COMPUTER UNIVERSITY (MANDALAY)

FINAL YEAR PROJECT REPORT

ON

TRAFFIC LIGHT CONTROL SYSTEM

Bachelor of Computer Technology

(B.C.Tech.)

Presented by Group (9)

2014-2015

ACKNOWLEDGEMENTS

It could not have been possible to complete this project without help from many resources. I would like to express my profound gratitude to: Dr. Win Aye, Rector of the Computer University (Mandalay), who gives valuable advice at seminars with her kind permission to develop this project.

I would like to express grateful thanks to **Dr. Zar Ni Sann**, Associate Professor, Head of Computer Hardware Technology Department, CU (Mandalay), for her guidance and suggestion for this project.

I would like to show to my deep appreciation to my supervisor, **Daw Myo Thidar Win**, Tutor, Hardware Department, Computer University (Mandalay) for her close supervision, helpful advice, encouragement, numerous invaluable suggestions and comments, without which this would not have been completed.

Especially I would like to thank my teacher **Daw Kyi Kyi Mon**, Lecturer, Department of English, Computer University (Mandalay) for editing our project.

I also thank my parents and all the teachers who have enabled me to obtain this **B.C.Tech.** degree.

Finally I am extremely grateful to all the friends of CU (Mandalay) and many colleagues for their contribution to the completion of this project.

Group Member List

Sr.No	Name	Roll No.
1	Ma Phyo Pa Pa Htay	4CT-3
2	Ma Chaw Su Su Naing	4CT-17

Supervisor Name : **Daw Myo Thidar Win** 29-9-2015

Rank : **Tutor**

Department : **Hardware Department**

Computer University (Mandalay)

Project Schedule

Project proposal : : March , 2015

First Seminar : : 11.6.2015

Second Seminar : : 10.7.2015

Third Seminar : : 6.8.2015

Book Submission : : September , 2015

Time Schedule	March 2015	June 2015	July 2015	August 2015	September 2015
Project Proposal					
First Seminar					
Second Seminar					
Third Seminar					
Book Submission					

Abstract

The control logic controls the sequencing of the lights for a traffic signal at the intersection of a busy main roads and an occasionally used side roads. It provides the instruction to the driver whether to drive through the intersection or yield at the intersection. A major use of smart traffic-lights could be as part of public transport systems. The signals can be set up to sense the approach of traffic and change the signals in their favour. Thus, it can occur further improvement in speed and efficiency of sustainable transport modes. Traffic lights alternate the right way accorded to road users by displaying lights of a standard color as RED, and GREEN which are a universal color code. The green lights allows traffic to proceed in the direction denoted. The red signal prohibits any traffic from proceeding. A flashing red indication is used as a stop sign. By using this system, traffic congestion can be passed over without having danger.

List of Tables

List of Figures

List of Equations

CHAPTER (1)

INTRODUCTION

1.1 INTRODUCTION

Traffic light is also known as traffic signal. Traffic lamps, signal lamps & stop lights are devices to signal which way you can go at road intersections and which indicate psedestrain crossing and other locations to control competing flows of traffic. This signal can communicate with each other and adapt for changing traffic conditions to reduce the amount of time that cars idling. Traffic lights have been installed in most cities around the world to control the vehicular traffic. In the modern era, everyone has different types of vehicles. That's why traffic lights are mandatory to avoid the traffic jams and accidents. Traffic light has proved to be an amazing way to stop the vehicular collisions and control the traffic jams in today's modern era where everyone owns the different types of vehicles. The automatic controlled traffic light systems are built at the intersections. Side road traffic is stopped by displaying red light while the main road traffic is allowed to go by indicating green light. While main road traffic is stopped by displaying red light, side road traffic is allowed by indicating green light.

1.2 Objectives of the Project

- To facilitate the safe movement of cars and avoid collisions
- To avoid traffic-jam evolution and to reduce the use of human-power resource
- To help drive safely
- To create a communication with vehicle to vehicle using the traffic light to avoid accidents

- To increase the efficiency of vehicles and to improve the safety of pedestrian, passengers and motorists
- To reduce the amount of time that cars idling

1.2.1 Application Area

- Traffic lights are signal devices that are very useful on congested road and other places.
- The traffic light controller can be implemented by using the 7 segment display in the four directions.
- Traffic light control system is to create a communication with the moving of vehicles.
- We can control the traffic light automatically without any user interaction.

1.3 Project Requirements

Basic hardware components are required in this project.

