Traffic Light Control Using Image Processing

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ABSTRACT

With the increasing population of India, there is also an increase in vehicles which needs control to regulate the flow. The purpose of this paper is to control the traffic which is a big issue mainly in metropolitan cities. The idea is to implement a smart traffic controller using image processing. The system will detect vehicles through images instead of using electronic sensors embedded in the pavement. A camera will be used to capture the image which is kept alongside the traffic light. The sequence of the camera is analyzed using the object counting method; the density of the vehicles will be counted and given the required changes in the signal. In this feature extraction from the input image is done and the count is calculated by comparing these features values with cutoff values. These cutoff values are statically specified and used to calculate the density. In this paper, an automatic counting method is proposed to calculate the count of the object. The paper proposes an automated system to detect emergency cars from CCTV footage using the text reading technique.

Keyword: Image Processing, Emergency vehicles detection, Object detection.

INTRODUCTION

In day-to-day life we have to face many problems related to traffic congestion which is becoming more serious every day. It has become very difficult to manage the traffic congestion and high number of road accidents which is increasing day by day. This situation is affecting our life in many ways such as health issues and pollution. There are many negative impacts of traffic congestion which includes to wasting time, inability to forecast travel time, higher chance of collisions due to tight spacing and constant stopping. The highway and roads are incapable of meeting the requirement of increasing number of vehicles.

The major cause leading to traffic jam is the large number of vehicles which was caused by the population and the development of economy. Instead of working on roads to control the traffic on roads various techniques have been devised to control the traffic.The project is to detect the traffic by using image processing to get the density of the vehicles and helping the emergency vehicle to give a brief way by text reading. The project system can be capturing the image which is used for counting the density of the vehicles and an emergency vehicle can be detected by text reading from a distance of 100 meters and change the signals without having the vehicle to stick into the traffic. Image tracking of moving vehicles can give us quantitative description of traffic flow.

METHODOLOGY

There are many methods of detecting vehicles on road such as motion detection, installing lasers on both sides of the road [6], etc., which is tedious and involves large number of hardware. This method uses image processing techniques to count the number of vehicles on road and estimate the density. The number of vehicles found can be used for surveying or controlling the traffic signal. The methodology is based on two parts, vehicle detection using image processing and emergency vehicle detection using image text recognition through image.
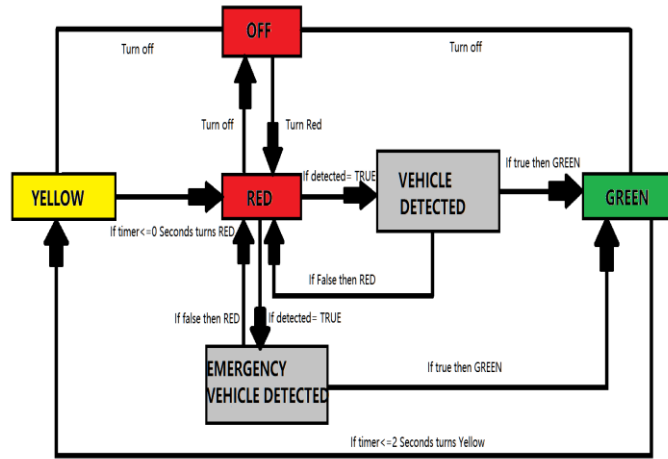
Fig.1 Block Diagram of traffic light control using image processing.

WORKING

The project proposes a system for controlling the traffic light by use of image processing. The system will detect vehicles through images instead of using electronic sensors embedded in the pavement. CCTV camera will be used to capture the images, which is kept alongside the traffic light. When the system is in work the initial condition is off (Red Signal). Every 5 sec the system will capture images and process it accordingly. While checking the density on the signal it will also simultaneously check for the emergency vehicle in the range of 100 meters.

Primarily the system will check for any emergency vehicle such as ambulance in the range of 100 meters and then it will check for density of vehicles and if both cases are TRUE then it will give the dynamic change in the signal to control the traffic.

If there is no emergency vehicle but the density is detected then the signal will show green signal and then go for yellow and then stop.

If the road has minimum number of vehicles then it will give the signal 2nd or 3rd priority and if there is no vehicle found on road i.e. empty road on any of the signal then the signal will show no change i.e. red.
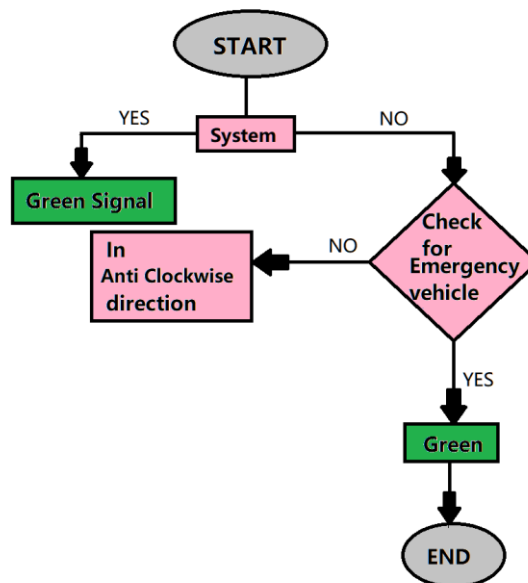

