Traffic Control System Using Image Processing

Aditya Gavad, Pravin Chauhan, Bhairav Bose, Jessica Dias
Department of Information Technology
St.Jhon College of Engineering and Management , Palghar, India

***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-by-traffic light and traffic policeman. Another way is to use electronic sensors in order to detect vehicles, and produce signal that cycles. Many of them they ignore the signal and pass their vehicles through signal when there no traffic policeman in signal. Because of this any accident occur in signal. For this overcome we propose a system for controlling the traffic by image processing. The system will detect vehicles through images instead of using recorded the vehicles number enter manually in their record. A camera will be installed alongside the traffic light. It will capture image sequences by sequences of vehicles when traffic light is red at every five second. The capture images processing in our system and forward the valid picture to the screen. For this valid picture checked by policeman and take legal action about them. For this it can be controlled.**

Keywords— Control; Decentralized – Traffic;

I. INTRODUCTION

As the problem of urban traffic congestion spreads there is pressing need for the introduction of advanced technology and equipment to improve the state of the art of traffic control. Traffic problems nowadays are increased because growing number of vehicles and the limited resources provided.

Nowadays to control traffic a person is sat in front of the screen to watch the vehicles whether they are above the mark or below the mark, where the person sitting on screen will click pictures which will take long process. To overcome this problem, we proposed a system by using image processing which will detect vehicles through images instead of using electronic sensors embedded in the pavement. A camera will be installed alongside the traffic light which will capture image sequence. The image sequence will then be analyzed using digital image processing for vehicle detection

II. LITERATURE REVIEW

A. *Intelligent Traffic Management System for Smart Cities*

In this proposed system the authors has used many domains of a Smart City wherein significant research can be seen. It is an area of work which has answers to many current day problems pertaining to traffic management of smart cities.

Conclusion: It is an Intelligent Traffic Management System for Smart Cities which facilitates Wireless Sensor Networks, Internet of Things, Cloud Computing and Data analytics.

Gap: Here we can use smart detectors to control the traffic

B. *Performance analysis of smart traffic control system using image procesing*

In this system the images of each lane which is compared with an image of reference lane in order to calculate the traffic density and to detect emergency vehicles in order to prioritise them

Conclusion: It is smart traffic control system where using image processing technique the density of traffic is analyzed and traffic sis controlled

Gaps: Here we can use automatic drones to keep an eye on traffic

C. *Automatic Traffic Using Image Processing*

The Control of Traffic” can be cheaply made from low cost, locally available components and can be used for various traffic streets.

Conclusion: We can use it to count the number of dynamic vehicles that are passing on highways to know the density, and we can use it to control the traffic

Gaps: Here we can use smart detectors to count vehicles

D. Density Based Traffic Control Using Image Processing

An efficient density-based traffic control system is simulated and implemented which provides a good traffic control Mechanism without time wastage. So it surely operates much better than systems which rely on the metal content of the vehicles to detect their presence. Image processing techniques overcome the limitations of the all the traditional methods of traffic control

Conclusion: It is much better way of detecting the presence of vehicles on the road since it makes use of image data

Gaps: We can use IR sensors to detect the traffic

III. PROPOSED SYSTEM

The main aim of the project is to capture those images that had crossed the traffic signal and try to run. The camera which is equipped on traffic signal will take a picture.
This picture will be processed using image processing technique and artificial intelligence and send it to traffic system.
The person sitting in the system will shortlist the images those who had crossed the signal.

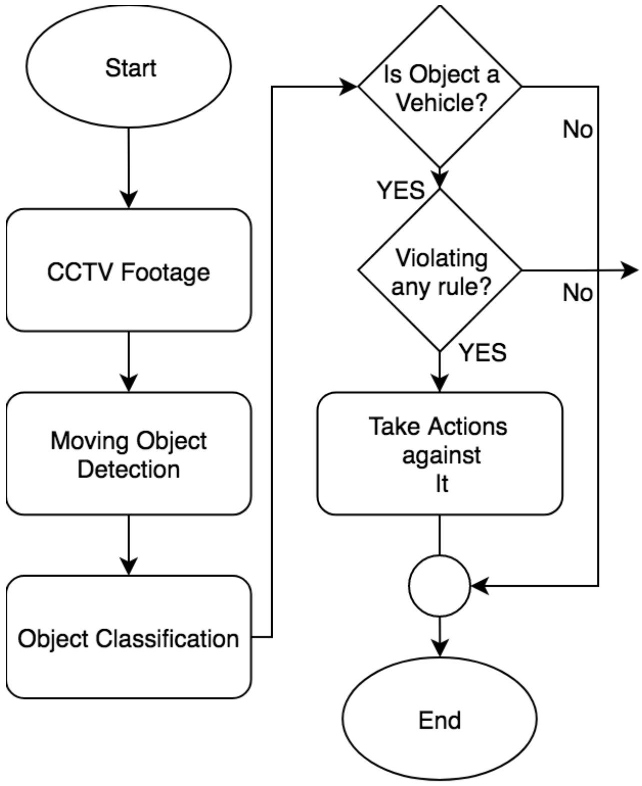


Fig. 1.System Architecture

In Figure 1, shows the entire process of Traffic Control System.

