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An Intelligent Traffic Monitoring System

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Abstract: Traffic is increasing day by day because of the increasing in vehicle usage especially in urban areas. Congestion in traffic also increases with the increase of vehicle numbers. To regulate the flow of vehicles we are presently using traffic light controllers which have three signals. With the help of these signals we can regulate the vehicle's direction. Most of the controllers have some fixed duration for each of the three signals which may leads to the additional congestion in traffic. This congestion we can be avoided by two ways. One is to design an intelligent traffic light controller which alters the duration between each signal. Other is to make the user of the vehicle be aware of the traffic density of the path in which he is travelling. The scope of this paper is to design a system which makes the user to be aware of the traffic with the help of Global Positioning System (GPS) and GSM mobile phones, so that the user can make alternate route if possible or may plan his activity according to the traffic density. The performance of the Intelligent Traffic Light Controller is compared with the Fixed Mode Traffic Light Controller and it is observed that the proposed Intelligent Traffic Light Controller is more efficient than the conventional controller in respect of less waiting time and improvement in the distance travelled by vehicles and efficient operation during emergency mode.

Key words: Congestion · Traffic Light Controller · GPS · GSM · FPGA · Simulation

INTRODUCTION

Congestion in traffic is a serious issue since it may cause the serious damage to the daily planned activities. Monitoring the traffic is also a serious issue. The continuous increase in the congestion level on public roads, especially at rush hours is a critical problem in many countries and is becoming a major concern to transportation specialists and decision makers. Existing is not efficient to control the congestion in cosmopolitan cities. Measures are still taken to avoid traffic congestion by constructing flyovers, new highways and bypass. But all these lead to increase in the resource requirement and man power. This paper eliminates that threat to some extent by providing traffic information to the vehicle user prior to the user to get caught in traffic. So the user can redirect to the other route or he may change his plan [1].

Problems in Traffic: There are many problems which arises due to traffic and some of them are discussed below:

High Traffic Density: This occurs because of high number of vehicle usage in urban areas. High traffic density mostly occurs during the peak hours. It cannot be avoided unless we have efficient planning towards traffic by the individual vehicle user [2].

Fixed Timing Duration for All Signals in Talc: Timing duration of the red, green, yellow are fixed in most of the traffic light controller. It is not a suitable efficient control mechanism since it may leads to unwanted wastage of time in some direction. At certain junctions, sometimes even if there is no traffic, people have to wait [3].

Emergency Issues: It is a necessity of a TLC to identify the emergency vehicles like fire service, ambulance. But today's controller is lack of that capability. It leads to the stuck of emergency vehicle in the traffic [4].

Lack of Traffic Information to the User: Present traffic systems fail to provide traffic information including congested roads and alternate routes available in case of congestion [5].

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Intelligent Controller: In the proposed controller the problems which are discussed in the previous section can be eliminated by providing proper information to the user about traffic density in a particular junction.

The main aim is to avoid the unnecessary wastage of time due to heavy traffic. This project also aims for providing safe driving which gives information to any mobile if there occurs any accident. Accident alert system can be designed with the help of a vibration sensor and GSM model. An embedded controller must be used to alert the user's reference mobile and it also receives information to the user about the traffic density in the particular lane [6].

The controller must be fixed in the user's vehicle and it must be efficient to receive traffic density information from the combined model of sensor and GSM, vibration sensor which is also fixed in the vehicle. The most important part of the system is that embedded controller must be able to differentiate user's mobile number and the user's reference mobile number. Since the controller must provide traffic density information to the user's mobile number and the accident of vehicle information to the users reference mobile number. This project also aims to design a safe and efficient traffic flow, to assign the right way and minimizes the delay or waiting time at road. The traffic jam will be reduced by increasing the green signal time on busy road and increase the red signal time in non busy road. The information about congestion on road or possible alternate routes can also be informed to car drivers on demand on his/her GSM mobile phone. Infra Red-Light Emitting Diode (IRLED) transmitter and receivers are used to measure the traffic flow. In short, this project is a real-time, GSM enabled and intelligent Traffic Light Controller.

Two software's were used; one for the Arm processor i.e. is Embedded C for interfacing and controlling of different devices and in another section Visual Basic software is used for interfacing of Google Earth [7]. So that co-ordinates can be located in the Google map. With the help of these we can able to identify the location of the vehicle when the vehicle undergoes any accident.

