NEW HORIZON
COLLEGE OF ENGINEERING
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"Verilog Code for Traffic Light Controller"

A MINIPROJECT REPORT

Submitted by

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

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The mini project report has been approved as it satisfies the academic requirements in respect of mini project work prescribed for the said degree.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

In today’s busy life no one likes waiting a lot by strucking in traffic. Everyone is using individual images this is what leads to traffic jam and indeed let them to do the thing reluctantly. Traffic problem had always been a major problem though police are taking many measures they couldn’t sort it out. The Traditional traffic lights are not giving a good result, they should be controlled by a police officer as humans are fond of making mistakes this is leading to many traffic issues and the accuracy of taking decisions is even less. As we all know how fast the world is digitalizing so by using the controllers which works on clock and which are able to control the lights accurately we can reduce the traffic light problem a lot, the traffic light controller we are doing is written in Verilog and later dumped into FPGA which can be used to control the traffic , by using this there will be more accuracy and the traffic problems can be reduced a lot. This project is done by tying the code in Verilog and the simulating it, the output can be discussed by showing the waveform.

CHAPTER 01

INTRODUCTION

Traffic lights play a very important role in controlling the day to day traffic. Traffic lights change their colors in a similar request inevitably. Requirement for Traffic Light Controller Traffic sticking is a basic situation in a significant number of the urban areas and towns everywhere throughout the world. Traffic blockage has been causing numerous misfortunes and difficulties in the major and most involved urban areas everywhere throughout the globe. To make a trip inside the urban areas to the work environment or diversion has become a major issue to the commutates from the start. Because of these issue's individuals lose time, cash and in particular the vitality assets will be depleted because of the ceaseless use in the cars. This car influx legitimately impacts the efficiency of the laborers, merchants, providers and in all affecting the market and raising the costs of the items as it were. To take care of these traffic related issues, we need to assemble new comforts and framework and yet make it shrewd. The main downside of making new streets on offices is that it makes the environmental factors progressively blocked, however then this will make an approach to have better approaches to facilitate the traffic. Maybe all the nations are attempting to oblige the traffic stream and advance transportation and decrease the interest of vehicle use. We need to construct new offices and foundation making its utilization more brilliant for its proficient use. For these numerous thoughts regarding the traffic light frameworks have come up in the ongoing past to disentangle the unpredictable issue of the traffic blockage. In most English-talking nations, traffic lights have a rule change in a specific order:

Red light on: This advises drivers to stop.

Green light on: This implies the driver can begin driving or continue driving.

Yellow light on: This advises drivers to stop when it is sheltered to, on the grounds that the light is going to turn red. Traffic lights which is one of the imperative open office that does a significant job to the street users

Lester Wire was credited with the creation of the electric traffic light in 1912 in Salt Lake City, Utah. Garrett Morgan, an African-American creator, additionally built up a traffic flagging framework, and was one of the main individuals to get a patent for a traffic light.

William Potts, a cop, developed the main traffic light with three colors.

In London, United Kingdom in 1868 traffic lights were first time experimented by J.P Knight and constructed by railway engineers Saxby & Farmer.

Verilog:

Verilog is a hardware description language which was invented by prabhu, Phil Moorby in between 1983 and 1984. Hardware description languages, for example, Verilog are like programming languages since they incorporate methods for portraying the synthesis time and sign qualities (affectability).

There are two kinds of task administrators; a blocking assignment (=), and a non-blocking (<=) assignment. The non-blocking assignment permits designing engineers to depict a state-machine update without expecting to pronounce and utilize impermanent capacity factors. At the hour of Verilog's presentation (1984), Verilog spoke to a huge efficiency improvement for circuit planners who were at that point utilizing graphical schematic catch programming and uncommonly composed programming projects to archive and reproduce electronic circuits.

By designing traffic light controller with Verilog code, we can reduce the effort of human and the accuracy of the controlling increases and there won’t be any scope for human error.

CHAPTER 02

LITERATURE SURVEY

Title of the paper	Author & year of publication	outcome	Limitation
Digital system design using Verilog	Charles H Roth, Jr.	Creating traffic light control using Verilog for intersection of two streets A and B	Sufficient for small and suburban areas
Traffic control systems used	Vaishali Mahavar &2014	Awareness about road transportation	Implementable only in highways
Research of traffic Intelligent Control system based on micro controller	Z. Yuye and Weicheng & 2009	Knowledge about Intelligent Control system	Bit complicated

Table 2.1 Literature Survey

CHAPTER 03

EXISTING SYSTEM AND PROBLEM STATEMENT

Existing Systems:

The project deals with the Traffic light controller which is implemented by using a type of hardware description language called Verilog code.

The existing systems used to run with external remote control which should be operated by a system and there are possibilities for human errors, which sometimes may result in a serious accident.

Problem Statement:

To write a Verilog code by using the problem statement i.e. by considering a junction and by taking four directions (North-South, West-East) as reference by considering clock cycles to change the colors from one to the another.

simulating the code to get output wave form. clock and reset are considered as inputs where reset is initially used to start the working of traffic lights.

Objectives:

- To reduce the traffic in many urban areas
- To increase the accuracy rate of working of traffic lights
- To reduce the human errors that are caused by Traffic polices.

CHAPTER 04

PROPOSED SYSTEM

In this project we are going to write a Verilog code for traffic light controller, which can be later dumped into and can be used as a traffic light controller, the main purpose of doing this project is reduce human errors and to reduce the traffic jams by proper functioning of traffic lights.

For achieving this First we have to write the Verilog code, before writing Verilog code we should know the condition i.e. for which we are writing code. Here we are considering a junction consisting of north-south and west-east roads respectively. In this the design will start at north, next it will move to south, then to east and at last to west.

