A Survey on Authentication System using Various Facial Recognition Techniques

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Abstract: In the area of computer vision and image analysis, Face recognition has been a turning point. Criminal identification, surveillance system, unlock phones and facilitate secure transaction are some examples of concrete applications that might be further advance with the use of various face recognition techniques. Based on the Face data Identification Methodology. There are three categories of face recognition techniques and they are credibly classified. procedure that deals with video sequences; those that operate on intensity images; and also require other sensory data they are infra-red imagery either 3D information. In the area of computer vision and image processing. Well defined quality detection in face has been the most demanding area of research. This paper studies the various face noticing approach viz, Artificial Neural Networks (ANN), Eigen faces using Principal Component Analysis (PCA), Support Vector Machines (SVM) and Hidden Markov Models (HMM). The key of this survey is to put forward an extensive literacy survey over various facial recognition techniques along with its application. The conclusion has few of the crucial discovery, after in depth discussion.

Keywords: Face Recognition, Artificial Neural Networks (ANN), Principal Component Analysis (PCA), Support Vector Machines (SVM), Hidden Markov Models (HMM).

1. Introduction

Over the last 40 years, the recognition of face is being a functional analysis section in the field of neural networks, computer vision, machine learning approach, image processing and pattern recognition. The process of Face Recognition involves two main steps. first one is to train the face image of familiar particulars. Second step involves the classification of recent trial image within the class. Which can be a major issue in recognition of face. Humans can solve various problems of Face Recognition in which restricted storage space is the major issue.

The constraints of Face Recognition structure in the field of machine learning:

1. Pose interchange
2. Front vs. Profile
3. Blockage because of scarf, mask or obstacles in front
4. Ageing
5. Facial Expression change
6. Illumination variation
7. Size of the image
8. Closure because of scarf, mask or obstacles in front

Regarding sensors, we have different types, including wearable inertial sensors, EEG, depth, RGB and thermal. These sensors can be in use to acquire the data. To spot the face images over the pair of stable image and video series, The sensors are allowed to supply additional details as well as to assist the face recognition system. The outcomes of Face Recognition system is extremely depending upon the extracted features which are used to illustrate the pattern of the face as well as the categorization procedures and differentiate in the middle of faces where the base of extraction of productive attribute are face localisation and normalisation.

Robust Face Recognition Structure can be classified into three basic strategies:

1. Image Segmentation
2. Feature Extraction
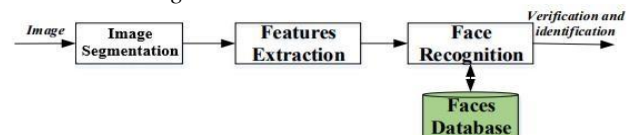3. Classification

Work-Flow Diagram:

Fig. 1. Work-flow diagram of facial recognition

The image segmentation strategies are used for dividing and locating the face images acquired by the structure. The Feature Extraction strategies are used for extracting the attribute vector considering any face situated within the initiative.

Lastly, Classification strategy incorporates the extraction of feature out of the human face for the sake of comparing this among entire template face data bases for deciding the human face recognition as shown in the work diagram in Fig. 1.

2. Methods and Techniques of Face Recognition

A. Artificial Neural Networks (ANN)

Following the development in the field of Neural Networks and Artificial Intelligence, ANN provides an effective Feature Recognition Technique. ANN is basically a mesh, where neurons are organized in the structure of layers. Improved

Neural Network Architectures and administrative methods have boosted the accuracy of Face Recognition. And in recent times remarkable Face Recognition Techniques have evolved with the help of Deep Learning. For Evaluating ANN models with tightly cropped images, we have used Labelled Faces in the Wild (LFW) dataset which are designed for studying the problem of unconstrained face recognition. The reduction in complexity is the most viable feature of Neural Networks. It gets trained from the given samples to work great on pictures with varying Lightning condition and to boost the efficiency. The major setback in using ANN is the increased time required for building up the initial predecessor step to get the needed results.

Maha Jazouli et al. [1] have used CPF Technique with Multi PIE dataset and have obtained 99.50% accuracy.
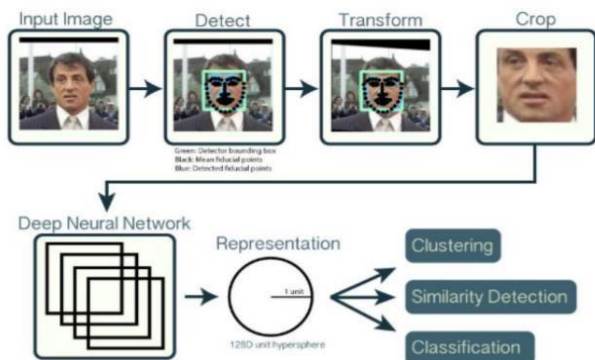

