Vehicle Detection and Tracking for High Sensitive Area and E-mail Reporting by Using HAAR Cascade Classifier

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Abstract – *Now a day so many applications came for Safety/security purpose. This paper presents a real-time vision framework that detects and tracks the vehicles from stationary camera for High sensitive area where vehicle entry is strictly prohibited for safety/Security purpose. The framework consists of three main stages. Vehicles are first detected using Haar-like features in framework. Then In the second stage, trained model is built to dynamically keep track of the detected vehicles till vehicle is present in that area. This model is also used in the third phase of data association to fuse the detection and tracking results by to sending E-mail to respective faculty with stored image. The practical value of the proposed framework is demonstrated in real-life experiments that for High sensitive area where vehicle entry is prohibited.*

Key Words: Vehicle detection and tracking, HAAR cascade classifier, E-Mail reporting, Python language

1. INTRODUCTION

With the rising requirement of detection-based security and industrial applications mainly high sensitive area and in the automotive field, the vehicle detection and tracking in a fast and reliable manner has been attracting much scope and concern. Such high sensitive area like Mantralaya, Mumbai share market in this area vehicle entry is strictly prohibited but still some vehicles are not following instruction and keep entering in prohibited area so need to detect and track that vehicles and by storing their images and data we can punish them. Here to get the proof that vehicle really entered in this high sensitive area we introduce new proposed system as E-mail reporting to concern faculty with images.

2. BLOCK DIAGRAM

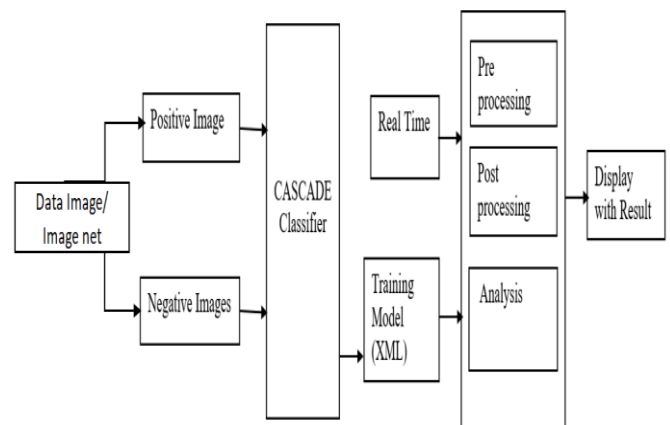Figure shows the Block diagram containing

Fig-1: Block Diagram of Vehicle detection and tracking for high sensitive area

3. WORKING PRINCIPLE

In proposed system we are detecting and tracking the vehicle for high sensitive area where Vehicle entry is prohibited, and we can give alert my E-mail reporting. Where we can identify any Vehicle, which is entered in High sensitive area where Vehicle entry is not allowed. After detection of the vehicle it tracks in the form several frames and after capturing right images with respect to trained model it is sending through E-mail to concern faculty as an alert. And this whole system using HAAR CASCADE CLASSIFIER.

4. HAAR CASCADE CLASSIFIER.

Haar Cascade is a machine learning object detection algorithm used to identify objects in an image or video and based on the concept of features proposed by Paul Viola and Michael Jones in their paper "Rapid Object Detection using a Boosted Cascade of Simple Features.
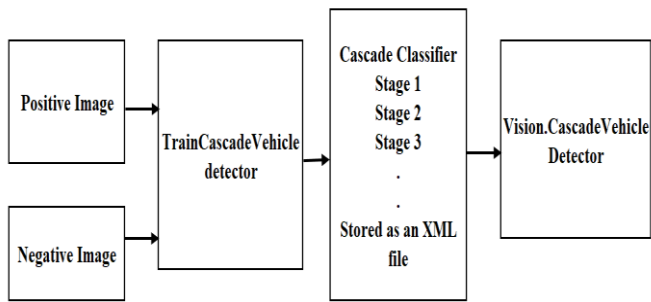
Fig 2: Block diagram of HAAR CASCADE Classifier

4.1 Positive image and Negative Image:

Those images contain images of object or Vehicle called as Positive Image and those images contain rather than image of object or vehicle called as Negative Image. Following Fig 3 shows the positive Images and Fig 4 shows negative images.

Fig 3- Positive Images

Fig 4 – Negative Images

4.2 Train Cascade Classifier:

There are total 6 Training Steps to Create a Haar-like Classifier.

1. Collecting Image Database
2. Arranging Negative Images
3. Crop & Mark Positive Images
4. Creating a vector of positive images
5. Haar-Training
6. Creating the XML File

4.2.1 Collecting Image Database:

All the member will receive eg. 200 positive and eg. 200 negative sample images for training. The positive images are those images that contain the object. Having more number of positive and negative (back ground) images will normally cause a more accurate classifier

4.2.2 Arranging Negative Images:

Put your background images in folder ..\training\negative and run the batch file create_list.bat

dir /b *.jpg >bg.txt

Running this batch file, you will get a text file each line looks as below

    image1200.jpg
    image1201.jpg

We need this negative data file for training the classifier.

4.2.3 Crop & Mark Positive Images:

In this step you need to create a data file (vector file) that contains the names of positive images as well as the locationof the objects in each image. You can create this file via two utilities: Objectmarker or Image Clipper. Before running the objectmaker.exe make sure you are relax and you have enough time to carefully mark and crop tens or hundreds of images.

