

SMART TRAFFIC CONTROL SYSTEM USING GSM

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ABSTRACT:

The increasing population growth, urbanization, and motorization have resulted in increased road traffic congestions worldwide. Forecasts imply that road traffic will grow faster than road capacity within the next years, leading to a worsening of the traffic situation. Requirements to improve traffic congestions include efficient traffic management, using smart traffic control systems. This system not only allows traffic management but also traffic reporting advice to road users. The occurrence of traffic congestion at the intersections in cities is one of major problem. The present traffic light controlling system is not sufficient to tackle the traffic congestion due to the lack of efficiency in designing. Presently the automated systems have less manual operations, but high flexibility, reliability and accuracy. Due to these advantages every field prefers automated control systems. The monitoring and control of city traffic is becoming a major problem in many countries. With the ever increasing number of vehicles on the road, the Traffic Monitoring Authority has to find new methods of overcoming such a problem. The main aim of this paper is to design a smart traffic light controller using embedded system. This paper also aims to design a safe and efficient traffic flow, to assign the right way and minimizes the delay or waiting time at road. This system also provides GSM phone interface to the user, with SMS facility to those who wish to obtain the latest traffic information on congested roads. The map of the traffic signal will be provided to the users on their request.

INTRODUCTION:

Present Traffic Light Controllers are based on microcontrollers. These traffic light controllers have limitations because they use the predefined hardware, which functions according to the program that does not have the flexibility of modification on real time basis. Due to the fixed time delay the waiting time is more and fuel is wasted.

In the Smart Traffic Control System we use of Sensors along with Embedded Technology. The timings of Red, Green lights at each crossing of road will be decided by the total traffic on all the adjacent roads. To increase road capacity and traffic flow optimization traffic light switching is used which prevents traffic congestion. The unique feature of this paper is to provide GSM cell phone interface to the users who wish to obtain the latest position of traffic on congested roads. This is very useful to car drivers as they will get a message indicating congestion status of road and they can take an alternate route in case of congestion. Proposed traffic control system is able to handle the problem of emergency vehicle by giving priority to it. That is, when emergency vehicle is passing by the route then other vehicles will get red signal or stop signal and emergency vehicle can easily pass by the route.

PROPOSED MODEL:

The system design method will be divided into three phases as follows:

Phase one: Sensing unit

Phase two: Control section

Phase three: GSM Model

The Infrared Sensors are mounted on road to detect the vehicle on the road. The presence of a vehicle is sensed by a sensor assembly mounted on each road. This acts as an input to the traffic control unit. The traffic control unit generates an output signal for Red, Green and Yellow Signal and monitors their timings taking into consideration the number of vehicles on each road. The same information is transmitted to the mobile user who will request for congestion status. If vehicle driver at a junction sends SMS on GSM mobile phone to traffic control unit, the driver will get message indicating congestion status of road. Traffic control system will also give information about alternate route to the user, if present traffic is heavy.

In addition to above, in the emergency mode, for a vehicle like ambulance, fire brigade or police car, the signals are altered for the fast and easy movement of these vehicle. If an emergency vehicle is passing by the route the signals on the roads which are crossing this route will be immediately changed to red to stop vehicles on these routes. This is an important feature which is very useful in case of emergency.

BLOCK DIAGRAM:

