Implementing Cloud Based Anti-Vehicle Theft System using Computer Vision

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Abstract

A cloud based anti-vehicle theft system using computer vision in the cloud uses license plates information to identify the theft vehicles. To use this service, the users have to first register their personal information and their vehicle data with this system to track their lost vehicle. The objective of this paper is to develop an efficient automatic vehicle tracking system which is useful for people if their vehicle is lost. The system continuously retrieves information from surveillance, tollbooths and traffic signals
For vehicle tracking, the license plate images are retrieved from videos captured. Then the image is segmented, object is detected matching the information with the data stored in the cloud. its help the vehicle owner and the police to locate the vehicle.

Keywords: *Image Capturing, Object Detection, Object Classification, Image Similarity, Visual Recognition*

1. Introduction

Computer vision is associated with scientific field that deals with how computer can achieve high level understanding from digital picture or videos. In computer engineering the tasks are atomized without human intervention. Indeed, using computer vision processing analyzes and then understands the digital image from which it extracts the high dimensional knowledge required to solve any problem. With this knowledge it can give a numerical or symbolic information used to provide solutions.

In this paper, the license plate image captured using camera or with any captured image under surveillance are transformed into visual images. Their descriptions are stored to an appropriate action. The image understanding is ultimate which is more concerned with computer vision, when exact information of the image from the video sequence or multiple cameras is retrieved. In this application, we would choose to process the vision of the video limiting the data upload only with the license plate image instead of loading the complete videos or storage space of all the videos may be expensive even in the cloud with respect to this application. Filtering aggregates videos captured from multiple camera.

2. RELATED WORK

There are many who implemented edge detection methods to identity points in an image at which the brightness change or discontinuities. The edges termed as group of curved line segments are identified in this techniques [4] [5].

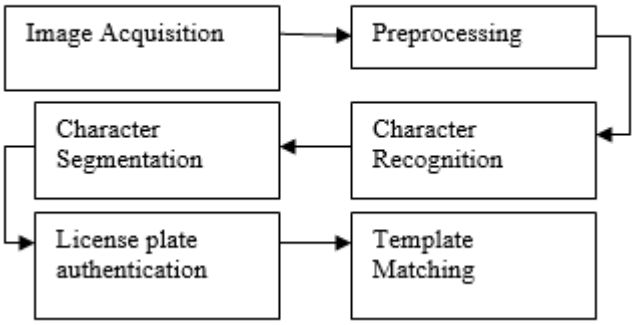

Fig 1: Basic steps for license plate recognition

3. PROPOSED SYSTEM

In the cloud based anti-vehicle theft system, computer vision comes into picture in extracting the required information from image and capturing knowledge from multiple video sequences. Their information is matched with the original information which is actually stored in the cloud database.

We assume that the vehicles owner register their data initially to use this system. The cloud database storage allowed this project to be implemented in a better manner. In this paper, the owner of vehicle who are likely to use this anti vehicle theft system anywhere need to register into this system entering their personal data and their vehicle details which is stored in the cloud. To track their vehicle this will be useful. There are several benefits offered by cloud computing to computer vision. There is on demand access of computational power and storage with the cloud. All the computer vision algorithms can be accessed. The simple APIs for creating and running applications using computer vision are available. They are used to implement this proposed system.

For vehicle tracking, the license plate images are retrieved from the video captured. Then the image is segmented, object is detected and then classified. Image similarity is detected matching the information with data stored in the cloud. It helps the vehicle owner and the police to locate the vehicle.

The stages involved are:

1. Image Acquisition
2. Object Detection
3. Image Extraction
4. Image Segmentation
5. Image Recognition

1. Image Acquisition

As the vehicle will be moving on road, special cameras are used to capture the images to avoid blur caused by motion of the vehicle.

2. Object Detection

To detect the objects in the image i.e., to detect the license plate Canny Edge detection technique is used. This is a mathematical method which organizes the digital image into curved line segment sets termed as edges. Every pixel has a property called edge that is calculated or an image function behavior with a neighbor pixel. Canny edge detection technique initially smoothens the image by convolving the image with a Gaussian of a sigma value that is given. The derivation of the smoothed image in x and y direction are computed. There values are used to calculate the gradient magnitude of the image. Then the non-maximum suppression process is performed which suppress the pixels to a local maximum. Finally, the hypothesis operation is performed in which the pixels are considered as either edges or non–edges or in between depending upon the computed threshold values. The result is a binary image.

