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Real-time Indoor Theft Detection System Using Computer-Vision

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ABSTRACT

Real-time Indoor theft detection from surveillance videos is not only a challenging problem of object detection and human activity recognition in the field of computer vision, but also an urgent need for preventing theft crimes in real life. The system uses digital cameras to scan the faces of people approaching a security gate i.e. the entry gate, and then matches its faces with the faces in the database, and if found not to be a known one it automatically generates an alert. In this paper, we propose a framework for real-time indoor theft detection based on the combining result of face recognition and pattern matching by analyzing the activities with that of thieves. At last, if detected abnormal it automatically sends a message using Multimedia Message Service with the help of GPRS/GSM modem.

Keywords: Theft detection, Computer Vision, Human activity analysis, Face recognition.

I. INTRODUCTION

Visual surveillance in dynamic scene with multiple cameras, attempt to detect, recognize and track certain objects from image sequences, and more significantly to understand and describe object behaviors. The main goal of visual surveillance is to develop intellectual visual surveillance to replace the traditional passive video surveillance that is proving unproductive and ineffective as the number of cameras exceed the capability of human operators to monitor them. The goal of visual surveillance is not only to put cameras in the place of human eyes, but also to achieve the entire surveillance task as quickly as possible. The capability of being able to analyze human movements and their activities from image sequences is crucial for visual surveillance.

In the modern era, the crime execution has become easier than before. Because of this reason, security has become one of the biggest concerns for everyone today. Everyone is busy in earning money and reputation and wants that concern for security of home should not bother them while at work or at travel. Real time indoor security system based on computer vision provides a solution to this problem.

Security is a developing need all through the world, and absence of security can bring about tremendous harm. People often consider themselves as insecure while travel, at work or when not being at home because every time they concern about security of home. So, we need to keep a continuous track for avoiding and preventing from being theft.

In recent years, computer vision has played a significant role in person identification and tracking in various field of surveillance. Biometric identification based security systems are also considered to be the most secure especially due to their ability to identify people with minimal ambiguity. It uses a face detection and recognition

system that identifies and verifies a person automatically by extracting unique features of face from an image or video captured by the camera. Therefore, we here aim to develop a system which monitors the entire security of home in absence of owner using the technology of computer vision.

Building up of a security mechanism that is incorporated inside an automotive is a novel idea. The proposed system is having great relevance in detecting theft of indoor area when the owner leaves his home for getting in to the work.

A general framework of a common visual surveillance system has been shown above, which divides the whole process into following sequential **steps:**

1. Object Detection
2. Object Classification
3. Object Tracking
4. Behavior analysis
5. Person Identification.

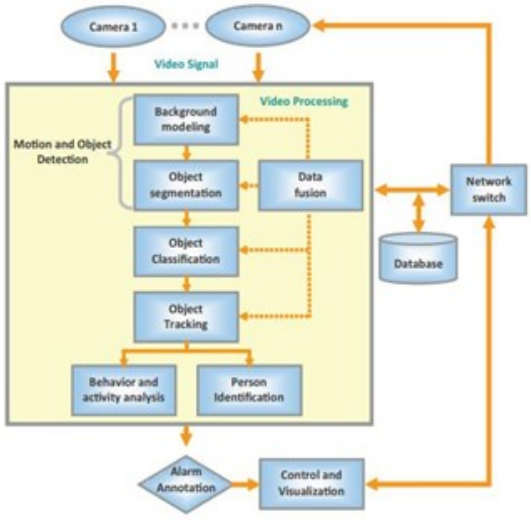

Figure 1. A general framework of video surveillance system.

II. OBJECT DETECTION AND FACE RECOGNITION

Object detection and tracking has become the important task in the field of computer vision. There are basic 3 steps in video analysis: detection of moving objects, tracking of such objects in each frame ,and analysis of object behavior. Object tracking in videos can be defined as the process of segmenting an object of interest from a sequence of video scenes. This process should keep track of its motion, orientation, occlusion and etc. in order to extract useful context information, which will be used on higher-level processes for more complex issues.

After the motion is detected, the face recognition stage operates and starts detecting face of the person and matches with the database. As soon as it finds the unauthorized person in the camera, it studies its behavior and sends an alert to the owner.