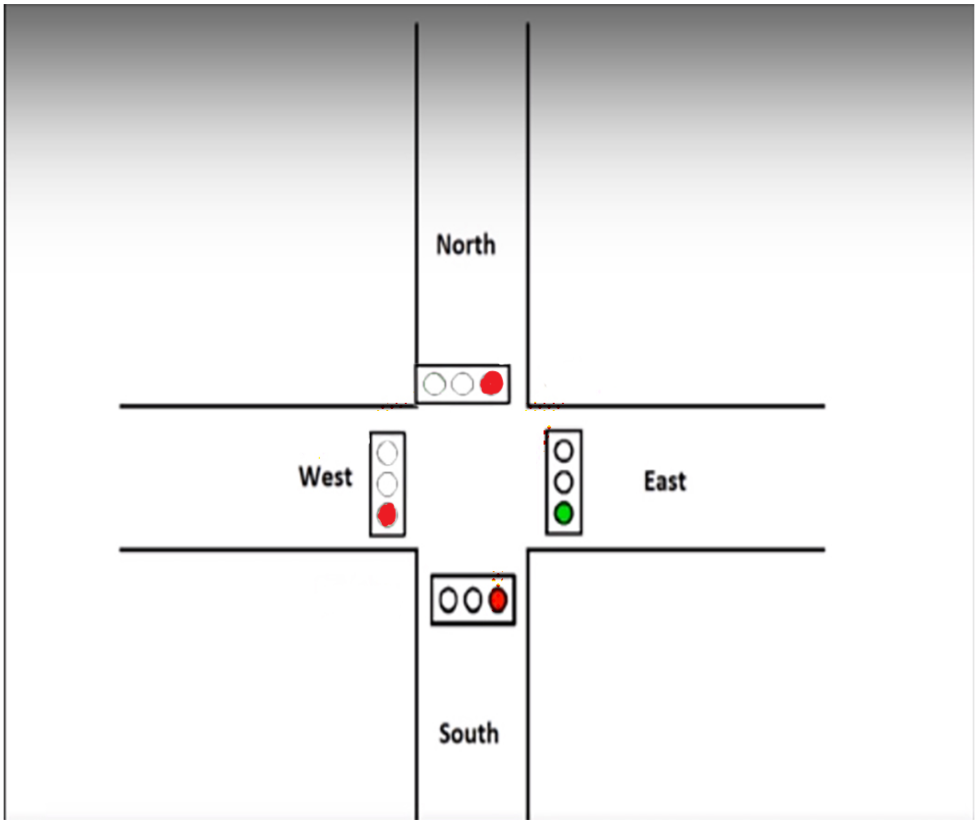


Fig4.1: Sample diagram of junction.

We will compose a Verilog code for traffic light controller in reference with Finite State Machine. In the recreation the after the turning on of reset signal, plan will go into north and begin giving yield after the reset goes towards low.

It will go to green for eight clock cycles and yellow light after four clock cycles.

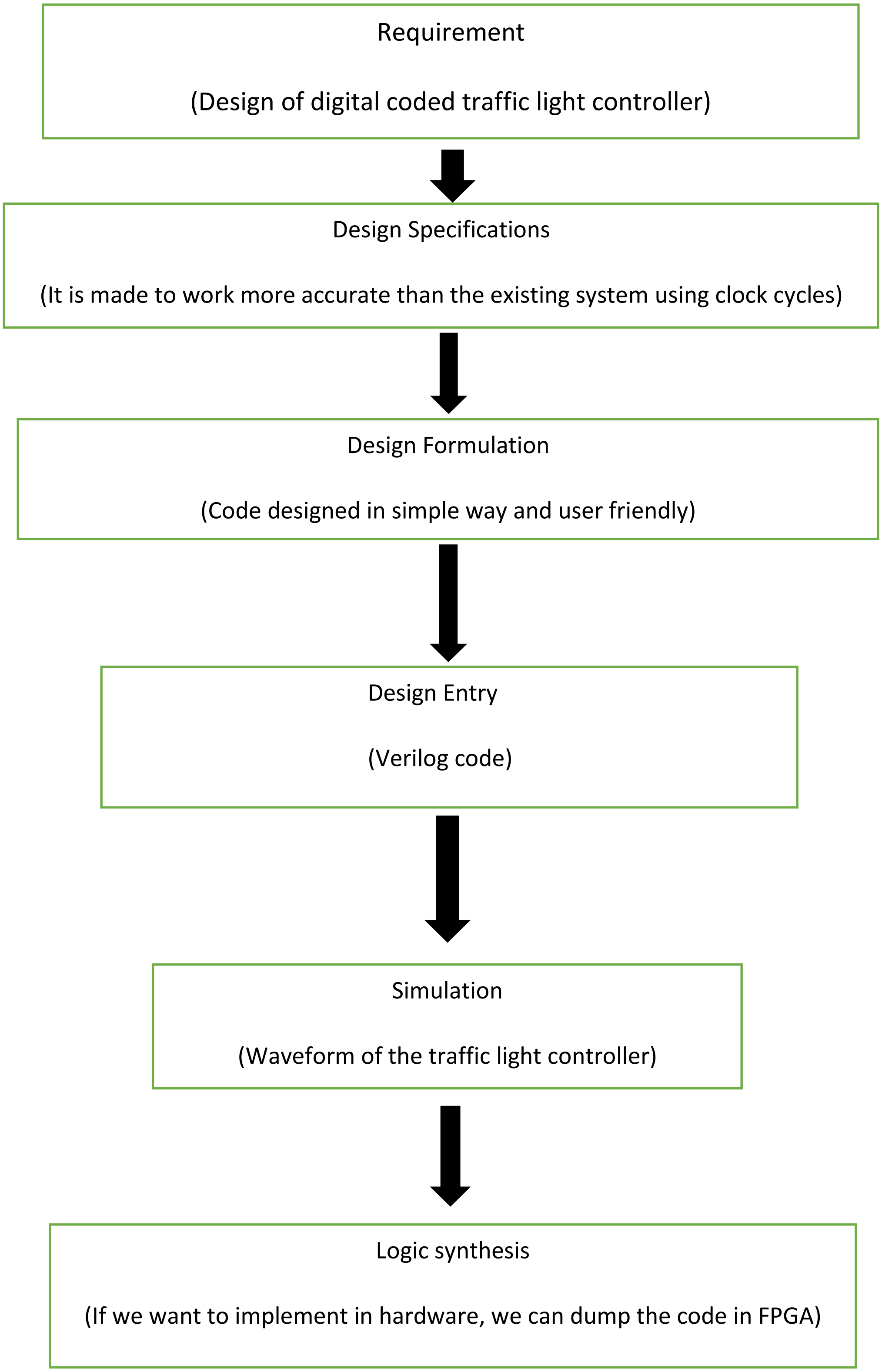

Requirement
(Design of digital coded traffic light controller)
Design Specifications
(It is made to work more accurate than the existing system using clock cycles)
Design Formulation
(Code designed in simple way and user friendly)
Design Entry
(Verilog code)
Simulation
(Waveform of the traffic light controller)
Logic synthesis
(If we want to implement in hardware, we can dump the code in FPGA)

Fig 4.2: General block diagram of the project

4.1 Finite State Machine:

Finite state machine is also called as finite state automation or a state machine, it is employed as a computational model which can be tested and used with either hardware or software and it can also be used in the simulation of sequential logic and some computer programs. It is used in many fields such as mathematics, artificial intelligence, games, and linguistics.

An application where particular inputs cause particular changes in state can be simply represented by finite state machine and if you consider traffic light controller, the signals are Three different lights i.e. green, yellow and red they change in accordance with the state like they change with respect to clock cycles and they started working at the low edge of the reset pin the change from one state to another state is called as transition.

The conduct of state machines can be seen in numerous gadgets in current society that play out a foreordained arrangement of activities relying upon a grouping of occasions with which they are introduced. Straightforward models are candy machines, lifts, whose arrangement of stops is dictated by the floors mentioned by riders, traffic lights, which change succession when vehicles are pausing, and mix locks, which require the contribution of a grouping of numbers in the correct request.

Types:

There are two kinds of finite state machines (FSMs): deterministic limited state machines, frequently called deterministic limited automata, and non-deterministic limited state machines, regularly called non-deterministic limited automata. There are slight varieties in manners that state machines are spoken to outwardly, however the thoughts behind them originate from the equivalent computational thoughts.

