INTELLIGENT TRAFFIC LIGHT SYSTEM USING VEHICLE DENSITY

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ABSTRACT

The frequent traffic jams at major junctions call for an efficient traffic management system in place. The resulting wastage of time and increase in pollution levels can be eliminated on a city-wide scale by these systems. The paper proposes to implement an intelligent traffic light system using Infrared (IR) sensors. Subsequently, the number of vehicles at the intersection is evaluated and traffic is efficiently managed. The paper also proposes to implement a real-time emergency vehicle detection system using image processing. In case an emergency vehicle is detected, the lane is given priority over all the others.

Keywords : Traffic Management, IR Sensors, Emergency Vehicles, Image Processing.

I INTRODUCTION

Traffic signals are the most convenient method of controlling traffic in a busy junction. But, we can see that these signals fail to control the traffic effectively when a particular lane has got more traffic than the other lanes. This situation makes that particular lane more crowdie than the other lanes. If the traffic signals can allot different lanes to different vehicles based on their weight, like buses, trucks etc. in one lane, cars in one lane and like this the traffic congestion can be solved by diverging the traffic accordingly.

Current traffic system consists of fixed signal timing and manual system for management of traffic and to avoid any violation of traffic rules. The paper proposes the new system of traffic management in which we are using IR sensors for signal timing control. Many times roads are traffic free still the timer takes its default time. In the first step we need a system to calculate the density of traffic and control the signal timer accordingly that is we reassign the green signal time. Maximum density of traffic will correspond to maximum default timing. Minimum density of traffic will correspond to minimum defined timing [1].

In the next step we are looking for the diversion of traffic from the previous signal. If traffic density is more at a particular square then the signal will be sent to the previous signal for diversion. This project also gives priority to emergency vehicles such as ambulance, fire vehicle, police cars by allowing that signal to be green till the vehicle crosses the signal because it is not possible to build separate roads for such vehicles.

II. IMPLIMENTATION PHASES

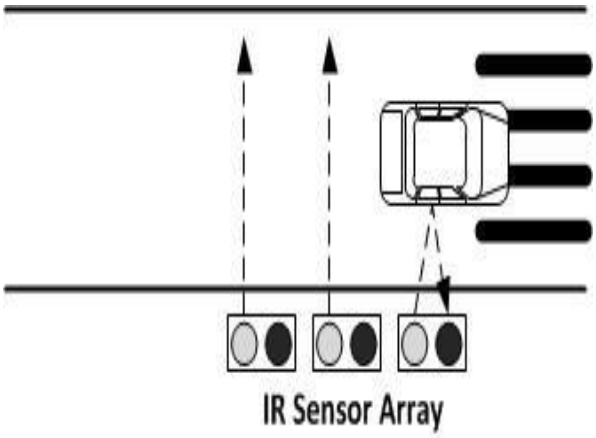
A. System Overview

In this project we have three phases, first phase is about green signal timing control, second is about diversion of vehicles on heavy density lane, and third is about image processing of emergency vehicles.

B. Phase I

This phase consist of green signal timing control. In this every square will be having an array of IR sensors which will detect the presence or the absence of the vehicle. Here each module of sensor consists of IR Light Emitting Diode (LED's) and

Thin Small Outline Package (TSOP) sensors and 555 timer IC which is used as a comparator and it also converts analog input to digital output. When vehicle comes in front of IR sensor, IR sensor emits infrared rays on the vehicle and these rays then get reflected from the vehicles and fall on TSOP. The TSOP outputs a constant HIGH signal when idle and as it receives data, it tends to invert the data that is when an IR LED is transmitting data onto the TSOP, every time the IR led goes high and reflect rays on TSOP, the TSOP will go LOW and vice versa. The output of TSOP is sent to 555 timer IC where we set a threshold voltage and then this output is compared with that threshold voltage and if it is found high then digital one(1) will be sent to surface mounted devices based Atmega 16 microcontroller else 0 will be sent. Depending upon the outputs of various lanes the microcontroller will decide which signal will first turn green [2].