4.2.4. Creating a vector of positive images:

In folder-\training\ there is a batch file named samples_creation.bat

The batch file loads info.txt and packs the object images into a vector file with the name of e.g. vehiclevector.vec and after running the batch file, you will have the file vehvector.vec in the folder-\training\vector

4.2.5 Haar-Training:

In folder -\training, you can modify the haartraining.bat

haartraining.exe -data cascades -vec vector/vector.vec -bg negative/bg.txt -npos 200 -nneg 200 -nstages 15 -mem 1024 -mode ALL -w 24 -h 24 –nonsym

Harrtraining.exe collects a new set of negative samples for each stage. And –nneg sets the limit for the size of the set. It uses the previous stages' information to determine which of the "candidate samples" are misclassified. Training ends

when the ratio of misclassified samples to candidate samples is lower than 500.

4.2.6: Creating the XML File:

After finishing Haar-training step, in folder-/training/cascades/ you should have catalogues named from "0" upto "N-1" in which N is the number of stages you already defined in haartraining.bat. Now we have own XML file.

Here we need train CASCADE CLASSIFIER only once and no need to create every time. Once XML file created that file we need to compare with real image for detection of vehicle.

4.3 Pre-Processing:

To get the result we need compare XML trained file to real image for that XML file should be in grey scale for accuracy. So Pre- processing operation is working that covering XML file in grey scale.

5. SOFTWARE IMPLEMENTION

Operating System: Python language, OpenCV Library, Anaconda software.

5.1 Python Language:

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance.

Python's standard library supports many Internet protocols:

1. HTML and XML
2. JSON
3. E-MAIL processing
4. Support for FTP, IMAP and other Internet protocol
5. Easy to use Socket interface

5.2 OpenCV Library:

OpenCV-Python is a library of Python bindings designed to solve computer vision problem solve computer vision problem. All the OpenCV array structures are converted to and from Numpy arrays. This also makes it easier to integrate with other libraries that use Numpy such as SciPy and Matplotlib.
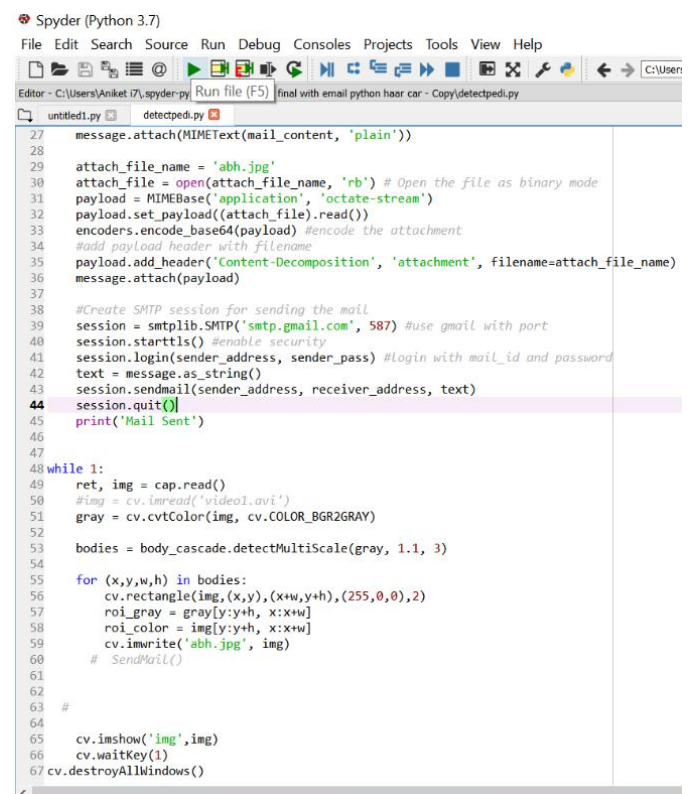
5.3Anaconda distribution:

Many scientific packages require a specific version of Python to run. It's difficult to keep various Python installations on one computer from interacting and breaking, and harder to keep them up-to-date. Anaconda Distribution makes management of multiple Python versions on one computer easier, and provides a large collection of highly optimized, commonly used data science libraries to get you started faster.

6. PROGRAMMING -PYTHON

Below Python program is used to detect the Vehicle by given input

7. RESULT /OUTPUT

This system detecting and tracking the vehicle for high sensitive area where vehicle entry is not allowed for security purpose by using the HAAR Cascade classifier. Where we are detecting the positive images of the object by this classifier and Having more number of positive and negative images will normally cause a more accurate classifier and this Cascade classifier having many features to collect the positive and negative images and hence we are getting more accuracy. So that we can detect the Vehicle and track as shown in fig . By using SMTP program we send E-mail to current faculty with captured image.
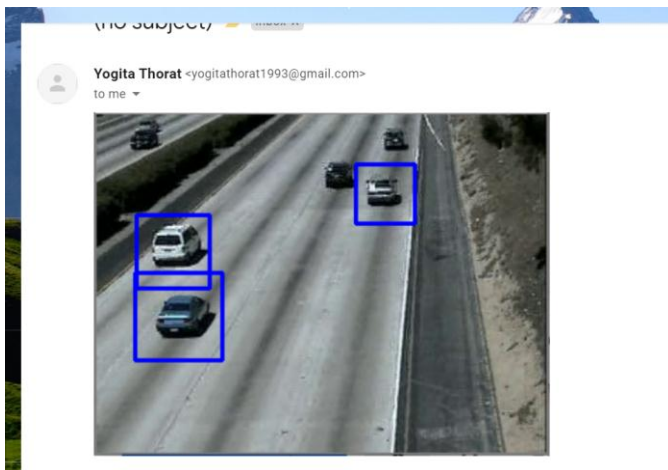
8. CONCLUSION:

The proposed system is designed to detect and track the vehicle of Sensitive area where the vehicle entry is prohibited, and which will give more security and safety.

This system detecting and tracking the vehicle for high sensitive area where vehicle entry is not allowed for security purpose by using the HAAR Cascade classifier. Then by using SMTP program we send E-mail to current faculty with captured image.

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