The System consists of two main components -

- Vehicle detection model and
- A graphical user interface (GUI)

First the CCTV camera footage from the road side is sent to the system. Vehicles are detected from the footage. Tracking the activity of vehicles system determines if their is any any violation or not. Different types of violations have different algorithms to determine the violation. A system flowchart 1 shows how the system works. The Graphical User Interface (GUI) makes the system interactive for user to use. User can monitor the traffic footage and get the alert of violation. User can take further action using the GUI.

A. Methodology

1. Image Processing

1. Gray-scaling and blurring:- As the part of prepossessing the input frame got from the CCTV footage, the image is gray-scaled and blurred with Gaussian Blur method.

2.Background-subtraction:- Background subtraction method is used to subtract the current frame from the reference frame to get the desired object's area. equation (1) shows the method. dst(I) = saturate(|scr1(I) − scr2(I)|)

3. Binary Threshold:- Binarization method is used to remove all the holes and noises from the frame and get the desired object area accurately. equation (2) shows how the binary threshold works. dst(x, y) = maxVal if scr(x, y) > thresh else 0

4. Dilation and find the contour :- After getting the thresholded image, it is dilated to fill the holes and the contour is found from the image. drawing rectangle box over the contours desired moving objects are taken.

2. Vehicle Classification

From the prepossessed image moving objects are extracted. A vehicle classification model is used to classify those moving objects into three class – Car, Motorbike and Non-vehicle. The classifier model is built with mobile net v1 neural

Type / Stride	Filter Shape	Input Size
Conv / s2	3 x 3 x 3 x 32	224 x 224 x 3
Conv dw / s1	3 x 3 x 32 dw	112 x 112 x 32
Conv / s1	1 x 1 x 32 x 64	112 x 112 x 32
Conv dw / s2	3 x 3 x 64 dw	112 x 112 x 64
Conv / s1	1 x 1 x 64 x 128	56 x 56 x 64
Conv dw / s1	3 x 3 x 128 dw	56 x 56 x 128
Conv / s1	1 x 1 x 128 x 128	56 x 56 x 128
Conv dw / s2	3 x 3 x 128 dw	56 x 56 x 128
Conv / s1	1 x 1 x 128 x 256	28 x 28 x 128
Conv dw / s1	3 x 3 x 256 dw	28 x 28 x 256
Conv / s1	1 x 1 x 256 x 256	28 x 28 x 256
Conv dw / s2	3 x 3 x 256 dw	28 x 28 x 256
Conv / s1	1 x 1 x 256 x 512	14 x 14 x 256
Conv dw / s1	3 x 3 x 512 dw	14 x 14 x 512
Conv / s1	1 x 1 x 512 x 512	14 x 14 x 512
Conv dw / s2	3 x 3 x 512 dw	14 x 14 x 512
Conv / s1	1 x 1 x 512 x 1024	7 x 7 x 512
Conv dw / s2	3 x 3 x 1024 dw	7 x 7 x 1024
Conv / s1	1 x 1 x 1024 x 1024	7 x 7 x 1024
Avg Pool / s1	Pool 7 x 7	7 x 7 x 1024
FC / s1	1024 x 1000	1 x 1 x 1024
Softmax / s1	Classifier	1 x 1 x 1000

network architecture.

Fig: MobileNet Body Architecture.

Parameter name	Value
learning rate	0.01
training steps	100

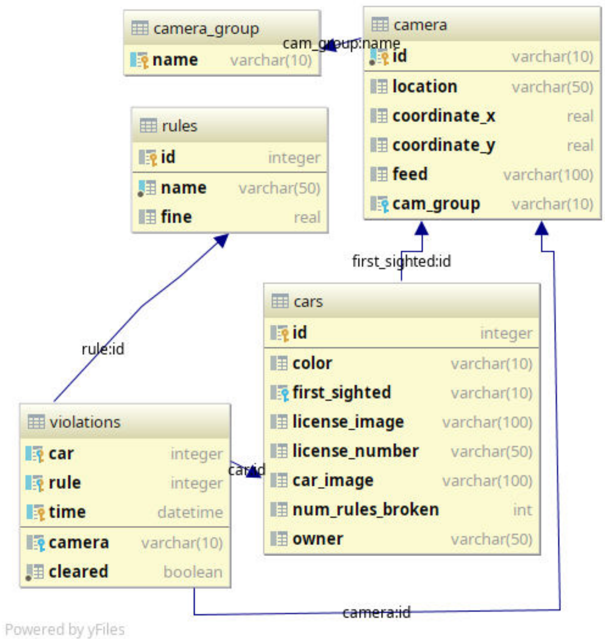
Fig-2: Trainning hyperparameters.

