A Review on Anti Theft Mechanism through Face Recognition

Ms.Neha J. Agrawal
Department of Information Technology,
Sipna College of Engineering, Amravati.

Dr. Siddharth A. Ladhake
Principal/Professor,
Sipna College of Engineering, Amravati.

Abstract— **Face Recognition concept is one of the successful and important applications of image analysis. It's a holistic approach towards the technology and have potential applications in various areas such as Biometrics, Information society, Smart cards, Access control etc. A face recognition technology is used to automatically identify a person through a digital image. It is mainly used in security systems. The face recognition will directly capture information about the shapes of faces. The main advantage of facial recognition is it identifies each individual's skin tone of a human face's surface, like the curves of the eye hole, nose, and lips, etc. this technology may also be used in very dark condition. It can view the face in different angles to identify.**

Also this is use in vehicle security. The use of vehicle is must for everyone. At the same time, protection from theft is also very important. Prevention of vehicle theft can be done remotely by an authorized person. The purpose Embedded Car Security System captures the image using a camera which will be hidden in the dash board. Face Detection Algorithm is used to detect the face. A database is created by taking the pictures of all the family members. A minimum of ten photos of each family member is taken. This captured image is compared with the already present database using PCA algorithm. Once the captured face matches with the already present database a message is sent to the owner of the vehicle stating "Match Found". Otherwise, if the captured face does not match with the database then the processor activates the GPS module and the GSM module. Using the GPS module the location of the vehicle is found out. This location is sent through the GSM module to the owner of the vehicle. Also along with the location, the image of the driver is sent through MMS to the owner.

Keywords - Face Detection System (FDS), Principle Component Analysis (PCA), Short Message Service(SMS), Global System for Mobile(GSM).

I. Introduction

With the development and applications of many embedded techniques, car security system design and analyses are constantly improving. Many new techniques, such as biometric recognition technique, image processing technique, communication technique and so on, have been integrated into car security systems. Biometric and non-biometric methods usually provide such security features. Sometimes these systems fail due to hacked password and encryption of decrypted data, but it is almost impossible to make replica of distinctive characteristics. Biometric systems are modern and use techniques like fingerprint recognition, iris recognition and face recognition.

Of these face recognition and detection systems are more sophisticated, easy to deploy and people can be identified without their knowledge. Some advantages of facial recognition method for vehicle security application are:-

1. More convenient, sensed as soon as one is seated in position.

2. Low cost and a better approach to be used with existing methods.

3. Requires no active part of the user.

Security system involves face recognition using PCA algorithm which is cost effective. Database consists of several images of the user. PCA algorithm compares the new image with the pre-defined images in the database. If the new image matches with any of the image in the database then the car remains running. But if the image mismatch occurs, then the car will get stopped immediately. The microcontroller module can stop the car once it gets information that the car is being driven by an unauthenticated person. The GSM module can send the information out to the user by SMS.

The Principal Component Analysis (PCA) algorithm is used for face recognition with fixed back ground (white in color). The PCA converts a number of possibly correlated variables into number of uncorrelated variables called Principal Components related to the original variables by using statistical methods. PCA is a dimensionality reduction technique which is used for compression and recognition problems.

II. Literature Review

There are many algorithms used in face recognition and detection, and many more are being developed. PCA is the best and mostly used algorithm in face recognition [2]. It is used for compression and to overcome many of the recognition queries like pose variations, illumination etc[3]. The Linear Discriminate Analysis (LDA), Independent Component analysis (ICA) and some other systems are developed by combining different algorithms. PCA is also known as "Eigen faces" algorithm. The main idea is to de-correlate data in order to highlight differences and similarities by finding the principal directions (i.e. the Eigen vectors) of the covariance matrix of a multidimensional data. A part of the great efficiency of the PCA algorithm is to take only the "best" eigenvectors in order to generate the subspace ("Face Space") where the gallery images will be projected onto, leading to a reduction of dimensionalities[1][2].

