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Novel Approach for Multimodal Biometric Recognition

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Abstract: The proposed paper deals on novel approach for multimodal biometric recognition system by using face, iris and fingerprints. In recent years almost all organizations like, educational institutes, offices, banks and industry are using biometric recognition system for confirmation of employers. This biometric identification system makes use of biometric templates or characteristics of employer and based on comparison of this template with stored data of an employee for identification. The confirmation of result is made by the combination of matching level of database templates, by using face, iris and finger prints are created independently. This multimodal biometric system is planned for collecting the database contains a face, iris and finger frints of each individuals for identification and security purpose.

Keywords: Biometrics, Multimodal, Face, Fingerprint, Irises.

I. INTRODUCTION

Digital image processing has become an applied research area that goes from professional photography to several different fields such as astronomy, meteorology, computer vision, medical imaging, among others. The aim of digital image processing is to improve the pictorial information in order to perform subsequently other tasks such as image based classification, feature extraction or pattern recognition.

In general terms, a biometric is observed data of a human that allows the identity of that person to be determined. Examples of biometrics actively being investigated are DNA, shape of the ear, faces, fingerprints, hand geometry, irises, and pattern of keystrokes on a keyboard, signature, and speech. While each biometric has its own strengths and weaknesses, for a biometric to be effective it should have the following four properties: (1) universality, all members of population being identified should possess the biometric;(2)uniqueness, biometric signature should be different for all members of the population; (3) invariance, the signature should be invariant under the conditions that it will be collected; and (4) resistance, the biometric should be resistance to potential countermeasures.(Jonathon phllips*et.al*)

In recent years the security level is very moderate and the online fraud is very high so its necessary for highly secure identification and personal confirmation techniques using systems are required. The biometrics systems are used for identification and authentication of security purpose, this systems are now a days improved in accuracy and showing good performance. (Phalguni Gupta *et.al*, 2003)

Biometric systems are started as a unimodal, it consists of three major modules: sensor module, feature extraction module and matching module (Rose *et.al* 2003). The fully automatic face recognition system are successfully developed. A fully automatic system detects and identifies / varies a face in an image or video sequence without human intervention. The face recognition biometric systems are contains two components there are recognition and detection. Varies face are identified by recognition component. Usually, a recognition module requires that the face be in a standard position. Currently recognition is performed exclusively from a still image or a single video frame. **(**Rohit M. Thanki*et. al.*2013)

After face recognition biometric system the next considerable attention is iris. Recognition from irises is based on wavelet features derived from the texture patterns of the iris. Like fingerprints, the irises are phenotypical (features are a function of the interaction of genetics, environment, and development), whereas faces are genotypical (features are primarily genetically inherited). Iris recognition system is a three stage system requiring face detection, iris acquisition, and recognition.

The interest in face recognition goes beyond biometrics. There are applications of face recognition to low bit video compression, human computer interfaces, gesture recognition, smart kiosks, and analysis/synthesis of faces. Because face recognition is a basic function of the human visual system, there is also significant interest in face recognition from neuroscience and pyschophysics.

The biometric system performance is low due to the damaged or affected image data stored in system and the features extracted from the not proper identified signal. Further, if the biometric trait being sensed or measured is noisy (a fingerprint with a scar or a voice altered by a cold, for example), the resultant matching score computed by the matching module may not be reliable. (A S Tolpa *et.al* 2000)

As on date the superficial biometric systems are facing many problems; some of the systems are intrinsic to the technology itself. In particular, biometric authentication systems generally suffer from enrolment problems due to non-universal biometric traits, susceptibility to biometric spoofing or insufficient accuracy caused by noisy data acquisition in

certain environments. One way to overcome these problems is the use of multi-biometrics. Driven by lower hardware costs, a multi biometric system uses multiple sensors for data acquisition. This allows capturing multiple samples of a single biometric trait (called multi-sample biometrics) and/or samples of multiple biometric traits (called multi source or multimodal biometrics). This approach also enables a user who does not possess a particular biometric identifier to still enrol and authenticate using other traits, thus eliminating the enrolment problems and making it universal. **(**Rohit M. Thanki*et. al* 2013).

The aim of present study is to design the multimodal biometric recognition system by using face, iris and fingerprints, it can be used to reduce the problem for using unimodal biometric system and it can give perfect authentication using multi features vectors (face, iris and fingerprints).

II. RELATED WORK

In multimodal biometric system, the last few years researchers are working in this system to develop the perfect biometric traits by using face, iris and fingerprints. Biometric based authentication is more advance and getting wide acceptance in different areas. In biometric systems, for authentication initially image has to be captured. Sometimes the environmental conditions the image may be blurred, in this situation a good pre-processing method is required (Arun Kumari *etal* 2013). Fingerprint image can be smoothened by using Low pass filters like Gaussian. In Short Time Fourier Transform (STFT) analysis is adopted in addition to Gaussian filter to increase the quality of the fingerprint image (Zhang Y*et.al* 2010) . Iris Pre processing includes localization, normalization and enhancement. To localize the iris image integro differential operator (IDO) is proposed. (J.G. Daugman*et.al* 1993). Hough transform technique is used to localize iris and proposed simple filtering and histogram operations for iris segmentation Wildes. R. Locates iris inner boundary by deploying wavelet transform and for outer boundary Daugman's IDO is applied (J.G. Daugman*et.al* 1993). The important step for before feature extraction, to obtain an image from the captured palm print image by removing the variations caused by rotations and translations or noise due to environmental conditions David D Zhang (2004).An overview of Multimodal Biometrics and have proposed various levels of fusion, various possible scenarios, the different modes of operation, integration strategies and design issues. A multimodal system can operate in one of three different modes: serial mode, parallel mode, or hierarchical mode (Ross and Jain. 2003).

