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ON ROAD VEHICLE DETECTION AND CLASSIFICATION USING HAAR FEATURES

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ABSTRACT *- Traffic is one of the key problems in tremendously populated countries. Vehicle detection procedure on street is used for automobile tracking, counts, common pace of every person automobile and site visitor's analysis. In this paper, the vehicle data aggregation process is proposed using Haar cascade algorithm also the vehicles are detected based on the Boosting techniques. The learning of the system is performed on a set of Positive Images (Vehicle) and Negative images (non vehicle) and the test is done on another set of scenes. The advantage of this classifier is that, it uses floating numbers in computations and hence, 20% more accuracy can be achieved in comparison to other classifiers and features of classifiers such as LBP (Local Binary Hence the proposed system consists of vehicle detection and it is evaluated by using real data, collected from a single camera.*

Key Words: Data aggregation, Haar cascade, Boosting Technique, Classifier.

1. INTRODUCTION

Vehicle identification from the video and data set creation are highly important to develop an intelligent traffic system. A video analyses technique is employed in this work with the help of Haar Cascade classifiers which contains list of states and each of them contains a list of weak learners. The features train those cascade functions from lots of positive and negative images. It reduced complexity of feature calculations in images as RGB pixel values whereas methods used in other photogrammetric imageries were computationally expensive.

Major assist of Haar like functions is its calculation speed. It can use integral images and can be processed in constant time. It takes 60 microprocessor instructions for a 2- rectangle feature, approximately.

1.1 Vehicle Detection System

Vehicle utilization is growing daily because of growing of population in the world. It has been a prime assignment to manipulate the traffic through traffic signal management system. The vehicle tracking, detection, and traffic analysis are the supporting setup which will help for traffic management system. In the vehicle identification and traffic data set analysis, many research works are going on in the world. These two major works support traffic automation process through various intelligent algorithms. There are algorithms in image processing, deep learning to identify the vehicles from the snap shots and videos, machine learning algorithms are used to investigate the visitor's facts set.

1.2 Haar Feature Selection

It is a system learning-primarily based method where in a cascade feature is skilled from a lot of positive and negative samples. It is then used to stumble on gadgets in different images. A Haar-like function considers adjoining square areas at a selected place in a detection window, sums up the pixel intensities in every place and calculates the distinction among those sums.

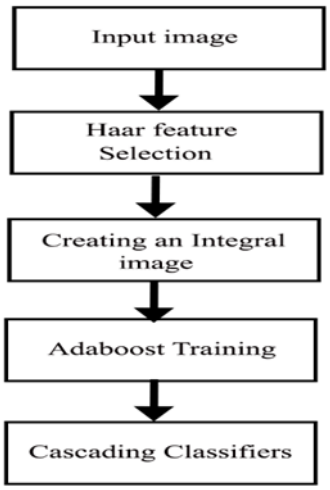


Fig-1 Architecture Diagram

The training steps to create a Haar-like classifier is shown in Fig-1. An input image contains the Collection of Positive and negative samples. The haar feature selects the set of training stages based on the classifier aspect ratio. In order to construct a strong classifier, the Adaboost training will be performed. In this algorithm,

each cycle of boosting a feature among all other potential features is selected. After the training completed the cascade classifier will generates the xml file. Based on this xml, the detection will be done.

2. LITERATURE SURVEY

2.1 Moving Vehicle Detection Using Adaboost And Haar-Like Feature in Surveillance Videos

Vehicle detection is a generation which its intention is to discover and display the car length in virtual images. In this generation, cars are detected in presence of different such things as bushes and buildings. It has an essential function in lots of laptop imaginative and prescient programs which include car tracking, reading the site visitors scene and green site visitors management. In this paper, cars detected primarily based totally at the boosting approach via way of means of Viola Jones. Our proposed gadget is examined in a few actual scenes of surveillance movies with unique mild conditions. The experimental consequences display that the accuracy, completeness, and pleasant of the proposed car detection technique are higher than the preceding techniques (approximately 94%, 92%, and 87%, respectively). Thus, our proposed method is powerful and green to locate cars in surveillance movies and their programs.

2.2 Real-time detection of vehicles using the Haar like features and artificial neural networks

In this document, a vehicle detection tool is presented. This system is based on two algorithms, a descriptor of the photo kind haar-like, and a classifier kind synthetic neuron network. In order to make certain rapidity with inside the calculation extracts functions via way of means of the descriptor the idea of the essential photo is used for the illustration of the photo. The learning of the tool is finished on a difficult and rapid of positive images (vehicles) and terrible images (non-automobile), and the test is done on another set of scenes (positive or negative). To deal with the overall performance of the proposed system by varying one element among the determining parameters which is the number of neurons in the hidden layer; the effects received have proven that the proposed device is a quick and sturdy automobile detector.