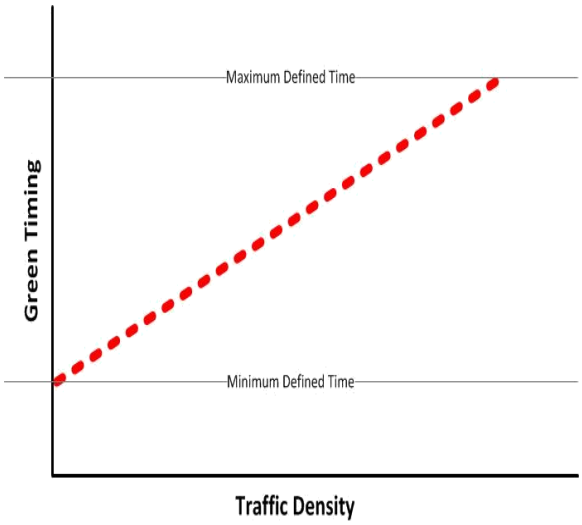


Fig. 1. Working of IR Sensor **Fig. 2 Graph of green light signal timing v/s traffic density**

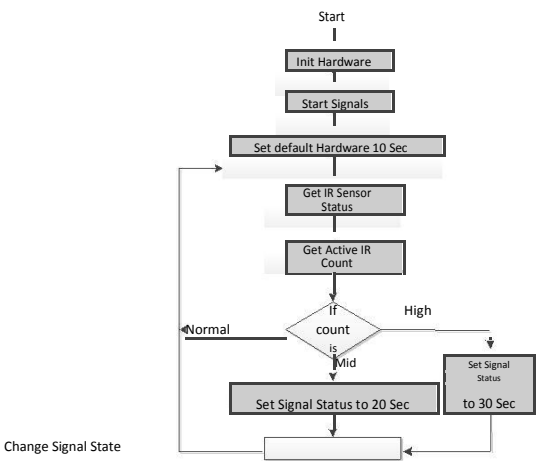


Fig.3 Flow Chart of Phase I

C. Phase II

Phase II includes concept of diversion depending upon the density of vehicles on signal. If traffic density, monitored in Phase I, is observed to be continuously high at a particular lane then the signal will be sent to the previous traffic signal indicating diversion for vehicle [3].

III. RESULT

Results include the successful operation of the intelligent traffic light control and monitoring system. The IR sensor with IR transmitter is placed at a gap. Gap acting as a proto-type indicating a road. The system is placed near road as a stand-alone device. Whenever any obstacle like vehicle passes between IR transmitter and IR sensor, microcontroller detects and increase number of vehicle count in a recording interval for particular traffic light. Traffic light is placed ahead of IR sensor at a distance so that decision taken by microcontroller to control traffic light can help in reducing the congestion at traffic light.

On the basis vehicle count microcontroller decide the traf-fic light delays for next recording interval. Traffic light de-lays are classified as LOW, MEDIUM, HIGH range. Thee ranges are predefined by varying vehicle count. Microcontroller display shown in figure 8 shows its opera-tion.

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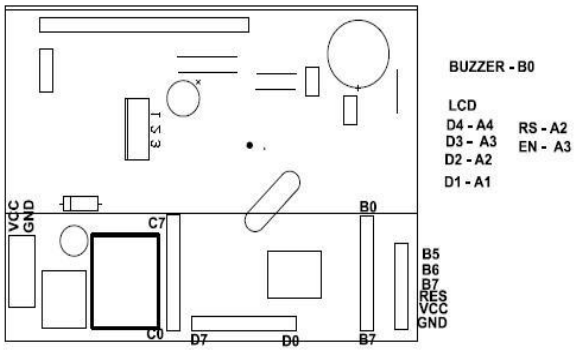

Fig.4 Microcontroller display at time of system running Fig.5 Block Diagram of Traffic Light System Hardware

The L1 and L2 indicate the traffic light whose output user at system want to view. Next character current light activated on traffic light. Next time in seconds indicate elapses time for current light. Next three characters show current mode of traffic light delay. This mode depends on the previous vehicle count calculated in predefined recording inter-val. Second lie of display start with display running time of the system. Next is shown the vehicle count counted by the micro-controller form IR sensor for respective traffic light. This count is for current recording time. After completion of re-coding interval, this count value is saved in flash memory for further analysis. The microcontroller is connected to computer through a serial communication cable. Through the cable user sitting on the computer as traffic administrator can command the microcontroller system to send the recorded data for moni-toring. For the basis of data of traffic at respective load, where sensor is situated, can update the timings of traffic light delays with an updating command to microcontroller. Administrator can also send command microcontroller to erase pervious recorded data after analysis. Figure 5 shows the graphical user interface for administrator [4].

IV. CONCLUSION AND FUTURE SCOPE

In this paper we have studied the optimization of traffic light controller in a City using IR sensors and microcontroller. Fig 1 shows working of IR sensors modules whose output is compared with a threshold value and accordingly the green signal timing is set and in the second phase the density of vehicles is checked and accordingly the diversion is given from the previous signal.

This project can be enhanced by using image processing technique in which cameras are placed at every signals so that they can monitor all the signals in the square and can detect whether emergency vehicles are present or not and if they are, it will give priority to that signal and will turn that signal green.[5]

V. REFERENCES

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