1.3.1 Hardware Requirements

1. 40110 IC
2. 7 Segment Display(Common Cathode)
3. JK Flip Flop
4. 555 IC
5. Resistors(330 ohms)
6. NOT Gate
7. NOR Gate
8. AND Gate

CHAPTER (2)

THEORY BACKGROUND

2.1 40110IC UP/DOWN COUNTER

An up/down counter is one that is capable of progressing in either direction through a certain sequence. An up/down counter, sometimes called a bidirectional counter. The 40110 is a dual-clocked up/down counter with a special preconditioning circuit that allows the counter to be clocked, via positive going inputs, up or down regardless of the state or timing of the other clock line [7].

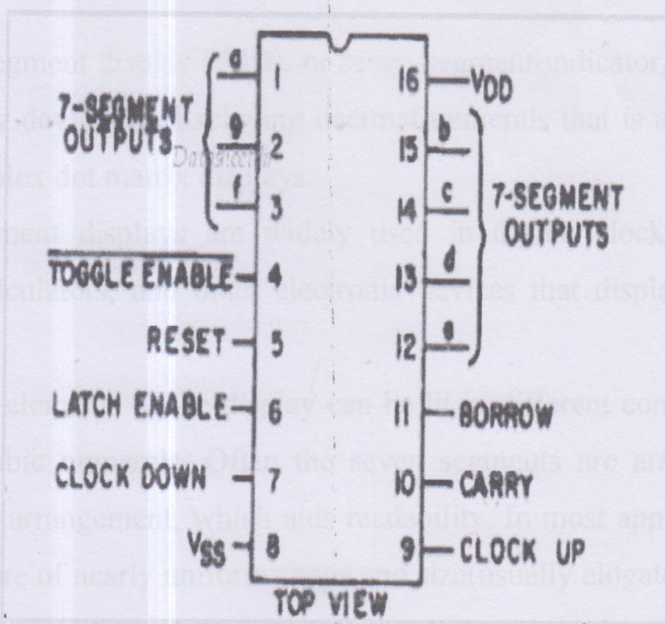

Fig 2.1 40110IC

- a, b, g, b, c, d and e are output pins.
- Pin No.4 is a toggle enable
- Pin No.5 is used to reset.
- Pin No.6 is used to Latch enable.

- Pin No.7 is used to clock down.
- Pin No.8 ground.
- Pin No.9 is used to clock up
- Pin No.10 is used to carry.
- Pin No.11 is used to borrow.
- Pin No.16 V_{cc}.

2.2 7 Segment Display (Common Cathode)

A seven-segment display (SSD), or seven-segment indicator, is a form of electronic display device for displaying decimal numerals that is an alternative to the more complex dot matrix displays.

Seven-segment displays are widely used in digital clocks, electronic meters, basic calculators, and other electronic devices that display numerical information.

The seven elements of the display can be lit in different combinations to represent the arabic numerals. Often the seven segments are arranged in an oblique (slanted) arrangement, which aids readability. In most applications, the seven segments are of nearly uniform shape and size(usually elogated hexagons, though trapezoids and rectangles can also be used),though in the case of adding machines, the vertical segments are longer and more oddly shaped at the ends in an effort to further enhance readability.

The numerals 6, 7 and 9 may be represented by two or more different glyphs on seven-segment displays with or without a 'tail' [5].

The seven segments are arranged as a rectangle of two vertical segments on each side with one horizontal segment on the top, middle, and bottom. Additionally the seventh segment bisects the rectangle horizontally. There are also fourteen-segment displays and sixteen-segment displays (for full a;

phanumerics); however these have mostly been replaced by dot matrix displays. The 7-segment display are referred to by the letters A to G, where the optional decimal point (an "eighth segment", referred to as DP) is used for the display of non-integer numbers [3].

