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Face recognition technique for door phone embedded system

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Abstract : *This paper describes the architecture of a face recognition technique for door phone embedded system with interactive face and voice response. for the face recognition method using PCA algorithm. In this paper feature is extracted using PCA. The face recognition system using UVC Driver camera has been considered. The proposed system recognize the persons up to 300 cm and send feedback to mobile by using GSM in the form of message. In addition to this, an UVC webcam is connected to 32-bit ARM micro controller which supports features and algorithms for designing of face recognition and voice recognition system. In the proposed system, after completion of face recognition the message will be send to sender mobile by using GSM modem, that word is pronounced at the MIC of the 32-bit ARM controller. Then the door will be get accessed. The algorithms are implemented in Open CV, which runs on Linux.*

Keywords : *Face recognition, voice, Principal Component Analysis, Euclidean distance.*

I. INTRODUCTION

Human sees so many people's face repeatedly in his life. Whenever they meet someone, he remembers peculiar facial features of that person with the feature extraction process rather than whole face. So they will recognize facial image naturally. Of course, this feature extraction process is unconscious activity and is unknown process to us. In human face profiles, the shape and size of eyes, nose, mouth and their relationship have been commonly used as feature. With correctly extracted features we can easily recognize humane face. However, shadow hair, glasses, and noise or rotation of a face may distort the face shape.

II. HEADINGS

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III. Literature Review

Face recognition systems can be widely used in areas where more security is needed. Like Air ports, Military bases, Government offices etc. Sirovich and Kirby had efficiently represented human faces using principal component analysis. M.A. Turk and Alex P.Pentland developed a near real time Eigen faces system for face recognition using Euclidean distance. A face recognition system can be considered as a good system if we extract the face with the help of Principal Component Analysis and for recognition back propagation Neural Network are used. In this paper we give a new approach to recognize the faces in less training time and less training patterns(images). Face recognition system consists of face verification, and face recognition tasks. In verification task, the system knows a priori the identity of the user, and has to verify this identity, that is, the system has to decide whether the a priori user is an impostor or not. In face recognition, the priori identity is not known: the system has to decide which of the images stored in a 32-bit ARM controller resembles the most to the image to recognize.

IV. Overview Of The System

The proposed face recognition system consists of two phases which are the enrolment and recognition/verification phases as depicted .It consists of several modules which are Image Acquisition, Face

Detection, Training, Recognition and Verification. In image processing session, the image acquisition, feature extraction and data normalization are performed.

4.1. Enrolment phase: The image is taken using a web camera and stored in a 32-bit controller. Next, the face image is detected and trained. During training, the face image is pre-processed using geometric and photometric normalization. The features of the face image are extracted using several feature extraction techniques. The features data is then stored together with the user identity in a 32-bit ARM controller.

4.2. Recognition/verification phase: A user's face is once again acquired and system uses this to either identify who the user is, or verify the claimed identity of the user. While identification involves comparing the acquired biometric information against templates corresponding to all users in the database, verification involves comparison with only those templates corresponding to claimed identity. The recognition/verification phase comprises of several modules which are image acquisition, face detection, and face recognition/verification.

4.2.1. Image acquisition/face detection module: Image acquisition module is to seek and then extracts a region which contains only the face. Face detection is used to detect face and to extract the information related to facial features. The image will then be resized and corrected geometrically and it will eliminate the background and scene which are unrelated to the face so that it is suitable for recognition/verification.

4.2.2. Face recognition/verification module: The face recognition module contains of preprocessing, feature extraction, and classification sub-modules. The input to the face recognition/verification module is the face image, which is derived from two sources from the camera or from the database. Each image is preprocessing to get the geometric and photometric normalized form of the face image. During feature extraction, the normalized image is represented as feature vectors. The result of the classification for the recognition purpose is determined by matching the client index with the client identity in the 32-bit ARM controller.

4.2.2.1 Feature Extraction: The purpose of the feature extraction is to extract the feature vectors or information which represents the face. The feature extraction algorithms used is Principal Component Analysis (PCA).

