VEHICLE MODEL RECOGNITION

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ABSTRACT: Machine learning is of great use in developing the tools that automatically detect and recognize the items in like cars, animals, humans etc. Recognizing the model of the vehicle is the sole aim of this paper. This paper represents an approach to recognize the model of a vehicle from CCTV footage from various angles. Vehicle model recognition system uses various methods with the quality of being new and original, where temporal processing is used to improve the reliability. The model of the vehicle is recognized from the frame of CCTV footage by any angle (front, back, side). Python programming is used for better understanding of logic and for ease of use in further design and implementation. This VMR design is divided into two phase where one phase deals with model detection of vehicle from side angles using machine learning algorithms based on design of vehicles, whereas the other phase deals with the model detection from front and back views of a vehicle which will detect the number plate and recognize the registration number of that vehicle which uses pattern recognition algorithms. The vehicle recognition can be done more accurately & with more accuracy nearly 100% when both phases are combined.

KEYWORDS: VMR, machine learning, pattern recognition.

1. INTRODUCTION

Vehicle Model Recognition system from a live CCTV footage is a new area of developing for enhancement in the traffic surveillance. Normally, an image of a car is taken from the front or back view where the numbers plate exists and the model of vehicle is recognized. What if the number plate is forged? This may create a problem for the traffic surveillance people. Thus, this paper suggests a solution to recognize the vehicle model from side view, front and back. This system will recognize the model of vehicle in 2 ways. One way is through side views based on design of vehicle and the other way is through number plate detection from front or back views.

For Example, The number plate recognized will carry a vehicle registered number. This number will be stored in the database of the RTO (Road Transport Office) in India. This number will be checked, model and the owner details of the vehicle is known. If the model through number plate and side views are same then, no number plate forgery has occurred, else, it has. The tracking of the vehicle in an event of crime will be improved and enhancement of the surveillance security can be achieved. To make this happen, various algorithms and modules are used for pattern recognition and for machine learning concepts. Python programming language is used for developing of this system as it reduces the difficulty in coding and its ease of use in developing and implementation.

2. LITERATURE SURVEY

In [1], the author presents a striking approach to recognize the make and model of the vehicle from an CCTV footage. Since, the CCTV cameras are not effectively configured for VMR tasks, as vehicles are captured at different angles, to remove the skews of the vehicles detected from CCTV footages effectively; the author makes use of Coherent Point Drift (CPD). Here, the author also proposes the use of Region Of Interest (ROI) segmentation.

In [2], the author presents a 2- stage framework for a VMMR task that uses multiple instance learning for fine classification of the vehicles. In the first stage, the solution is in constraining the high dimensional instance space, by selecting the most informative clues of given visual category. In second phase, vehicle manufacturer logo is detected for images classified with low confidence in first phase to verify the output of the system.

In [3], the paper presented by the author aims to extract image frames from a streaming CCTV footage, recognize the vehicle number and convert it into its corresponding text format. Template matching has been earlier used in recognition of digits and letters, this paper also uses the concept of template matching methodology using a SIMULINK model in MATLAB which is developed to extract the vehicle number from number plate.

In [4], the author presents the system for vehicle detection, tracking and classification from the footage of CCTV by categorizing them into four different groups: Cars, Vans, Bikes and Buses. To deal with sudden illumination changes and camera vibration a new background Gaussian Mixture Model (GMM) and shadow removal model have been used.

As seen the above all methods, the new method of recognizing the vehicle from side view is developed and cross checked with its number registered on number plate. Vehicle model recognition system is developed with more accuracy by implementing few methods as discussed in above papers.

3. PROPOSED SYSTEM

3.1: SYSTEM REQUIREMENT SPECIFICATION

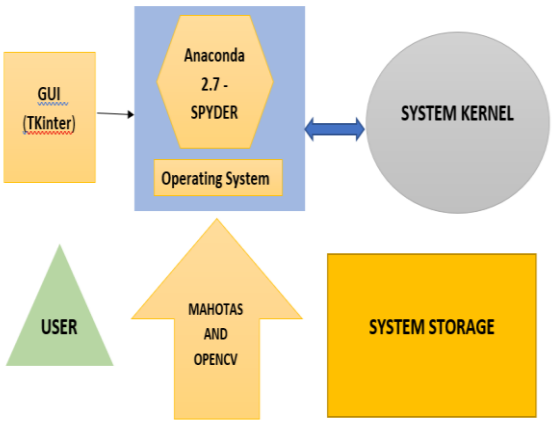

Figure 3.1: System configuration requirements

GUI is a desktop app which helps you to interact with the computers. They are used to perform different tasks in the desktops, laptops, other electronic devices, etc..