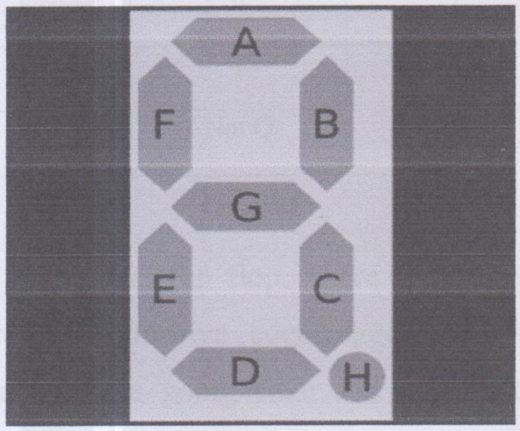

Fig 2.2 7 Segment

2.3 JK Flip Flop

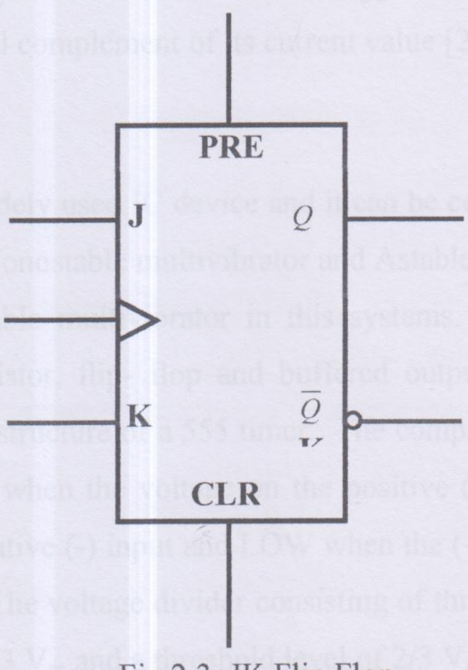

Fig 2.3 JK Flip Flop

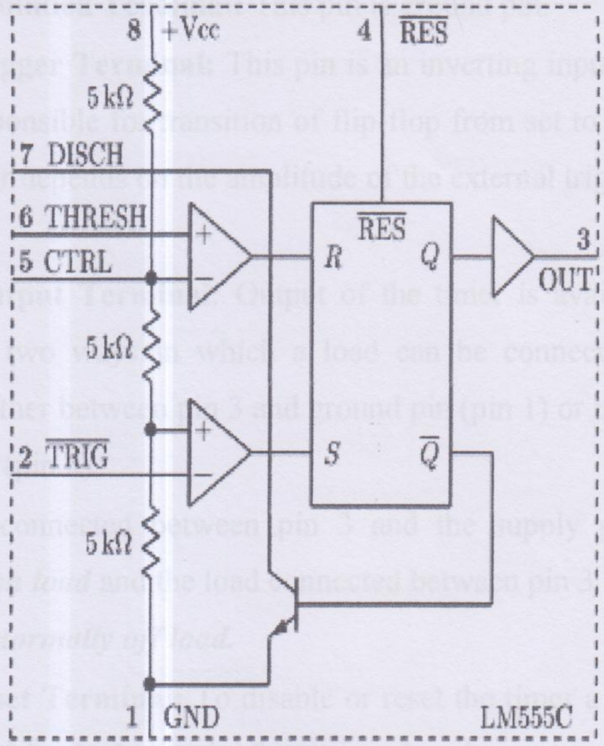

Fig 2.4 Internal functional diagram of a 555 timer

The control voltage input (pin 5) can be used to externally adjust the trigger and threshold levels to other values if necessary. When the normally HIGH trigger input momentarily goes below 1/3 V_{cc}, the output of lower comparator switches from LOW to HIGH and sets the S-R latch, causing the output (pin 3) to go HIGH and turning the discharge transistor off. The output will stay HIGH until the normally LOW threshold input goes above 2/3 V_{cc} and causes the output of upper comparator and turning the discharge transistor on.

The external reset input can be used to reset the latch independent of the threshold circuit. The trigger and threshold inputs (pins 2 and 6) are controlled by external components connected to produce either mono stable or astable action [2].

- **Pin 1: Grounded Terminal:** This pin is ground pin.
- **Pin 2: Trigger Terminal:** This pin is an inverting input to a comparator that is responsible for transition of flip-flop from set to reset. The output of the timer depends on the amplitude of the external trigger pulse applied to this pin.
- **Pin 3: Output Terminal:** Output of the timer is available at this pin. There are two ways in which a load can be connected to the output terminal either between pin 3 and ground pin (pin 1) or between pin 3 and supply pin (pin 8).
- The load connected between pin 3 and the supply pin is called the ***normally on load*** and the load connected between pin 3 and ground pin is called the ***normally off load.***
- **Pin 4: Reset Terminal:** To disable or reset the timer a negative pulse is applied to this pin due to the fact it is referred to as reset terminal. When this pin is not to be used for reset purpose, it should be connected to + V avoid any possibility of false triggering.
- **Pin 5: Control Voltage Terminal:** The function of this terminal is to control the threshold and trigger levels. Thus either the external voltage or a pot connected to this pin determines the pulse width of the output waveform.
- The external voltage applied to this pin can also be used to modulate the output waveform. When this pin is not used, it should be connected to ground through a 0.01 micro Farad to avoid any noise problem.
- **Pin 6: Threshold Terminal:** This is the non-inverting input terminal of comparator 1, which compares the voltage applied to the terminal with a reference voltage of 2/3 VCC.
- **Pin 7: Discharge Terminal:** This pin is connected internally to the collector of transistor and is connected between this terminal and ground.

- **Pin 8: Supply Terminal:** A supply voltage of + 5 V to + 18 V is applied to this terminal with respect to ground (pin 1).

