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Feature Extraction for Human Identification Using Local Ternary Pattern

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ABSTRACT-Unimodal biometric frameworks have included a scope of specialists and made extraordinary progress. Unimodal framework alone will be unable to meet the expanding necessity of high precision in the present biometric framework. Single biometric frameworks experience the ill effects of much test, for example, uproarious information, non all-inclusiveness and satire assaults. Multimodal biometric frameworks can resolve these confinements successfully by utilizing at least two individual modalities. In this procedure combination of iris, unique mark and face characteristics are utilized as a part of request to enhance the precision, security of the framework and to recognize the human. The fundamental intention is to go over about whether the mix of unique mark, iris, face and finger print biometric can accomplish execution that may not be conceivable utilizing a solitary biometric innovation. In this paper a multimodal acknowledgment framework approach has been purposed that has been used for acknowledgment of individual in light of numerous traits. In this paper LTP has been utilized for include extraction from confront, unique mark and iris pictures. These highlights have been intertwined utilizing highlight level fusion, The include vectors acquired from LTP is profoundly discriminative and valuable for promote acknowledgment errands.

KEYWORDS: Multimodal biometrics, Iris, face, finger print, local ternary pattern, unimodal biometrics, security.

I. INTRODUCTION

A. Digital Image

A computerized remotely detected picture is commonly made out of picture components (pixels) situated at the crossing point of each line I and section j in every K groups of symbolism. Related with every pixel is a number known as Digital Number (DN) or Brightness Value (BV), depicts the average radiance of a relatively small area within a scene[4]. The extent of this small area impacts the propagation of points of interest inside the scene. As pixel measure is decreased more scene detail is exhibited in advanced digital representation.

B. Biometric Systems.

A biometric framework is basically an example acknowledgment framework that works by getting biometric information from an individual, separating a list of capabilities from the gained information, and looking at this list of capabilities against the format set in the database. Depending upon the application setting, a biometric framework may work either in check mode or ID mode. In the confirmation mode, the framework approves a man's personality by contrasting the caught biometric information and her own particular biometric template(s) put away in the framework database. In such a framework, a person who wants to be perceived cases a character, more often than not through an individual recognizable proof number (PIN), a user name or a smart card, and the system conducts a one-to-one comparison to determine whether the claim is true or no. Character check is commonly utilized for constructive acknowledgment, where the point is to pre-vent various individuals from utilizing a similar personality.

C. Face

Face acknowledgment is a non-nosy strategy, and facial pictures are likely the most well-known biometric trademark utilized by people to make an individual acknowledgment. The utilizations of facial acknowledgment extend from a static, controlled "mug-shot" confirmation to a dynamic, uncontrolled face distinguishing proof in a jumbled foundation. The most well known ways to deal with confront acknowledgment depend on either, 1) the location and

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shape of facial attributes such as the eyes, eyebrows, nose, lips and chin, and their spatial relationships, or 2) the overall (global) analysis of the face image that represents a face as a weighted combination of a number of canonical faces.[8] While the check execution of the face acknowledgment frameworks that are industrially accessible is sensible, they force various confinements on how the facial pictures are gotten, once in a while requiring a settled and straightforward foundation or exceptional enlightenment. These frameworks likewise experience issues in perceiving a face from pictures caught from two radically extraordinary perspectives and under various enlightenment conditions[7]. It is faulty whether the face itself, with no logical data, is an adequate reason for perceiving a man from an extensive number of personalities with a to a great degree abnormal state of certainty. All together for a facial acknowledgment framework to function admirably by and by, it ought to naturally, 1) identify whether a face is available in the gained picture; 2) find the face if there is one; and 3) perceive the face from a general perspective. Figure 1 mentioned the Feature Extraction Based Face Recognition System.