Tkinter is the Python interface to the Tk Graphics User Interface toolkit provided along with Python.

Anaconda is widely used to:

- Collect data from files, databases, and data lakes.
- Manage environments with Conda along with all package dependencies.
- Share, collaborate on, and reproduce projects.
- Deploy comes into production with one click of a button.

Spyder is cross-platform integrated development environment (IDE) which is an open source for scientific programming in the Python language. Spyder has a number of different packages in its stack, like NumPy, SciPy,etc.

Mahotas is a computer vision and image processing library for Python.

OpenCV (Open Source Computer Vision) library is an software that helps users in machine learning and computer vision. It was built to provide an infrastructure for applications which uses machine learning and computer vision.

3.2: SYSTEM DESIGN

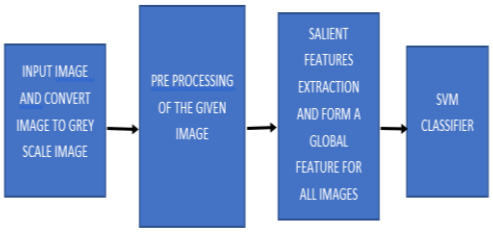

Figure 3.2: System Architecture

Datasets which are arranged in folders, each folder holding the name of the monument whose images it contains. We iterate through the folders understanding features of each image, along with their label. The three features which we extract are,

- Histogram
- Haralick
- Hu moments

First step that happens in the development of the project is, it converts the video footage into the frames. Second step is that the system gathers the vehicles detected from the frames and detects the vehicle type from frames. From side view, machine learning concepts are used to recognize the vehicle and from front and back view, pattern matching algorithms are used. Final step is that the system must check whether the model of the vehicle detected from both the steps are same or not, to ensure higher accuracy.

3.3: SYSTEM TESTING

Machine leaning model is used for testing the test images. The images were subjected to image pre-processing which included noise removal and colour transformation. Further the image was subjected to segmentation where the image features are extracted and combined to form the global feature. Each image will have a unique global feature which is stored digitally over a .py file for comparison in future for monument detection. Based on the feature the SVM classifier is used for classification and Recognition of the Vehicle Model. In order to detect the type of vehicle we are using opencv HOG descriptors and SVM classifier, you need to first train the classifier. In broad terms, you will need to complete the following steps:

Steps Performed:

Step 1:

Collected some images in order to train the images of the vehicles you want to detect (positive samples). Also we need to collect some images with no objects of interest (negative samples).

Step 2:

Once the images are collected, they were converted into specific size that is (256x256) and a specific format (.JPG), and store them according to their name in different folders

Step 3:

Once done data is collected and rearranged, and the execution takes place referencing the path of our dataset, features of all the images are collected and stored in h5 format, collected from the other end and svm algorithm creates an finalized model .

Step 4:

Finally the user interface gives excess to choose a image and trained system predict the model of the vehicle.

Example:

The demonstration of how the model of the vehicle is detected from an cctv footage from different angles, according to the two phases discussed.

Phase1:

This is an Innova.

Phase 2:

By combining the phase 1 and 2, we are able to get the real accurate model of the vehicle.

3.4: RESULTS

Vehicles are detected and their model is recognized wilt almost 100% accuracy when both phases of this system, as discussed are combined.

CONCLUSION AND FUTURE WORK

The project presents a method for recognizing the model of the vehicle. The proposed new method relies mostly on Machine learning algorithms and SVM classifier for extracting representations and detecting the vehicle model. The experiments performed proved the importance of using many images of vehicle model as the datasets, to build an effective vehicle model recognition system. It was seen that performance of model increased with mean shift algorithm and as the number of images trained increases, the better results can be obtained. The entire system was tested, by providing the images of the vehicles in the beginning as training datasets. Finally, this system provides the potential for classification of vehicle mode almost better than human surveillance. In addition to this the Graphical User Interface added an attractive way of representing data. Further developments can be done for better security in surveillance systems. The algorithm needed for this project is developed completely which will detect the model of a vehicle (Ex.Innova). More vehicle model detection can be done by having more vehicle model data. More probability is achieved in detection of a vehicle models.

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