

An Automated Traffic Control System for Indian Cities-A Survey

¹Tejal H. Nayak, ²Mitesh Patel, ³Vimal H. Nayak

¹Master in computer engineering, ²Assistant Professor, ³Assistant Professor

¹Computer Engineering,

¹ Silver Oak College of Engineering & Technology,
Ahmedabad, India

Abstract - Road traffic congestion is a major problem worldwide. In India, due to fast growing economy, the problem is acutely felt in almost all major cities. This is because of gradually decreased in infrastructure growth as compared to growth in vehicles on roads, due to space and cost constraints. Secondly, Indian traffic being non-lane based and chaotic is dissimilar from the western traffic. The difference can be understood fully only through experience, but some example scenarios can be seen at [1]. Thus, Automated Traffic Control System can be used for efficient traffic management in developed countries, cannot be used as it is in India.

Index Terms - Automatic Controlling, traffic management, traffic density, traffic controller.

I. INTRODUCTION

Due to the ever-increasing traffic demand, modern societies with well-planned road management systems, and adequate development of transportation still faces the problem of heavy traffic. This results in longer travelling time consumption, and larger financial charges. Though constructing new roads could be one of the solutions for reducing the traffic congestion, but looking less feasible due to political, environmental and due to other concerns. An alternative would be to make more efficient use of the existing infrastructure. In this paper, we will study the method which specially focuses on traffic management and control.

Various Traffic control methods are used for the betterment of controlling the traffic and to avoid or lessen traffic congestion problems, or to expand the performance of the traffic control system. The context of this paper focus on throughput, travel times, safety, security, emissions, fuel consumption etc. The present traffic management System approaches make use of roadside-based traffic control measures (traffic signals, vigorous route information panels, and dynamic speed limits) and infrastructure-based equipment (including sensors and traffic control centers).

II. PRESENT TRAFFIC CONTROL SYSTEM

In the current era simplest form of traffic management is used in which human operates traffic flow on the road. In this system, a traffic officer is placed on every cross roads; the flow of traffic is controlled by traffic police As shown in fig. 1, a police officer stands on cross road and observes the traffic flow. At the time of congestion she/he gives signals to the vehicle driver regarding to when to drive and when to stop. Meanwhile it is also possible to know emergency cases, so that priority regarding lane can be decided. This technique is very efficient than other techniques But as it includes human as a part of system this scheme is poor. It has very constraints like experience and capability of the person on which Efficiency of system relies.



Figure 1 Traffic Control by Traffic Police[7]

III. TECHNIQUES OF TRAFFIC MANAGEMENT

There have been drastic changes in management of traffic compared to another old methods.

Automatic Controlling of Traffic :

As we know Timers and electrical sensors are very much useful in automatic controlling of traffic signals. It is possible to load any value of timer that one wants for each stage. With respect to this value timer values, the signal automatically grows ON and OFF periodically. The presence of the vehicle and signals on each phase are caught by the sensors and with this, signal the lights automatically operated. This helps actually to control heavy traffic congestion considering timing.



Figure 2 . Automatic Traffic Control Light based on timer

Magnetic Loop Detectors (MLDs)

Magnetic loop detectors are efficient in counting of the number of vehicles using magnetic properties. We use Present traffic management techniques like magnetic loop detectors which are submerged on the road, radar and infrared sensors on the side of roads which provide partial traffic information. It again requires the installment of separate system on road which is not very much reliable.

Inductive loop detectors (ILDS)

Use of inductive loop detector provides a cost-effective solution for traffic controlling but the failure rate of using inductive loop detector is higher on poor road surfaces. It also requires more maintenance and repairing so again it causes the traffic issues at the time of maintenance and repairing. So use of ILD is not really reliable.

Light beams Light

Infrared and Laser beams can be used for the traffic control but it does not give the accurate result so using of Light Beams Light is not advisable.