Terminology

Latitude and Longitude: Both are the angles that are uniquely defined on the sphere. Together the angle comprises the co-ordinate scheme that can locate or identify the geographic position on the planet.Latitude is defined with respect to the equatorial reference; the value becomes positive as it moves towards north and it becomes negative towards south. Longitude is measured with reference to prime meridian and is positive towards east and negative towards west.

Routing: Routing means a compass sensor is used to calculate the angle between the current direction of mobile vehicle and magnetic north direction.

Tracking: Tracking allows the base station to continuously track the vehicle without any interference of the driver or the method of continuously collecting the co-ordinates of moving vehicle that is getting from GPS receive.

System Model: The signals from sensor assembly will be applied to input switching circuit. These input signals from sensors will be in the form of digital signals which corresponds to presence or absence of a vehicle. These digital signals from each lane will be given to the input port of microcontroller, where the microcontroller will determine the length of vehicle at each lane. This information is the input to microcontroller to determine various timing signals. The on and off time of the four junctions will be calculated by microcontroller, in order to keep waiting time minimum. These signals will be applied to two relay drivers which consist of ULN 2003[6]. These relay drivers are level shifters and current amplifiers. The output of relay driver is applied to Red, Green and Orange LED at each Junction. IC 24C61 is used for I2C interface. One LCD Display will be provided with each signal. LCD Display is shown only for prototype mode LCD Display will indicate the time left for the signal to become green i.e. it indicates the time a vehicle has to wait at a particular junction.

RESULTS

The most important criteria of this system is to minimize the delay of vehicle waiting time due to traffic. This indicates the time period for which a vehicle has to wait on the junction.

The results on the user interface of supervised centre will show the routing and tracking function of the system. The project is locating the position of the car. By designing this project the ignition of the project can be stopped or the speed can be locked so that the thief can be catch easily, this is one of the additional features of the project.

Table 1: Average waiting time by a vehicle

Time	Fixed TLC	ITLC
Peak (S)	17	14
Non peak (S)	12	8

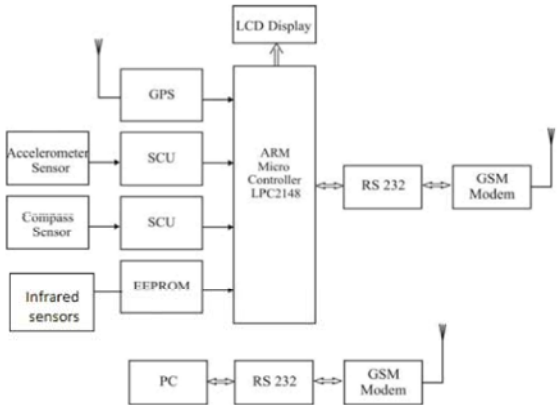

Fig. 1: Block Diagram

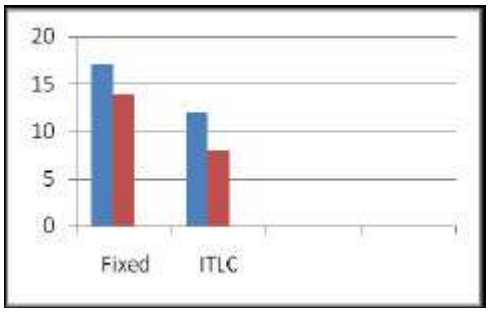

Fig. 2: Average waiting time of the vehicle.

Fig. 3: Google map image

CONCLUSION

The improvement of town traffic condition is largely dependent on the modern ways of traffic management and control. Advanced traffic signal controllers and control system contribute to the improvement of the traffic problem. The intelligent of traffic signal controller is introduced in this project with powerful functions and hardware interface.

To improve the safety, security and efficiency of the transportation systems and enable new mobile services and applications for the travelling public, the project have been developed, which apply rapidly emerging information technologies in vehicles and transportation infrastructures. It is one of the most challenging and critical issues for the industries. The practical model of this paper proved to be very efficient, cheaper and reliable system for security. Moreover, the designed system has simple architecture, fast response time, user friendliness and scope for further expansion.

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