2.4.1 Astable Multivibrator

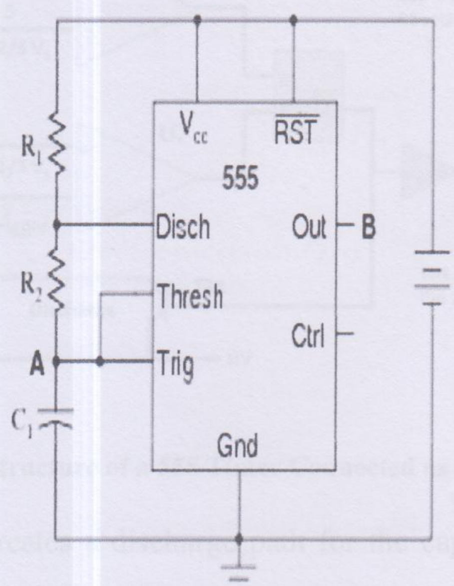

Fig 2.5 555 timer connected as a one-shot

An astable multivibrator is a device that has no stable states; it changes back and forth (oscillates) between two unstable states without any external triggering. The resulting output is typically a square wave that is used as a clock signal in many types of sequential logic circuits. Astable multivibrators are also known as pulse oscillators.

A 555 timer connected to operate as an astable multivibrator is shown in figure (2.5). The threshold input(THRESH)is now connected to the trigger input (TRIG).The external components R_1 , R_2 , and C_1 form the timing network that sets the frequency of oscillation. The 0.01F capacitor, C_1 connected to the control (Ctrl) input is strictly for decoupling and has no effect on the operation; in some cases it can be left off.

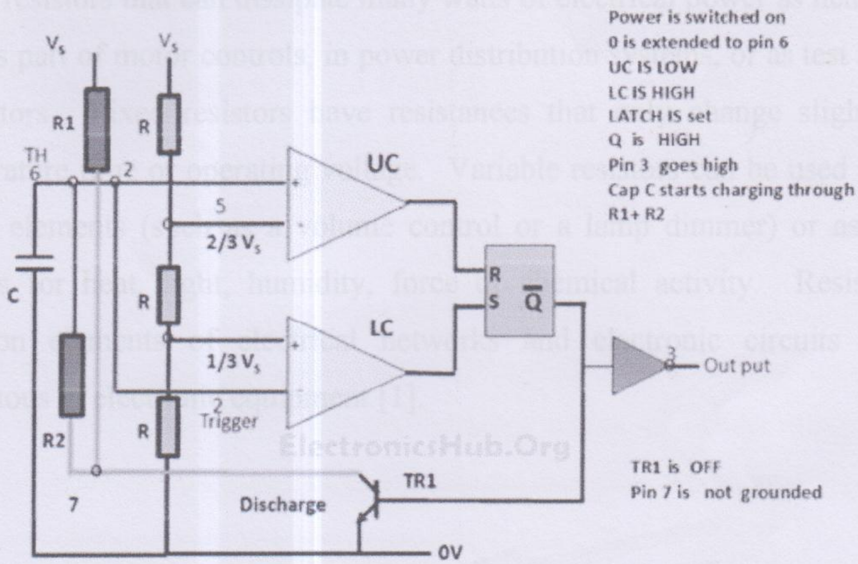

Fig 2.6 Internal Structure of a 555 Timer Connected as an Astable Multivibrator

The sequence creates a discharge path for the capacitor through R_2 and the transistor, as indicated. The capacitor now begins to discharge causing upper comparator to go LOW. At the point where the capacitor discharges down to 1/3 V_{cc} lower comparator switches HIGH; this sets the latch, making the base of Q LOW and turning off the transistor. Another charging cycle begins, and the entire process repeats. The result is a rectangular wave output whose duty cycle depends on the values of R_1 and R_2. The frequency of oscillation is given by the following formula [2].

$$f=1.44/(R_1+2R_2)C_1 \qquad \textbf{Eq 2.1}$$

2.5 Resistor

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. Resistors act to reduce current flow, and at the same time, act to lower voltage levels within circuits. In electronic circuits, resistors are used to limit current flow, to adjust signal levels, bias active elements, and terminate transmission lines among other uses. High-power resistors that can dissipate many watts of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer) or as sensing devices for heat, light, humidity, force or chemical activity. Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment [1].

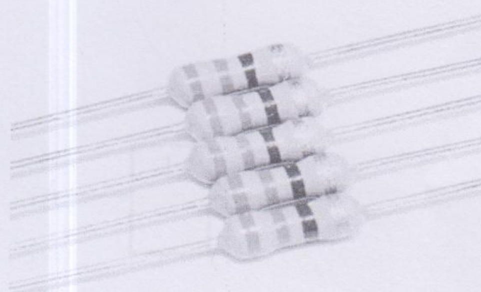

Fig 2.7 Resistor

Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits. The electrical function of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than nine order of magnitude. The nominal value of the resistance will fall within a manufacturing tolerance [6].