By definition, deterministic limited automata perceive, or acknowledge, normal dialects, and a language is customary if a deterministic limited machine acknowledges it. FSMs are generally instructed utilizing dialects comprised of parallel strings that follow a specific example.

Both ordinary and non-normal dialects can be made out of paired strings. A case of a parallel string language is: the language of all strings that have a 0 as the main character. In this language, 001, 010, 0, and 01111 are substantial strings (alongside numerous others), however strings like 111, 10000, 1, and 11001100 (alongside numerous others) are not in this language**.**

Example:

A case of a basic component that can be displayed by a state machine is a turnstile. A gate, used to control access to trams and event congregation rides, is a door with three pivoting arms at abdomen tallness, one over the portal. At first the arms are bolted, obstructing the passage, keeping benefactors from going through. Saving a coin or token in an opening on the entryway opens the arms, permitting a solitary client to push through. After the client goes through, the arms are bolted again until another coin is embedded.

Considered as a state machine, the entryway has two potential states: Locked and Unlocked. There are two potential data sources that influence its state: placing a coin in the opening (coin) and pushing the arm (push). In the bolted state, pushing on the arm has no impact; regardless of how often the information push is given, it remains in the bolted state. Placing a coin in – that is, giving the machine a coin input – shifts the state from Locked to Unlocked. In the opened state, placing extra coins in has no impact; that is, giving extra coin inputs doesn't change the state. Nonetheless, a client pushing through the arms, giving a push input, moves the state back to Locked.

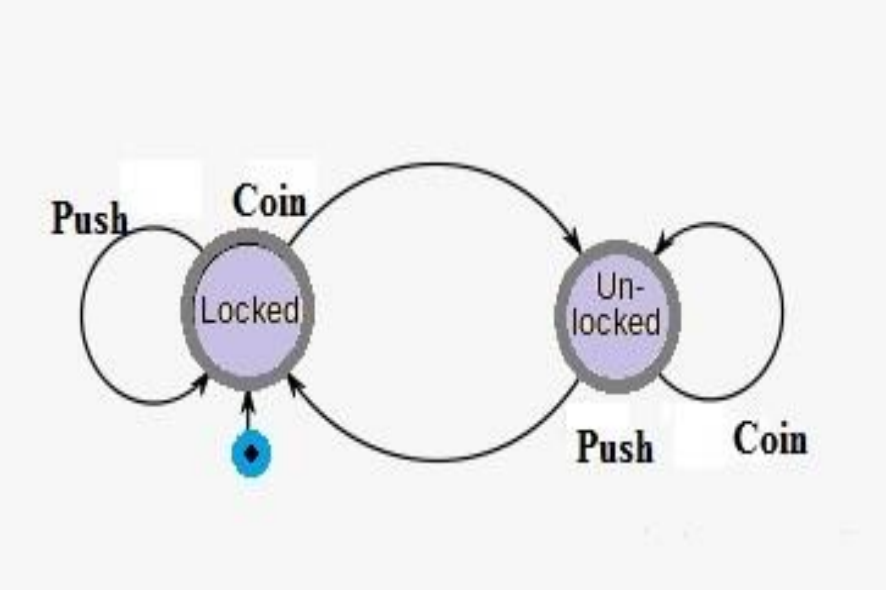


Fig4.3: Example for F.S.M

4.2 Traffic in India:

In this busy life everyone wants there work to get done quickly, in that process to move from one place to other place they use their own vehicles to save time in that process they end up strucking in traffic which is also called as traffic jam.

These traffic jam had become a throne inside a shoe to the police officer, it has even led to some serious issues. A lady who was a pregnant had taken to hospital by an ambulance, as they were travelling in a city that too in peak hours, they couldn't save the mother finally ended in death of the person. There are many such issues describing the seriousness of the issue.

Some of the reasons for the Traffic:

1-Too numerous vehicles for the roadway because of lacking mass travel alternatives or different reasons.

2-Obstacles in the street causing a blockage and merger. These can be any of the accompanying: Path conclusion because of utility work, Street narrowing down

3-Traffic flags out of match up ordinarily deliberately or every so often when the PCs are breaking down.

4-Inadequate green time

5-Too numerous walkers crossing not allowing vehicles to turn

6-Over advancement in zones where the mass travel framework is as of now packed and the street framework is insufficient.

Fig4.4: Picture depicting traffic

Some facts and stats related to Traffic:

1. Bangalore has stood in 1st place in the whole world as “Most traffic congested city in the world”, the drivers here spend 71% more time for travelling by getting stucked in traffic. The people living in Bangalore city are spending 243 extra hours in whole year. This survey was done amongst 57 countries by collecting the stats of 416 cities.
2. One Volvo bus could convey indistinguishable number of individuals from 30 vehicles, while just consuming the street space of three vehicles.
3. There is a loss of 5.7 billion USD per hour due to Traffic jams in America.
4. In India on an everyday there was purchase of 54,000 vehicles in the year of 2018 and there was a purchase rate of over 18,000 vehicles a day 10 years back.

Ways in which we can reduce traffic:

- Traffic is mainly caused by over usage of vehicles, it can be reduced if people start using public means of transport such as buses, metro because a bus can help 50 people to go to there respectively places by just consuming the space that three cars consume, if peoples use individual cars the space consumed by the cars will be more resulting in traffic jams.

- The roads should be widened, if the number of vehicles coming on to the road increase day to day if the roads are not widened finally results in traffic jam so main roads connecting to I.T parks and industries to where more cars go in that places roads should be widened.

- Parking vehicles at the place where vehicles should not be parked is mainly the cause for traffic, so police should take a measure against this they should increase the individual penalty posed towards individual and they should ensure to cease the vehicle if they do the same mistake multiple times.

- Another major concern when it comes to Traffic is accidents, when accidents occur on the roads the vehicles coming on that road will be blocked, the concerned authorities should keep emergency services available to people so that whoever met with accident that victim will be treated by first aid and later took to hospitals.

- Traffic lights are mainly introduced to control the flow of the traffic they ensure the free moment of the vehicles by directing them when to go.

4.3 Traffic Lights:

Traffic lights which are otherwise called as traffic signals, traffic lamps stoplights which are technically called as traffic control signals, these are signalling devices which are placed at the place where four roads intersect, at the place where people cross the roads and placed in certain locations to control the flow of traffic

The traditional traffic lights contain three gas lamps made of colours namely Red, Yellow, and Green. There was no yellow light until 1920's. The purpose for which traffic lights are introduced is to reduce traffic.

Traditionally it was operated by a police man still in few places this is being implemented. The gas lamps process has worked perfectly for some time the draw back in this was the operational life for this is very short, It exploded in 1869, due to which there was an explosion occurred which led to the death of a police man. By taking its safety into consideration the usage was stopped until the electric signals came.

Fig4.5: Picture of Traditional Traffic lights.

History:

The Traffic light which plays a vital role in Transportation system and plays an important role to the road users. This traffic light system was 1st introduced in U.K in 1868, it is placed in front of British parliament in London.

It was placed by two engineers, they used to work in railway department, the traditional traffic lights were designed by J.P knight and made by Saxby & farmer.

