International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 03 | Mar 2021 www.irjet.net p-ISSN: 2395-0072

Vehicle Theft Detection in Video Stream

Ashwini Patil[1], Dr. K R Sudhindra [2]

[1]*M. Tech student, Dept. of ECE, BMS College of Engineering, Bangalore, Karnataka, India*
[2]*Associate Professor, Dept. of ECE, BMS College of Engineering, Bangalore, Karnataka, India*

Abstract - *The main applications of the Intelligent Transport System (ITS) are vehicle detection, monitoring, and face recognition, which play an important role in traffic surveillance. There is a rise in the quantity of vehicles in the current era, as is the sum of auto theft efforts, nationally and internationally. With the introduction of burglary techniques, car owners are fearful of having their cars stolen from the popular parking lot or from outside their homes. The proposed framework which comprises of an optical flow method with a gaussian mixture model (GMM) to obtain an absolute shape of particular moving objects which improves the detection performance of moving object. Optical flow calculates the intensities of moving pixels and calculates the optical field flow which is combined with foreground object after the background subtraction by GMM to obtain better results. The extracted face is then recognized using the improved local binary patterns algorithm, which compares the extracted image with the database to verify whether or not the individual is an authenticated driver. This project aims to achieve the vehicle detection, movement as well as face recognition in parking areas.*

Key Words: *Optical flow, Local Binary Pattern, Gaussian Mixture Model*

1. INTRODUCTION

In today's international situation, safety and particularly the safety of cars in common parking spaces have become a major concern. The identification of theft in cars has become a big problem, so we have been surveyed that almost 30 percent of the car has been stolen last year. This is due to the person's consciousness, so we have developed a system for theft detection. In our day by day life, bunches of vehicles get taken and following them is a difficult task. It is very tedious and no certain outcome is gotten. Regardless of whether we use GPS beacons, they can be easily removed and we need a legitimate strategy for it.

Because of the expansion of population the utilization of vehicles is expanding step by step both in created and creating nations which have prompted an increment in the quantity of vehicles on highways and messing traffic problems, for example, blockage and extreme street mishaps. In two modes, namely auto and manual, the control of the vehicle system can be maintained. In vehicle security framework, the main objective is to design the automatic system to control vehicle robbery using image processing.

The measurement of vehicle identification has been isolated into procedures focused on presence and motion. The appearance-based processes use the highlights of appearance such as the form, coloring and surface of the vehicle to identify or distinguish the vehicle from the foundation, while the movement-based approaches use the moving trademark to identify vehicles from the image of the fixed foundation. Surveillance systems frameworks have become less expensive and better due to the expansion in the capacity abilities, computational force and video encryption calculations. The recordings put away by these observation frameworks are commonly examined by people, which is a tedious errand. To defeat this issue, the need of the programmed video based reconnaissance frameworks has expanded in the field of PC vision. Reconnaissance cameras are introduced on the public structures, on roads, home, interstates, in parks and public transportation vehicles to identify the wrongdoing. These frameworks may screen and additionally track individuals, vehicles, machines, risky conditions, and so on.

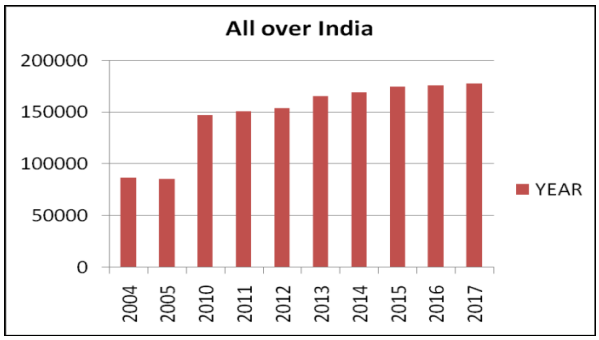

Figure 1. Statistics on car stealing

There is exponential development in quantities of vehicles on street just as in quantities of vehicle burglary cases. As per some details, four vehicles were taken from Delhi consistently in 2017, with the all out number of such thefts ascending to more than 39,000 from 36,702 in 2016. Out of the 39,080 vehicles stolen last year, just over 10% (4053) were recovered by police stated in a report by Hindustan times.

Annual crime statistics for a minimum of 10 years indicate that the absolute number of criminal cases registered in Delhi is the absolute number and the supply of complete cases reported throughout India have gradually increased from around 50,000 cases (2.4% of all instances in India) in

2009 to 249,000 cases (7.9% of all instances in India) in 2018.

