

Smart Traffic Light Control Using Image Processing

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ABSTRACT

As the problem of urban traffic congestion spreads, there is a pressing need for the introduction of advanced technology and equipment to improve the state-of-the-art of traffic control. Traffic problems nowadays are increasing because of the growing number of vehicles and the limited resources provided by current infrastructures. The simplest way for controlling a traffic light uses timer for each phase. Another way is to use electronic sensors in order to detect vehicles, and produce signal that cycles. We propose a system for controlling the traffic light by image processing. The system will detect vehicles through images instead of using electronic sensors embedded in the pavement. A camera will be installed alongside the traffic light. It will capture image sequences. The image sequence will then be analyzed using digital image processing for vehicle detection, and according to traffic conditions on the road traffic light can be controlled.

KEYWORDS- Image acquisition, Image enhancement, RGB to grayscale transformation.

1.INTRODUCTION

Traffic congestion is a major problem in many cities of India along with other countries. Failure of signals, poor law enforcement and bad traffic management has led to traffic congestion. One of the major problems with Indian cities is that the existing infrastructure cannot be expanded more, and thus the only option available is better management of the traffic. Traffic congestion has a negative impact on economy, the environment and the overall quality of life. Hence it is high time to effectively manage the traffic congestion problem. There are various methods available for traffic management such as video data analysis, infrared sensors, inductive loop detection, wireless sensor network, etc. All these methods are effective methods of smart traffic management. But the problem with these systems is that the installation time, the cost incurred for the installation and maintenance of the system is very high. Hence a new technology called Radio Frequency Identification (RFID) is introduced which can be coupled with the existing signaling system that can act as a key to smart traffic management in real time. This new technology which will require less time for installation with lesser costs as compared to other methods of traffic congestion management.



Use of this new technology will lead to reduced traffic congestion. Bottlenecks will be detected early and hence early preventive measures can be taken thus saving time and money of the driver.

2.RELATED STUDIES

Pezhman Niksaz et. al. propose a system that estimates the size of traffic in highways by using image processing has been proposed and as a result message is shown to inform the number of cars in highway. This project aims to prevent heavy traffic in highways.

Chandrasekhar. M, Saikrishna.C, Phaneendra Kumar propose the implementation of image processing algorithm in real time traffic light control which will control the traffic light efficiently. A web camera is placed in each stage of traffic light that will capture the still images of the road where we want to control the traffic.

Vikramaditya Dangi, Amol Parab, Kshitij Pawar & S.S Rathod propose the way to implement an intelligent traffic controller using real time image processing. The image sequences from a camera are analyzed using various edge detection and object counting methods to obtain the most efficient technique.



3. IMPLEMENTION



Figure 1: Block diagram of proposed system.

The algorithm behind the block diagram consists of following steps

- A. We have a reference image and the image to be matched is continuously captured using a camera that is installed at the junction.
- B. The images are pre- processed into two steps as follows
 - 1. Images are rescaled to 300*300 pixels.
 - 2. Then the above rescaled images are converted from RGB to grey.
- C. Edge detection of pre- processed images is carried out using canny edge detection technique.
- D. The output images of previous step are matched using pixel to pixel matching technique.
- E. After matching the timing allocation is done depending on the percentage of matching as
 - 1) If the matching is between 0 to 30% green light is on for 90 seconds.
 - 2) If the matching is between 30 to 50% green light is on for 60 seconds.



3) If the matching is between 50 to 70% - green light is on for 30 seconds.

4) If the matching is between 70 to 90% - green light is on for 20 seconds.

If the matching is between 90 to 100%- red light is on for 90 seconds.

4. RESULTS

Results of individual steps for reference and real time image are shown below







Figure 2: Results of individual step for Reference image

Figure 3: Results of individual step for Real time image



5. CONCLUSION

Traffic control using image processing" technique that we propose overcomes all the limitations of the earlier (in use) techniques used for controlling the traffic. Earlier in automatic traffic control use of timer had a drawback that the time is being wasted by green light on the empty. This technique avoids this problem. Upon comparison of various edge detection algorithms, it was inferred that Canny Edge Detector technique is the most efficient one. The project demonstrates that image processing is a far more efficient method of traffic control as compared to traditional techniques. The use of our technique removes the need for extra hardware such as sound sensors. The increased response time for these vehicles is crucial for the prevention of loss of life. Major advantage is the variation in signal time which control appropriate traffic density using Density Calculation. The accuracy in calculation of time due to single moving camera depends on the registration position while facing road every time.

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