Smart Traffic Control System

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Abstract

Recent studies show that all over the world, there has been a rapid increase in vehicle numbers. The latest statistics show that there are approximately 1 million licensed vehicles in the year 2014 . As a result traffic problems has increased in the last few years and the present traffic light controllers have limitations because it uses the predefined hardware that does not have the flexibility of modification on real time basis. Due to the fixed time intervals of green, orange and red signals the waiting time is more. To make this traffic light controlling more efficient we exploit the emergence of new technique called as "Smart Traffic Control System". This makes use of sensors along with embedded technology .The timings of the red and green lights will be smartly decided based on the traffic on adjacent roads. As compared to fixed mode traffic light controller this new system is more efficient and flexible. It also has an intelligent traffic control system to pass the emergency vehicles such as ambulance, fire brigade etc. and also detect and track the stolen vehicles. The design also has scope for further expansion.

Keywords : *Smart Traffic Control System*

I. INTRODUCTION

Traffic management has become one of the severe problem today because of the growth of industrialization and population there has been a tremendous growth in the traffic.

With the increase in traffic there arise a number of problems such as heavy traffic jams ,violation of traffic rules etc. Mismanagement and traffic congestion also results in long waiting times, loss of fuel and money etc. It is therefore necessary to have a fast, economical and efficient traffic control system for national development. One way to improve traffic flow and safety of the current transportation system is to apply automation and intelligent control methods to roadside infrastructure as well as vehicles.

The problems of conventional traffic light Controller are as mentioned

A. Heavy Traffic Jams

With increasing number of vehicles on road, heavy Traffic jams have increased in cities. This happened usually at the main junctions commonly in the morning, before office hour and in the evening, after office hours. The main effect of this is increased time wasting of the people on the road. The solution for this problem is by developing the program which different time delay settings for red, orange and green signals at different juctions. The delay for junctions that have high volume of traffic should be set longer than the delay for the junction that has low traffic.

B. No Traffic, but Still Need to Wait

At certain junctions, sometimes even if there is no traffic, people have to wait. Because the traffic light remains red for the preset time period, the road users should wait until the light turns green.The solution of this problem can be obtained by developing a system which detects traffic flow on each road and set timings of the signails accordingly.

C. Emergency Car Stuck in Traffic Jam

Usually, during traffic jam, the emergency vehicle, such as ambulance, fire brigade etc. get struck in the traffic. This is because the road users wait for the traffic light to turn green. This is very critical problem because it can cause the emergency case to become complicated , involving life.

D. Detect the Stolen Cehicle

During these days there is also a problem that the vehicles are being stolen. To detect the stolen vehicle is a very difficult task, the stolen vehicle can be found only by its number and it is a bit tedious task and thus quite difficult to find out the stolen vehicle .The solution to this can be obtained by using GPS in our smart system with the help of which we will be able to detect and track the stolen vehicle and by making use of GSM we can send the information about the location of the vehicle by sending an SMS over the given number.

II. LITERATURE SURVEY

Traffic is a critical issue of transportation system in most of all the cities of Countries. This is especially true for countries where population is increasing at higher rate. Traffic condition in Bangalore city is as shown in fig(1.1). There is phenomenal growth in vehicle population in recent

years. As a result, many of the arterial roads and intersections are operating over the capacity and average journey speeds on some of the key roads in the central areas are lower than 10 Km/h at the peak hour. In some of the main challenges are management of more than 36,00,000 vehicles, annual growth of 7–10% in traffic, roads operating at higher capacity ranging from 1 to 4, travel speed less than 10 Km/h at some central areas in peak hours, insufficient or no parking space for vehicles, limited number of policemen. Currently a video traffic surveillance and monitoring system commissioned in Bangalore city. It involves a manual analysis of data by the traffic management team to determine the traffic light duration in each of the junction. It will communicate the same to the local police officers for the necessary actions.[1]

Fig(1.1) Traffic Condition in Bangalore

Reinforcement learning for traffic light control has first been studied by Thorpe He used a traffic light-based value function, and we used a car-based one. Thorpe used a neural network for the traffic-light based value function which predicts the waiting time for all cars standing at the junction. This means that Thorpe's traffic light controller have to deal with a huge number of states, where learning time and variance may be quite large. Furthermore, Thorpe used a somewhat other form of RL, SARSA (State-Action, Reward-State Action) with eligibility traces [2].

Roozemond describes an intelligent agent architecture for traffic light control Intelligent traffic signalling agents (ITSAs) and Road Segment Agents (RSAs) try to perform their own tasks, and try to achieve local optimality. One or more Authority Agents can communicate with groups of ITSAs and RSAs for global performance. All agents act upon beliefs, desires, and capabilities. No results were presented [3].

