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Traffic Rule Violation Detection system

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Abstract*: The world is becoming increasingly urbanized. As a result, the number of automobiles on city roadways has increased dramatically, causing traffic offenses to skyrocket. Nowadays, people are more critical. This results in significant damage to the environmental property, as well as more accidents that could put people's lives injeopardy. The populace. To address the worrying condition and prevent future occurrences, traffic violation detection, unimaginable repercussions. It is necessary to implement systems.*

Key Word*: Image processing, Vehicle detection, Violation detection, V1 Mobilenet Architecture, Graphical User Interface.*

I. INTRODUCTION

As we know authorities are constantly covering the roads, a real-time business violation discovery system is needed. As a result, business enforcers won't only be more at ease in enforcing safe roads. Directly, but also efficiently, because the business discovery system detects violations. Faster than humans. A stoner-friendly graphical interface is related to the system to make it simple forthe stoner to work the system, examine the business, and take action. against violations of business rules. This system can descry the most common three types of business violations in real-time.

Objective: The thing of the design is to automate the business rules violation discovery system and make it easy for the business police department to cover the business and take action against the violated vehicle proprietor in a fast and effective way.Detecting and tracking the vehicle and their conditioning directly is the main precedence of the system.

Existing Approaches: The first approach that relies on mortal participation is the police watch. A traffic squad is a police patrol unit created mainly for the purpose of supervising and administering traffic safety compliance on roads and roadways. Another technology to fight traffic violations is by using cameras installed on the signal lights. The aim is just to bring to light the red-light crossing violations.

II. SYSTEM OVERVIEW

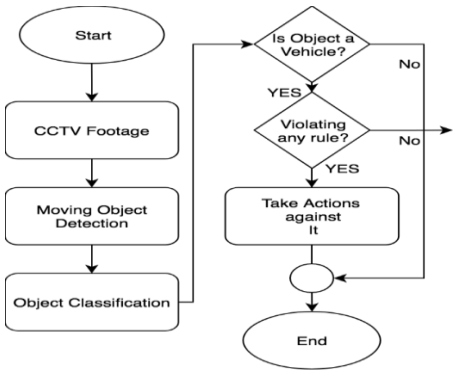

Fig 1: *Flow Chart of the System*

The System consists of two main parts –

- Vehicle Detection using image processing
- A graphical user interface (GUI)

The CCTV camera footage from the roadside is first transferred to the system. Vehicles are detected in the footage. The tracing of vehicle action determines if there's any weather it's a violation or not. Different types of violations have different algorithms thatare being used to detect the violation.1st flowchart of the system demonstrates how the system operates The graphical user interface (GUI) makes the system interactive for the user. The user has the option to watch the

traffic footage and enter violation cautions with the captured vehicle image The user has the option to take additional action using the graphical user interface.

III. METHODOLOGY

Image Processing-

• Gray scaling and blurring: As the part of pre-processing the input frame got from the CCTV footage, the image is Gray scaledand blurred with the Gaussian Blur method.

•Background Subtraction: Background subtraction methods are used to subtract the current frame from the reference frame to getthe desired object's area. statement (1) shows the method. dst(I) = saturate(|scr1(I) − scr2(I)|)

• Binary Threshold: Binarization approach is used to remove all the openings and noises from the frame and pick up the askedobject area precisely. statement (2) shows how the binary threshold operates. dst(x, y) = maxVal if scr(x, y) > thresh else 0

• Dilation and find the contour: After receiving the thresholded image, it's dilated to pack the holes and the contour is detectedfrom the image. Drawing rectangle boxes over the figures required moving objects are taken.

Vehicle Classification-

Table 1: - *Blueprint of the mobile net neural network*

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 3 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

From the preprocessed image moving objects are pulled. A vehicle categorizing model is used to categorize those moving objectsinto three classes – Car, Motorbike, and Non-vehicle. The classifier model is assembled with mobile v1 neural network architecture.

Table 2: *Training Parameters*

Parameters Name	Value
Learning rate	0.01
Training steps	100

The transfer learning approach is used to train the model with our dataset. The dataset consists of 500 images per class.

Violation detection -

After detecting the vehicles three violation cases arise-

•Signal violation: If a vehicle crosses a predefined line on the road while there is a red signal, it is detected as a signal violation.

• Direction violation: When a vehicle comes from the wrong direction, it is detected by tracking the vehicle. The direction of thevehicle is determined using its current position and previous few positions.

Database Structure-

We've applied SQLite database with python to operate the entire data of our application. And, in the relational database, we've applied BCNF of 5 tables. The table is:

Cars: This table will hold the records of the cars by the camera that has violated rules. A car entity table is a car record with a unique identifier (id), color (color), license- number of the car's number plate (license), where the car is first sighted (first_sighted),a picture of the license number plate (license image), an image of the car (car_image), number of rules broken by the car so far (num_rules_broken) and the name of the possessor of the car (owner).

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

Camera: The 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 thecamera is in(group).

Camera group**:** This table simply holds the unique group names of the camera groups(name). Violations: This table takes all the idsof other tables as a 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.

IV.IMPLEMENTATION

Image processing and computer vision:

The processing of images is done by using the library that is present in the python that is OpenCV. It is used for implementing thevehicle classifier with the Tensor Flow machine framework is used.

Graphical User Interface:

In this way, the supervisor can add the position of the camera, the feed document for the camera. Then the feed document is installed by the camera module over the internet. We've used a Linux train sharing pattern for getting the videotape from the camera, where the camera will feed the given document to the host, and the host will take the feed document to process and detect violations. Also, the X and Y coordinate of the camera venue can be saved by the admin.

After adding the camera, the software will automatically start detecting violations of traffic rules. He can check the list of ruleviolations and can see details of the cars that have breached the traffic rules.

V. CONCLUSION AND RECOMMENDATION

The designed algorithm was effective in detecting the types of violations specified on this project, which were denying traffic signals, parking in no-parking zones, and driving in the wrong direction. The detection convergence for the three types of traffic violations mentioned differs because each has a distinct threshold state. The system detects all three violations, but it detects signal and parking violations better than direction violations. Likewise, the system can only process one data set at a time. Also,the programmed runtime is a little slow, which can be bettered by using a computer with a high-speed processor or GPU. Future research will concentrate on the application of the developed algorithm to other advanced image processing ways. Because of this, the program's runtime may be bettered.

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