In Multi biometric systems, features from different biometrics are combined at any level like sensor level, feature level, matching score level, decision level. Palm print and iris are combined in feature level (R. Gayatri*et.al* 2013). So feature level fusion gives better performance. As different fusion methods are available, the comparison of these methods is In *Fusion at the Feature Extraction Level*, information extracted from the different sensors is encoded into a joint feature vector, which is then compared to an enrollment template (which itself is a joint feature vector stored in a database) and assigned a matching score as in a single biometric system. In *Fusion at the Matching Score Level***,** feature vectors are created independently for each sensor and are then compared to the enrollment templates which are stored separately for each biometric trait. Based on the proximity of feature vector and template, each subsystem computes its own matching score. These individual scores are finally combined into a total score which is passed to the decision module. In *Fusion at the Decision Level*, a separate authentication decision is made for each biometric trait. These decisions are then combined into a final vote. This architecture is rather loosely coupled system architecture, with each subsystem performing like a single biometric system (Yufeng Zheng*et.al*.). Discrete Wavelet Transform (DWT) and Principal Component Analysis (PCA), Morphological processing and Combination of DWT with PCA and Morphological techniques have been popular fusion of image. (Shrivsubramani Krishnamoorthy & Jonathon Shlens*et.al.* 2010). These related methods for fusion of feature extraction to be used in this proposed paper to develop the advanced multimodal biometric system.

III. PROPOSE METHODLOGY

The proposed project diagram is shown in figure 1. The Proposed system for multimodal biometric based personal identification focuses on the feature level fusion (Face, iris and fingerfrints). This methodology has the benefit of exploiting more amount of data from each biometric.

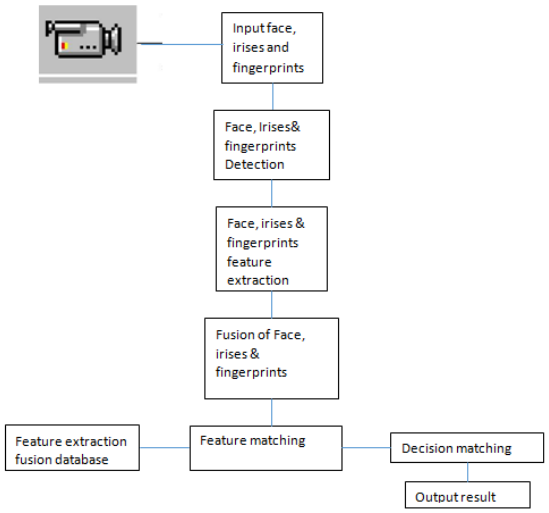

Fig 1: Flow Diagram of Face and Irises Recognition.

Face Recognition

Face Recognition is a noninvasive process where a portion of the subject's face is photographed and the resulting image is reduced to a digital code. Facial recognition records the spatial geometry of distinguishing features of the face (I. Craw, D.*et.al* 1993). The recognition algorithm takes facial image, measures the unique characteristics and computes the template corresponding to each face. Using templates, the algorithm then compares that image with another image and produces a score that measures how similar the images are to each other.

Iris Recognition

The iris image acquired from a 3CCD camera is localized by finding the center of pupil from the spectrum image. The radius of the pupil is the distance between the pupil center and nearest non-zero pixel. The outer iris boundary is detected by drawing concentric circles of different radii from the pupil center and the intensities lying over the perimeter of the circle are summed up. Among the candidate iris circles, the circle having a maximum change in intensity with respect to the previous drawn circle is the outer iris boundary. The annular region lying between pupil and iris boundary is transformed to polar co-ordinates to take into consideration the possibility of pupil dilation and appearing of different size in different images. From the normalized strip the eyelids are detected and removed. (J.G. Daugman*et. al* 1993)

Fingerprint recognition

The fingerprint recognition system has been developed by the fusion of Reference Point and Minutiae Matching Techniques (N.K.Ratha, *et.al* 1996). The key steps involved are fingerprint enhancement, feature extraction using Reference point Algorithm and Minutiae Matching approach and computation of matching score. The goal of fingerprint enhancement is to increase the clarity of ridge structure so that minutiae and the reference points can be easily and correctly extracted. (L. Hong *et.al* 1998)

Feature Fusion

The different types of fusion in biometric systems can done by mixture of two or more biometric traits are: (i) pixel level fusion (ii) feature level fusion (iii) matching score level fusion (iv) decision level fusion. In feature level fusion, the feature vectors are extracted from different biometric traits which are combined into new feature vector. The new feature vector contains richer information when compared to information after fusion by applying other fusion techniques. From large set of features, valuable features can be extracted by using feature reduction techniques. (Arun Kumari *etal*)

IV. CONCLUSION

In recent years the Biometrics systems are extensively used to overcome the traditional methods of identification. Sometimes the unimodal biometric systems are not identified properly due to lack of biometric data for particular trait.In view of this, the advanced multimodal biometric system is required for various field of protection and security reason. In this proposed research paper we develop the multimodal biometric system by using human feature extraction like face, irises and fingerfrints for the feature fusion method its shown in figure 1. This proposed multimodal biometric system provides good security and perfect authentication and its application widely used for different organisations.

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