The Principal Component Analysis (PCA) is one of the most successful techniques that have been used in image recognition and compression. PCA is a statistical method under the broad title of factor analysis. The purpose of PCA is to reduce the large dimensionality of the data space (observed variables) to the smaller intrinsic dimensionality of feature space (independent variables), which are needed to describe the data economically. This is the case when there is a strong correlation between observed variables.

The functions of PCA are prediction, redundancy removal, feature extraction, data compression, etc. Because PCA is a classical technique which can do something in the linear

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domain, applications having linear models are suitable, such as signal processing, image processing, system and control theory, communications, etc.

Principal component analysis or simply "PCA", is a method used for the statistical pattern analysis in data, and expressing the data in such a way as to highlight the similarities and dissimilarities. Since patterns in the data can be hard to find in data of high dimensions, where the luxury of the graphical representation is not available, PCA is a powerful tool for analyzing the data. The other main advantage of the PCA is that, the data can be compressed without much loss of information by reducing the dimensions and identifying the patterns in the data. This technique is used in the image compression and image recognition.

PCA algorithm involves face recognition and it compares the input image/face with images/faces in the data-base with fixed background such as white in color. The images/faces in the database are called authorized images/faces and the input image/face is called as un-known/unauthorized image/face. Ten images are stored in our database for testing purpose. The Eigen vectors are calculated from the images and the threshold values are determined. By using Euclidian distance between threshold values of authorized and unauthorized faces corresponding images are compared and persons will be identified accord ingly.

Benefits of PCA:
- The reduction in the dimension of the data.
- No data redundancy, as components are orthogonal.
- Complexity of grouping the images can be reduced.
- Used for criminal investigation.
- Entrance control in buildings, access control for computers, for Automated Teller Machines, at the post office, passport verification, and identifying the faces in a given database.

PCA Feature:
- PCA computes mean, variance, covariance, and correlations for large data set.
- PCA computes and ranks the principal components and their variances.
- Automatically transforms data sets.PCA can analyze datasets up to 50,000 rows and 200 columns.

III. Hardware Specification

1. Microcontroller
   Micro controller Based Circuitry is the BRAIN in our system. The microcontroller we have implied here is Atmel's atmega32.
2. Motor
   The motor used here is DC motor with the rating of DC-12v, 0.48A.
3. GSM modem
   A wireless link between the FDS and MCU is provided with GSM module.

IV. Proposed Work

Using face recognition methods for security purposes is one of the best and accurate methods for law enforcement. It is also very useful for commercial applications. Although we can find many other identification and verification techniques, the main motivation for face recognition is because it is considered a passive, no intrusive system to verify and identify people. There are numerous methods employed in face detection.

It is mainly used in airports were it ill recognize the face and we can avoid some unwanted terrorist. When compared with other biometrics systems using fingerprint and iris, face recognition has different advantages because it is without touching the person. Through Face images we can capture the person identification from a distance without touching or interacting with them. And also face recognition is used for crime restriction purpose because face images that have been recorded and archived, so that it will help us to identify a person later.

In this system, a database of the employees, for example, of a firm, who are supposed to be given entry into the concerned building, is prepared. Depending upon the method used, the type of database is prepared. For instance, in some cases we require a single photo of each person, while in some cases; photos in different conditions are required.

A camera is kept at the main entrance, which takes the photo of the person trying to gain access to the building. The photograph needs to be taken properly to get proper result. This photo is then appropriately processed, according to the code based on a particular face recognition technique and then compared with each and every face in the database. The steps carried out and the time required for processing, as well as comparison, depends on the method employed. Different techniques employ different algorithms for the detection purposes. If the authorized person is present, his face gets detected and he is given entry into the building, while, an unauthorized person is denied entry.

The main objectives if the system is that the image-recognition technique that can provide the important functions required by advanced intelligent Car Security, to avoid vehicle theft and protect the usage of unauthenticated users was implemented. Thus if an unauthenticated person tries to steal the car, the embedded controller platform stops the car immediately. GSM module will send the intimation to the user as soon as the car gets stopped.

The system can be used to reduce the increased vehicle theft and allows the owner to identify the intruder thereby having the vehicle under his/her control. The system is also reliable to be used in other authorization applications involving robotics, border management, banking security involving ATMs etc.