3. Image Extraction

In this step the features of the image are extracted transforming the inputs image into a set of features which involves in reducing the size of the input image to be processed. The color, texture and shape features will be extracted.

4. Image Segmentation

In segmentation the image is partitioned into multiple segments which simplifies the image representation makes it easier to analyze. The objects and boundaries in images can be easily located. The color, texture and intensity characteristic can be extracted.

5. Image Recognition

To identify and detect a feature or an object in a digital image, the process of image recognition is used. There are many number of image recognition algorithm existing

License plate detection using color and shape features:

In the image captured, the licensed plate has to be detected and extracted. To find the location of the license plate on the digital image we can use the edge features, color features, shape features and other features.

1. **Edge features:** Canny edge detection algorithm is used so that the license plate region is retrieved. This region has more than one character.

2. **Color features:** License plate has three colors white, black, yellow and also black characters on white background or yellow background.

3. **Shape features:** License plate is rectangular in shape with an aspect ratio of certain proportion.

4. **Other features:** Other features such as the license plate frame features and its statistical feature are to be considered.

BASIC ARCHITECTURE OF THE PROPOSED SYSTEM

The proposed system can be implemented using characters of the license plate to be retrieved using the above method explained and compare them with the registered details

stored in the cloud server. This system can be used at check posts, traffic signals and toll booths to easily identify the theft vehicle. The reason to store the data in cloud is to make the police to identify the vehicle outside the state also. As data in the cloud can be accesses anywhere in the world with a high end internet. The cloud provides an environment with high data storage space, elastic resources on demand, specialized user applications and high end computing power.

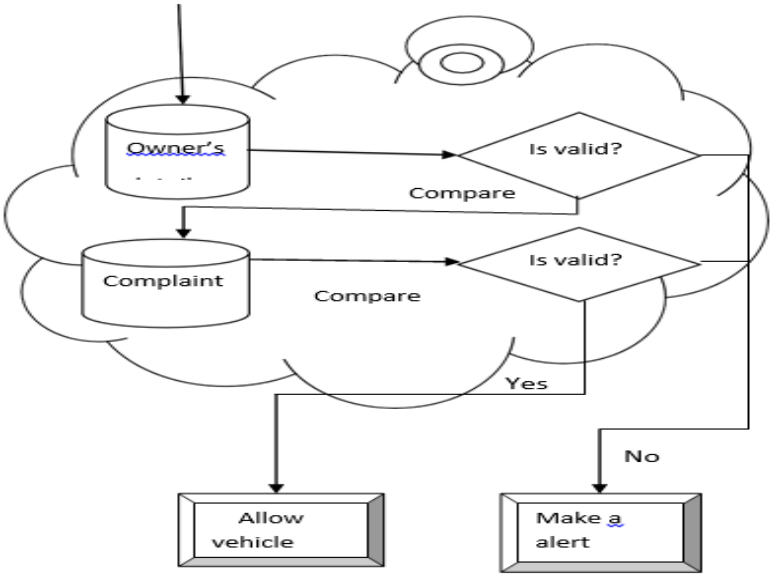

Fig 2: Proposed Architecture

4. SIMULATION AND EXPERIMENTAL RESULTS

The proposed solutions have been implemented using Matlab considering a sample video downloaded. The vehicles are detected and license plate is captured. To initially store the registered data the data is stored with Amazon S3 which is likely to be retrieved whenever on need and comparison is made with the obtained data and retrieved data.

5. CONCLUSION

With the improvement in technology, there are tools, libraries and many frameworks for cloud based software for improvement in developing a faster approach in resolving the problem finding the lost vehicle quickly. The theft of the vehicles is becomes a major issue day by day. Based on this method the theft vehicle can easily be caught. The vehicle details are stored in the cloud server. These details can easily be stored and retrieved by the RTO officer getting connected to this server for which the information is available during the vehicle registration time. The license plate information which is retrieved from the image captured can be matched with the data stored in server. So we can easily tell where the vehicle is found and from which place to other place it is moved.

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