2.6 NOT Gate

The inverter (NOT circuit) performs the operation called *inversion or complementation.* The inverter changes one logic level to the opposite level. In term of bits, it changes a 1 to a 0 and 0 to a 1. The negation indicator is a "bubble" that indicates inversion or complementation when it appears on the input or output of any logic element. When appearing on the input, the bubble means that a 0 is the active or asserted input state, and the input is called an active-LOW input. When appearing on the output, the bubble means that a 0 is the active or asserted output state, and the output is called an active-LOW output. The absence of a bubble on the input or output means that a 1 is the active or asserted state, and in this case, the input or output is called active-HIGH.

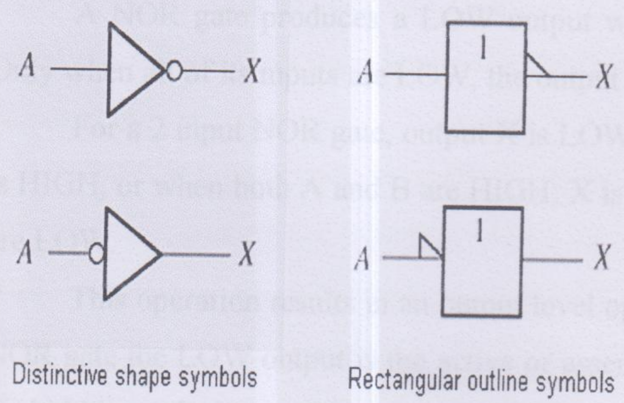

Fig 2.8 NOT gate

When a HIGH level is applied to an inverter input, a LOW level will appear on its output. When a LOW level is applied to its input, a HIGH will appear on its output [2].

Table 2.2 NOT Truth Table

Input	Output
0	1
1	0

2.7 NOR Gate

The NOR gate is a useful logic element because it can also be used as a universal gate; that is NOR gates can be used in combination to perform the basic logic gate operations, such as AND, OR, and inverter operations. The term NOR is a contraction of NOT-OR and implies an OR function with an inverted (complemented) output.

A NOR gate produces a LOW output when any of its inputs is HIGH. Only when all of its inputs are LOW, the output is HIGH.

For a 2 input NOR gate, output X is LOW when either input A or input B is HIGH, or when both A and B are HIGH; X is HIGH only when both A and B are LOW.

This operation results in an output level opposite that of the OR gate. In a NOR gate the LOW output is the active or asserted output level as indicated by the bubble on the output [2].

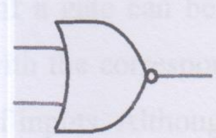

Fig 2.9 NOR Gate

Table 2.3 NOR Truth Table

Inputs		Outputs
A	B	X
0	0	1
0	1	0
1	0	0
1	1	0

2.8 AND Gate

The AND gate is one of the basic gates that can be combined to form any logic function. An AND gate can have two or more inputs and performs what is unknown as logical multiplication. The AND gate is composed of two or more inputs and a single output.

An AND gate produces a HIGH output only when all of its inputs are HIGH. When any of the inputs is LOW, the output is LOW. Therefore, the basic purpose of an AND gate is to determine when certain conditions are simultaneously true, as indicated by HIGH levels on all of its inputs, and to produce a HIGH on its output to indicate that all these conditions are true.

The logical operation of a gate can be expressed with a truth table that lists all input combinations with the corresponding outputs. The truth table can be expanded to any number of inputs. Although the terms HIGH and LOW tend to give a "physical" sense to the input and output states. The truth table is shown with 1s and 0s; a HIGH is equivalent to a 1 and a LOW is equivalent to a 0 in positive logic. For any AND gate, regardless of the number of inputs, the output is HIGH only when all inputs are HIGH [4].

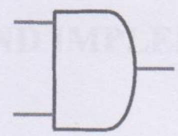

Fig 2.10 AND gate

Table 2.4 AND Truth Table

Inputs		Outputs
A	B	X
0	0	0
0	1	0
1	0	0
1	1	1

CHAPTER (3)