III. METHODOLOGY

This research work is to implement the theft security system based on face reorganization. It is based upon GUI (graphical user interface) in MATLAB. It is an effort to further grasp the fundamentals of MATLAB and validate it as a powerful application tool.

Face recognition technology is used to monitor continuously who is in front of a computer terminal. The proposed system will be made operated when the householders leave home or the doors are locked. This may be performed using sensors. The sensor senses the doors to be locked, and then automatically starts the system. The system continuously scans through camera, and if a person is found, it immediately matches with the faces in the databases. If found to be a known person, it terminates and start sensing again. And if not found to be known, it uses behavior analysis and finally inform the householder through GSM modem. The flowchart of the whole process ids shown below:-

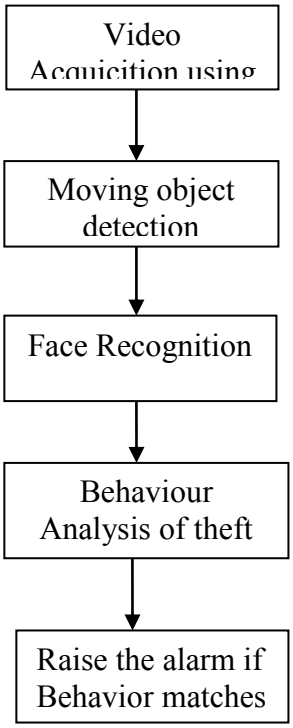

Figure 2. Flowchart of the proposed work.

A. Face Recognition and Matching:

Face recognition is the process of identifying or verifying a person in the given digital image .In recognition phase, the extracted face blob is matched with the images of possible drivers in the training set. If a match is found, the face in the given digital image is recognized. Otherwise an mms is sent to the owner of vehicle including the details of the vehicle theft Mostly feature based algorithms are used in the security systems involved in real time. Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) algorithms are efficient in terms of extracting the features to perform recognition. The algorithm used for face recognition is the traditional method of eigenface approach(Principal Component Analysis).

1. The first step in the eigenface method is to represent each image as a vector, which just required a simple reshaping of the image array. Each image is treated as one vector, simply by concatenating the rows of pixels in the original image, resulting in a single row with r × c elements. For this implementation, it is assumed that all images of the training set are stored in a single matrix A, where each column of the matrix is an image.
2. Subtracting the mean:- The average image is calculated and then subtracted from each original image in A.
3. Then find the eigenvectors and eigenvalues of the matrix ATA (this gives the eigenvectors for the covariance matrix, which helps understand correlation patterns between the various images).
4. Choosing the principal components:- Sorting the eigenvalues in descending order and arrange eigenvectors accordingly. The number of principal components k is determined arbitrarily by setting a threshold ε on the total variance.These eigenfaces are then used to represent both existing and new faces.

B Human Behavior Analysis

Human action recognition is a challenging field of research because of its diversity of applications in surveillance. Modeling and classification of human activities are not easy due to the randomness and complex nature of human movement. The idea is to divide the observed human movements into some discrete states and then classify them appropriately and more accurately. Automatic human activity recognition in video using background modeling and spatio-temporal template matching based technique [1] can be used for understanding human behavior and capturing its picture for further sending it to the house holder.

IV. ALGORITHMIC STEPS

Step 1:

Acquire the home video recorded by surveillance camera.

Step 2:

Read the background of the video.

Step 3:

Identify the moving object with respect to the background of the video.

Step 4:

Identify the Activities of the theft and recognize the activities of the theft.

Step 5:

Test the recorded video of the theft activities and recognition.

Step 6:

Apply the Behavior analysis technique to detect the theft, if the theft is identified then raise the alarm.

Step 7:

If the theft is not detected then repeat the step 1 to step 6.

Step 8:

Stop.

V. CONCLUSION

Video surveillance systems have been around for a couple of decades. Most current automated video surveillance systems can process video sequence and perform almost all key low-level functions, such as motion detection and segmentation, object tracking, and object classification with good accuracy. With this need of era, we have proposed a way of providing indoor surveillance when the owner is not present at home and needs it to be monitored continuously. This paper provides a proposal method of using existing methods of face recognition and behavior analysis methods for acquiring information about unauthorized person entering the house in absence of the householder.

VI. REFERENCES

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