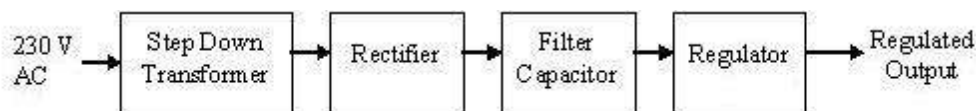


Figure1. Block diagram of the power supply section

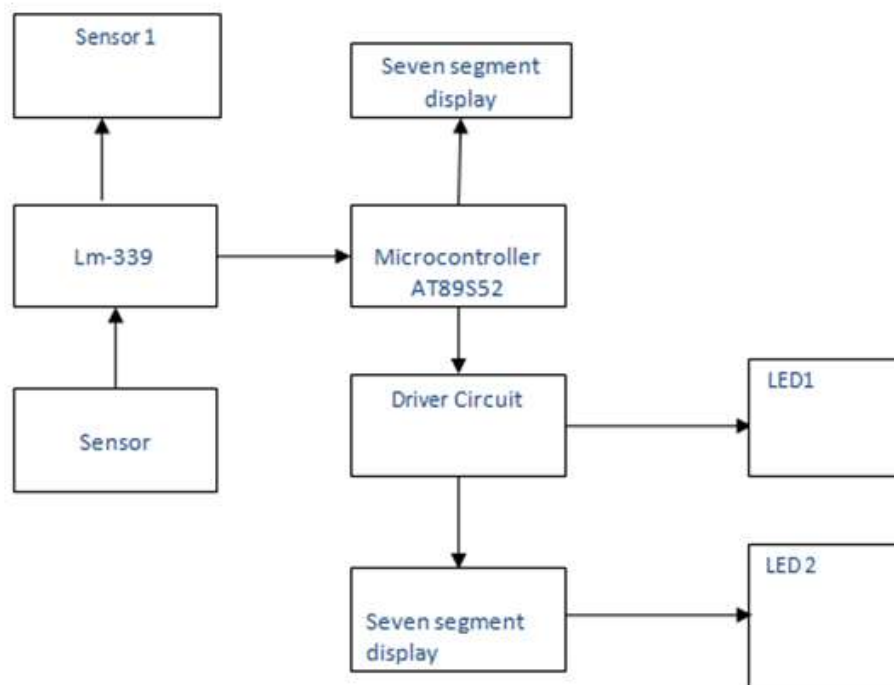


Figure2. Block diagram of the microcontroller section

The Figure 2 shows the block diagram of Smart Traffic Light Control System which consists of power supply section, driver circuit, microcontroller, IR Sensors. The sensor detects traffic present at a signal, and provides it as input to the microcontroller and then time period is decided through programming and this time is given to a signal through control circuit. So finally depending on current traffic present at the signal, time period is assigned to it and the red, green, light signal glows accordingly.

The system provides the information about the traffic present at different signal to the driver who wishes to get that information on their mobile phone.

The Basic Model of Smart Traffic Light Control System is shown in Figure.3. In proposed model the junctions are shown by letter P, Q and R. To detect the traffic length Infrared sensors are mounted on road

side at each junction. Sensors detect the traffic level and provide this as input to microcontroller which decides the time period for each red, green and yellow light for which it remains in glowing state. As shown in figure, if there is heavy traffic congestion at junction P then through SMS, car driver will be informed about congestion so that he can decide to take another route i.e. route 1 passing by R on their mobile phone.