DESIGN AND IMPLEMENTATION

3.1 Design

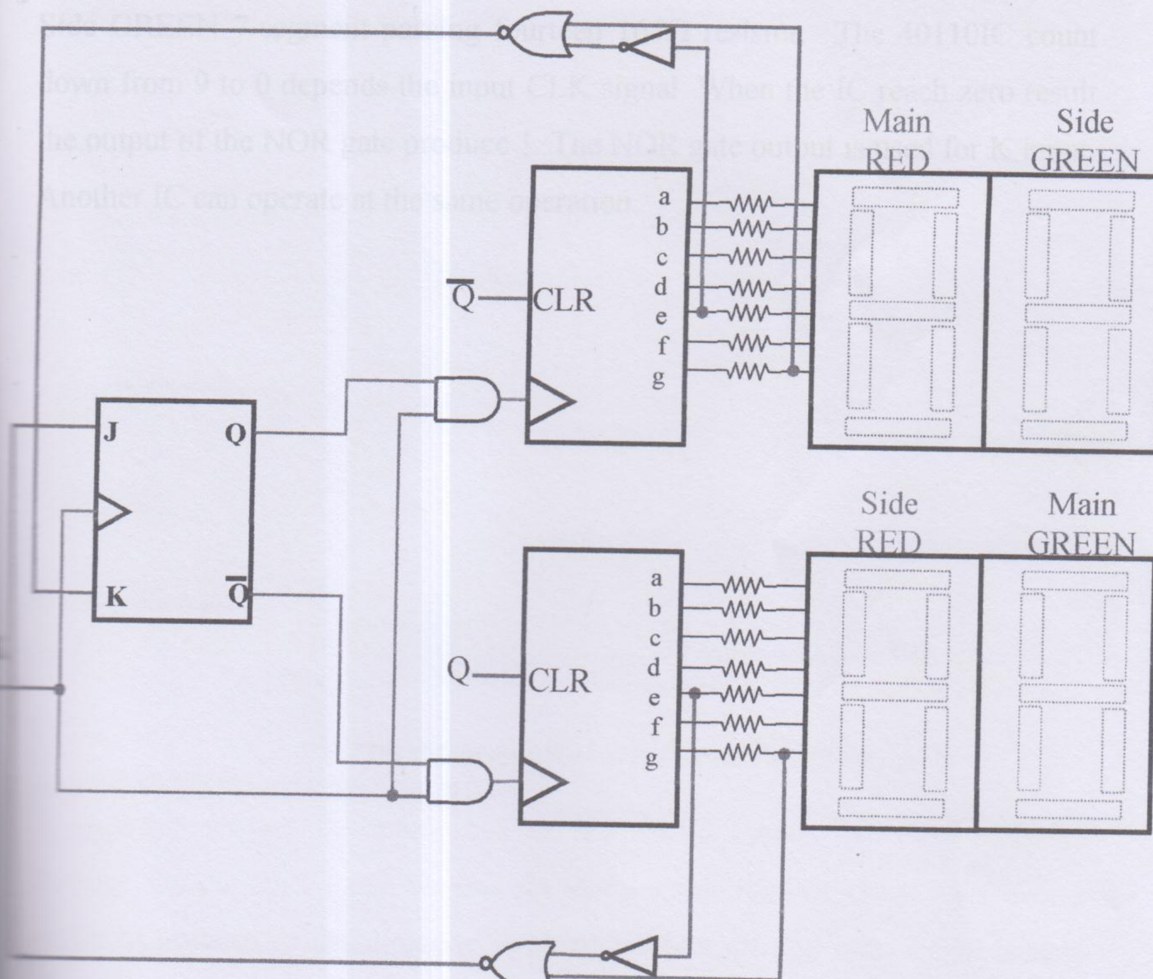

Fig 3.1 Design of Traffic Light Signal Control

CLR=Clear

CLK=Clock

Our Design is used two 40110IC, two RED 7-segment, two Green 7-segment, fourteen 165Ω resistors, one JK Flip Flop and 1Hz CLK input signal.

1Hz CLK signal is used for JK signal input. JK operate SET and RESET state depends their input signal. One of the 40110IC CLK signal uses the output of AND Gate Q AND 1HZ CLK signal. Another 40110IC uses $\overline{Q}$ AND 1Hz CLK signal.

The output of the 40110IC is connected with Main RED 7-segment and Side GREEN 7-segment passing fourteen 165Ω resistor. The 40110IC count down from 9 to 0 depends the input CLK signal. When the IC reach zero result the output of the NOR gate produce 1. The NOR gate output is used for K input. Another IC can operate at the same operation.

