



Congestion control using Image Processing

Nagaraj Eshwaraj
Computer Science Engineering
Appa Institute of Engineering & Technology
Gulbarga, India
inagarajeashwaraj@gmail.com

Jagdish Mulge
Computer Science Engineering
VTU Regional
Bangalore, India
jaggumulge@gmail.com

Abstract—Traffic means the congestion of vehicles on the roads. Congestion may result due to heavy traffic at a junction. In developing cities, traffic management is becoming important issue day by day due to rapid increase in number of vehicles. Lot of man-hours is being wasted in traveling due to bad traffic management.

Index Terms—Image processing, traffic management, vehicle management

I. INTRODUCTION

Traffic means the congestion of vehicles on the roads. Congestion may result due to heavy traffic at a junction. In developing cities, traffic management is becoming important issue day by day due to rapid increase in number of vehicles. Lot of man-hours is being wasted in traveling due to bad traffic management. To avoid traffic there are so many congestion management techniques available. Even though many companies are working on traffic management over years, no technique is perfect by itself as the real time situations are generally continuously changing and the system has to adapt itself to change in the continuously changing circumstances. In the rapidly growing cities due to lack of adaptive congestion management system, traffic management is not effective and incapable of avoiding congestions. Congestion may result in traffic jams at junctions. In developing cities like Bangalore traffic management is becoming important issue day by day due to rapid increase in number of vehicles. Lot of man-hours is being wasted in traveling due to bad traffic management. We have to make an attempt to provide some congestion management strategies which are self adaptive in nature, so as to fit in to continuously changing real time traffic scenarios.

II. STATEMENT OF THE PROBLEM

The problem statement of our project can be brought to points as below.

- In the rapidly growing cities due to lack of adaptive traffic management system, traffic management is not effective and incapable of avoiding congestions which would have been avoided with better congestion management system.
- For different real time traffic situations, the approach of the system is not different, in currently working traffic management systems, which may lead to bad congestion management.

III. THE SOLUTION

We have made an attempt to provide some traffic management strategies which are self adaptive in nature, so as to fit in to continuously changing real time traffic scenarios.

For the Junction at which rate of change of average traffic density is less we have provided strategy called Gradual Adaptation and for the Junctions at which average traffic density varies drastically with respect to time we have provided a strategy which we have named On-Situation scheduling. In exceptional situations we have provided option for manual traffic control.

Image Processing:

An Image is rectangular graphical object. Image processing involves issues related to Image representation, compression techniques and various complex operations, which can be carried out on the image data.

Traffic density of lanes is calculated using image processing which is done of images of lanes that are captured using digital camera. We have chosen image processing for calculation of traffic density as cameras are very much cheaper than other devices such as sensors.

- Image processing is done by using images of lanes that are captured using digital camera.
- Image processing involves image representation, and some operations which can be carried out on the image data.
- The operations under image processing are enhancement operations such as sharpening, blurring, brightening, edge detection etc.

We have provided an attractive graphical user interface to the user through which he can communicate with our system. The various technologies used in the implementation of our project are Java Swings and AWT to provide the graphical user interface to the user.

IV. OBJECTIVES OF PROJECT

Our main objective is to design a system that adopts itself to real time changing environments and that should gain us maximum benefits.

- To develop a unique technique that can manage traffic problem effectively.
- To avoid congestion and efficiently manage emergency situations.
- To encourage effective products in the area of traffic management.
- In exceptional situations we have provided option for manual traffic control.
- For the Junction at which rate of change of average traffic density is less we have provided strategy called “Gradual Adaptation”
- For the Junctions at which average traffic density varies drastically with respect to time we have provided a strategy which we have named “On-Situation scheduling”.

V. SCOPE

In a software development project errors can be injected at any stage during the development. During testing the program tested is executed with a set of test cases and output of the program is evaluated to determine if the program is performing as it is expected to.

For each phase of development, different techniques for detecting and eliminating errors that originate in that phase are used. This is done so that the errors from a module do not carry on, into the system affecting further development.

VI. ARCHITECTURE

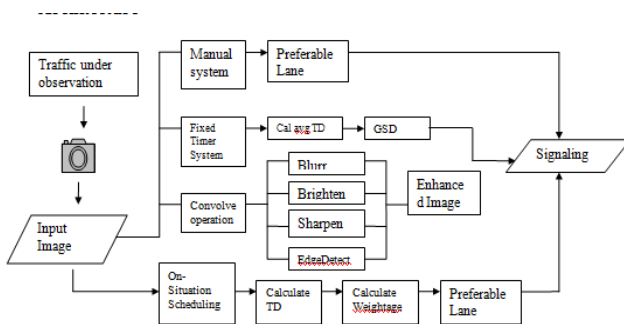


Figure 1: Architecture of traffic management System.

Traffic Management

Gradual Adaptation

- Round Robin
- Better Suited for junction at which the rate of change of traffic density is low.
- Timing display is provided
- The change descriptions (Green Signal Duration) are deployed when the lane is switching from green signal to red signal.

On-Situation Scheduling

- Scheduling is based on weight age of lanes calculated using Traffic density and waiting time.
- Better Suited for junction at which the rate of change of traffic density is high

- Timing display not possible since the algorithm is dynamic.