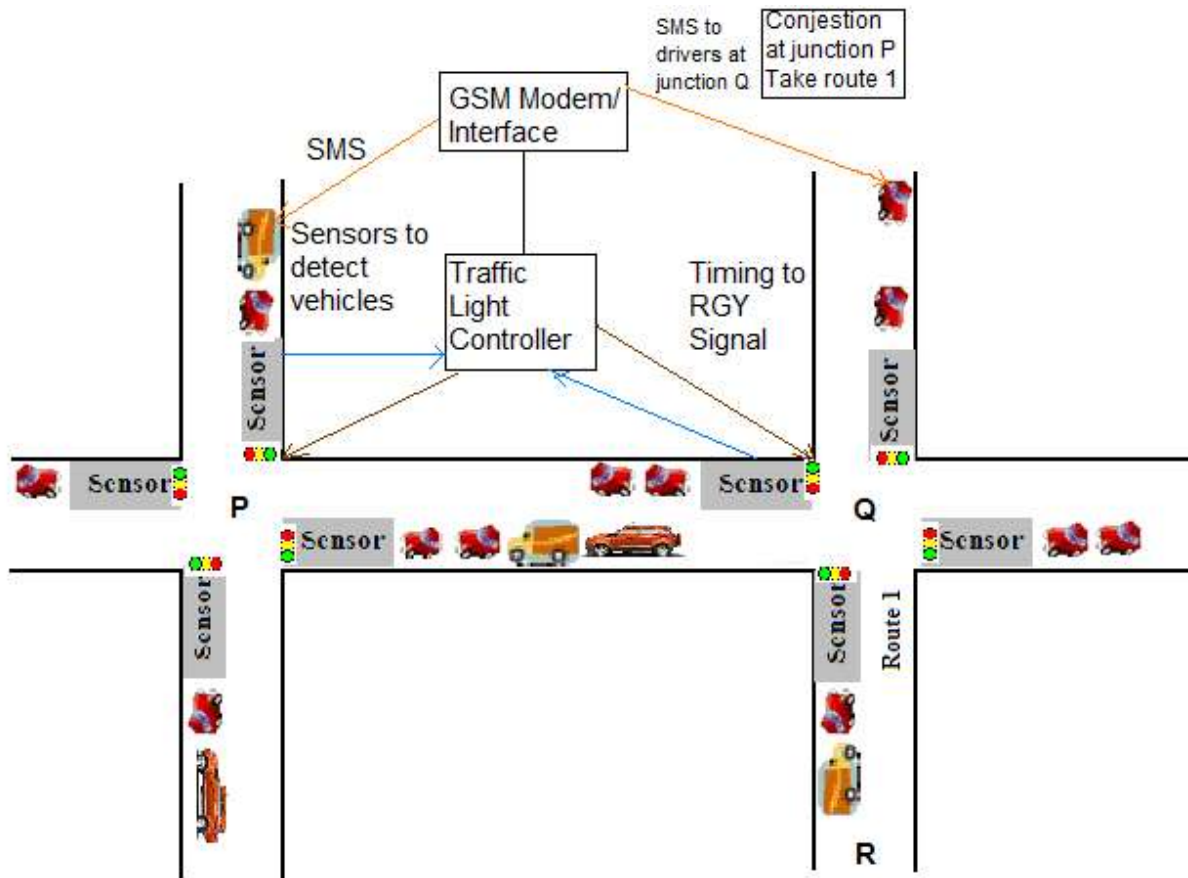


Figure3. Smart traffic control system using GSM

If an emergency vehicle is passing by the route P-Q, the signals on the roads which are crossing this route will be immediately made red to stop vehicles on these routes. This is a very important feature which is very useful in case of emergency.

CIRCUIT DIAGRAM:

First of all the 220V voltage is supplied to the step-down transformer. This ac signal is changed to dc signal with the help of a rectifier and given to regulator (7805) which provides the 5 volt voltage. As per the power requirement of the hardware of the smart traffic control system, supply of 5V with respect to GND is developed. The heart of the system is microcontroller AT89s52. The basic operation of STC System can be realized by using embedded system which has advantages such as simplicity, user friendly, easily programmable and a facility for GSM mobile interface. In our proposed model the basic operations are implemented using Microcontroller AT89s52.

This circuit is made in the Proteus software, which is circuit making and simulation window based software. Microcontroller receives the 11.0592MHz from the crystal oscillator at XTAL1 and XTAL2 pin. Reset switch of microcontroller provides manual reset of the microcontroller. Pull-up network resistances of 10K are provided at each port to properly differentiate between high and low TTL signal.