3.2 Implementation

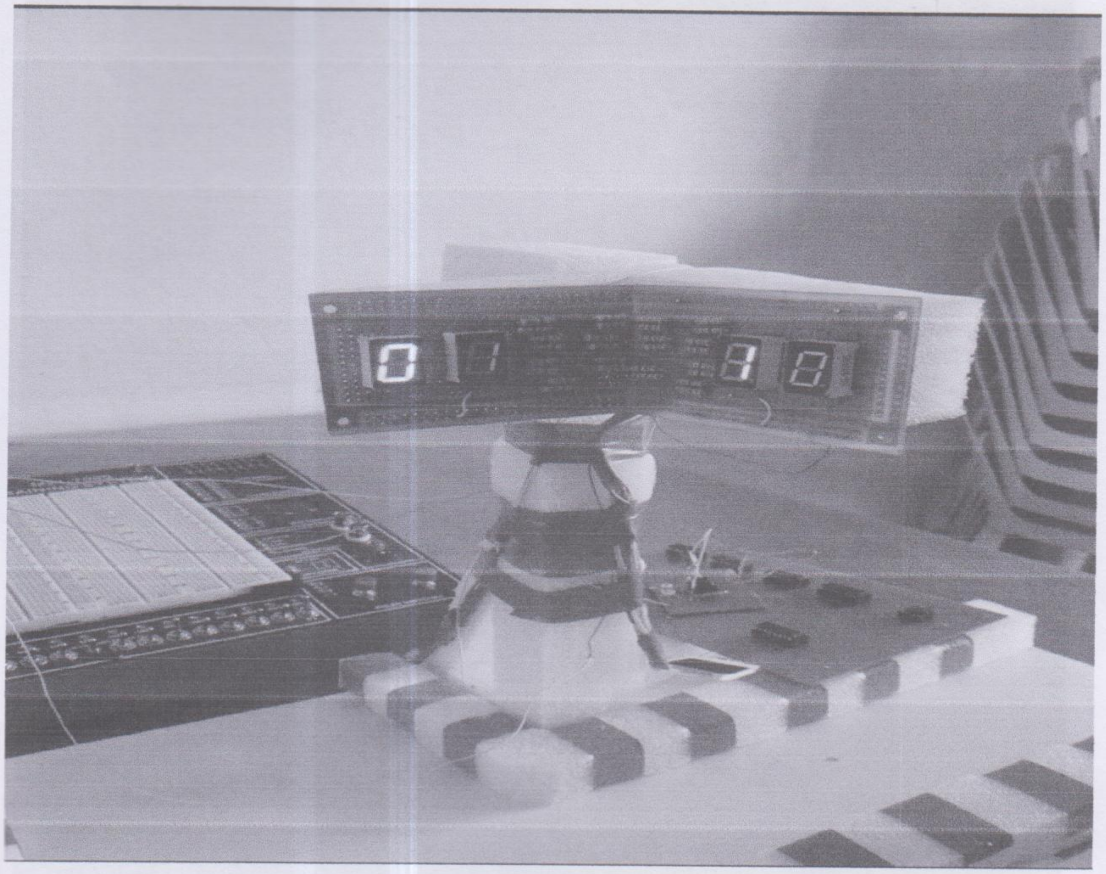

Fig 3.2 Simulation of the Traffic Light Signal

When we see the main road of **red** traffic signals, we must stop the driving. On the other hand, we can see that the side road of **green** light allows traffic to proceed in the direction denoted. When the red time signal counts down from 9 to 0 on the main road, the green time signal will be counted down with the same way on the side road. Meanwhile, the green time signal of the main road will stop at 0 and the red time signal of the side road will remain the same.