In G. Sathya, et al[3]achieved with the help of "AARS using GPRS 3G TECHNOLOGY". Through this, we can provide a smooth flow for the ambulance by controlling the traffic light according to the ambulance location to reach the hospital. The location of the ambulance can be easily identified with the help of the GPS unit installed in it.[4]

The microcontroller-based traffic light system for road intersection control was developed to direct the movement of vehicles meeting at a road junction without any collision. To achieve this, the microcontroller allocates time for each path when the vehicles along that path will move and the other vehicles from the other path will stop. When the time allocated for a specific path has been exhausted, the red light will be ON meaning stop and the next line will be ON (green light) which means the vehicle in that path should start moving. When the time is about to be exhausted, the yellow light will be ON in the third path informing the vehicles in that path to be ready to move, and after some seconds the green light will be ON. Disadvantage is traffic light timing is fixed.[5]

One major drawback of all these systems is they can't detect stolen vehicles and there is fixed time interval for each signal light. In order to detect and track stolen vehicles as well as to vary signaling time according to density of traffic and give clearance to emergency vehicles the new system which is able to do all these things simultaneously should be established.

III.PROPOSED MODEL

The proposed operations of Smart Traffic Light Controller is shown in Figure 1.The Infrared Sensors are mounted in the dividers inorder to detect the vehicles. The presence or absence of vehicle is sensed by a sensor assembly mounted in the dividers.

This will act as input to the STCS. This input signal will indicate the length of vehicles on the road. The STCS unit generates output signals for Red ,Orange and Green Signal and monitor their timings taking into consideration the length of vehicles on each road. If the flow of traffic detected is normal then the timings of the red, orange and green signals is normal but if the traffic detected is medium then the time of the green signal is automatically increased by a few seconds by the STCS and if the traffic detected is high then the timing of green signal is increased even more as per the program by the STCS .In addition to above intelligence, in the emergency mode, for a vehicle like ambulance, fire brigade etc. the time of the green signal is made large so that the emergency vehicle can easily and quickly pass through.

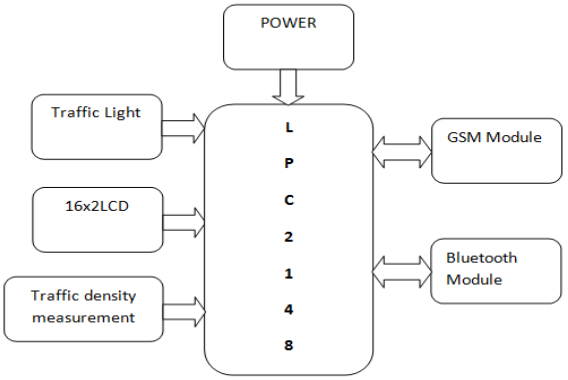
The basic operation of STCS can be realized by using embedded system which has advantages of simplicity, user friendly, and easily programmable. In our proposed model the basic operations are implemented using Microcontroller LPC2148. The main reason for selecting this microcontroller is ease of programming, sufficient number of input output lines, manageable size of RAM and ROM and simple architecture. The block diagram of the proposed model is shown in Figure 2. The heart of the system is microcontroller LPC2148. For communicating with the external signals additional ports and multiplexers are

used. Additional RAM and ROM are used for storing system program and application program. The block diagram consists of the microcontroller, input switching matrix, serial communication interface, GSM interface, Real Time Clock 1307, Clock circuit.

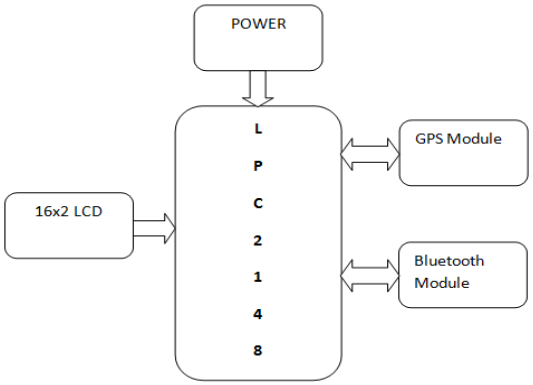
Every individual vehicle will be equipped with Bluetooth and GPS. (Bluetooth will be placed in every vehicle during the manufacturing process of the vehicle in a place where the module cannot be removed or spoilt). We use Bluetooth,GSM module and microcontroller system on chip to identify vehicles. It measures the traffic density using IR sensors.It also determines the network congestion and hence the green light duration for that path is decided accordingly.If stolen vehicle is detected then a message is sent using GSM to the control room also when an ambulance is approaching at the junction it will (vehicle unit) communicate to the traffic controller (signal unit) in the junction so as to increase the timings of the green signal so that the emergency vehicle can pass through easily without much delay. This module uses Bluetooth module and LPC2148 system on chip for wireless communication between emergency vehicle and traffic controller.