Lester Wire was credited with the creation of the electric traffic light in 1912 in Salt Lake City, Utah. Garrett Morgan, an African-American creator, additionally built up a traffic flagging framework, and was one of the main individuals to get a patent for a traffic light. William Potts, a cop, developed the main traffic light with three colors.

Design of the light:

In the United States, traffic lights are as of now planned with lights around 12 inches (300 mm) in measurement. Beforehand the standard had been 8 inches (200 mm); notwithstanding, those are gradually being eliminated for the bigger and progressively noticeable 12-inch lights. Varieties utilized have likewise incorporated a half and half structure, which had at least one 12-inch lights alongside at least one lights of 8 inches (200 mm) on a similar light prominent).

These were intended for emblematic optics to make up for the light misfortune brought about by the image. In any case, following an investigation supported by the UK Highways Agency and finished by Aston University, Birmingham, UK, an upgraded optical structure was presented in the mid-1990s.

Analysis of daylight waste of time (can't see the lit-up signal because of daylight falling on it), and sun-apparition prompted the structure of a sign that utilized to concentrate light from a conventional glowing bulb through gaps in a matt dark front cover. This restored the two issues in an effectively made arrangement.

This plan demonstrated fruitful and was taken into creation by various traffic signal makers through the building structures of Dr Mark Aston, working initially at the SIRA Ltd in Kent, and hitherto as an autonomous optical fashioner. The producers took a permit for the conventional plan from the Highways Agency, with Dr Aston building an exceptional answer for every maker.

Creating both bulb and LED variants of the sign angles, these signs are as yet the most widely recognized sort of traffic light on UK streets. With the innovation of against apparition, exceptionally noticeable Aston focal points, lights of 8 inches (200 mm) could be intended to give a similar yield as plain focal points, so a bigger surface territory was superfluous. Therefore, lights of 12 inches (300 mm) are not, at this point endorsed for use in the UK and all lights introduced on new establishments must be 200 mm (8 in) as per TSRGD (Traffic Signs Regulations and General Directions).

Light sequences in various countries:

1. China:

The sequence is Green, red and yellow, In this green means it is safe to cross, red means do not cross and yellow means it is about to change to red be cautious, continue to cross, when the individual is unable to stop safely. Blinking yellow means be cautious while crossing.

2. Japan:

The sequence is blue, yellow and red in which blue means it is safe to cross, yellow means it is about to change to red be cautious, continue to cross, when the individual is unable to stop safely.

3. Germany:

IN Germany the sequence is green, orange, and red in which green means it is safe to cross, red means do not cross and orange means continue to cross, when the individual is unable to stop safely.

Types of Traffic lights based on placement colors:

These are based on single aspect, dual aspect, three or more aspects.

Single aspect:

The most straightforward traffic light contains either a solitary or a couple of shaded angles that cautions any client of the common option to proceed of a potential clash or threat.

flickering red: treated as a stop sign. This can likewise flag the street is shut down. In France and the United Kingdom, blazing red commands total stop, at the intersection of a railroad line, an air terminal strip, a swing span, or a fire station.

flickering amber: alert, going across or street danger ahead.

flickering green: differs among purview. Glimmering green can offer consent to go straight just as make a left turn before restricting traffic, can show the finish of a green cycle before the light changes to a consistent yellow in British Columbia, Canada, or Mexico City demonstrates the convergence is a person on foot crosswalk.

Dual aspect:

These have two lights, typically mounted vertically. They are frequently observed at railroad intersections, fire stations, and crossing points of roads. They streak yellow or white when cross traffic isn't normal, and go red to stop traffic when cross traffic happens (e.g., the fire motors are going to leave the station). They are additionally some of the time utilized for incline metering, where drivers enter a controlled-get to interstate during substantial traffic. Typically, just a single vehicle on the incline continues when the sign shows green. A few for every green are permitted at times.

Three or more aspects:

The standard traffic signal is the red light over the green, with yellow between.

At the point when the traffic signal with three angles is masterminded on a level plane or sideways, the course of action relies upon the standard of the street. In right-path nations, the grouping (from left to right) is red–yellow–green. In left-path nations, the grouping is green–yellow–red.

On a level plane mounted signals in Japan

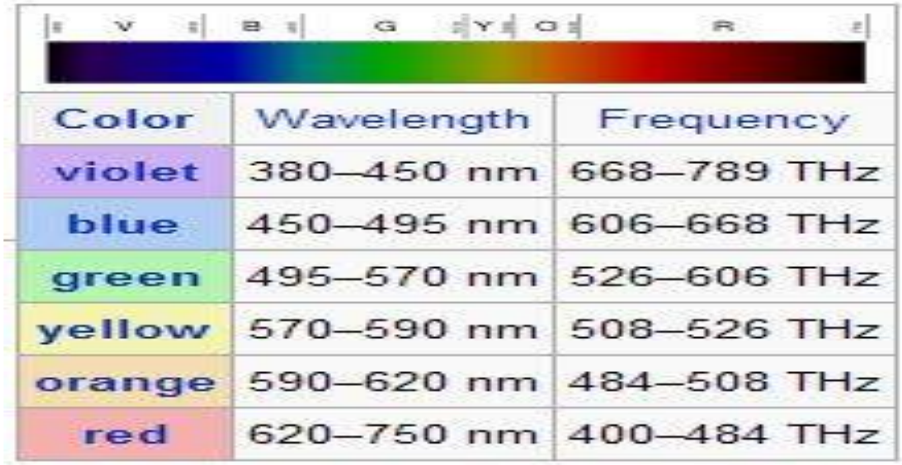
A traffic signal in Halifax, Nova Scotia, Canada, with exceptionally formed lights to help individuals with visual weakness

Different signs are now and again included for more control, for example, for open transportation and right or left turns permitted just when the green bolt is lit up or explicitly denied if the red bolt is enlightened.

Why RED, YELLOW, GREEN:

One reason behind this is to standardize the colors around the world because most of the people who travel across the countries should not face a problem when they drive on abroad roads.

The second reason is according to the spectrum of colors the colors Red , Yellow , Green have the highest wavelength comparatively. And because of this they are visible from quite long distance, by employing this colors the people who are travelling on roads can identify the colors from long distance because of the property of their wavelength and the same reason lies behind painting the school buses in yellow color so that they can be seen from long distances.



Color	Wavelength	Frequency
violet	380–450 nm	668–789 THz
blue	450–495 nm	606–668 THz
green	495–570 nm	526–606 THz
yellow	570–590 nm	508–526 THz
orange	590–620 nm	484–508 THz
red	620–750 nm	400–484 THz

Fig4.6: Picture showing the wavelengths of different colors.

4.4 Implementation method:

In this project we are using Verilog which is one among the two famous hardware description languages by using this we are going to do Traffic light controller, this is a simple Verilog code in which we'll be considering a four road junction as reference by taking along with their directions, we write the code by using state and clock pulses by linking one direction light with another like if north light is green then the other side should red to stop the traffic flowing towards north.