Fig. 2. Face recognition using neural network

B. Eigen Faces

Eigenfaces are designed by a German word "Eigen wert". Word "Eigen" means characteristics along with the word "wert" means worth. To acknowledge an attribute in a portrayal, Eigenfaces are a well-established algorithm and based upon Principal Components Analysis (PCA). The Essential abstraction in Eigenfaces is to grant the face by obtaining it's distinctive knowledge regarding the face in a query and then encrypt it to contrast with the decrypt outcome of formerly taken image. In Eigenfaces technique, calculation of Eigenvector and then representing it as a matrix is used in decoding. Analysing dissimilar outcomes speculate the analyst have shown improvement in accuracy in the past few years as differentiated to preceding outcomes.

Jacky Efendi et al. [3] have used PCA+RMF technique, with Emgu CV library with 93% Accuracy.

Riddhi A. & S.M. Shah [2] have used PCA with Yale Database and obtained 98.18% Accuracy.

C. Support Vector Machines

Regression Analysis and Classification is done by a Superintended learning Algorithm called SVM. The biggest advantage of SVM is High Dimensional efficiency in Image processing. After Facial Feature Extraction, Support Vector Machines (SVM) can be used as a tool for recognizing the faces from the images. In order to yield better outcomes from SVM we need to use large volumes of dataset for training. Among many SVM types, LS-SVM which is popularly known as Least

Square Support Vector Machine is used for advantageous implementation for various Face Recognition task. SVM provides improvement in Fast computation speed and High recognition speed. On a broad scope of various classification problems, SVM classifier is the most utilized method. SVM is beneficial when handling data of Large Dimensions. Scientists have researched on categorization of Facial Recognition using SVM and obtained preferable outcomes as shown below.

Bhaskar Anand & Prashant K. Shah [4] have used SVM technique, with Yale Faces Database and got accuracy of 97.78%.
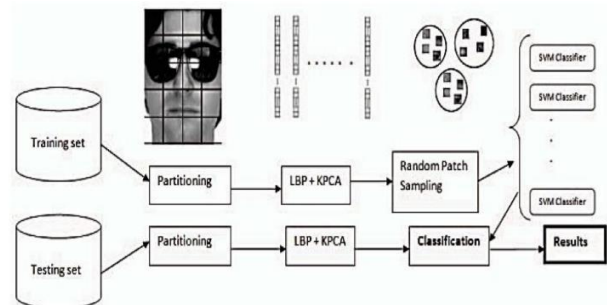

Fig. 3. Face recognition by using SVM

D. Hidden Markov Models (HMM)

Hidden Markov Models (HMM) are a class of probabilistic geographical model that allow us to predict a sequence of hidden variables from a set of observed variables. (Fig.4). In 1960, HMM was established and provided a major benefaction in speech recognition. Hidden Markov Models is a widespread technique in Bioinformatics applications, augmentation studying, and temporal design identification. Presently this one is applied to the video sequences for face recognition and to recognize face expression.

Kiani, K., & Rezaeirad, S et al. [5] have used HMM Models on half image using AR database achieved an Accuracy of 98.90%.
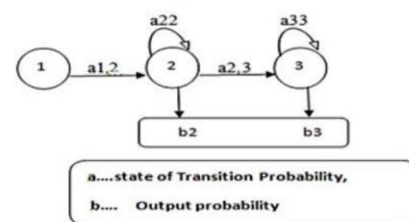

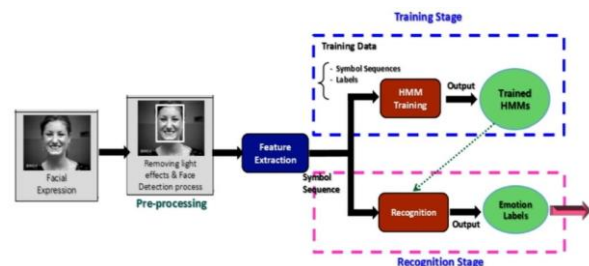Fig. 4. Three States of transition from left to right for HMM models

Fig. 5. Hidden Markov Model process of recognition

3. Conclusion

For numerous years, scientists had many difficulties in the department of Face identification. The paper contains an extensive literacy survey over various Facial Recognition Techniques, were performed along with its application. After the detailed survey Eigen faces perform well on frontal face recognition. If the proportions of characteristics are higher for indigenous face images, the best suited technique is PCA. The Artificial Neural Networks (ANN), Support vector Machines (SVM) and Hidden Markov Models (HMM) among other face identification these are most favoured approach that furnish greater results if the image size is 150 or higher. There still remains a space to fill up the void to enhance its correctness and efficiency in the learning of face identification system.

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