Manual

- An operator has to manage depending on situation.
- Best suited in exceptional cases such as arrival of VIPs, Accidents etc.

VII. RESULT

This chapter deals with the obtained results from our system. Let us see some of the results with examples.

Traffic Density calculation

Scheduling is based on weightage of lanes calculated using Waitage to Traffic density (TD), Waitage to waiting time and Waitage to rate of change of traffic density (RCTD).

$$\text{Weightage} = \frac{\text{TrafficDensity} * \text{WaitageToTD} + \text{RCTD} * \text{waitageToRCTD} + \text{waited} * \text{WaitageToW}}{\text{waitageToTD} + \text{waited} * \text{WaitageToW}}$$

Image Operation GUI

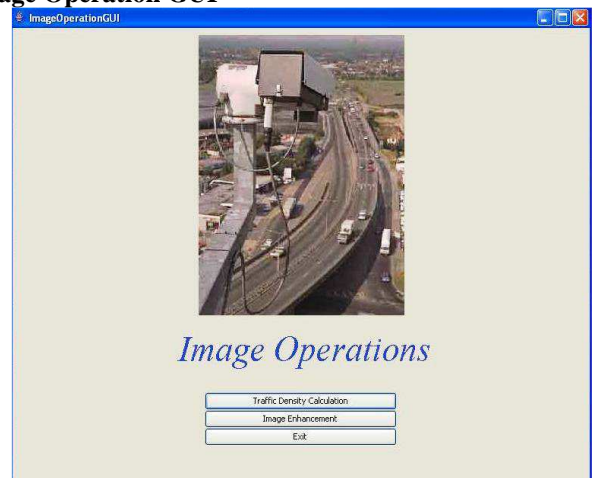


Figure 2: Image operations GUI

Manual Operation

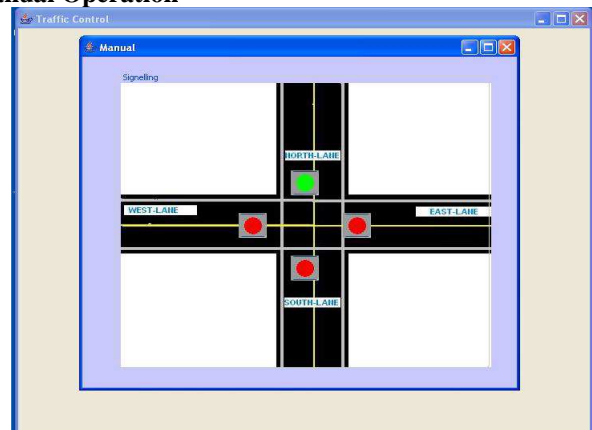


Figure 3: Manual operation

Gradual Adaptation

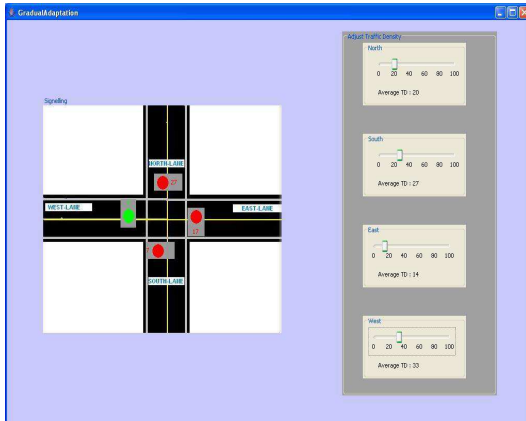


Figure 4: Gradual Adaptation GUI

On-Situation Scheduling

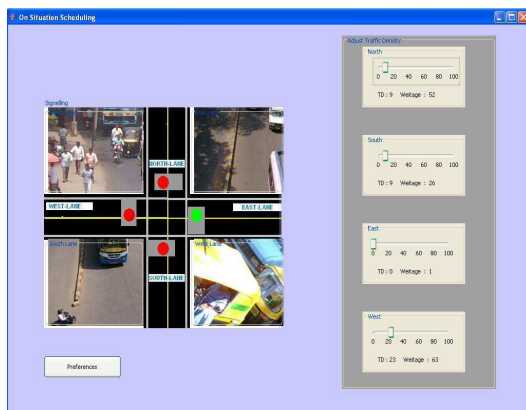


Figure 5: On-Situation Scheduling snapshot

VIII. ADVANTAGES AND LIMITATIONS

Advantages

- Employing this new system can be useful in traffic management system, as it is capable of avoiding congestions and ensures better traffic management system.
- For different real time traffic situations, the approach of the system is different, in currently working traffic management systems we don't find such adoptions to different circumstances.
- As it is designed and developed by using minimal resource, it acts as a cost-effective product amongst the traffic management systems.

Limitations

- It is important to critically evaluate the results and the whole study.

- The present study has certain limitations that need to be taken into account when considering the study and its contributions.
- Some of these limitations can be seen as fruitful avenues for future research under the same theme.
- Phenomenon that is a very extensive and major one.

The selection of the case studies naturally brings forth many limitations as far as the generalization of the results of the study is concerned.

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