In this clock and reset are two info signal and n-lights, s-lights, e-lights and w-lights are 3 piece yield signal. In yield signal, "001" speaks to Green light, "010" speaks to Yellow light and "100" speaks to Red light. On the reset signal, structure will go into north state and begin giving yield after reset will go low. Configuration will turn on Green light for eight clock cycles and Yellow light for four clock cycles. Configuration will begin with north, at that point goes into south, at that point east lastly into west and by this it will continue onward.

In this when north is initially green the south will be red and the west and east will be yellow

Similarly, the same happens depending on the clock pulse.

The above mentioned is the General Block diagram of the project and we are doing this project in Xilinx and 1st we should open the project and write the code inside it then check the syntax by opening the project saved before and then pressing the check the syntax later click on the chip and enter new source option then Xilinx will generate automatic testbench for which we should give the input response for which we'll get the output.

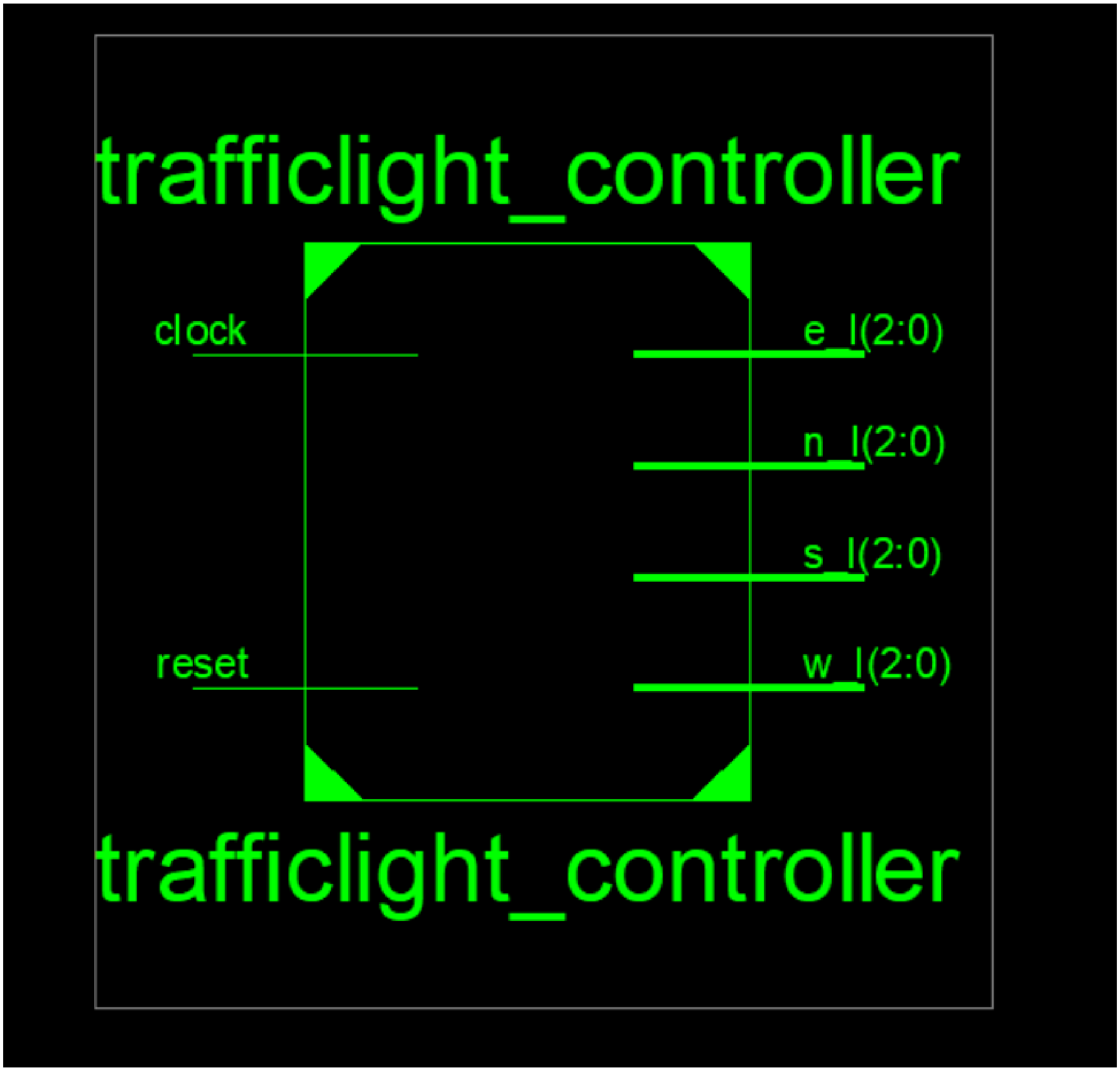


Fig4.7: RTL Schematic of Traffic light controller.

4.5 Purpose of the Project:

The main purpose of the project is to reduce the traffic in cities. Traffic problem has been regarded as on f the major problem everywhere around the world and it had resulted to many chaos conditions in different parts of the world .The purpose of the project is to develop a system that can control the traffic easily and accurately as we all now before few years the traffic lights were controlled by police officers whom ever may be controlling sometimes it leads to major or minor mistakes as all humans are fond of making mistakes so if we employ the traffic light controller which will be controlled on the basis of clock it will work more accurately and many mistakes done can be reduced.

Serial no	**Name of the pin**	**Input/output**	**Description**
1	n_l	output	North Lights (001 = Green, 010 = Yellow, 100 = Red)
2	s_l	output	South Lights (001 = Green, 010 = Yellow, 100 = Red)
3	e_l	output	East Lights (001 = Green, 010 = Yellow, 100 = Red)
4	w_l	output	West Lights (001 = Green, 010 = Yellow, 100 = Red)
5	clock	input	Clock Signal
6	reset	input	Reset Signal

Table4.1: Table depicting the inputs, description.

Benefits of using traffic light controller over Traditional one:

Traffic control is a difficult issue in numerous urban communities. This is because of the huge number of vehicles and the high elements of the traffic framework. Poor traffic frameworks are the integral explanation behind mishaps, time misfortunes. In this it will decrease holding up time of the vehicles at traffic signals. Traffic Light Control (TLC) framework likewise dependent on microcontroller and microchip. Be that as it may, the weakness of with microcontroller or microchip is that it chips away at fixed time, which is working as per the program that doesn't have the adaptability of change on constant premise. In rush hour gridlock light controller, thickness of traffic is detected by utilizing IR sensors all through day and night, and appropriately time is apportioned for clients to pass. Different preferences of this framework are: I) System detects crisis vehicles on the individual street in addition it offers need to the traffic of that specific street where the crisis vehicles are detected. ii) Finds out defaulter who crosses the red sign by catching pictures utilizing camera. In this, we are utilizing FPGA with traffic sensors to control traffic concurring necessity implies we can change the program on the off chance that it requires and hence decreases the holding up time. The equipment configuration has been created utilizing Verilog Hardware Description Language (HDL) programming. The yield of framework has been tried utilizing Xilinx14.7.

Expected outcomes of the project:

- The Traffic in urban areas will reduce to a great extent.
- The accuracy of the changing of the signals will increase enormously
- Number of deaths because of not able to take to hospital due to tuck in traffic will reduce a lot.
- Human error will reduce.

