**Intelligent Traffic Light Control Using Image Processing**

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in Partial Fulfillment of the Requirements

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specialization

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# DevOps

Under

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**ABSTRACT**

In India, with the growing number of vehicles, traffic congestion at junctions has become a serious issue. The density of vehicles is increasing day by day and there is a real need of adaptive traffic signals which can monitor traffic density. We describe a system which uses image processing for regulating the traffic in an effective manner by taking images of traffic at a stop. A step by step approach of image acquisition, image processing to change the traffic light duration as per the density of vehicles on different roads at a traffic signal is followed. The number of objects in a given image is counted and priority is given to the densest road.

**KEYWORDS:** Intelligent Transportation System (ITS), Traffic light, Image Processing, edge detection

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**INTRODUCTION**

In modern-day lifestyles we need to face with many issues considered one of that's traffic congestion turning into greater serious each day.[1] It is stated that the excessive tome of vehicles, the scanty infrastructure and the irrational distribution of the development are important reasons for augmented traffic jam. The predominant cause leading to traffic jam is the high number of vehicles which was because of the high population and the development of financial system.[1] To resolve this problem, the government must encourage humans to use public transport or vehicles with small length which includes bicycles or make tax on private/personal vehicles. Particularly, in a few Asian international locations which includes Viet Nam, the nearby authorities surpassed regulation limiting to the number of vehicles for each family. That the inadequate infrastructure cannot handle the issue of traffic is likewise a decisive reason. Besides, the main highway and roads are incapable of meeting the requirement of growing number of vehicles. Instead of working on roads to accommodate the growing traffic diverse strategies had been devised to govern the traffic on roads like embedded controllers which can be installed on the junction. These techniques are in short defined in next section.

* 1. **Standard Traffic Control Systems:**

**1.1.1 Traditional Manual Controlling**

Manual controlling the name itself defines that it requires man strength to manipulate/control the traffic.[1] Depending on the countries and states the traffic polices are allotted for a particular area or town to control traffic. The traffic polices will carry signal light, sign board, and whistle to manipulate/control the traffic. They may be instructed to put on precise uniforms in order to manage/control the traffic.

**1.1.2 Automatic Controlling**

Automatic Traffic light is managed/controlled by means of timers and electric sensors. In traffic light each section/phase a consistent numerical value loaded within the timer. The lighting is robotically getting ON and OFF depending on the timer value changes. While the use of electric sensors it'll seize the availability of the vehicle and indicators on every section, depending at the sign the lighting fixtures robotically transfer ON and OFF.[1]

**1.2 Drawbacks:**

In the manual controlling process, we want extra man strength. As we've poor strength of traffic

police we can't manipulate traffic manually in all region of a metropolis or city. So, we need a better solution to control the traffic. On the opposite side, automated traffic controlling a traffic light uses timer for each segment/phase. Using electronic sensors is any other way in an effort to locate vehicles, and produce signal that to this approach the time is being wasted by means of a green light on an empty road. Traffic congestion also occurred while the use of the digital sensors for controlling the traffic.

All these drawbacks are alleged to be removed via the usage of Image processing.

**1.3 Image Processing in Smart Traffic Light Control**

We propose a machine for controlling the traffic light by means of image processing. The vehicles are detected by the system through images instead of using electronic sensors embedded in the pavement.[2] A digital camera might be located alongside the traffic light. It will capture photo sequences.

Image processing is a better technique to manipulate the phase change of the traffic light. It suggests that it can lower the traffic congestion and avoids the time being wasted by using a green light on an empty street. It is likewise greater dependable in estimating car presence as it makes use of actual traffic photographs [2]. It visualizes the practicality, so its capabilities a good deal higher than the ones structures that depend upon the detection of the vehicle’s metallic content material.

**1.4 Introduction to Image Processing**

Image Processing is a way to enhance raw photographs/images acquired from cameras/sensors placed on aircraft's and satellites or pics taken in regular day-today life for numerous applications.[3] An Image is square graphical object. Image processing includes issues related to photograph/image illustration, compression techniques and various complicated operations, which may be achieved at the photograph/image data. The operations that come below image processing are

image enhancement operations which includes sprucing, blurring, brightening, aspect enhancement and so on.[3] Image processing is any mode of sign processing for which the input is a photo, along with pictures or frames of video; the output of picture processing may be either a picture or a set of characteristics or parameters related to the image. Most photograph-processing strategies involve

treating the photograph as a dimensional signal and applying popular sign-processing strategies to it. Image processing generally refers to digital picture processing, however optical and analog photo processing also are feasible.

