Density Based Traffic Control System with Priority for Emergency Vehicles

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Abstract

The Project is aimed at designing a density based dynamic traffic signal system where the timing of signal will change automatically on sensing the traffic density at any junction. Traffic congestion is a severe problem in most cities across the world and therefore it is time to shift more manual mode or fixed timer mode to an automated system with decision making capabilities. Present day traffic signaling system is fixed time based which may render inefficient if one lane is operational than the others. To optimize this problem we have made a framework for an intelligent traffic control system. Sometimes higher traffic density at one side of the junction demands longer green time as compared to standard allotted time. We, therefore propose here a mechanism in which the time period of green light and red light is assigned on the basis of the density of the traffic present at that time. Once the density is calculated, the glowing time of green light is assigned by the help of the microcontroller. The sensors which are present on sides of the road will detect the presence of the vehicles and sends the information to the microcontroller where it will decide how long a flank will be open or when to change over the signal lights.

Keywords: AURDINO, Buzzer, GSM module, LCD Display, Ultrasonic sensors and IR sensors

I. INTRODUCTION

Traffic system plays a vital role in this civilized world and many aspects of life that relies on it. The reason of traffic is an inefficient controlling of traffic signals that affects the traffic flow. This phenomenon requires finding methods of optimizing traffic flow, especially during rush hours. Most of the city traffic is controlled by sensors and cameras shall be installed in big highways and streets.

Vehicle counts are typically used to gather data for determination of vehicle hourly patterns, daily or seasonal variations and growth trends, or annual traffic estimates. The most common use for the traffic image data collection is signal timing. Traffic signal preemption or prioritization allows the normal operation of traffic lights to be preempted. The most common use of these systems is to manipulate traffic signals in the path of an emergency vehicle, halting conflicting traffic and allowing the emergency vehicle right-of-way, to help reduce response times and enhance traffic safety. This problem can be controlled by the proper analysis of traffic, proper adjustment in the controlling of traffic management. One of the methods to overcome the traffic problem is to develop a traffic analysis by measuring the traffic density on a road using microcontroller.

II. CONVENTIONAL METHODS

Manual Controlling: Manual controlling the name instance it require man power to control the traffic.
Automatic Controlling: Automatic traffic light is controlled by timers and electrical sensors.

A. Drawbacks of the Conventional Methods

In the manual controlling system we need more man power. As we have poor strength of traffic police we cannot control traffic manually all area of a city or town. So we need a better solution to control the traffic. On the other side, automatic traffic controlling a traffic light use timer for every phase. Using electronic sensors is another way in order to detect vehicles and produce signal that
to this method the timer is being wasted by a green light on an empty road. Traffic congestion also occurred while using the electronic sensors for controlling the traffic. All these drawbacks are supposed to be eliminated by using microcontroller.

B. Modern Technology Methods going to be employed

Automatic traffic light is controlled by timers and electrical sensors. In traffic light each phase a constant numerical value loaded in the timer. The lights are automatically getting ON and OFF depending on the timer value changes. While using electrical sensors it will capture the availability of the vehicle and signals on each phase on each phase, depending on the signal the lights automatically switch ON and OFF.

C. Advantages of the Modern Technology Method

- Technically feasible to implement with low cost and with optimum accuracy.
- Gives the count of vehicles.
- No need of extra traffic person.

III. LITERATURE SURVEY

Our project is Mainly Based on 2009 IEEE Paper by Anuran Chattaraj, Saumya Bansal, and Anirudhha Chandra. For the Traffic congestion problem caused due to Traffic Lights the authors have described a solution using RFID.

According to the solution in the paper every vehicle has to be fitted with a RFID tags which has a unique code and a RF Reader is placed at the entrance of each lane thus enabling to get a count of the number of vehicles in each lane and hence timing the signals as per the count.

IV. OBJECTIVES

A steady increase in population, and the exponential increase in the number of vehicles, leads to traffic jam often during peak hours. Traffic analysis becomes a challenging problem as well as the needed one to control the traffic in decent and safe manner. Normally the traffic signals are operated on predefined fixed program, based on the time of day. In case if there is no vehicle in the allotted road, the time will lapsed for the other vehicles who are all waiting on the other side, which leads congestion. To rectify this issue, this project presents an approach for analysis and detecting vehicles in highways traffic by means of real time density based traffic control system techniques. To count the detected vehicle region properties are used. The result are then used to control the traffic signals. The whole work has been developed using microcontroller to monitor the traffic signals.

V. PROBLEM STATEMENT DEFINITION

- Vehicles have to wait at a road crossing even though there is little or no traffic in the other direction.
- Ambulances get caught up at red traffic signals and waste valuable time.

![Functional Block Diagram](image-url)

Fig. 1: Functional Block Diagram
VI. Expected Results

In the first part of our project we have made an attempt to reduce the problem of traffic congestion caused by traffic signals by using IR sensors to detect the density of traffic in each lane. We have used 8051 microcontroller as a central processor to control and time signals based on the number of IR sensors blocked. We have used 3 LED’s to represent the signal lights. We have designed a 5V DC power supply for the microcontroller kit. We have also used a 7 segment display as a timer.

In the second part of our project we have tried to build a system to provide priority to an arriving emergency vehicle before it gets trapped in traffic. We have implemented this idea by placing unique RFID tags in all the lanes at a particular distance from the signal. We are placing the RF reader in the emergency vehicle. Whenever the emergency vehicle passes over the RFID tag the information is sent to the ARM processor.

The Zigbee transmitter connected to the ARM processor communicates this information to the Zigbee receiver which is connected to the microcontroller. On receiving information about an arriving emergency vehicle the microcontroller aborts the ongoing process and provides a green signal to the lane with the arriving emergency vehicle so as to provide the vehicle a traffic free zone. Here we have used LM317 to control the input voltage given to the ARM processor.

VII. Applications

1) Reduce the problem of traffic congestion caused by traffic signals by using IR sensors to detect the density of traffic in each lane.
2) Provide priority to an arriving emergency vehicle before it gets trapped in traffic. We have implemented this idea by placing unique RFID tags.

VIII. Conclusions

By using this system we were able to successfully build a system to control and manage traffic signals to avoid traffic congestion caused due to traffic signals. The number of IR sensors blocked decides the density range of traffic and on this basis traffic lights are prioritized to lanes with highest number of IR sensors blocked. We were also able to build a system so as to clear a lane when an emergency vehicle is detected in that particular lane. During the process we learnt about the various hassles faced in the interfacing of various hardware and the methodologies to overcome them. We were able to accomplish our baseline goals and implement some extra ideas in this project.

REFERENCES

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