4.6 Working:

Some of the terms used in the Verilog code are n_l,s_l,e_l,w_l these are used as output ports and clock and reset are used as input ports, the size of output ports are 3bits. We also used count and state in the program. we used register to store the values and we used parameters

In between the program. Clock and reset are in the sensitivity list based on which output depends. Initially when the execution starts everything will be red when reset is through it will activate the green light of north and rest directions will be red next after 8 clock pulses the north light will turn to yellow and rest will be in red similarly next the green state will go to south and after 8 clock pulse even south turns yellow at that instant rest will be red, similarly the flow continues to east and west. we took 001as green, 010 as yellow and 100 as red.

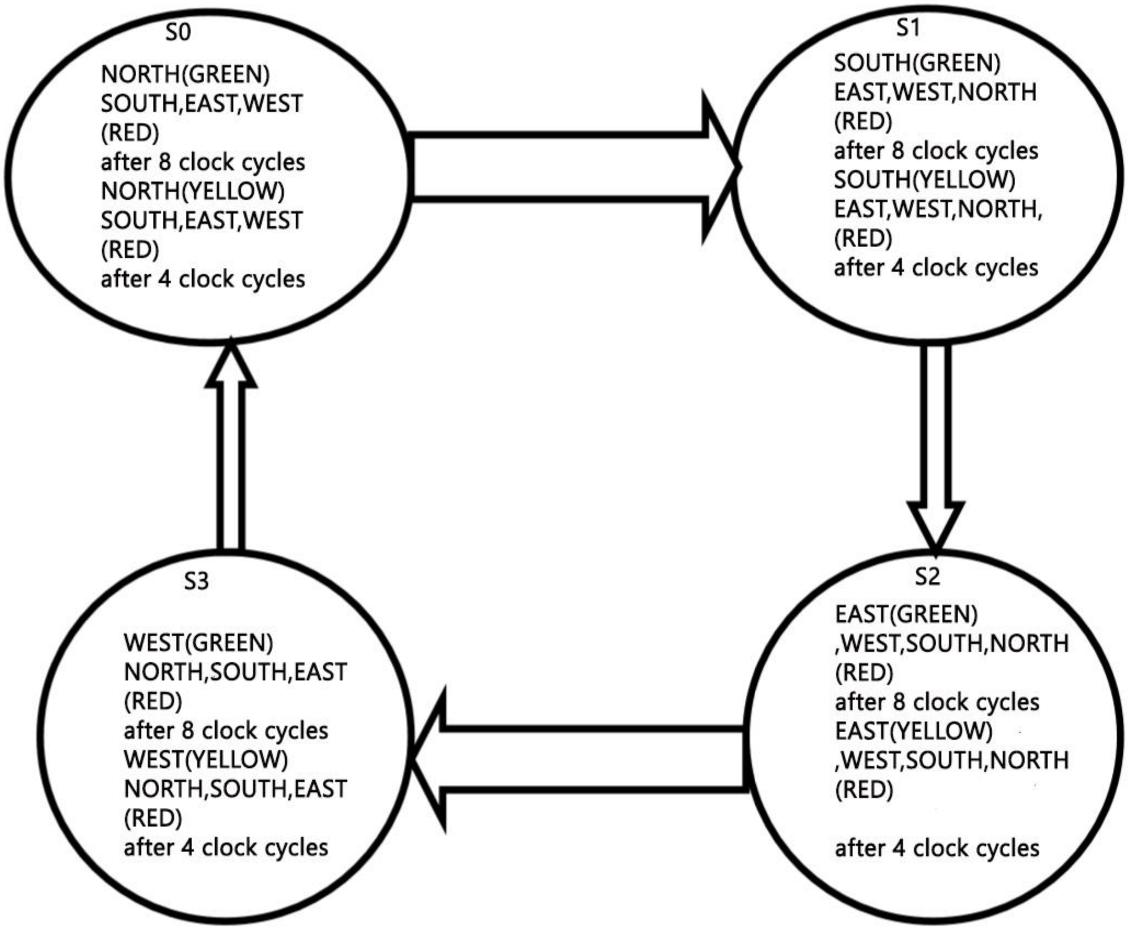


Fig 4.8: State diagram of Traffic light controller

CHAPTER 05

SOFTWARE SPECIFICATION

Software Tool used: Xilinx ISE

The Software tool used in this project is Xilinx ISE, it is a hardware description language used to describe the behaviour and structure of digital systems. It is a general-purpose hardware description language that can be used to describe and simulate the operation of a wide variety of digital systems across the globe, complexity was ranging from a few gates to an interconnection of many complex integrated circuits. Verilog was developed by an industry It was beginning created at a restrictive language by the organization called Gateway Design Automation in the year 1984. Verilog was the principal mainstream equipment portrayal dialects to be concocted. It was found by Prabhu Goel, Phil Moorby and Chi-Lai Huang between late 1983 and early 1984. The rights of holder for this process, at the time proprietary, is "Automated Integrated Design Systems". Gateway Design Automation was purchased by Cadence Design System in 1990 and Cadence now has full proprietary rights to Gateway's Verilog and the Verilog-XL, HDL-simulator that would become the de facto standard for the next decade. Originally Verilog was just proposed to depict and permit recreation, the robotized combination of subsets of the language to truly were feasible structures are created after the language has achieved widespread usage over the globe.

VERILOG:

In the case of Verilog, if you already know other hardware description language, it is good to compare it with Verilog, but you should be always careful when comparing it with programming language such as C language. VHDL and Verilog have a very different purpose from languages such as C, and a comparison with C language will not be a meaningful activity. We have to start

describing this language assuming to be our first HDL however, we will assume basic knowledge of computer languages such as C and the basic compilation and execution flow.
At the point when somebody learns the new language, one needs to contemplate the letter set of the new dialect, its jargon, sentence structure, linguistic structure rules, and semantics of language depictions. The way toward learning Verilog isn't vastly different. One needs to get familiar with the letters in order, jargon or lexical components of the language, sentence structure (syntax and rules), and semantics. The lexical components of the language incorporate different identifiers, held words, unique images, and literals. The language structure or syntax figures out what mixes of lexical components can be consolidated to make legitimate Verilog depictions.

These are the guidelines that oversee the utilization of various Verilog develops. At that point one needs to comprehend the semantics or significance of Verilog portrayals. It is here that one comprehends what portrayals speak to combinational equipment versus consecutive equipment. Also, similarly as familiarity with a characteristic language stops by talking, perusing, and composing the language, authority of Verilog drops by rehashed utilization of the language to make models for different advanced frameworks. Since Verilog is an equipment portrayal language, it contrasts from a standard programming language in a few different ways. Above all, Verilog has proclamations that execute simultaneously since they should show genuine equipment in which the parts are all in activity simultaneously. It is prominently utilized for the reasons for portraying, recording, re-enacting, and consequently producing equipment.

Designed By: Prabhu Goel, Phil Moorby and Chi-Lai Huang and Douglas Warmke

Developer: Gateway Design Automation

Advantages of Xilinx ISE (Verilog):

- It will be performing timing analysis.
- It Examines the RTL diagrams.
- Behavioral verification is done before implementing into hardware and also verify logical and timing issue.
- It has the predefined unary operators inside it.
- Verilog is Easy to learn and very similar to C language.