2. LITERATURE SURVEY

2.1 Real-time vehicle theft detection and prevention system based on image processing.

Author provided a brief introduction to the detection of vehicle theft using hardware and software setup. They defined the reason for using algorithms for DCT normalization and background cancellation. Later, they provided the information about software, Setup of hardware along with facial identification and system of recognition using principal component analysis. This system detects the vehicle theft detection and verifies whether or not he is an authenticated driver, it then compares his or her face with the database. The alarm will ring and the 'Vehicle in Danger' alert will be dispatched to mobile owners if the driver is not licensed.

2.2 Raspberry Pi based intelligent car anti-theft framework by face recognition using GSM and GPS.

Author addressed the detection of intelligent car theft using GSM and GPS. They have implemented a low-cost smart car safety system architecture consisting of a Face Recognition Subsystem, a GPS (Global Positioning System) module, a GSM (Global Mobile Communications System) module and a control platform. This system will continuously track the moving vehicle and report the vehicle's status to the owner for theft control. . These protection systems minimize complexity and boost efficiency, often much cheaper and smarter than conventional ones, but because of experimental results it takes 6 seconds to detect one 320 * 240 color jpeg image and cannot be enforced on real-time detection.

2.3 Real time car parking system *using image processing*.

Author has given brief introduction about car parking lots in traffic and civilian applications. They proposed system which counts the number of parked vehicles and also, identifies the available stalls in parking area. He has specified the reason for using automatic parking information and guidance system. Because of the basic machinery, this scheme is inexpensive and easy to install. Through the guidance information monitor, drivers can get valuable real-time parking lot data from this device.

2.4 Real-time object *detection and classification using a static camera.*

Author explored a device capable of detecting and classifying people and vehicles outdoors using a static camera under various environmental conditions. Multiple cameras are used to view the scene from various angles to maximize the accuracy and robustness of the system's object tracking and classification. A vision-based system is shown to track complex objects and identify them. This is used in monitoring for public safety, traffic management and study of pedestrian flows. In various weather conditions, the suggested device can deal with occlusions and gives good results over multiple artefacts.

3. METHODOLOGY

The proposed system combines vehicle detection and tracking techniques, biometric techniques for effective surveillance design and vehicle safety alert systems. The main objective of the proposed system is to track the vehicle's movement and to recognize the faces of seasoned offenders. Proposed vehicle protection system as shown in fig.2.

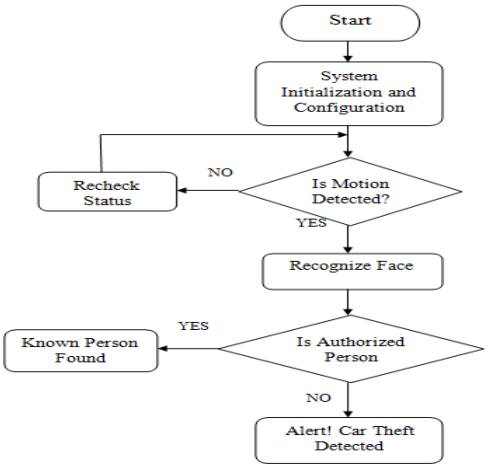

Figure 2. Flowchart of the proposed protection system for vehicle

The proposed vehicle security system uses MATLAB as environment to detect fraud in real time video streaming. System starts by clicking button run which will start to preview video captured from webcam attached to the system. When the vehicle moves from parking area vehicle movement will be tracked using optical flow and GMM algorithm and also, driver face will be captured from the parking entry camera. After detecting the vehicle motion, next step is to validate the vehicle owner through face recognition technique. It includes matching the faces in the database with the input face. Using the enhanced local binary patterns algorithm, the extracted face that is test image is recognized; face images that compare the image to the database to verify whether or not the person is an authenticated driver. If driver is authenticated then output window shows the 'known person found and vehicle is safe'.

If the driver is not authenticated, a warning ring will be will be displayed in output window saying that 'Alert! Car theft detected'. This shows the sequence of events to the point where an alert is sent, starting from the intrusion case.

