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# REVIEW PAPER ON DENSITY BASED SENSOR IN TRAFFIC LIGHT CONTROL SIGNAL USING VHDL

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**ABSTRACT**

Traffic Light Control Systems (TLCS) have assumed to play a significant role in traffic management all through the world, particularly in enormous urban communities. Be that as it may, there is still no successful technique to assess their exhibition and unwavering quality. Traffic congestion has consistently been a conspicuous issue in numerous urban cities, notably around the world posing a real threat to citizens, this is brought about by the lopsided planning of traffic signals or a slack in signal. In the way the road users are increasing constantly and resources provided are limited, a traffic light controller is a significant prerequisite. So the need emerges for simulating and enhancing traffic control system to be smart enough to better meet this growing demand. In this review paper, the working of traffic light control signal will be explained and the view of implementing it by using VHDL code and density based sensor will be given.

Keywords: Smart Traffic light control system, traffic congestion, VHDL

## 1. Introduction:

The world is now equipped with traffic lights, which are also known as traffic signals, traffic lamps, stop & go lights, installed at crossroads in most cities around the world traffic flow control. To guide the traffic three standard colors- Red, Yellow and Green (Stop, Be Alert/Proceed and Go, respectively) are used. The present traffic control framework in the metro areas of India is disorganized because of haphazardness of the traffic density pattern designed for the duration of the day. The signaling timer has a defined time to route traffic in different directions. As a result, the vehicle will have to wait for long, even when the traffic is very low. If the occurrence of the traffic signal timer can be designed such that it can employ or manipulate the regularly varying traffic density, this way the traffic congestion can be reduced accordingly. The traffic congestion consequences leads to loss of productivity, trading issues, delayed delivery and the cost gets increased. Therefore, every individual advises to build new facilities and infrastructure for the problem of traffic congestion.

Many traffic lights signals operate on the basis of timing mechanism which is optimized to alter the traffic lights after a given period of time resulting the traffic to wait for long. Most of the traffic light controllers are designed in such a way that they have a fixed-cycle and do not take into account the density of traffic coming from each direction. This paper aims at making a traffic light control system through simulation in VHDL and a density based sensor is used to get the input from vehicles which guides in decreasing the waiting time.

## 2. Literature review:

[1] INTELLIGENT TRAFFIC LIGHT CONTROL SYSTEM BASED IMAGE INTENSITY MEASURMENT by Muzhir Shaban, Al-Ani and Khattab Alheeti proposed an algorithm consisting many subsystems to increase the efficiency of the system by employing a camera and using infrared object sensors to detect the density of the traffic. The camera is then used to capture the image and calculate

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the histogram of that captured image. This paper asserts that the proposed algorithm can reduce the travelling time of vehicles and lessen the traffic congestion.

[2]ADAPTIVE TRAFFIC LIGHT CONTROL WITH WIRELESS SENSOR NETWORKS by Malik Tubaishat, Yi Shang and Hongchi Shi implements traffic light control system using wireless sensors. After classifying the system into 3 layers; the system works as the remote sensors are set up on the paths going in and out the crossway. These sensors identify vehicles number, speed and send their information to the closest Intersection Control Agent (ICA) which, decides the flow model of the crossway contingent upon sensors information (e.g., number of vehicles moving toward a specific crossway).

[3] FOUR-WAY TRAFFIC LIGHT CONTROLLER DESIGNING WITH VHDL by Faizan Mansuri, Viraj Panchal designed the whole system of traffic-light controller for intersection in four-way using VHDL for serial communication and finite state machines then uploading the designed VHDL code on ALTERA kit for design verification.

[4] FPGA-BASED INTELLIGENT TRAFFIC LIGHT CONTROLLER SYSTEM DESIGN presented by V. V. Dabahde, Dr. R. V. Kshirsagar aims at abbreviating the waiting time of the vehicles and this proposed framework utilizes FPGA innovation alongside traffic sensors to control traffic as indicated by the traffic prerequisite and along these lines decreases the waiting time at a crossing point of two streets. The time intervals of the green, yellow and red states depend on continuous traffic thickness, which enhances traffic light planning and stays away from traffic congestion and it is an improvement upon the proficiency of the present Traffic Light Controllers.

## 3. Methodology:

The approach of implementing a traffic light control signal starts with a flow chart. A flow chart is needed for representing and visualizing several progressions of traffic management system which will be helpful in the recognition of a traffic light control system.