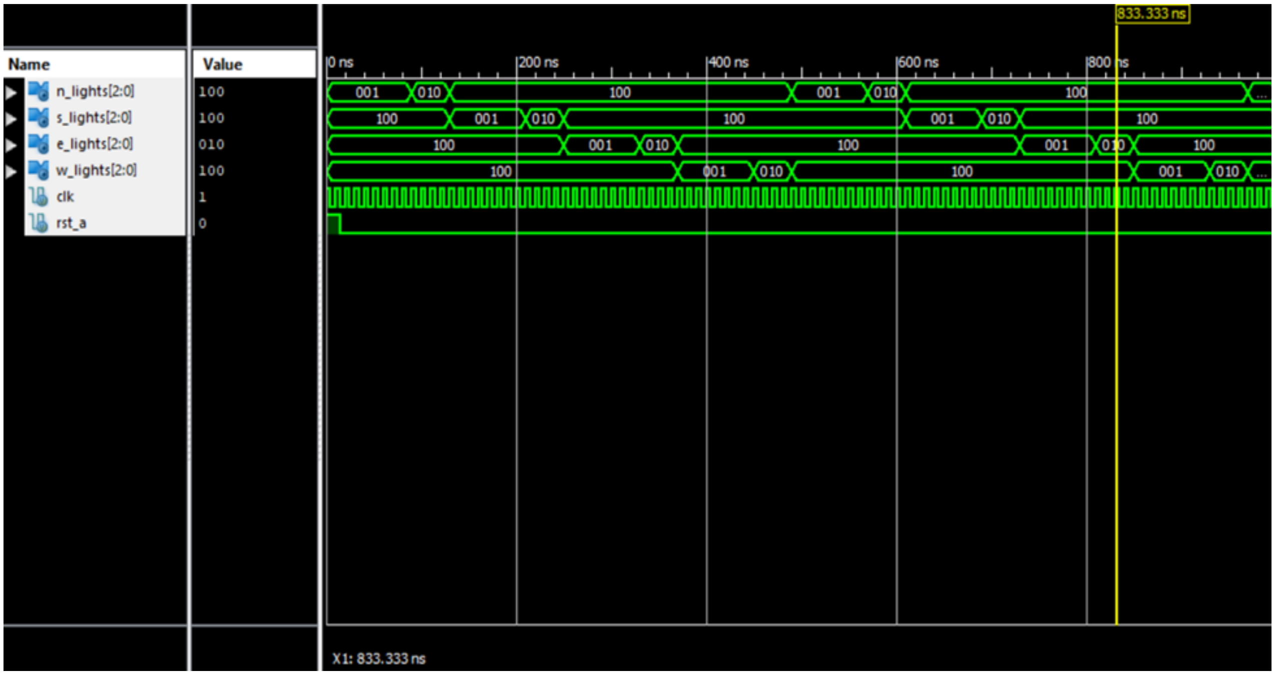
Disadvantages of Xilinx ISE(Verilog):

- Bottom up synthesis flows have huge negative impacts on revision control, shared code, simulation and design management.
- Data types are all built in. The user cannot define datatypes.
- Multidimensional array cannot be defined. No keyword exists to define array.
- Concurrent task calls are not allowed

CHAPTER 06

RESULT AND DISCUSSION

The Software Project, traffic light controller using Verilog code is working perfectly as per our objectives. It takes clock input and lights as the output of action is done using Verilog code on the traffic signal on the roads which is show on the figure.



Name	Value
n_lights[2:0]	100
s_lights[2:0]	100
e_lights[2:0]	010
w_lights[2:0]	100
clk	1
rst_a	0

Fig 6.1: Simulation waveform of Traffic light controller

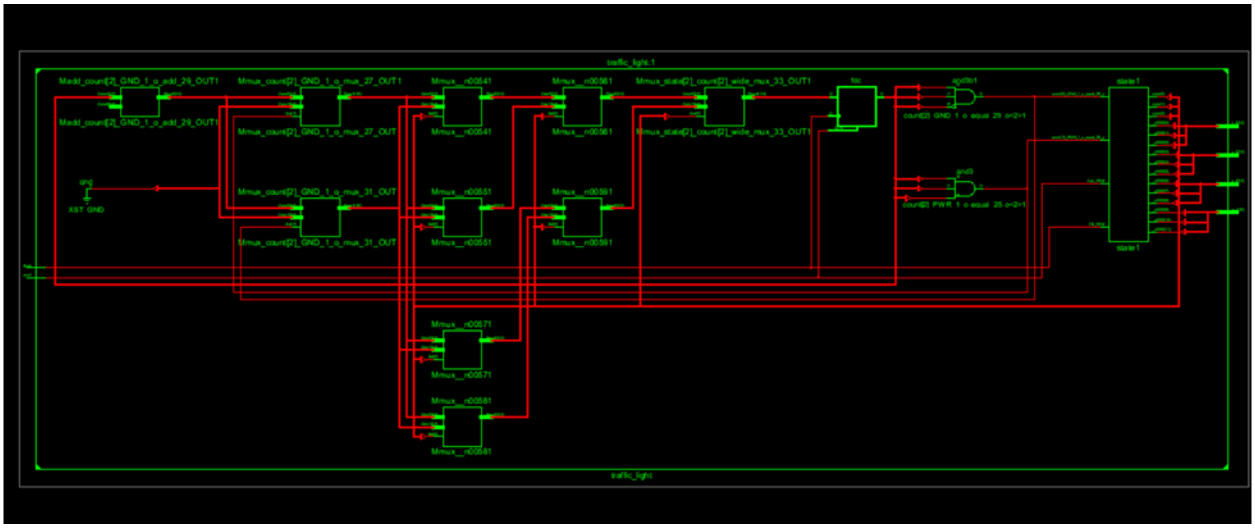

traffic_light:1
Madd_count[2]_GND_1_o_add_29_OUT1
Madd_count[2]_GND_1_o_add_29_OUT1
Mmux_count[2]_GND_1_o_mux_27_OUT1
Mmux_count[2]_GND_1_o_mux_27_OUT
Mmux__n00541
Mmux__n00541
Mmux__n00561
Mmux__n00561
Mmux_state[2]_count[2]_wide_mux_33_OUT1
Mmux_state[2]_count[2]_wide_mux_33_OUT1
fdc
and3b1
count[2]_GND_1_o_equal_29_o<2>1
and3
count[2]_PWR_1_o_equal_25_o<2>1
state1
state1
gnd
XST_GND
Mmux_count[2]_GND_1_o_mux_31_OUT
Mmux_count[2]_GND_1_o_mux_31_OUT
Mmux__n00551
Mmux__n00551
Mmux__n00591
Mmux__n00591
Mmux__n00571
Mmux__n00571
Mmux__n00581
Mmux__n00581
traffic_light

Fig 6.2: Technology schematic

CHAPTER 07

ADVANTAGES AND APPLICATIONS

Advantages of the project:

- Ensures free movement of traffic in all directions.
- It will reduce the possibilities of traffic jams by traffic light controller to some extent.
- They intercept heavy traffic to allow other traffic to cross the road intersection and also pedestrians to cross.
- Traffic light controller to ensures an orderly flow of traffic and reduce the number of conflicts between vehicles from entering intersections from different directions.