**LITERATURE REVIEW**

**Mohammad Alani** [5] utilized RL (Reinforcement learning) algorithms to design adaptive traffic signal controllers called actor-critic adaptive traffic signal controllers (A-CATs controllers). Worked done rested on the integration of three threads: (a) shows performance compared of both discrete and continuous A-CATs controllers in a traffic network with recurred congestion (24-h traffic demand) in the upper downtown core of Tehran city, (b) analysed the effects of different traffic disruptions included opportunistic pedestrians crossing, parking lane, non-recurring congestion, and different levels of sensor noise on the performance of A-CATS controllers, and (c) compared the performance of different function approximators (tile coding and radial basis function) on the learning of A-CATs controllers. First an agent based

traffic simulation of the study area was carried out. Then six different scenarios are conducted to find the best A-CATs controller that was robust enough against different traffic disruptions. They observed that the A-CATs controller based on radial basis function networks (RBF (5)) outperforms others. They said that RBF (5) was benchmarked against controllers of discrete state Learning, Bayesian Q-learning, fixed time and actuated controllers; and the results revealed that (RBF (5)) consistently outperforms others.

**Ishant Sharma** and **Dr. Pardeep K. Gupta** [6] proposed to replace existed traffic signals with a system that are monitored the traffic flow automatically in traffic signal and sensors are fixed in which so the time feed are made dynamic and automatic by processed the live detection.

**Chandrasekhar.M** et.al. [7] suggested a system that implement image processing algorithm in real time traffic light control which will control

the traffic light efficiently.

**Pavan Kumar** and **Dr. M. Kamala kumara** [8] studied adaptive traffic control systems with VANET, focused on reliable traffic prediction approaches and various types of adaptive traffic control algorithms also proposed a mobile crowd sensing technology to support dynamic route choices for drivers to avoid congestion. Suggested crowd sourcing can be one of the best options for Adaptive traffic control system for

India.

**PROBLEM STATEMENT**

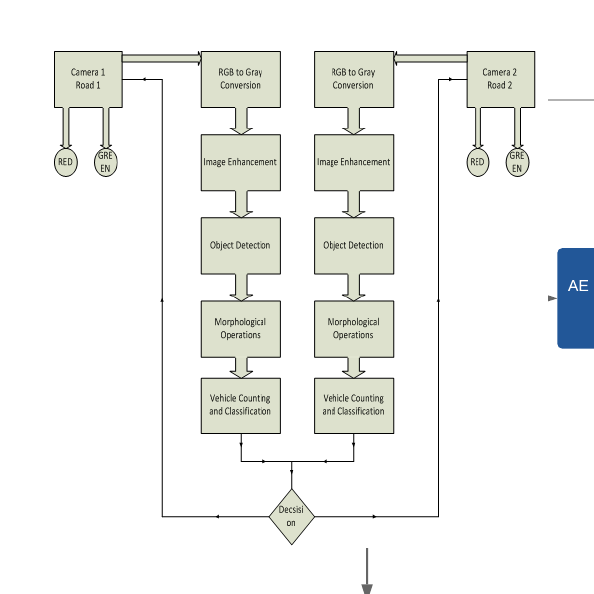
Traffic congestion is an increasing problem in cities and sub urban spend more of their time commuting to work, school, shopping, and social event as well as dealing with traffic light jambs and accidents. Traffic became heavy in all directions, more to and from cities as well as between sub urban locations. Suburban business locations required huge parking lots because employees have to drive; there were few buses trains, and trolleys to carry scatter workers to their work place.

The hope of reduced congestion in the sub urban had not been realized; long commutes and traffic jams could be found everywhere

**OBJECTIVE**

The project proposed is an intelligent real time system to control the traffic light using image processing.

**METHODOLOGY**



1. **Foreground Detector (RGB to GRAY Conversion)**

Foreground Detector is considered as the most important function in this code; it plays a big role in the filter and detects the ground. Foreground Detector also changes the image type from “RGB” to “Grey” then to “Binary” and applies filtering at different levels. Converting images to binary type is done by replacing all pixels according to the specified luminance with either white (logical 1) if the pixel is equal or greater that the level or black (logical 0) otherwise. Specified level should belong to the range [0, 1].

2) **Capturing Image**

We can take the capture image from live camera that can take every 10 sec a capture image. But in my paper, we will take the video and divide it into frames and take every few second a frame. If we use the camera, we should install it in a fixed place so it does not vibrate.

3) **Image Enhancement**

Image enhancement is the process of adjusting digital images so that the results are more suitable for display or further analysis. For example, we can eliminate noise, which will make it easier to identify the object. Image enhancement are same used in image detecting and video detecting except in image rode process are not use.

