

AUTOMATED TRANSPORT CONTROL SYSTEM

Presented on Theme
Transportation in Smart Cities

For
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Introduction

The current traffic control system (TCS) in the metro cities of India are inefficient due to randomness in the traffic density pattern throughout the day. The traffic signal timers have a fixed time period to switch traffic between different directions. Due to this, the vehicles have to wait for a long time span even if the traffic density is very less. If the traffic signal timer (TST) can be programmed to be manipulated with the continuously varying traffic density, the problem of traffic congestion can be reduced to a significantly lower levels.

The proposed system adapts the traffic signal timer according to the random traffic density using image processing techniques. This model uses high resolution cameras to sense the changing traffic patterns around the traffic signal and manipulates the signal timer accordingly by triggering the signals to the timer control system. The increase and decrease in traffic congestion directly depends upon the control on the flow of traffic, and hence, on the traffic signal timer. Due to this phenomenon, the vehicles have to face an irregular delay during transit in the urban areas. At present, the traffic control systems in India, lack intelligence and act as an open-loop control system, with no feedback or sensing network. The aim in this work was to improve the traffic control system by introducing a sensing network, which provides a feedback to the existing network; so that it can adapt the changing traffic density patterns and provides necessary signals to the controller in real time operation. Our major objective is to optimize the delay in transit of vehicles in odd hours of the day.

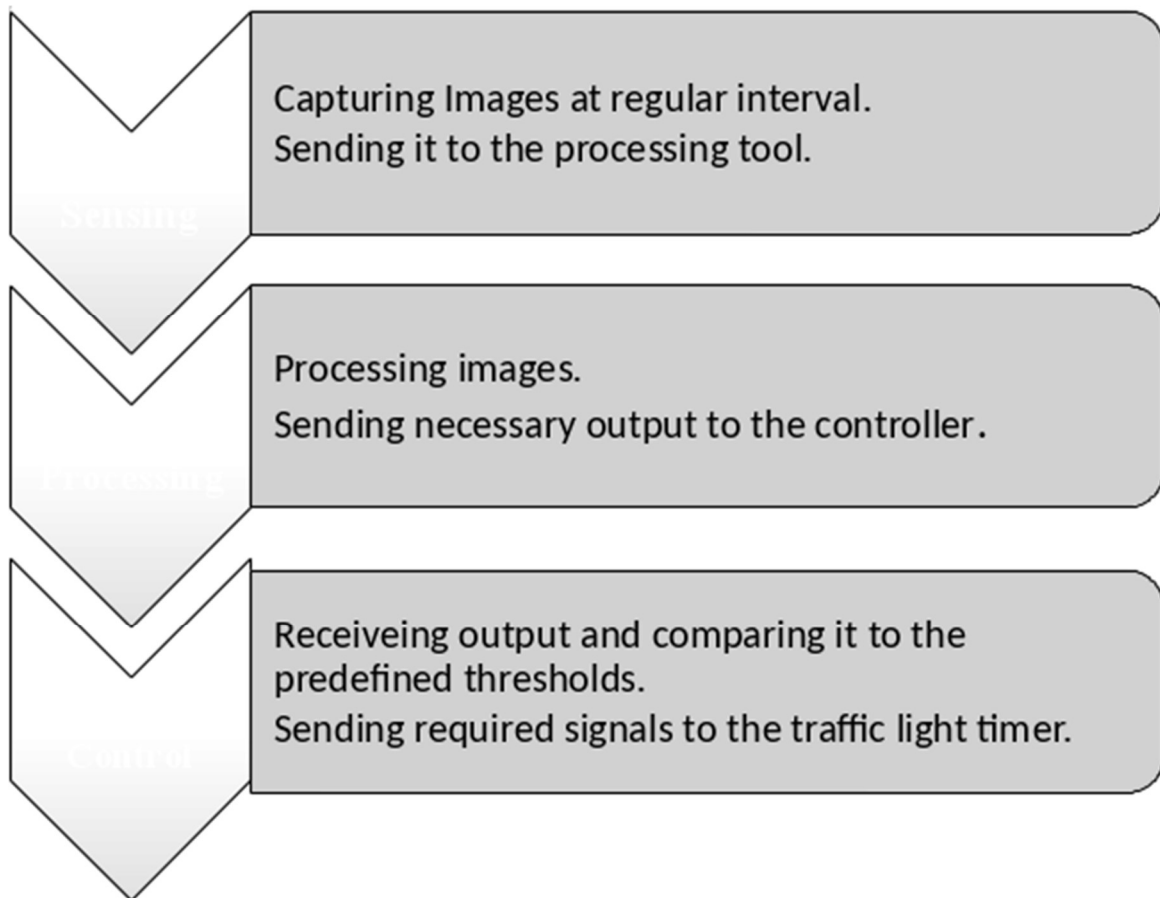
The objective is to design an intelligent traffic signal control system algorithm with the use of sensing devices and image processing systems. The captured images were to be processed in real time using an image processing and various parameters have to be calculated to estimate the density of vehicle traffic in all four directions. The controller has to execute the developed algorithm on the traffic signal timer to vary its time period.

Further ahead the solution proposed in this is also capable of detecting anyone who violates the traffic rules during driving. The system automatically detects any violation and detects the number plate of the vehicle through high image processing and then can issue an e-challan to the violator. When a specific limit of violations is reached for a specific person then the Driving License of that person can directly be dismissed. It can also be used to detect anyone who uses an invalid number plate on their vehicle so that the nearest local police station can take immediate action against it when contacted.

Project Breakdown

This autonomous control system consists of four major entities,

1. High resolution imaging device.
2. Image processing at the backend using jimp and pixel-match.
3. Microcontroller based traffic light timer control.



The Image Processing Algorithm proceeds in the following way. Assuming day time analysis, four snapshots of each of the four directions is captured, with the help of high resolution cameras, when there is negligible density of vehicles on the road. These four images act as a reference. For the remaining part of the day the images are captured at regular interval of 5 seconds and then compared with the reference images using image processing techniques described through images below.

Technology stack

1. A high resolution image capturing device with high frame rate(fps) and wide viewing angle.
2. Node.js along with express, jimp and pixel-match packages for image processing.
3. Image processing and background subtraction to find out the best traffic control dynamically.

Use cases

1. Optimized traffic control system
2. Reduced number of traffic rule violators
3. Fake number plate detection
4. Faster response time in various circumstances