Principal component analysis (PCA): PCA for face recognition is based on the information theory approach. It extracted the relevant information in a face image and encoded as efficiently as possible. It identifies the subspace of the image space spanned by the training face image data and decorrelates the pixel values. The classical representation of a face image is obtained by projecting it to the coordinate system defined by the principal components. The projection of face images into the principal component subspace achieves information compression, decorrelation and dimensionality reduction to facilitate decision making. In mathematical terms, the principal components of the distribution of faces or the eigenvectors of the covariance matrix of the set of face images, is sought by treating an image as a vector in a very high dimensional face space. We apply PCA on this database and get the unique feature vectors using the following method .Suppose there are P patterns and each pattern has t training images of m x n configuration.

• The database is rearranged in the form of a matrix where each column represents an image.
• With the help of Eigen values and Eigen vectors covariance matrix is computed.
• Feature vector for each image is then computed.

This feature vector represents the signature of the image. Signature matrix for whole database is then computed.

• Euclidian distance of the image is computed with all the signatures in the database.
• Image is identified as the one which gives least distance with the signature of the image to recognize.

Euclidean distance (E.D.): The Euclidean distance is the nearest mean classifier which is commonly used for decision rule.

Normalized correlation (N. C.): The normalized correlation decision rule based on the correlation score.

4.2.3. Speaker authentication procedure: The speaker authentication procedure uses the natural human modality of speech. The speaker identification process is used to determine which one of the registered speakers the given utterance comes from, whereas the speaker verification process is used to accept or reject a speaker's identity claim. Speaker recognition processes can be classified into text-dependent and text-independent methods. Text-dependent types require the speaker to provide utterances of the same text for both training and recognition, whereas text-independent types do not require the utterance of a specific text. Our system uses a text independent speaker recognition process employing speech recognition technique. Figure shows a simple dialog flow diagram that provides reasonable user machine interaction for speaker authentication. The speaker authentication procedure starts with an incoming call from a door phone device within the internal network. The user introduces himself by saying his message. The speech recognition engine accepts or rejects the recognized sentence. If the name is not in the recognizer vocabulary or if something else was uttered, the authentication procedure starts again from the beginning.

FIGURES

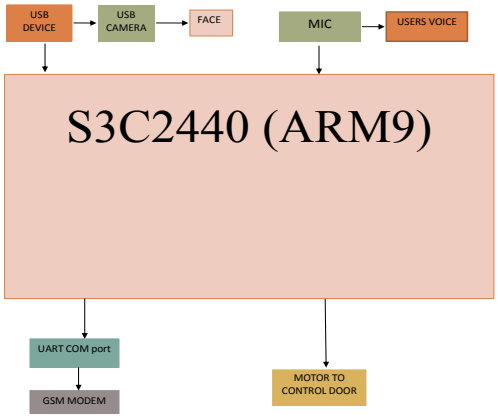

Figure 1: Block Diagram of proposed system

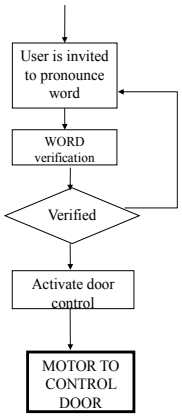

Figure 2: Flow Diagram of voice recognition system

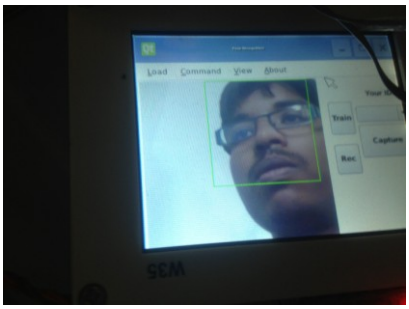

Figure3: FACE RECOGNITION

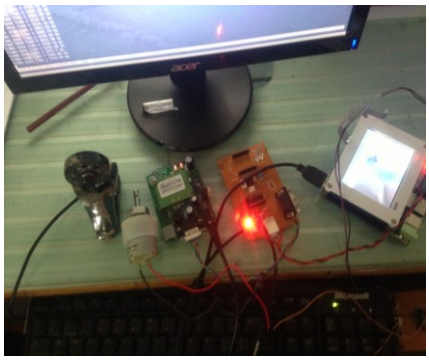

Figure4: THE OUTPUT OF PROPOSED SYSTEM

V. CONCLUSION

In this paper, the face recognition is used to identify the identity person for the security purpose. In this paper, we also propose a new approach in which we develop the new tool like face recognition, voice recognition etc. They had taken 15 inputs of 3 persons using 32-bit controller.

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