AUTOMATIC TRAFFIC CONTROL

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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 in India. 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. A camera will be installed alongside the traffic light. It will capture image sequences. The captured images are sequentially matched using image matching and according to saturation of traffic, light durations can be controlled.

Acknowledgement

This proposal describes the research and development that was done to accomplish the project. The project was carried out under **Electronics Section**, Indian Institute of Technology, Roorkee.

First of all, we would like to thank our staff advisor, **Mr. Kamal Singh Gotyan** for his guidance and support. His knowledge and ideas have given us a lot of inspiration. Secondly, we would like to thank our mentors, **Padmanabh Pande** for his ideas and suggestions, **Rahul Ratan Mirdha** for giving us information about the MATLAB and **Gaurav Waghmare** for helping in designing the circuit.

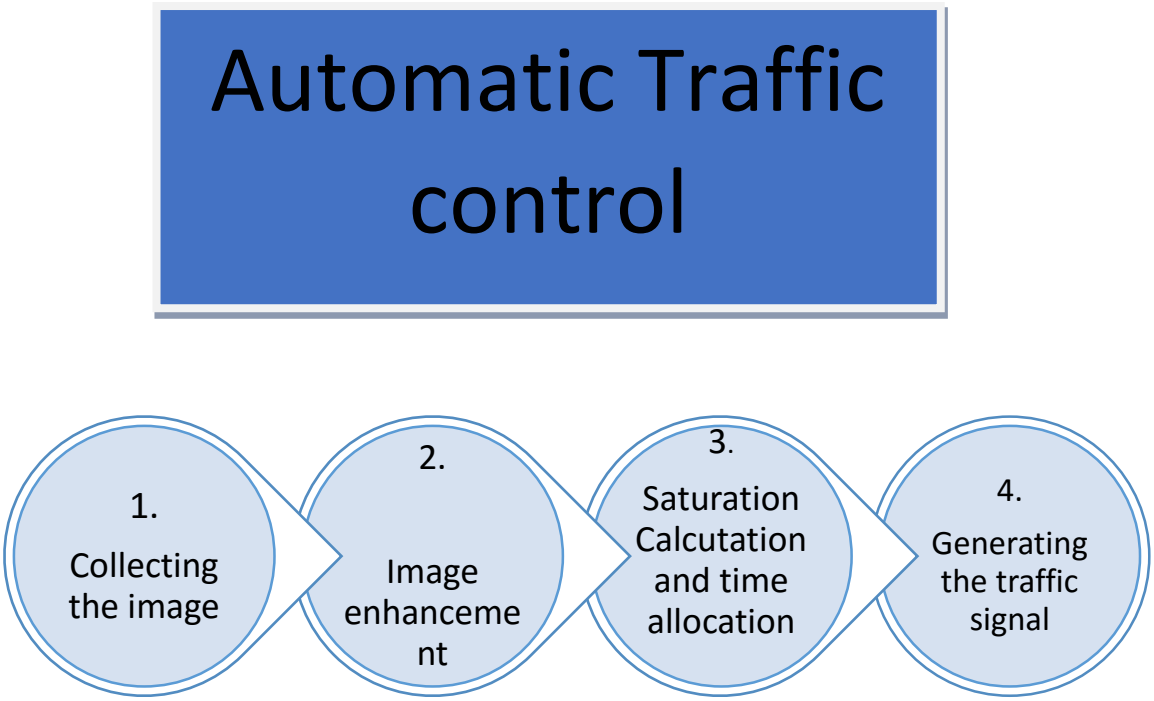
Big thanks to all of our friends and family who helped and supported us directly or indirectly with the project. Their help and support motivated us to finalize this project.

Introduction

In recent years, traffic congestion has become a significant problem in India due to increasing number of vehicles and poor transportation infrastructure, especially in large urban areas. The resulting congestion has become a major concern to transportation specialists and decision makers. The simplest solution is to lay more lanes to reduce traffic density, but laying more lanes in already densely populated areas like metropolitan cities require more land which is already scarce and over the top expensive hence adding more lanes is not a feasible solution on account of time, cost and efficient utilization of the infrastructure.

One possible solution that could be offered by the present infrastructure is the use of surveillance cameras that could be installed by law enforcement agencies on the road. This would help in automatic traffic monitoring, control and surveillance which are important for road usage and management.

Program Overview



1 Collecting image

The image could be collected in real time through a camera or from a video recording . We used images from video recording of roads from various surveillance cameras already installed across the world. The videos were taken from http://www.youtube.com

2. Image Enhancement

1. *Grayscale conversion*

*T*he selected image is first converted from RGB scale to gray scale in order to perform other image enhancement process.

2. *Background detection*

The grayscale image is then converted to background by making small objects to disks of pixels. This background when subtracted from the original grayscale image we get a image devoid of small erroneous objects

(Background)

(Grayscale image after subtracting background)

3. Contrast enhancement

Furthermore the contrast of the image
is increased for better differentiation between the vehicles and background.

(Contrast enhancement)

4. Threshold selection and Grayscale to B/W conversion

For further enhancement a threshold level is selected using Otsu's method and image is converted to black and white with respect to this threshold.

5. ***Removing unnecessary objects***

Finally the enhanced image is further made devoid of any small object less than 50 pixels to give final enhanced image.

This image is devoid of any erroneous object like people, trees , small plants etc.

3. Saturation calculation and time allocation

Saturation calculation

The enhanced image from previous step is then counted for white pixels (all cars being of white pixels). Then these pixels are converted to relative percentage of white pixels. Weightage of each pixel should be adjusted based on the position of cameras for example for top view i.e. camera is on top of vehicles then all pixels should have equal weightage , for front view the pixels at bottom should have less weightage compared to pixels at far top because car at far top would

be smaller(for this configuration) and hence should be compensated for while calculation.

After calculating percentage saturation of roads relative saturation is calculated.

Time Allocation

From relative saturation we calculated time for 4 green lights for one minute cycle and red and yellow lights are switched on and off correspondingly.

4. Generating the traffic signal

We used round robin technique for cycle of lights, once started it goes in anticlockwise direction.

The time for each light already calculated is then sent to Arduino whose 12 pins control MOSFET (IRFZ44N) which in turn triggers 12 (6V/7A) relays connected to the 220 V AC supply and traffic lights.

In this way traffic lights are controlled by the relay which is controlled by MOSFET, which is controlled by Arduino, which in turn is controlled by the relative saturation of roads.

Conclusion

With the given project we could control traffic in much more efficient and economical way. We used MATLAB by mathworks for image processing and controlling Arduino in windows environment. The methods we used showed promising result. Therefore it could also reduce the need for traffic police personnel.

It could also help in understanding the traffic patterns of roads and help in reducing traffic jams.

Besides that it is always better to have a surveillance on roads.

Limitations

The algorithm we used could not detect traffic saturation at night, or on days when there is low visibility pertaining to smog in metros. It could also fail to find correct saturation if the camera is mounted very near to the road or any other object is obstructing its line of slight.

Future Work

1. We could develop saturation weightage functions more accurately, we here used nearly linear weightage function where bottom row of pixels had highest weightage and top row of pixels had highest weightage.
2. The present work could also be implemented for traffic during nights and low visibility days by using extra sensors which could be embedded under pavements
3. We did this for a intersection of two roads system, this could be further improvised for T points, single road two way road etc.
4. We could also provide external control to the authorised personnel via external control.