3.1 Gaussian mixture model

The model of the Gaussian mixture consists of a K Gaussian distribution mixture demonstrated by parameters such as mean (μ), weight (w) and variance (σ2). Gaussian mixtures are added to each frame by the proposed algorithm and convert images into binary images once they are colorful. The value 1 (black) is assigned to the corresponding image pixels that do not undergo any state changes, and the value 0 (white) is assigned to the pixels that undergo dramatic state changes. The positions of all the moving objects in the video can thus be created.

3.2 Optical flow

Optical flow is the observable motion of any object in a video between the back-to-back sequences of frames; it is induced by the motion of an object in a camera-related scene. The use of drift trajectories of moving objects over video is created by the optical flow method. In this method, the shallow speed and track of each edge pixel must be established. This system is basically monotonous. Using optical flow, the background motion illustration can be measured to offset the image of the background plane. Similarly, this method will interpret free motion as either a waiting flow or a flow to the picture slant, which is not predicted by the motion of the background plane. Even from the moving camera and moving background, this machine can perceive motion in video progression.

3.3 Blob analysis

Detection of the blob is one of the critical measures in distinguishing moving objects in video sequences. The moving entity in a scene is known, essentially. It works on a binary image and stands for Binary Large Object. In a binary image, there may be white patches which do not correspond to the actual object. These patches are attributed to the presence of excessive noise attributed to background movements. Thus, those blobs that fulfill the features of moving objects are considered and all remaining unwanted blobs are discarded. This is achieved by putting a threshold on the blob's size and aspect ratio. The size is the blob's total associated pixels. The aspect ratio is the height to the blob's width ratio.

4. COMBINING GLCM AND LBP

Most of the datasets of the face images contains gray scale images. There are two non-minutiae features such as Gray Level Co-occurrence Matrix (GLCM) and Local Binary Pattern (LBP) offer multiple advantages like being rotation invariant, free from gray scale invariance, robust to noise and small skin distortions. The benefits of using the local features in the representation of face recognition are that they are computed in the picture at many stages.

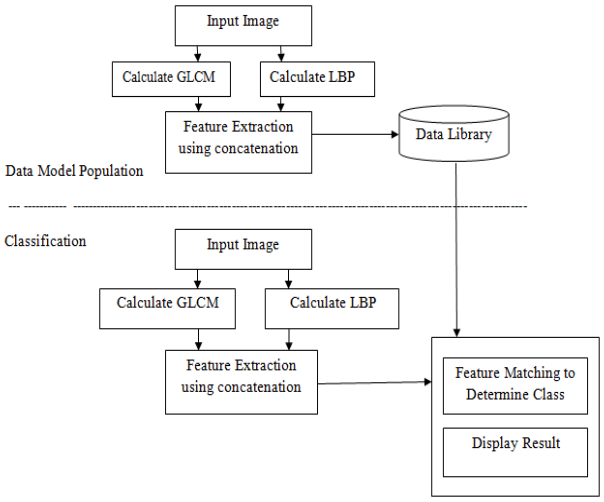

Figure 3. Classification flow using fusion features with KNN classifier

The flowchart of the combination of LBP and GLCM features with KNN classifier as shown in above figure. This includes two stages, such as the extraction phase of the functionality and the classification phase. Textural properties are extracted in the first stage in order to construct a model for each of the textures used in the training platform.

The image texture of the test sample is first analyzed in the second stage using the same technique used in the preceding step, then the extraction characteristics of the test image are compared with the train image using a classification algorithm and its class is determined. The features of input image are calculated using both the GLCM and LBP. Then both the extracted features are concatenated to generate final feature vector. The model library is populated with the features of training images of face recognition. Classification is carried out with and kNN classifiers.

5. RESULTS

The outcome of the identification of moving vehicles and user authorization has been shown in the below figures. The video input is 1036 kB in size and has a 15 frame / sec frame rate. The amount of original image sequences for training the background model is selected as 500 in this simulation, the threshold is selected as 0.038 and the variance is taken as (50/255)^2 to initialize the new Gaussian mode and the minimum blob area is taken as 250 and the maximum blob area is 3600.