GSM/GPS has been used for the sending MMS and knowing location of the car. By using suitable camera (3D camera) all face recognition troubles like poor light and background conditions, pose variations etc., will be covered. With the

adoption of standards and community awareness, this technology will become more and more acceptable.

The facial recognition is accomplished in a five step process-

Step 1 Acquiring the Image of an Individuals Face

 2 ways to acquire image

1) Digitally scan an existing photograph

2) Acquire a live picture of a subject

Step 2 Locate Image of Face

 MATLAB (image processing toolbox)is used to locate the image that has been used.

 Step 3 Analysis of Facial Image

Software measures face according to is peaks and valleys (nodal points) -nodal points are used to make a face print

Step 4 Comparison

The face print created by the software is compared to all face prints the system has stored in its database.

Step 5 Match Or No Match

Software decides whether or not any comparisons from step 4 are close enough to declare a possible match

Facial recognition technology is a fairly new way of identify people who could be dangerous or need to be located. It works by picking faces out of a crowd, obtaining the measurements necessary and comparing it to the images already in its database.
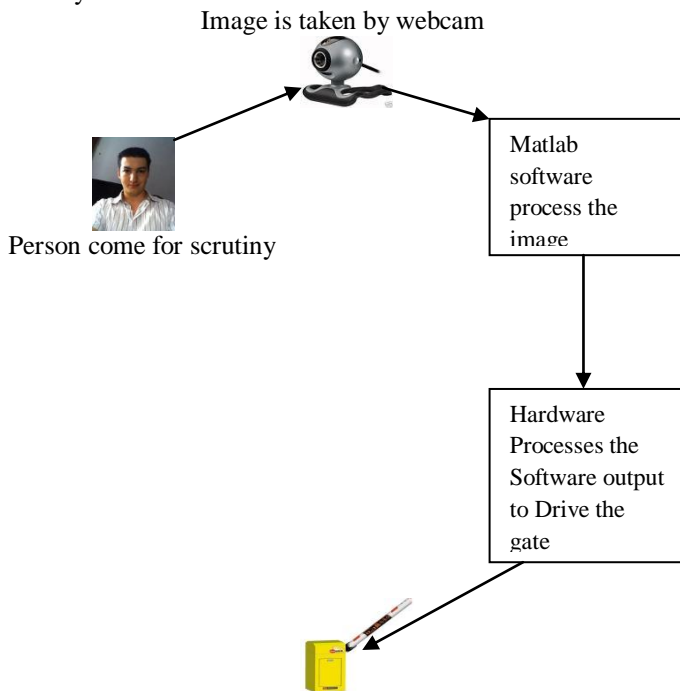

Fig: Pictorial Representation of the System

APPLICATION

1. Identification solutions:

With regards to primary identification documents, (Passports, Driver's licenses, and ID Cards), the use of face recognition for identification programs has several advantages over other biometric technologies.

2. Homeland defense:

This includes everything from preventing terrorists from boarding aircraft, to protecting critical infrastructure from attack or tampering (e.g. dams, bridges, water reservoirs, energy plants, etc.), to the identification of known terrorists.

3. Airport security:

 Airport and other transportation terminal security is not a new thing. People have long had to pass through metal detectors before they boarded a plane, been subject to questioning by security personnel, and restricted from entering "secure" areas. What has changed, is the vigilance in which these security efforts are being applied.

4. Financial services:

 The financial services industry revolves around the concept of security. Yet for the most part, security within the industry is limited to a simple personal identification number (PIN) or password.

V. CONCLUSIONS

Face recognition is a both challenging and important recognition technique. Among all the biometric techniques, face recognition approach possesses one great advantage, which is its user-friendliness.

This paper proposes the image recognition techniques that can provide the important functions by advanced intelligent automobile security, to avoid vehicle theft and protect the use of unauthenticated users. Secured and safety environment system for automobile users and also key points for the investigators can easily find out the hijacked image. From this we can predict the theft by using this in our daily life. This system mainly helps to reduce the complexity and improve security, also much cheaper and smarter than traditional one's.

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