Fig.2 Flow Chart of traffic light control using image processing

The project is made under the following libraries to execute the python code.

a. **Open CV:**
   Open CV (Open Source Computer Vision Library)to solve computer vision problems cv2 used to display an image in a window. The window automatically fits to the image size. Open CV is a great tool for image processing and performing computer vision tasks. It is an open-source library that can be used to perform tasks like face detection, objection tracking, landmark detection, and much more. It supports multiple languages including python, java C++.

b. **Py-Tesseract:**
   Py- Tesseract to recognize and "read" the text embedded in images. Python-tesseract is a wrapper for Google's Tesseract-OCR Engine. Tesseract tests the text lines to determine whether they are fixed pitch. Where it finds fixed pitch text, Tesseract chops the words into characters using the pitch, and disables the chopper and associate on these words for the word recognition step.

c. **NumPy:**
   Used NumPy which is a Python library used for working with arrays. NumPy is a library for Python that adds support for large, multi-dimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays. It also has functions for working in domain of linear algebra, Fourier transform, and matrices. It is an open source library.

d. **Glob:**
   The glob module is a useful part of the Python standard library. Glob (short for global) is used to return all file paths that match a specific pattern. The glob module is used to retrieve files/pathnames matching a specified pattern. The pattern rules of glob follow standard UNIX path expansion rules.

SOFTWARE

PyCharm:
The software PyCharm is used to code the program effectively in python programming language.

It provides code analysis, a graphical debugger, an integrated unit tester, integration with version control systems. Also helps in Coding assistance and analysis, with code completion, syntax and error highlighting, linter integration, and quick fixes, integrated unit testing, with line-by-line code coverage.
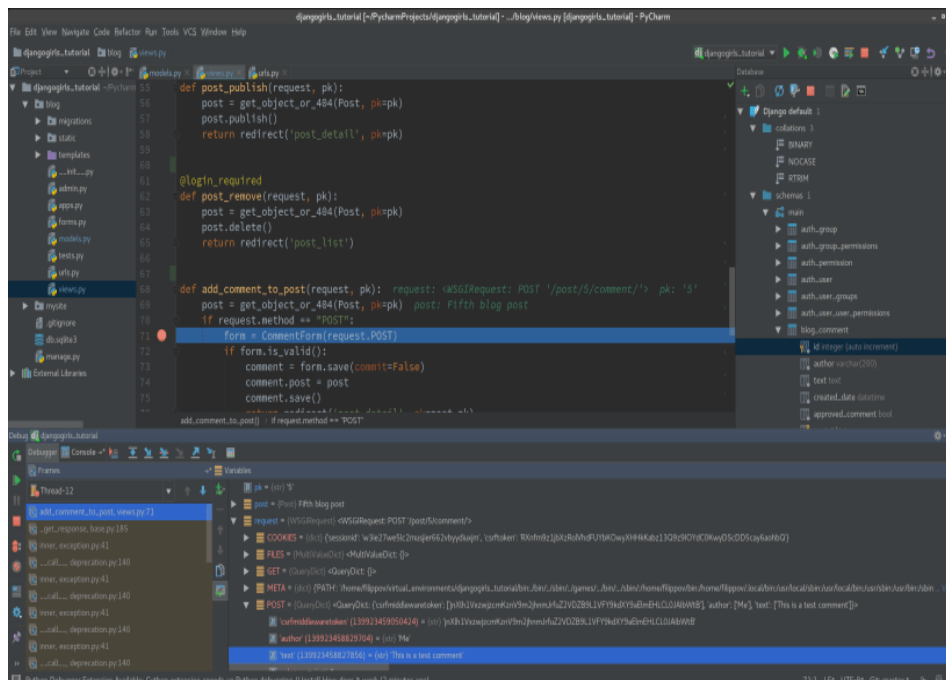
RESULT AND CONCLUSION

Fig.3 Before density count

Fig.3 shows that there are cars on the traffic signal waiting for the signal to get green. This is the scenario before the vehicles density detection. The camera will capture the image and then process it further.

Fig.4 After density count

As the image will be captured and then it will process as in above fig.4, density is detected by the system and the count of the vehicles is shown at the top of the image.

Fig.5 Before detecting Emergency Vehicle

Fig5. Shows that when there is emergency vehicle in the traffic it gets the dynamic change in the system and the emergency vehicle is detected as in fig.6.

Fig.6 After detecting Emergency Vehicle

If the density is detected then the green signal time got extended to clear the traffic in the particular path but if the density of traffic (no vehicles) is detected then the signal will be red and will look for the vehicles on the other hand side of the road Simultaneously the emergency vehicle will be detected by the Text Detection and the signal will give the dynamic change to clear the traffic for the emergency vehicle.

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