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A Review on Various approaches of face and fingerprint feature extraction

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Abstract-*in Computer security, biometrics alludes to validation methods that depend on measurable physical qualities that can be automatically checked. There are a few sorts of biometric recognizable schemes: face: the analysis of facial characteristics. In this process the literature is studied, related to face recognition, fingerprint and speech recognition technique and analyzed for proposed system then face, fingerprint and speech modalities and design multimodal for surveillance are analyzed by which the image complexity is decreased.*

Keywords*: Face recognition, Fingerprint, Speech recognition technique LBP, ICA, and PCA.*

INTRODUCTION

People have utilized body qualities, for example, face, voice, and walk for a huge number of years to recognize one another. Alphonse Bertillon, head of the criminal distinguishing proof division of the police office in Paris, created and after that rehearsed the thought of utilizing various body estimations to recognize criminals in the mid-19th century. It was darkened by a much more noteworthy and reasonable disclosure of the uniqueness of the human fingerprints in the late nineteenth century.Biometric identifiers are the unmistakable, quantifiable qualities used to name and depict individuals. Biometric identifiers are regularly arranged as physiological versus behavioral characteristics. Physiological attributes are identified with the state of the body. Illustrations incorporate, yet are not constrained to fingerprint, palm veins, face recognition, DNA, palm print, hand geometry, iris recognition, and retina. Behavioral attributes are identified with the example of conduct of a man, including however not constrained to writing beat, walk, and voice-note Some scientists have begat the term behavior metrics to portray the last class of biometrics.

1.1 BIOMETRIC SYSTEMS

A biometric system is essentially a pattern recognition system that operates by acquiring biometric data from an individual, extracting a feature set from the acquired data, and comparing this feature set against the template set in the database.

1.2 VAROIUS CHARACTERSTICS USED IN BIOMETRIC

1.1.1 Face: Face recognition is a non-intrusive method, and facial images are probably the most common biometric characteristic used by humans to make a personal recognition. The applications of facial recognition range from a static, controlled "mug-shot" verification to a dynamic, uncontrolled face identification in a cluttered background.

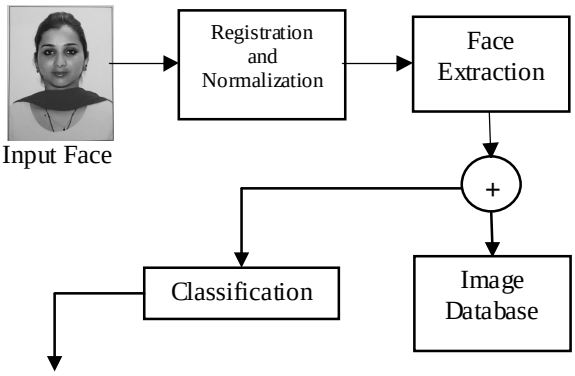

Figure 1.1 Face Recognition

1.1.2 Fingerprint: Unique mark Identification is the technique for recognizable proof utilizing the impressions made by the moment edge arrangements or examples found on the fingertips. No two persons have precisely the same plan of edge examples, and the examples of any one individual stay unaltered all through life. Fingerprints offer an in fallible method for individual ID.

- **Fingerprint Pattern Type**

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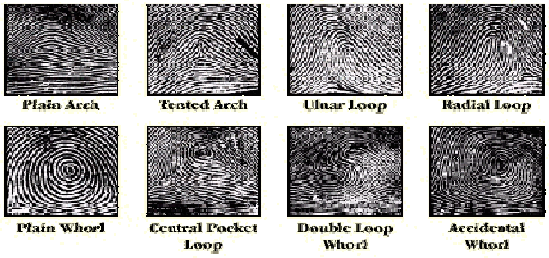

Fig1.2: Fingerprint samples

- **Fingerprint acquisition**

The most established and most known unique finger impression obtaining procedure is the "ink method", that is, pressing the finger against a card in the wake of spreading the finger skin with ink; this system is these days still to a great extent utilized by the police as a part of AFIS.

- **Fingerprint Anatomy**

A fingerprint is the representation of the epidermis of a finger. At a macroscopic analysis, a fingerprint is composed of a set of ridge lines which often flow parallel and sometimes produce local macro-singularities called whorl, loop and delta.

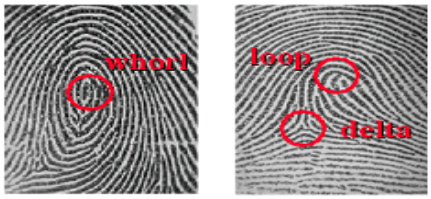

Fig.1.3: Fingerprint Anatomy

REVIEW OF LITERATURE

Jiali YuET. al.[1] proposed a new technique for face recognition using the texture features. Texture features often have a rotary deformation, and have strong resistibility to noise. The paper first constructs the gray level co-occurrence matrix of face image to describe texture feature of face image, and then uses the classification method of minimum weighted Euclidean distance to fulfill the matching and identification of face. Experiments results have shown that recognition rate was greatly increased by the combination of weighted Euclidean distance and texture feature.

P. Mohanaiah, ET. al.[2] proposed a new approach for Feature Extraction for capturing visual content of images for indexing & retrieval. Primitive or low level image features can be either general features, such as extraction of color, texture and shape or domain specific features. This paper presents an application of gray level co-occurrence matrix (GLCM) to extract second order statistical texture features for motion estimation of images. The Four features namely, Angular Second Moment, Correlation, Inverse Difference Moment, and Entropy are computed using Xilinx FPGA. The results show that these texture features have high discrimination accuracy, requires less computation time.