GPS

GPS (Global Positioning System) is a growing as an applicable product that is used commonly nowadays. Traffic can be managed with the use of GPS too. Owusu et al. [1] have shown the significance of using GPS (Global Positioning System) systems in observing the traffic speed in urban areas.

CCTV

Jain V. et al. [2] argued that there are numerous hotspots in a city that are lying to congestion. Using image processing analysis of the captured images by the CCTV is possible for the better traffic management. Dailey et al. [3] have also considered the use of CCTV cameras to estimate mean traffic speed.

IV. LITERATURE SURVEY

In this section, different solutions for the better traffic management have been introduced.

Embedded System

Automatic Intelligent Traffic Control System proposed by Dinesh Rotake & Prof. Swapnili Karmore[4]. In this system various electronics devices like AVR-32 microcontroller with flash memory, IR sensors, IR (i.e. Infrared) sensor is programmed to detect emergency vehicle and microcontroller is designed in such a way to give red signal to all other lane but one with emergency vehicle. There are some limitations of this system like: IR sensors are used, due to various climate circumstances in India, IR sensors are required to be keep in in safe place. Price factor of this system is high as compared to the other systems. So it is not advisable to implement this system.

Wireless Sensor Networks

Priority Based Traffic Lights Controller Using Wireless Sensor Networks by Shruthi K R and Vinodha K[5]. In this paper it is discussed that Wireless Sensor Network (WSN) is being used as a traffic light controller. Shruthi[5] said that System can be implemented with the use of fuzzy logic to define route of emergency vehicle in special cases. Central observing system gathers all the statistics and provides suitable response. There are some limitations of this system like Communication using Wireless Sensor Network (WSN) is still an area of research. Data exchange in between Sensor is not reliable. And as specified before Sensors need to become robust in order to survive in Indian weather.

Active RFID and GSM Technology

Koushik Mandal, Arindam Sen, Abhijnan Chakraborty and Siuli Roy[6] proposed Road Traffic Congestion Observing and Measurement using Active RFID and GSM Technology. This System consists of various devices like Wireless Router, Active RFID tag, GSM modems, and Central Monitoring software. The function of these Wireless devices is to gather

the statistics from Active RFID tags, these devices are mounted at roadside. Observing station gathers all statistics with the help of GSM technology, and gives suitable response to respective traffic signal. There are also some limitations like Contribution of several communication devices makes execution more expensive. It is also discussed that how Wireless communications have their own disadvantages. A Monitoring Station needs to be setup.

V. CHALLENGES IN INTELLIGENT TRAFFIC SYSTEM

Vehicle Tracking

There are many systems that try to process images and track vehicles. Basically there are two main methods to identify moving objects in a video like optical flow, background subtraction. One can have CCTV camera based application and utilize image processing and pattern recognition methods and functional capabilities of a system to monitor the road and initiate automated vehicle tracking.

Traffic Load Prediction

Many researches focus on improving the traffic by load prediction and forecasting. By these, one can manage the traffic once the correct estimate has been done. Usually in the given system it required to have the real time data to control the traffic more effectively. Reliable short-term predicting and observing models of traffic flows are critical for the achievement of any good managed traffic system. There are several factors that affect the performance of the conventional traffic control system, e.g. changes in traffic flow, accidents, different behavior and travel demand.

Real Time Signal control

In this the system takes the input from the detector and accordingly it controls the traffic flow on the road optimally.

VI. PROPOSED AUTOMATIC TRAFFIC CONTROL SYSTEM

Image Acquisition

Image acquisition is the process that describes how to retrieve an image from the given source, generally it can be a hardware-based source, therefore it is possible to pass the retrieved image through necessity processing steps. It is also possible that if it is required than the same image can be reproduced under some prescribed conditions.

Image Enhancement

The main purpose of doing image enhancement is to process in which image is given as input so that the result is more suitable than the original image for a specific application. It give emphasis to sharpens image features like edges, boundaries, or contrast which makes a graphic display more helpful for display and investigation. Actually Image enhancement is applied in all the fields where images are must to be understood and analyzed. Image enhancement has wide range of applications in medical image analysis, analysis of images from satellites etc.