Transfer learning approach is used to training the model with our dataset.The dataset consists of 500 images per class. The training parameters are mentioned in table (2).

3. Database Structure

We have used SQLite database with python to manage the whole data of our application. Here, in the relational database we have used BCNF of 5 tables. The tables are

1. Cars
2. Rules
3. Cameras
4. Violations



5. Groups

Here are the descriptions of each tables:

1. Cars: This table will hold the recorded cars by the camera. A car entity is a car with a unique identifier(id), color(color), license-number of the car(license), where the car is first

sighted (first_sighted), an image of the license number (license_image), an image of the car(car_image), number of rules broken so far(num_rules_broken) and the owner of the car (owner).

2. Rules: This table holds all the rules, their description(name) and fine for breaking that rule (fine).

3. Camera: Camera table holds a unique identifier for the camera(id), location description(location), the longitude(coordinate_x) and the latitude(coordinate_y) of the location of the camera, where the camera will feed its data video(feed) and in which group the camera is in(group).

4. Camera_group: This table simply holds the unique group names of the camera groups(name). Violations: This table takes all the ids of other tables as foreign key and creates a semantic record like this: A car with this id has broken that rule at this time, which is captured by this camera.

RESULT AND DISCUSSION

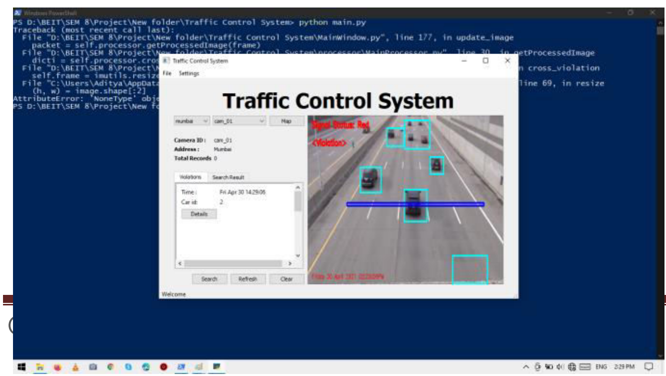
Implementation

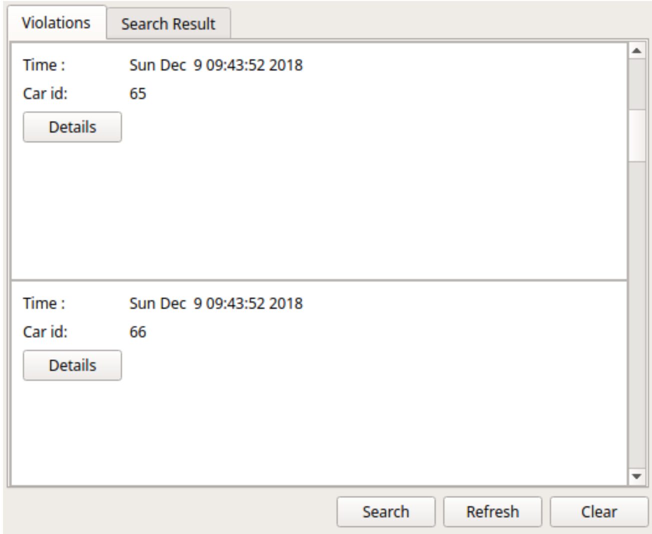
Image Processing and Computer Vision

Open-CV computer vision library is used in Python for image processing purpose. For implementing the vehicle classifier with, TensorFlow machine learning framework is used.

Graphical User Interface (GUI)

The user interface has all the options needed for the administration and other debugging purpose so that, we do not need to edit code for any management. For example, if we need to add some sample cars or camera in the database, we can do it with the menu item (see fig-3).





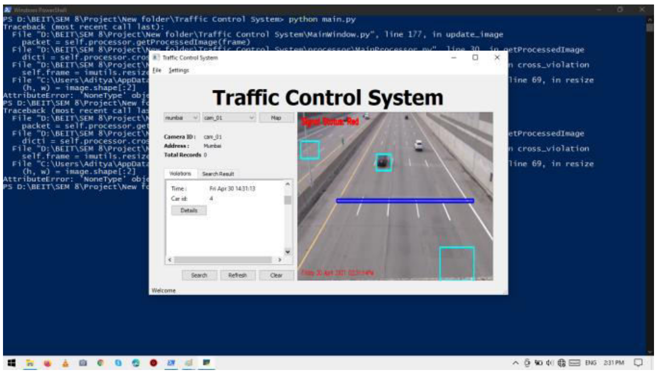


Figure 2: Overall user interface view

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