First step is removing small connected components and objects from binary image by using function specified for this process. Those objects have fewer pixels than the specified threshold Example: if we put the threshold is equal to 10 PIXELS then the object has size below 10 will remove. Removing the noise in the image is one of the most important and most difficult of the pre-handling techniques; but after that it will make the work easier.

Second step is by make dilate process it will enlarge/smooth the white areas and fill in black areas near borders/perimeters. Dilate process take two parameters first the image in stage before it and the other is defined by another function by creates a flat structuring element with the specified neighbourhood it has 2 parameters first for define the type of shape want to draw it and other is a size of matrix containing 1’s and 0’s; the location of the 1’s defines the neighbourhood for the morphological operation. The canter (or origin) of matrix is its center element. (Note: this function is also used when make rode to the pic.)

4) **Object Detection (Vehicle)**

Moving vehicle detection is in the video analysis. It can be used in many regions such as video surveillance, traffic monitoring and people tracking. There are many motion segmentation techniques, like frame difference. Frame difference method has less computational complexity, and it is easy to implement; its difference between the current frame and the reference frame is above the threshold is considered as moving vehicle.

Another method Optical flow method can detect the moving vehicle even when the camera moves, but it needs more time for its computational complexity, and it is very sensitive to the noise.

5) **Vehicle Tracking**

Vehicle tracking involves continuously identifying the detected vehicle in video sequence and is done by specifically marking the boundary around the detected vehicle. Vehicle tracking is a challenging problem. Difficulties in tracking vehicles can arise due to abrupt vehicle motion, changing appearance patterns of the vehicle, vehicle-to-vehicle.

In my paper we use also from Foreground Detector Blob Analysis function. This function detects the vehicles and then from bounding box we get the size of the detected vehicles. After that we draw a rectangle around the detected vehicle.

6) **Counting Vehicle**

It’s considered as the last stage in my paper, it gives the number of cars according to the number of boxes detected around the cars.

**SYSTEM REQUIREMENTS**

**Software Requirements:**

* Python IDE (PyCharm, /Anaconda/Jupiter notebook)
* AI algorithm modules

**Hardware Requirements:**

* 2 GHz Processor
* 4 GB RAM
* Camera

**PERT CHART**

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| --- | --- | --- |
| **Start Project** | | |
| 15-8-2019 | 7 days | 22-8-2019 |

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| --- | --- | --- |
| **Project Concept Development** | | |
| 23-8-2019 | 7 days | 30-8-2019 |

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| --- | --- | --- |
| **Planning** | | |
| 31-8-2019 | 7 days | 7-9-2019 |

|  |  |  |
| --- | --- | --- |
| **Requirement Analysis i.e. Dataset Collection** | | |
| 8-9-2019 | 5 days | 13-9-2019 |

|  |  |  |
| --- | --- | --- |
| **Design Algorithm** | | |
| 14-9-2019 | 15 days | 29-9-2019 |

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| --- | --- | --- |
| **Coding** | | |
| 30-9-2019 | 20 days | 20-10-2019 |

|  |  |  |
| --- | --- | --- |
| **Testing** | | |
| 21-10-2019 | 10 days | 31-10-2019 |

|  |  |  |
| --- | --- | --- |
| **Debugging** | | |
| 1-11-2019 | 15 days | 16-11-2019 |

**REFERENCES**

[1] In J. A. Storer and editors. M. Cohn, editors, Proc. 2000 IEEE Data Compression Conference, Los Alamitos, California, 2000. IEEE Computer Society Press.

[2]Calgary corpus 2000. ftp://ftp.cpsc.ucalgary.ca/pub/projects/text.compression.corpus.

[3] http://www.cs.wisc.edu/niagara/data/.

[4] N. Abramson. Information Theory and Coding. McGraw-Hill, 1963.

[5] Mohammad Aslani, Mohammad Saadi Mesgari, Marco Wiering, “Adaptive traffic signal control with actor-critic methods in a real

world traffic network with different traffic disruption events”, Transportation Research Part C 85 (2017) 732–752.

[6] Ishant Sharma and Dr. Pardeep K. Gupta, “Study of automatic traffic signal system for chandigarh”, international journal of

engineering sciences & research Technology, ISSN: 2277-9655,July, 2015.

[7] Chandrasekhar.M, Saikrishna.C, Chakradhar.B, phaneendra kumar.p, sasanka.c, “Traffic Control Using Digital Image Processing” ,

International Journal of Advanced Electrical and Electronics Engineering ISSN 2278-8948, Vol.2, May 2013

[8] Vadrevu S. V. S. R. Pavan Kumar, Dr. M. Kamala kumara, “A Novel Application of Adaptive Traffic Control System for India”,

International Journal of Science, Engineering and Technology Research (IJSETR) Volume 5, Issue 7, July 2016, ISSN: 2278 – 7798

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