Applications of the project:

- Traffic light controller provide an, safe and decent movement of traffic.
- It is mainly used to watch and control the flow of vehicles through the junction of many roads.
- We can allow the emergency vehicles by turning green light on that road and allow the traffic to move.
- Traffic light provides safety by avoiding the accidents.

CHAPTER 08

CONCLUSION AND FUTURE SCOPE

Conclusion:

The improvement of town traffic condition is to a great extent reliant on the advanced methods for traffic the board and control. Advanced traffic signal controllers and control frameworks add to the improvement of the traffic issue. The traffic signal controller is presented with Verilog code. This tasks primary is to plan a program, which comprises of reading, research, planning and planning a program. Verilog code was chosen to write a program code for getting the simulation and check the output of the program. The blinking or changing one colures to another is depending on the state machine transition sending traffic light alerts signals for drivers on road and precautions be taken not to indulge in traffic congestion .It is observed that traffic light controller is more efficient in respect of less waiting time more distance traveled by average vehicle and efficient operation during emergency mode moreover the designed code is simple to understand and user friendly and scope for further expansion. Drivers on street and precautionary measures be taken not to enjoy traffic blockage. It is seen that traffic light controller is increasingly proficient in regard of less holding up time more separation went by normal vehicle in addition the structured code is straight forward and easy to understand and scope for additional extension. The reason of taking traffic light controller as a project to reduce problems in roads faced by the public in day to day life.

Future Scope:

- To implement this software into the hardware components and control it automatically.
- This project can be enhanced in such a way as to control automatically the signals and by using the sensors in the roads making the traffic light glow green more in the roads which are having more traffic and less green in the low traffic roads
- For future works we can include pedestrian crossing lights and simulated.

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APPENDIX

```
module traffic_light (n_l, s_l,e_l,w_l,clock,reset);

  output reg [2:0] n_l, s_l,e_l,w_l;
  input    clock;
  input    reset;

  reg [2:0] state;

  parameter [2:0] n=3'b000;
  parameter [2:0] n_y=3'b001;
  parameter [2:0] s=3'b010;
  parameter [2:0] s_y=3'b011;
  parameter [2:0] e=3'b100;
  parameter [2:0] e_y=3'b101;
  parameter [2:0] w=3'b110;
  parameter [2:0] w_y=3'b111;

  reg [2:0] count;



  always @(posedge clock, posedge reset)
   begin
     if (reset)
       begin
         state=n;
         count =3'b000;
       end
```

```
else
  begin
    case (state)
    n :
      begin
        if (count==3'b111)
          begin
          count=3'b000;
          state=n_y;
          end
        else
          begin
          count=count+3'b001;
          state=n;
          end
      end

    n_y :
      begin
        if (count==3'b011)
          begin
          count=3'b000;
          state=s;
          end
        else
          begin
          count=count+3'b001;
          state=n_y;
        end
      end

  s :
      begin
         if (count==3'b111)
            begin
            count=3'b0;
            state=s_y;
            end
         else
            begin
            count=count+3'b001;
            state=s;
         end
      end

s_y :
   begin
      if (count==3'b011)
         begin
         count=3'b0;
         state=e;
         end
      else
         begin
         count=count+3'b001;
         state=s_y;
         end
      end
```

```
e :
   begin
      if (count==3'b111)
         begin
         count=3'b0;
         state=e_y;
         end
      else
         begin
         count=count+3'b001;
         state=e;
         end
      end

e_y :
   begin
      if (count==3'b011)
         begin
         count=3'b0;
         state=w;
         end
      else
         begin
         count=count+3'b001;
         state=e_y;
         end
      end
```

```
  w :
    begin
      if (count==3'b111)
        begin
        state=w_y;
        count=3'b0;
        end
      else
        begin
        count=count+3'b001;
        state=w;
        end
      end

  w_y :
    begin
      if (count==3'b011)
        begin
        state=n;
        count=3'b0;
        end
      else
        begin
        count=count+3'b001;
        state=w_y;
        end
      end
  endcase // case (state)
end // always @ (state)
```

```
  end



always @(state)
   begin
      case (state)
        n:
           begin
              n_l = 3'b001;
              s_l = 3'b100;
              e_l = 3'b100;
              w_l = 3'b100;
           end // case: north

        n_y :
           begin
              n_l = 3'b010;
              s_l = 3'b100;
              e_l = 3'b100;
              w_l = 3'b100;
           end // case: north_y

        s:
           begin
              n_l = 3'b100;
              s_l = 3'b001;
              e_l = 3'b100;
              w_l = 3'b100;
           end // case: south
```

```
s_y :
   begin
      n_l = 3'b100;
      s_l = 3'b010;
      e_l = 3'b100;
      w_l = 3'b100;
   end // case: south_y

w :
   begin
      n_l = 3'b100;
      s_l = 3'b100;
      e_l = 3'b100;
      w_l = 3'b001;
   end // case: west

w_y :
   begin
      n_l = 3'b100;
      s_l = 3'b100;
      e_l = 3'b100;
      w_l = 3'b010;
   end // case: west_y

e:
   begin
      n_l = 3'b100;
      s_l = 3'b100;
```

```
            e_l = 3'b001;
            w_l = 3'b100;
          end // case: east

        e_y :
          begin
            n_l = 3'b100;
            s_l = 3'b100;
            e_l = 3'b010;
            w_l = 3'b100;
          end // case: east_y
        endcase // case (state)
    end // always @ (state)
endmodule
```

Test bench:

```
timescale 1ns / 1ps

////////////////////////////////////////////////////////////////////////////////
// Company:
// Engineer:
//
// Create Date:   17:17:48 05/01/2020
// Design Name:   traffic_light
// Module Name:   C:/Users/harin/Desktop/hdl programs/preee/testbench.v
// Project Name:  Traffic light controller
// Target Device:
// Tool versions:
// Description:
//
```

```
// Verilog Test Fixture created by ISE for module: traffic_light
//
// Dependencies:
//
// Revision:
// Revision 0.01 - File Created
// Additional Comments:
//
////////////////////////////////////////////////////////////////////////////////

module testbench;

	// Inputs
	reg clock;
	reg reset;

	// Outputs
	wire [2:0] n_l;
	wire [2:0] s_l;
	wire [2:0] e_l;
	wire [2:0] w_l;

	// Instantiate the Unit Under Test (UUT)
	traffic_light uut (
		.n_l(n_l), 
		.s_l(s_l), 
		.e_l(e_l), 
		.w_l(w_l), 
		.clock(clock), 
		.reset(reset)
	);
```

```
        initial begin
                // Initialize Inputs
                clock = 1'b1;
                forever #5 clock=~clock;

                reset = 0;
                end



          // Add stimulus here
                initial begin
                reset = 1'b1;
                #15;
                reset = 1'b0;
                #1000;
                $stop;

        end
endmodule
```