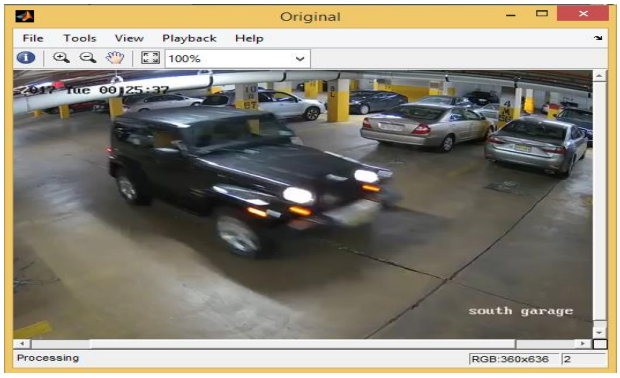

Figure 4. Snapshoot of original video frame

Here result of Gaussian mixture model with taken input video .avi format. With the GMM method, the foreground detects moving objects. The figure below describes the foreground of the moving object. Based on these changes taking place in the foreground, foreground detection distinguishes foreground from background. This extracted foreground is used as a reference foreground by the optical flow.

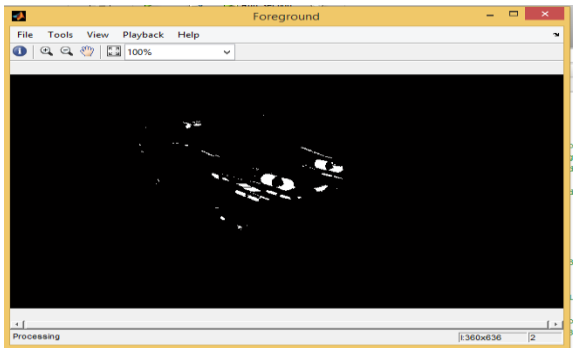

Figure 5. Foreground image

In order to eliminate noise, the video input is broken into pictures, and then filtering is done. The ratio between the area of blob and bounding box is computed if it is greater than 0.4 (40%), then the vehicle is detected. Fig. 7 shows the extracted foreground which is then detected by blob analysis. Finally green bounding box generated by blob analysis detects the moving vehicles.

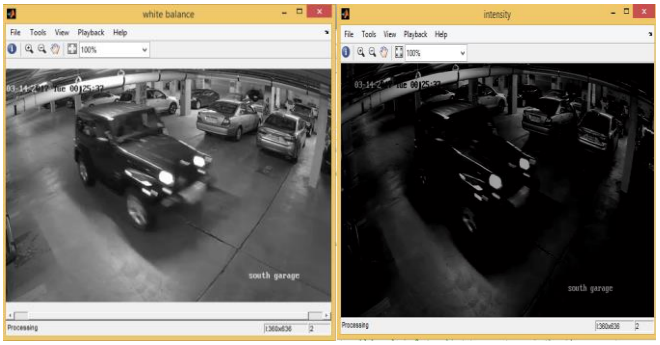

Figure 6. Grayscale of input video frames

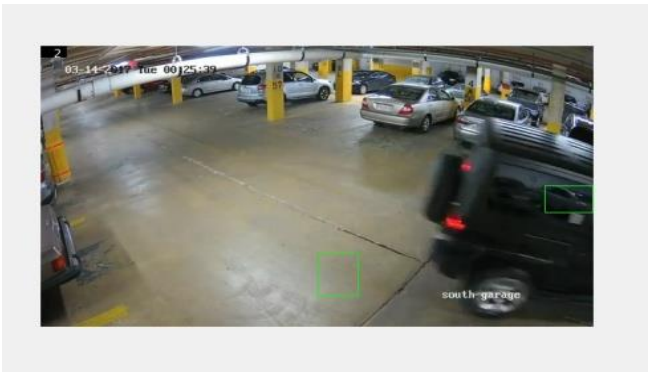

Figure 7. Output results of the input video frame

The database of the user as shown in below fig. 8. Here some of the vehicle owner family photos have been uploaded but one can make a database of as many photos as per his/her requirements.

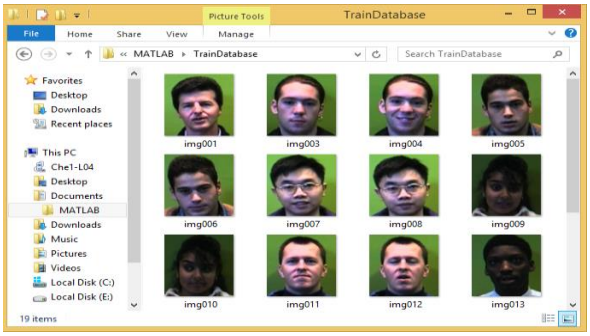

Figure 8. Database of the user

After detecting the vehicle motion next step is to validate the owner using face recognition, next it compares with database images that are train images. If it is not authenticated, it will display alarm rings and messages like "Alert! car theft detected" in command window.