Matti PietikainenET. Al.[3] Proposed approach for texture feature face recognition using LBP (Local Binary Patterns). Features used for texture analysis have been successfully used in some biometric applications. Texture-based region descriptors can be very useful in recognizing faces and facial expressions, detecting faces and different facial components, and in other face related tasks. This paper demonstrates this issue by considering the local binary pattern (LBP) as an example of texture-based approach and showing its efficiency in facial image analysis. Local binary pattern used a 3*3 matrix on the image segments and computed the binary pattern using a threshold value from the center pixel values.

KoneruAnuradhaET. al. [4] provided a new method for face recognition. In this paper combination of KLDA (combination of LBP and GABOR features) with gradient face features (which are more resistive to the noise effects) for more effective recognition process. This make three main contributions: (i) present a simple and efficient pre-processing chain that eliminates most of the effects of changing illumination while still preserving the essential appearance details that are needed for recognition; (ii) introduce Local Ternary Patterns (LTP), a generalization of the Local Binary Pattern (LBP) local texture descriptor that is more discriminate and less sensitive to noise in uniform regions, and show that replacing comparisons based on local spatial histograms with a distance transform based similarity metric further improves the performance of LBP/LTP based face recognition; and (iii) improve robustness by adding Kernel PCA feature extraction and incorporating rich local appearance cues from two complementary sources – Gabor wavelets and LBP – showing that the combination is considerably more accurate than either feature set alone.

TimoAhonenET. Al.[5] Proposed an approach Local Phase Quantization (LPQ). This method is based on the quantizing the Fourier transforms phase in local neighborhood. The phase can be shown to be a blur invariant property under certain commonly full-filled conditions. In face image analysis, histograms of LPQ labels computed within local regions are used as

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a face descriptor similarly to the widely used Local Binary Pattern (LBP) methodology for face image description. The experimental results on CMU PIE and FRGC 1.0.4 datasets show that the LPQ descriptor is highly tolerant to blur but still very descriptive outperforming LBP both with blurred and sharp images.

APPROACHES USED

PCA: Security and authentication of a person is a crucial part of any industry. There are many techniques used for this purpose. One of them is face recognition. Face recognition is an effective means of authenticating a person. The advantage of this approach is that, it enables us to detect changes in the face pattern of an individual to an appreciable extent. The recognition system can tolerate local variations in the face expression of an individual. Hence face recognition can be used as a key factor in crime detection mainly to identify criminals. There are several approaches to face recognition of which Principal Component Analysis (PCA) and Neural Networks have been incorporated in our project. The system consists of a database of a set of facial patterns for each individual. The characteristic features called "Eigen faces" are extracted from the stored images using which the system is trained for subsequent recognition of new images.

$$\min_{\mu,\lambda_1\ldots N,v_q} \sum_{n=1}^{N} ||x_n - \mu - v_q\lambda_n||$$

ICA: Functional connectivity-based analysis of functional magnetic resonance imaging data (fMRI) is an emerging technique for human brain mapping. One powerful method for the investigation of functional connectivity is independent component analysis (ICA) of concatenated data. However, this research field is evolving toward processing increasingly larger database taking into account inter-individual variability. Concatenated data analysis only handles these features using some additional procedures such as bootstrap or including a model of between-subject variability during the preprocessing step of the ICA. In order to alleviate these limitations, we propose a method based on group analysis of individual ICA components, using a multi-scale clustering (MICCA). MICCA start with two steps repeated several times: 1) single subject data ICA followed by 2) clustering of all subject independent components according to a spatial similarity criterion. A final third step consists in selecting reproducible clusters across the repetitions of the two previous steps. The core of the innovation lies in the multi-scale and unsupervised clustering algorithm built as a chain of three processes: robust proto-cluster creation, aggregation of the proto-clusters, and cluster consolidation. We applied MICCA to the analysis of 310 fMRI resting state dataset. MICCA identified 28 resting state brain networks. Overall, the cluster neuroanatomical substrate included 98% of the cerebrum gray matter. MICCA results proved to be reproducible in a random splitting of the data sample and more robust than the classical concatenation method.

$$x_j = a_{j1}s_1 + a_{j2}s_2 + \ldots + a_{fn}s_n$$

LBP: Within LBP-based algorithms, most of the face recognition algorithms using LBP follow the approach proposed by Ahonen et al in [12]. In this approach the face image is divided into a grid of small of non-overlapping regions, where a histogram of the LBP for each region is constructed. The similarity of two images is then computed by summing the similarity of histograms from corresponding regions. One drawback of the previous method is that it assumes that a given image region corresponds to the same part of the face in all the faces in the dataset. This is only possible if the face images are fully frontal, scaled, and aligned properly. In addition, while LBP are invariant against monotonic grayscale transformations, they are still affected by illumination changes that induce non-monotonic gray-scale changes such as self-shadowing

$$\text{LBP}(X_C, Y_C) = \sum_{P=0}^{P-1} 2^P \, \text{S}(I_P - I_C)$$

4. CONCLUSION

A biometric framework is basically an example acknowledgment framework that works by gaining biometric information from an individual, removing a list of capabilities from the obtained information, and looking at this list of capabilities against the layout set in the database. The pursuits of knowledge on the diverse biometric system envisage single biometrics feature is not sufficient to provide secure authentication. This dictates the importance of multi-modal system. Most of the multi-modal techniques are lacking in security aspect. Previous work presented the feature level fusion scenario with face and fingerprint modalities, using Gabor filter bank to

extract the features individually but still this work is lacking in some another way like this is not used for low resolution images. By using this filter time complexity increases because size increases. Their features properties are also not properly define due to which it does not give proper acceptance.

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