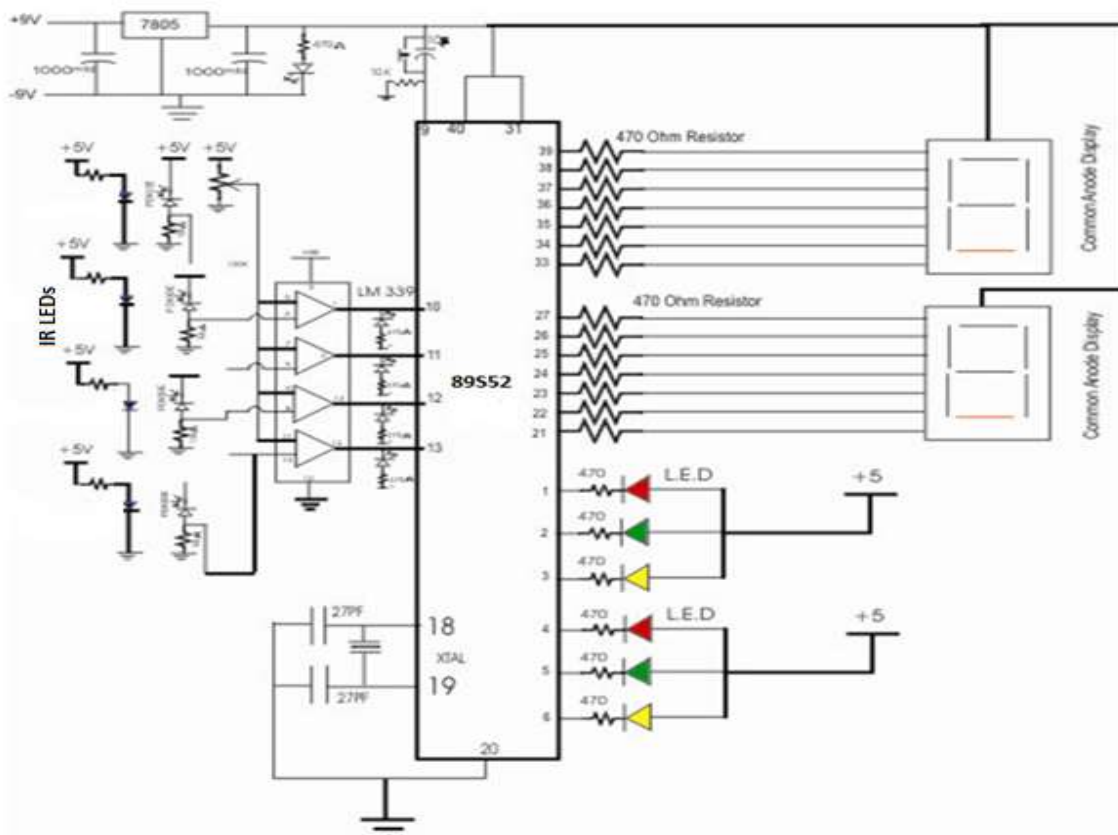


Figure4. Circuit Diagram of the system

The smart traffic control system stores the recorded sample into its flash memory through its feature of In-Application programming. Data is stored in real time. This real time and date is provided by the user.

Microcontroller transfers the recorded data to the computer by serial communication through MAX232. This data is used for traffic monitoring by the user sitting on the computer. To interface the UART and PC RS32 all the nine outputs are connected through MAX232 IC for the signal conversion.

A radio transmitter is connected to the vehicle which sends data to the receiver. The receiver reads the data provided by the transmitter and sends the information of the vehicle to the nearby control room. The control section continuously monitors the traffic. The control section then verifies the vehicle information in its database and sends a message to the driver using the GSM module advising him to proceed or take a different route depending on the traffic congestion.

The wireless transmitter is ideal for data transfer to a remote object. A range of up to 200 metres is possible with an antenna fitted. The unit can connect directly to HT12E IC or similar encoder. The new compact Radio Receiver works directly with the transmitter at operating frequency of 433.92MHz. It is suitable for data rates up to 4.8 KHz.

CONCLUSIONS AND FUTURE SCOPE:

Use of microcontroller instead of other controllers like PLCs can makes the smart traffic controller a feasible and affordable system. The program in the microcontroller enables the traffic control system to realize traffic flow optimization strategies at a single or multiple junctions.

In future algorithms can be developed that can allow major transportation agencies to use high-resolution models of traffic to solve optimization problems. A method of combining vehicle-level data with comprehensive city-level data on traffic patterns to produce better information than current systems provide can be developed. Current models do not assess the mix of vehicles on the road at a given time so they can't predict how changes in traffic flow may affect overall fuel use and emissions.

Presently, few traffic management departments offer traffic monitoring services in real time due to the high cost of such car traffic monitoring system. A low cost system based on the GPS signals coming from the smart phones of the drivers to build a colored traffic map and to pass such traffic information to a minimum path finder software resident on a mobility information system or on the user mobile to find better paths to destination can be made in near future. To build the traffic monitoring system it is necessary that enough drivers send their GPS data, during the travel, to the server to compute the traffic flows in real time. To encourage the users they should be given some discounts for receiving the traffic information and/or to provide them with some particular additional features.

Since it may be difficult to have traffic information from the driver GPSs for the entire traffic network, a mixed monitoring infrastructure seems more suitable to cover the entire network, e.g., traffic tubes/loops may be used in the downtown streets with little traffic, while webcams may be adopted in areas where it is useful to carry out video surveillance as well as to calculate the traffic flows. The proposed GPS monitoring system could be suitable for the periphery and for the downtown area with heavy traffic.

The increased accuracy of the mobile assisted positioning can be used for a traffic congestion estimation service with higher reliability compared to conventional techniques. It consists of two key components, namely the client side and server side. The server side component is the one responsible for detecting and estimating congestions, whereas the client side is responsible for inquiring about, and then displaying congestion status to the end user.

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