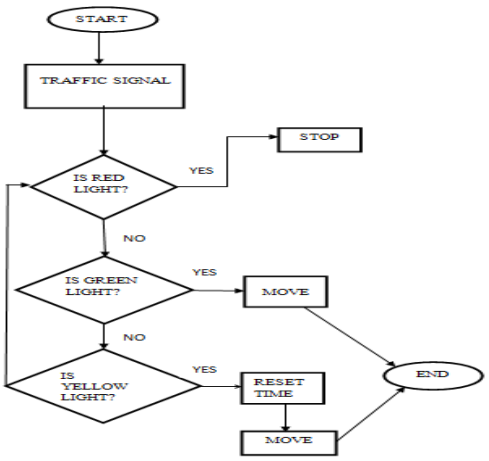


**Figure1: Flow Chart representing simple traffic control signals[8]**

The above given flow chart is the general representation of a traffic light control signal that how the system actually works. To reduce the waiting of the vehicles the code is synthesized in VHDL.

There are 4 directions, and works in pairs as East-West; North-South, each intersection will have the IR sensors to detect the presence of vehicle.

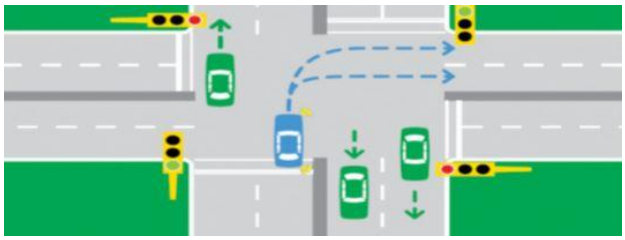

**Figure 2: Briefing of sensors applied opposite to each other[8]**

The figure 2 works according to the density based IR sensor which will sense the presence of heavy traffic and will work accordingly. The traffic light signal has three different colors of indicators RED, YELLOW and GREEN shown below in figure 3.

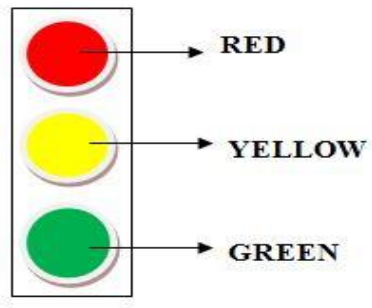


**Figure 3: Traffic Light Signals**

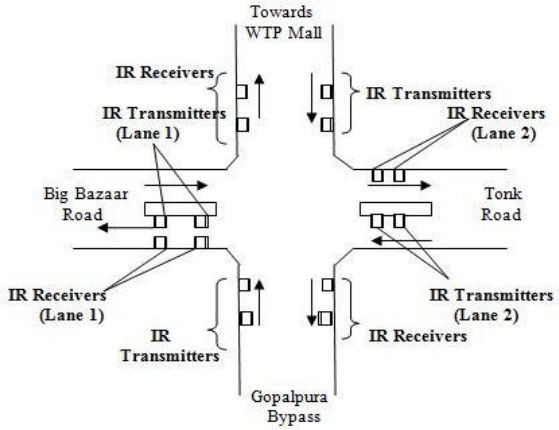


**Figure 4: Plot of a intersection of road studied; Infrared Transmitter and Receiver**

The intersection is equipped with IR (Infrared) sensor transmitter & receiver. It is a '+' type of road. Each lane has the same set up, this will be helpful in detecting the vehicles and reduce the waiting time causalities.

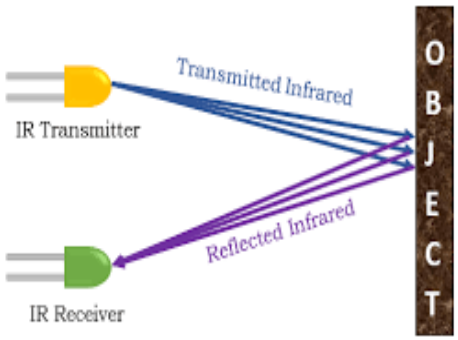


**Figure 5: Working of IR Sensor**

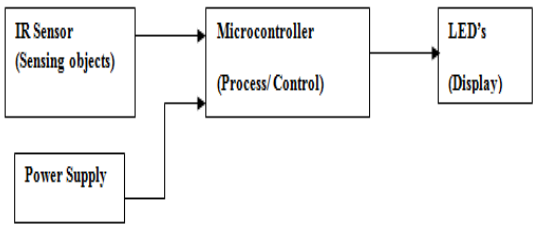


**Figure 6: Input/Output Block Diagram for Traffic lights in accordance with the sensor**

In the above figure 6 microcontroller AT89C51 will be used as it can be erased and can be also be programmed 1000 times once it is deployed. The above study and implementation shows the working of traffic light control signal in an adaptive or flexible aspect. This approach aims at decreasing the waiting time for the vehicles and also solves the traffic congestion issue.

## 4. Conclusion:

The traffic congestion has been a problem since many decades. New modifications and changes are made with invention of new technologies. The traffic light control system used nowadays is not adaptive, it has a fixed time cycle which repeats according to the time attributed. By using the sensor, the presence of heavy traffic in each direction can be determined and the traffic light signals will alter subsequently. The Four-way traffic light controller designing with VHDL is the research paper which solely matters in the implementation of this review paper.

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