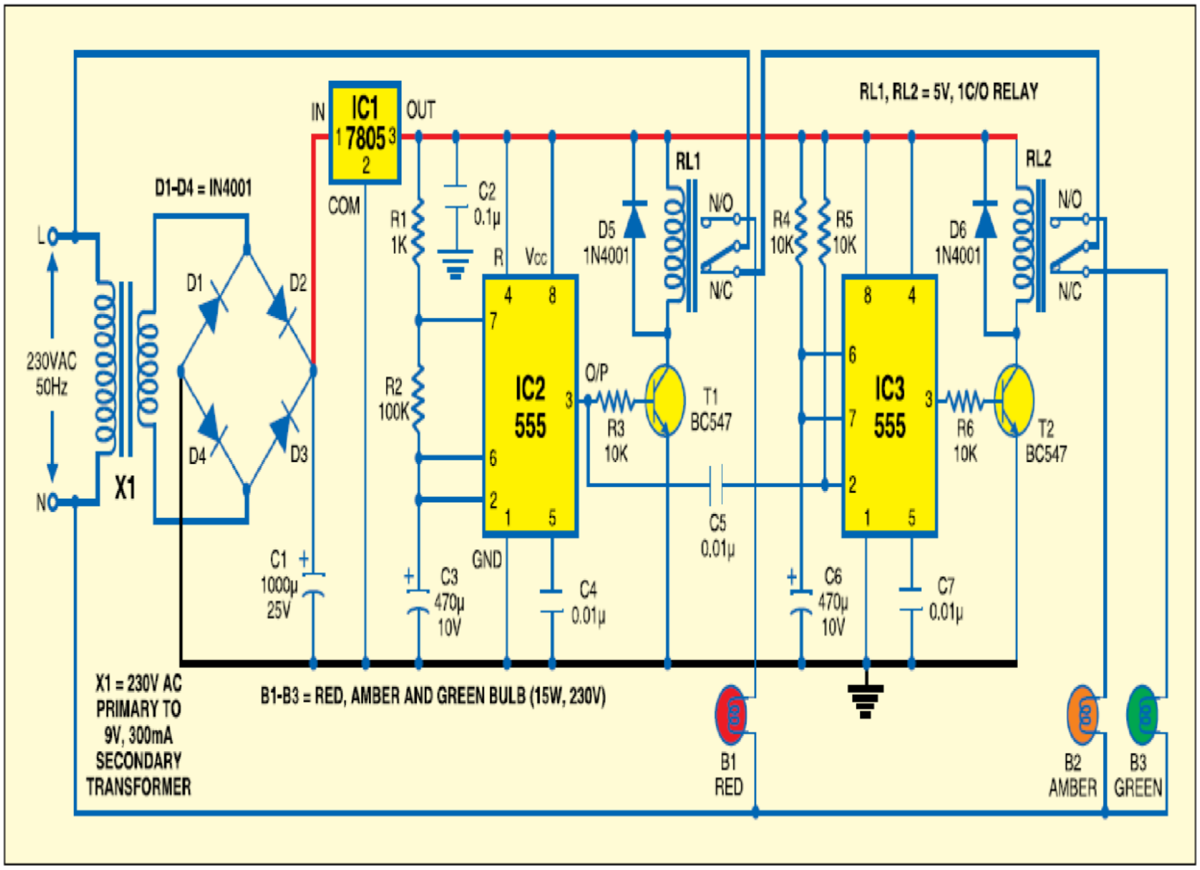


Fig. 1: Circuit of traffic controller

Figure : Main circuit diagram of Traffic controller

Hardware Implementation Of Traffic Controller

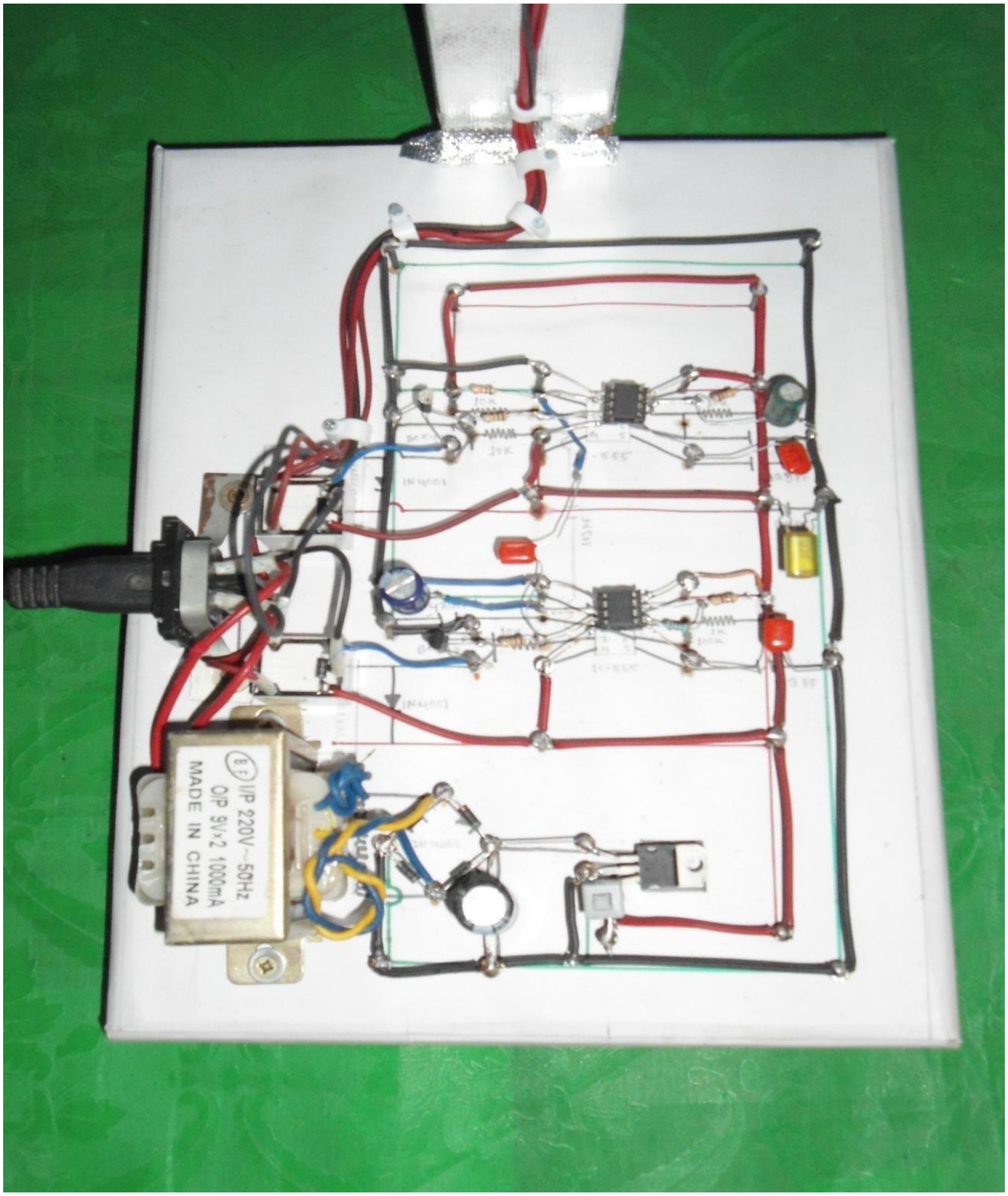


Figure : Hardware implementation of Traffic controller

Different View of project

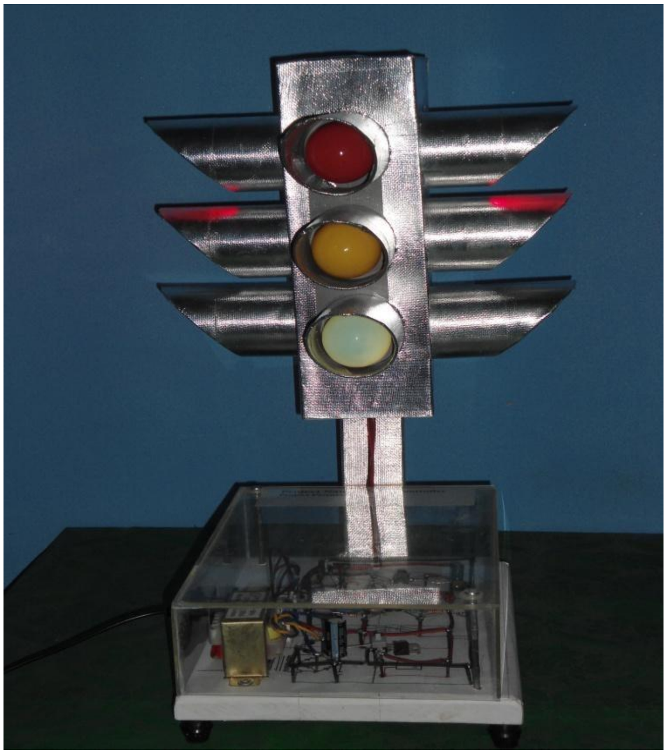


Figure: Front View

Figure : Side View

Conclusion

Conclusion

India is a populated country. Specially our city area is over populated and congested. Traffic jam is the common phenomena in city area. Delhi city is the most traffic jam affected area . Traffic jam is obstructing for trade and commerce also waste valuable time. The main reason of traffic jam can be not maintain traffic rules, faulty traffic signaling systems . Illegal parking is another reason for traffic jam. Cars, trucks and other vehicles are parked almost everywhere. Faulty traffic signaling systems, inadequate manpower and narrow road spaces and overtaking tendency of drivers create pro-longed traffic congestions and intensify sufferings of commuters keeping people motionless as well as creating suffocating condition in the streets. Also there are bus terminals not authorized by the traffic department and drivers do not go by traffic rules. VIP protocol maintaining is another reason for frequent traffic jams in the streets and divider problem in the city"s different important roads also causes congestion. So if we want to overcome this problem we must install a modern traffic controller system also grow up the tendency of maintaining traffic rules. The reason of taking Traffic Controller as a project to reduce that problem, hopefully this is a good effort.

To reduce traffic jam we can take steps such as:

- Have a good public transport system so people would use it
- Install modern and good traffic controller system
- Keep continuous repair and maintenance of traffic controller and signaling system
- Good traffic system
- Good lane system
- Traffic police should do their duty properly
- Use zebra cross and foot over bridge
- Respect the law

APPENDIX

References

1) MIT open-courseware, Power Electronics, Spring 2007
2) Tinkercad documentation
3) Arduino r3 official documentation
4) Official documentation from Indian government transportation sytem rules

Thank You