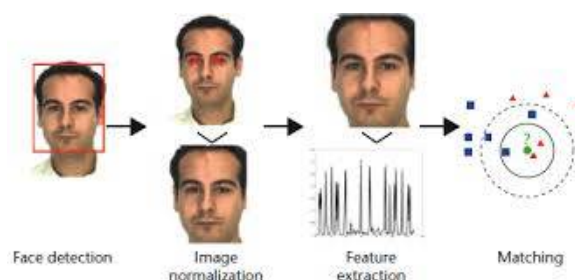


Figure.1.Feature Extraction Based Face Recognition System

D. Fingerprint

Extraordinary check Identification is the procedure for unmistakable confirmation using the impressions made by the moment edge arrangements or examples found on the fingertips. No two people have accurately a similar arrangement of edge cases, and the cases of any one individual remain unaltered all through life. Fingerprints offer an in unsteady technique for singular ID. Other individual characteristics may change, yet fingerprints don't. Fingerprints can be recorded on a standard special stamp card or can be recorded carefully and transmitted electronically to the FBI for examination. By differentiating fingerprints at the scene of a bad behavior with the exceptional stamp record of suspected people, experts can manufacture preeminent proof of the region of character of a person. In 1924 the recognizing verification division for the Federal Bureau of Investigation (FBI) was secured to give one central store of fingerprints. Exactly when the recognizing confirmation division was secured, its inspiration was to give a central store of criminal ID data for law necessity workplaces all through the Nation. However in 1933 the United States Civil Service Commission (now known as the Office of Personnel Management) turned the fingerprints of in excess of 140,000 organization agents and competitors over to the FBI. In this way a Civil Identification Section was secured, these improvements indicated the begin for the FBI's Civil File, which was bound to smaller person the criminal records in measure. In 1992 the Identification Division was re-secured as the Criminal Justice Information Services Division (CJIS).

E. IRIS

The iris has a thin circular diaphragm, which is in-between the cornea and the lens of the human eye. The iris is perforated close up to its center by a circular aperture renowned as the pupil. The intention of the iris is to handle the amount of light entering through the pupil and this is done by the sphincter and the dilator muscles, which adjust the dimension of the pupil.[6] The standard diameter of the iris is 12 mm, and the pupil dimension can vary from 10% to 80% of the iris diameter. The iris consists of a various quantity of layers they are, the lowest is the epithelium layer, which enclose dense pigmentation cells. The stromal layer lies on top of the epithelium layer and contain blood vessels, pigment cells and the two iris muscles. The outwardly visible surface of the multi layered iris contains two zones, which often differ in color. An external ciliary zone and an internal pupillary zone are these two zones separated by the collarette which show as a zigzag pattern. Formation of the iris starts in the third month of embryonic life. During the



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first year of life same model on the above the surface of the iris is formed, and pigmentation of the stroma takes place for the first few years. Formation of the unique pattern of the iris is informal and not related to any genetic factors. The only characteristic that is dependent on genetics is the pigmentation of the iris, which determine its colour.

II. LITERATURE SURVEY

Ashraf Aboshosha, Kamal A. El Dahshan and Eman A. Karam (2015), [1] analyzed score level used in that fusion of fingerprint, iris and face traits and in order to improve the accuracy of the system. Scores which obtained from the classifiers are normalized first using min-max normalization. Then sum, product and weighted sum rules are used to get fusion [4].

Sireesha V, Sandhyarani K (2013), Multimodal biometric systems outperform unimodal biometric systems and weighted, The In this Literature survey paper, finger print, face and face, these three verification is analyzed and fault rejection rate and fault acceptance rates are observed by use of PSO simulation values [10],

Javier Galbally, Sebastien Marcel and Julian Fierrez (2014), [3] multiple biometric systems software-based fake detection are used, this method that can to detect different types of fraudulent access attempts the experimental results, on openly available data sets of fingerprint, iris, and 2D face, show that the proposed method is highly competitive compared with other state-of-the-art approaches and that the analysis of the general image high quality and the proposed systems used to discriminate them from fake traits.