Block Diagram

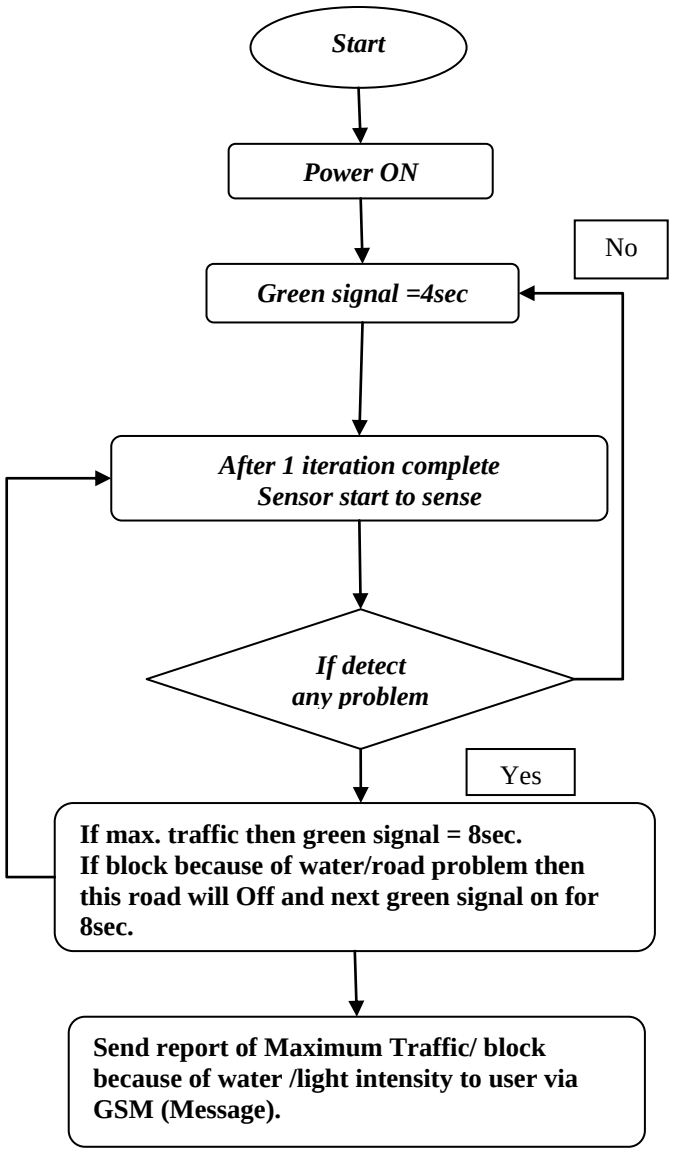
Signal Unit



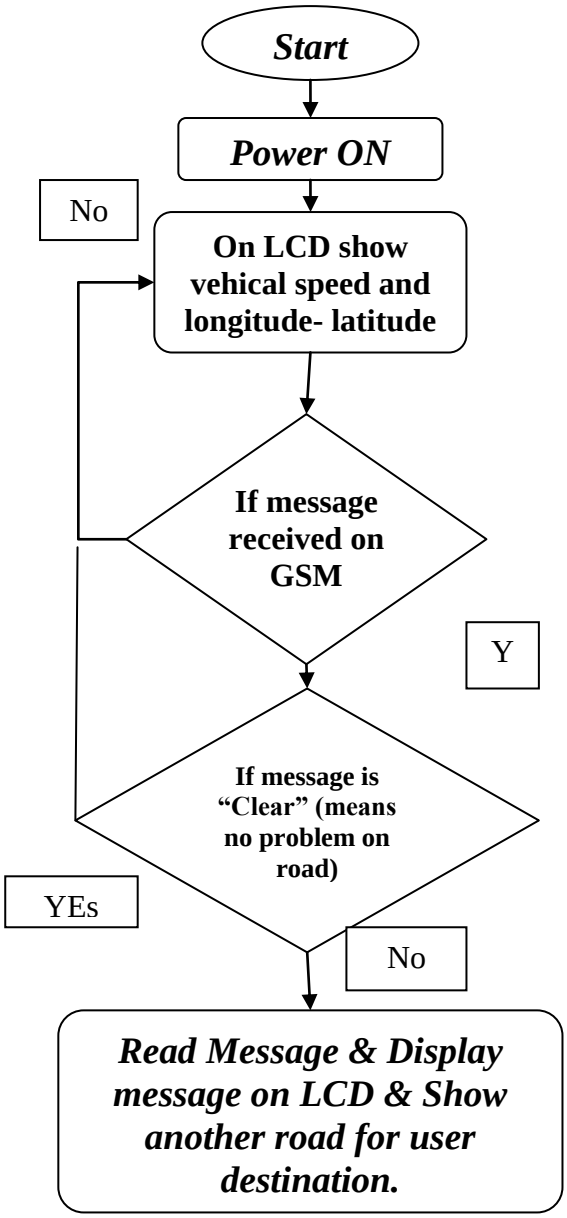
Vehicle Unit:



IV.FLOWCHART



Flowchart 1



Flowchart 2

V. CONCLUSIONS

The designed and implementation of this technique is directly targeted for traffic management so that emergency vehicle on road get clear way to reach there destination in less time and without any human interruption. The main feature of this operation is the ability to communicate with purpose using GSM and GPS. It is very smart to find the location of stolen vehicles, emergency and VIP vehicle and get clear path to pass it on.

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