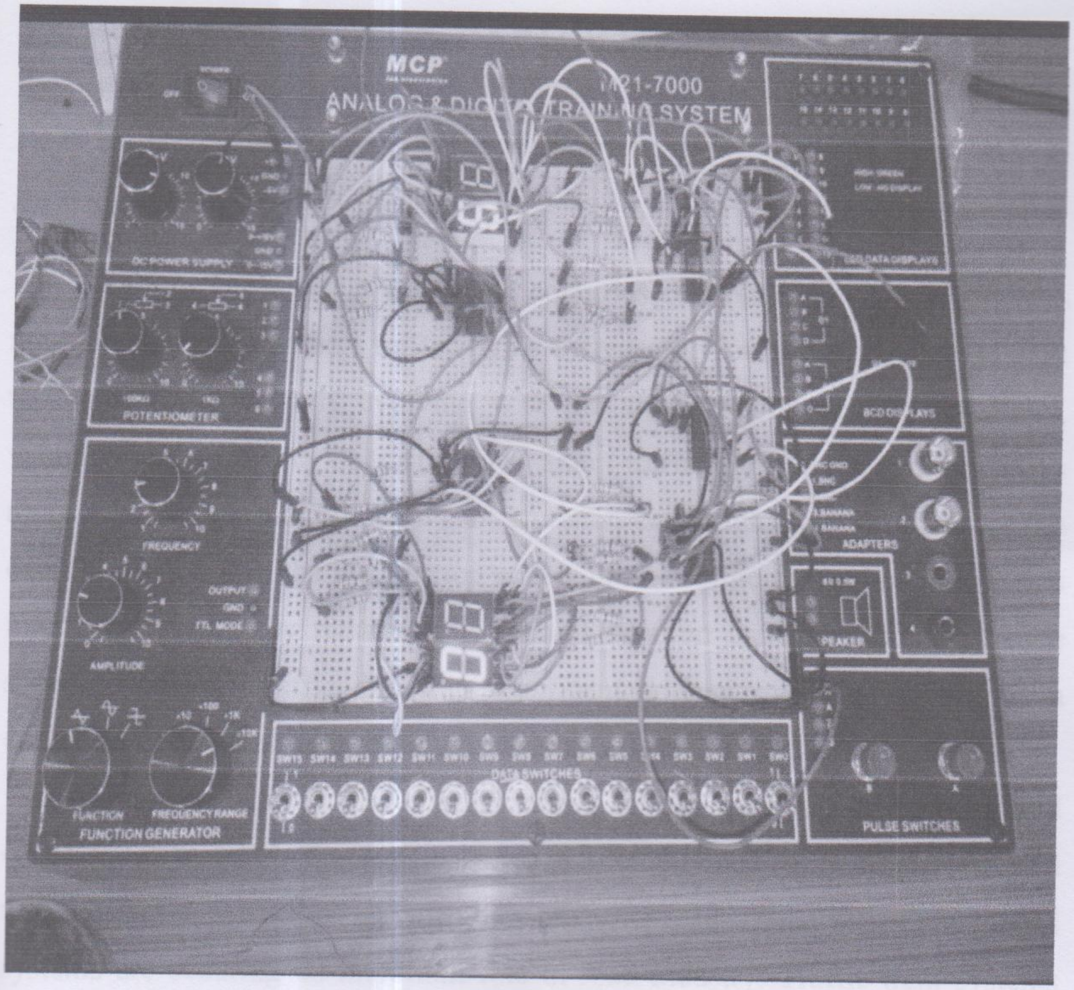

Fig 3.3 Testing of Our Project on Analog Trainer Board

CHAPTER (4)

CONCLUSION

4.1 Conclusion

With technologies in developed countries continuing to advance, there is now developed and smart traffic lights increasingly on the road. Traffic light technology is constantly evolving with the aims of improvement reliability, visibility and efficiency of traffic flow. Smart traffic lights could run their tasks more efficiently without human's interference. Such lights tend to decrease the overall efficiency of the intersection as it becomes congested, although it makes intersections safer by reducing the risk of head-on collisions and may even speed-up through traffic, but if a significant amount of traffic is turning, a dedicated turn signals helps to eliminate congestion.

The normal functions of traffic lights require sophisticated control and coordination to ensure that traffic moves as smoothly and safely as possible and that pedestrains are protected when they cross the roads. The traffic light control systems are occuring an important role in road industry. Traffic light systems are very useful on congested road and other places. Automatic system is better than human-power. Automatic Control Traffic Light System can extend to central control Traffic Unit. By using this system, it can be able to save time.

4.2 Advantages and Disadvantages of Project

Traffic lights allow maximum vehicle efficiency at intersections. They also provide a safe and easy to understand signal that tells motorists when it is safe for them to proceed through an intersection. Without some sort of signals to tell them when it is safe to proceed through a traffic light, motorists would be very confused, especially at busy intersections. Traffic lights are color coded, the lights that tells motorists when they should stop, slow down or proceed through an intersection.

It is also not necessary to know how to read to understand a traffic light. It is only necessary to know the significance of the different colored lights. However, many problems have been found in the traffic light system, from decreasing one type of accident while significantly increasing another to adding traffic to residential streets. They control the flow of traffic making it easier for drivers and safer for pedestrains, they reduce the risk of accidents and they have lower the chances of traffic jams. There is no way to tell who was driving the vehicle at the time of the crime. Once traffic lights were installed, the dominant street began to share equal time with its cross street. As a result, mant areas began to experience congestion on one street during hours of heavy traffic, making traffic delays another disadvantage of traffic lights.

4.3 Limitation

- In this project, we used green and red signals.
- In the real world, green, yellow and red signals can be used.
- This project can work when the electricity ON.
- This circuit can't show green light for the ambulances and emergency traffics due to the automation time countdown system.

References

[1] Thomas L. Floyd, "Electronic Device", 9th Edition, Prentice Hall, ISBN-13: 978-0-13-254985-1, 2012

[2] Thomas L. Floyd, "Digital Fundamental ", 10th Edition, Prentice Hall, ISBN-13: 978-0-13-254985-1, 2012

[3] http://www.circuitsgallery.com

[4] http://www.electronics-tutorials.com

[5] http://en.wikipedia.org/wiki/seven-segment display

[6] www.learnabout-electronics.org

[7] http://www.edutek.Itd.uk/Binaries/Datasheets/4000/HCF 40110. PDF