2.3 Applying the haar-cascade algorithm for detecting safety equipment in safety management systems for multiple working environments

There are many ways to maintain the safety of workers on a working site, such as using a human supervisor, computer supervisor, and smoke–flame detecting system. In order to create a safety warning system for the working site, the machine-learning algorithm—Haar-cascade classifier—was used to build four different classes for safety equipment recognition. Then a proposed algorithm was applied to calculate a score to determine the dangerousness of the current working environment based on the safety equipment and working environment. With this data, the system decides whether it is necessary to give a warning signal. For checking the efficiency of this project, three different situations were installed with this system. Generally, with the promising outcome, this application can be used in maintaining, supervising, and controlling the safety of a worker.

3. PROPOSED SYSTEM

This system proposes the following training steps to create a Haar-like classifier.

- Collect Dataset – Positive and Negative
- Create a folder P with Positive images
- Create a folder N with Negative images
- Use the Haar trainer GUI to train
  - Specify the path
  - Set the stages
  - Set the width and Height
  - Set the Boost type
- Create a cascade xml file

3.1 Dataset Collection

Positive images – It contains what we detected in an image or video.

Negative images- Any image will do, just make sure the object is not present in them.

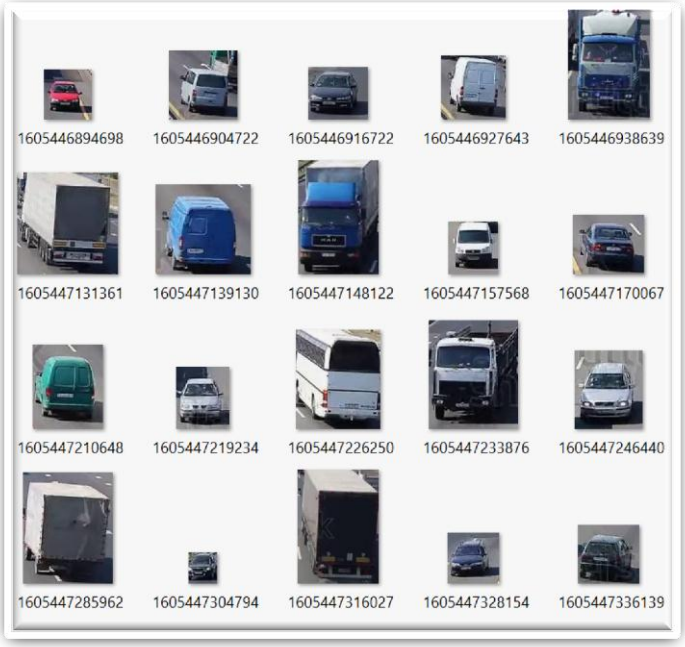


Fig-2 (a) Positive Images

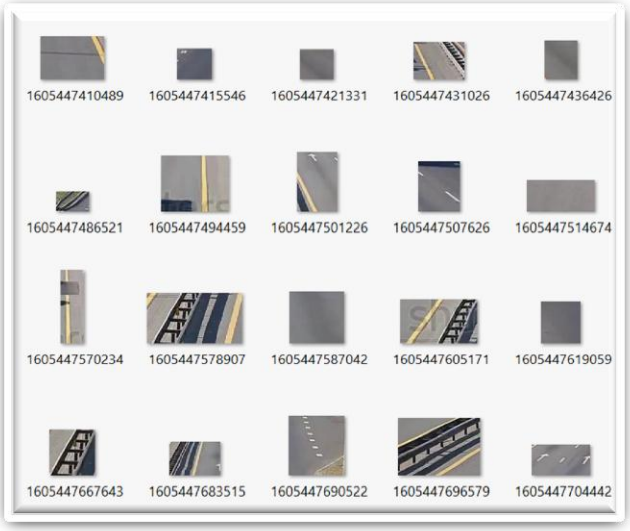


Fig-2 (b) Negative Images

3.2 Haar Training

Here, the training will be done by cascade trainer GUI. This GUI sets the specify path and allocate the number of stages for the training. Next to set the sample width and height. Make positive now no longer to set it to a completely massive length as it will make your detection very slow. Also set the characteristic kind to HAAR or LBP. Make positive to apply HOG most effective when you have OpenCV 3.1 or later. HAAR classifiers are very correct however require plenty greater time to teach so it is much wiser to use LBP if you can provide your classifiers with many samples.

```
***************************************************
************ TRAINING CLASSIFIER ****************
***************************************************
Running : opencv_traincascade
PARAMETERS:
cascadeDirName: E:\priya gct\Projects\haar1\classifier
vecFileName: E:\priya gct\Projects\haar1\pos_samples.vec
bgFileName: E:\priya gct\Projects\haar1\neg.lst
numPos: 16
numNeg: 500
numStages: 15
precalcValBufSize[Mb] : 1024
precalcIdxBufSize[Mb] : 1024

acceptanceRatioBreakValue : -1
stageType: BOOST
featureType: HAAR
sampleWidth: 24
sampleHeight: 24
boostType: GAB
minHitRate: 0.995
maxFalseAlarmRate: 0.5
weightTrimRate: 0.95
maxDepth: 1
maxWeakCount: 100
mode: BASIC
Number of unique features given windowSize [24,24] : 162336
```