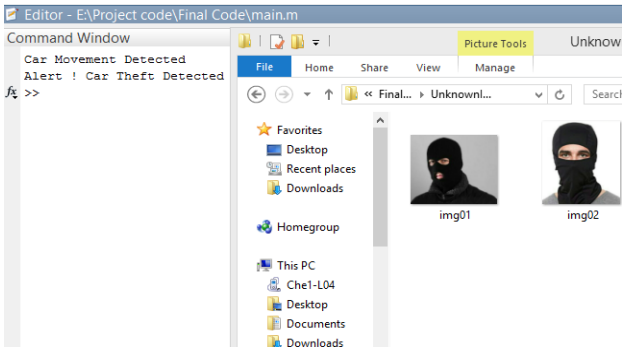

Figure 9. Face does not match with database

In Fig. 10 the user's face can be seen recognized as per the database and once it is recognized the system shows “known user found” as shown in figure.

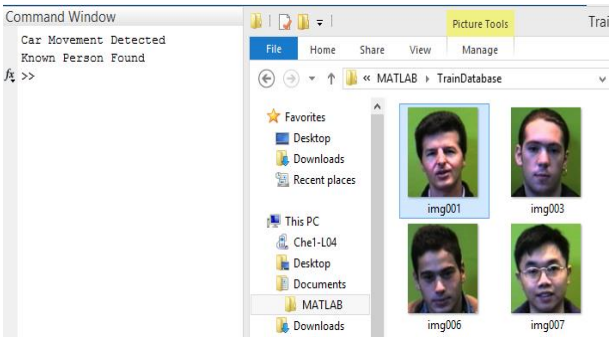

Figure 10. Face recognized according to the database

6. CONCLUSION

In image processing, vehicle movement detection and face recognition play a crucial role and have a wide range of applications. There are numerous strategies for discovery of vehicle burglary in video stream. In order to better and reliably identify and track moving vehicles in video sequences and face recognition, two approaches are combined. In this work, software based low-cost techniques of vehicle detection, tracking and face recognition have been discussed using Optical Flow, Gaussian Mixture Model, blob analysis and local binary pattern technique have been used to study the vehicle theft detection in video sequences. The proposed calculations lessens the expense and diminishes the time required for recognizing the vehicle and increment exactness rate with utilizing GMM, Optical flow and local binary pattern algorithms.

REFERENCES

[1] A. Pazhampilly Sreedevi, B. Sarath S Nair, "Image Processing Based Real Time Vehicle Theft Detection And Prevention System", Process Automation, Control and Computing (PACC), July 2011, pp. 1 - 6.

[2] Mohammed Shafeeq and Mrs. Varsha S, "Raspberry Pi Based Intelligent Car Anti-Theft System Through Face Recognition Using GSM And GPS", Department of Electronics and Instrumentation Engineering, Kerala, India 2016.

[3] S. Banerjee, P. Choudekar, M. K. Muju, "Real Time Car Parking System Using Image Processing", Electronics Computer Technology (ICECT), April 2011, pp. 99 - 103.

[4] S. Johnsen, A. Tews, "Real-Time Object Tracking And Classification Using A Static Camera", Workshop on People Detection and Tracking Kobe, Japan, May 2009, pp. 1 - 6.

[5] M. Zhao, H. Liu, Y. Wan, "An Improved Canny Edge Detection Algorithm", IEEE International Conference on Progress in Informatics and Computing, 2015, pp. 234 – 237.

[6] F. F. Chamasemani, L. S. Affendey, F. Khalid, N. Mustapha, "Object Detection And Representation Method For Surveillance Video Indexing", Smart Instrumentation, Measurement and Applications (ICSIMA), November 2015, pp. 1 - 5.

[7] S. Ojha, S. Sakhare, "Image Processing Techniques For Object Tracking In Video Surveillance- A Survey", Pervasive Computing (ICPC), January 2015, pp. 1 - 6.

[8] A. Beaugendre, H. Miyano, E. Ishidera& S. Goto, "Human Tracking Systems For Automatic Video Surveillance With Particle Filter", Circuits and Systems (APCCAS), IEEE Asia Pacific Conference on December 2010.