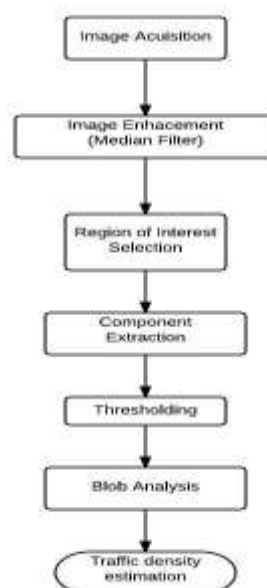


Figure 3 Flow of Automatic Traffic Control System

Region of interest selection

The concept of a ROI is commonly used in many application areas in the field of image processing. A region of interest (ROI) is defined as a selected subset of samples inside a dataset identified for a some determination. Generally it is used in medical imaging; the limits of a tumor may be defined on an image, for the purpose of measuring its size. It is also possible to say that in optical character recognition, the ROI (Region of interest) defines the limits of an object under concern.

Component extraction

In this section three main components of acquired image is extracted to detect the individual components. The set of connected components divide an image into different segments. Image segmentation is the one of the most useful process in many image processing applications in the various fields.

Once boundaries of the regions are identified it will be very easy to extract the regions which are not bifurcated by the boundaries. Any set of pixels which is not separated by a boundary is call connected. Each highest region of connected pixels is called a connected component.

Thresholding

One of the important processes in the image processing is thresholding. It is used to create the binary image from the gray scale image. In the thresholding methods each pixel in an image is going to be replaced with a black pixel if the image intensity is lesser than fixed constant or a white pixel if the image intensity is greater than that fixed constant.

Blob Analysis

A blob is an area of a digital image in which some of the belongings are fixed or vary within a prescribed range of values. the blob detection is used to find out the area in the digital images which has different properties like brightness or color, areas surrounding identified regions.

Traffic Density Estimation

Based on data retrieved from the blob analysis traffic density can be predicted in real time which can help to implement Intelligent automatic traffic control system. Even after this it is also possible to recognize the number plates of the cars.

CONCLUSION

In this paper it is possible to conclude after surveying numerous traffic controlling systems, automatic traffic density estimation can be carried out by some artificial vision technique which uses Image Processing for implementation. Though there are some disadvantages of the others methods but it can be overcome by adding some features from other technologies, but after doing this it may possible the resultant system becomes more costly. Whereas other techniques are costly and not suitable in Indian conditions.

REFERENCES

- [1] Owusu Joseph, Afukaar Francis and Prah B.E.K , " Urban Traffic Speed Management: The Use of GPS/GIS" .2006
- [2] Jain Vipin, Sharma Ashlesh, Lakshminarayanan, "Road traffic congestion in developing the world".ACM 978-1-4503-1262-2/12/03. 2012
- [3] Dailey Daniel J., Cathey Frederick W., Pumrin Suree, "The use of uncalibrated roadside CCTV camers to estimate mean traffic Speed".2001
- [4] Dinesh Rotake, Prof.Swapnili Karmore, "Intelligent Traffic Signal Control System Using Embedded System" , Innovative Systems Design And Engineering , ISSN 2222-1727 (paper) ISSN 2222-2871 (online), Vol. 3, No. 5, 2012
- [5] Shruthi K R, Vinodha K., "Priority Based Traffic Lights Controller Using Wireless Sensor Networks ", International Journal Of Electronics Signals And Systems (IJESS) ISSN: 2231- 5969, Vol-1 Iss-4, 2012.
- [6] Koushik Mandal, Arindam Sen, Abhijnan Chakraborty and Siuli Roy, " Road Traffic Congestion Monitoring and Measurement using Active RFID and GSM Technology" IEEE | Annual Conference on Intelligent Transportation Systems, 2011
- [7] <http://www.chandigarhtrafficpolice.org/drivingalong.htm> on 07/03/2016