Fig-3 Training Cascade Classifier

3.3 Creating the xml file

After finishing the Haar training, the new files and folders are created in the classifier folder. classifier folder contains XML files that are created during different stages of training.

```
<?xml version="1.0"?>
- <opencv_storage>
  - <cascade>
      <stageType>BOOST</stageType>
      <featureType>HAAR</featureType>
      <height>24</height>
      <width>24</width>
    - <stageParams>
        <boostType>GAB</boostType>
        <minHitRate>9.9500000476837158e-01</minHitRate>
        <maxFalseAlarm>5.0000000000000000e-01</maxFalseAlarm>
        <weightTrimRate>9.4999998807907104e-01</weightTrimRate>
        <maxDepth>1</maxDepth>
        <maxWeakCount>100</maxWeakCount>
      </stageParams>
    - <featureParams>
        <maxCatCount>0</maxCatCount>
        <featSize>1</featSize>
        <mode>BASIC</mode>
      </featureParams>
      <stageNum>5</stageNum>
    - <stages>
          <!-- stage 0 -->
       - <_>
          <maxWeakCount>2</maxWeakCount>
          <stageThreshold>-1.4465028047561646e-01</stageThreshold>
        - <weakClassifiers>
          - <_>
              <internalNodes> 0 -1 12 5.0786286592483521e-02</internalNodes>
              <leafValues> -9.8409545421600342e-01 8.4615385532379150e-01</leafValues>
            </_>
          - <_>
              <internalNodes> 0 -1 10 4.0405474603176117e-02</internalNodes>
              <leafValues> -9.6850550174713135e-01 8.3944511413574219e-01</leafValues>
```

Fig-4 XML Files

4. EXPERIMENTAL RESULTS

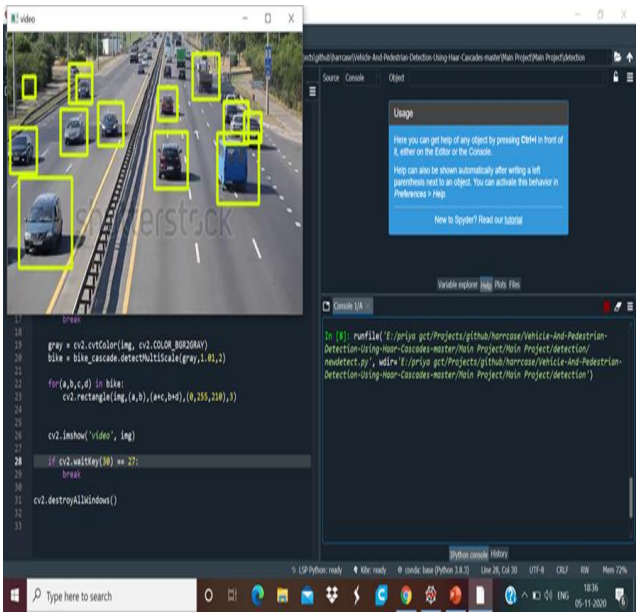
In order to evaluate the vehicle detection results, numerical accuracy assessment has been done by comparing the LBP and Haar classifier.

4.1 Reduction of false Alarm rate

Table-1 False Alarm Rate

Feature type	Stages	False Alarm Rate
LBP	Stage -0 Stage-1	0.183 0.098
HAAR	Stage-0 Stage-1	0.032 0.021

Thus, the cascade xml classifiers will be used for detection in images and videos.



Figu5 Vehicle Detection in Video

5. CONCLUSION

In this paper, proposed a real-time method for detecting numerous automobiles that is primarily based at the haar cascade Adaboost algorithm. This system involved detection of objects which was accomplished by the detect Multi Scale, the important parameter of this command is the scaling factor which plays an important role in avoiding false detection and miss detection. It can also use the obtain results in other computer vision application such as registering the driving violation and vehicle plate registration or other related aspects of complex systems.

6. FUTURE ENHANCEMENT

If greater paintings have been to be performed in this venture the primary precedence might be to expand higher classifiers, selecting a bigger object, have greater samples and use greater superior feature (now no longer handiest up proper ones). This can be performed with a bit effort. An opportunity technique to enhance the popularity robustness of the cascade classifier, is to look at optimizing an implementation of a YOLO detection algorithm.

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