Hiew Moi Sim, et al (2014), [4] "Face recognition using independent component analysis and support vector machines" proposed a combination of two techniques used in the face recognition. SVM and ICA are two approaches that have been used in different facial applications. SVM is a classifier that classifies the different objects into different classes on the basis of different features. This divided the object on the basis of their properties and feature values. SVM classifier is widely used in the object recognition problems. ICA is an approach that is used to extract the features from the facial images. This approach divides the image into different segments and computes the independent components from the facial image. This approach mainly works on the principal of PCA.

III. PROPOSED METHOD

The proposed method consists of extracting the face, fingerprint and iris features of the image using feature extraction techniques along with the initial preprocessing. The input images are first preprocessed using illumination normalization technique based on local gradient to obtain the illumination insensitive representation of the image [8]. The feature extraction process is carried out on the pre-processed image using local ternary pattern. The required output features obtained from these techniques can be used further in the classification or recognition of various images as shown below. Feature extraction is an important and crucial issue in automatic face recognition systems. Detection of the prominent facial features such as eyes, mouth and nose accurately is the most significant step in the face recognition algorithms.

The proposed method consists of extracting the facial features of the image using two feature extraction techniques along with the initial preprocessing. The input images are first preprocessed using illumination normalization technique based on local gradient to obtain the illumination insensitive representation of the image [8]. The feature extraction process is carried out on the pre-processed image using Local Binary Pattern and its noise resistance modified version Local Ternary Pattern.

The whole of the work has been carried out on MATLAB. The database has been created of the face images and the texture features get extracted from the face images by the implementation of Local Ternary Pattern scheme by applying 3*3 masks on the image. After this, the histograms have been calculated for each region of an image. The whole of the process is shown in a flowchart manner as shown in the figure 2.



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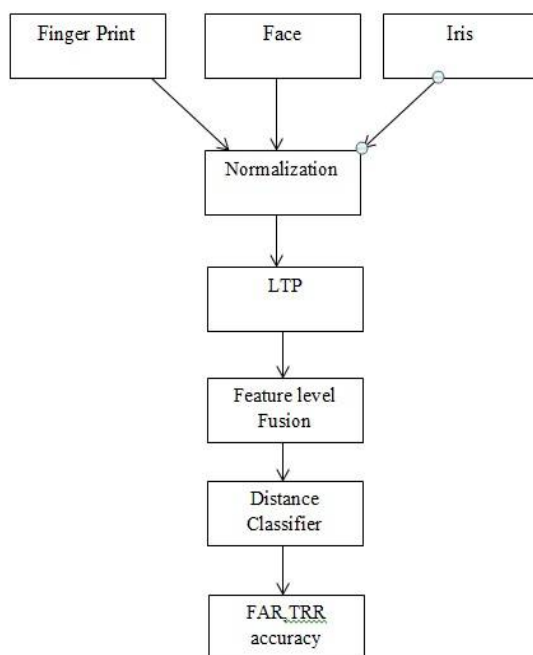


Figure.2. Proposed work

IV. FEATURE EXTRACTION USING LOCAL TERNARY PATTERN

Local Ternary Pattern is a noise resistant version of Local Binary Pattern. both the methods are utilized for encoding the power contrast between the middle pixel and its neighbors. LBP is sensitive to noise because even a small gray level change of the center pixel may result in different codes for a neighborhood in an image, particularly for the smooth regions. LTP overcomes the noise sensitivity issue in LBP by encoding the small difference in pixels into a third state. Instead of thresholding the pixels into 0 and 1 as in LBP, LTP uses a threshold constant to threshold the pixels into three values. Considering c as the value of center pixel, k as the threshold constant and p as the neighboring pixel, the result of thresholding is,

$$s'(x) = \begin{cases} 1 & p > c + k \\ 0 & p > c - k \text{ and } p < c + k \\ -1 & p < c - k \end{cases} \quad (1)$$

where k is a given threshold constant and it makes the LTP code more robust against noise. In this way, one of the three values are assigned to each of the thresholded pixel by LTP. A ternary pattern is obtained by combining the neighboring pixels after thresholding. If the histogram of these ternary values is computed, it will result in a large range, so the ternary pattern is split into two binary patterns. A descriptor double the size of LBP is obtained by concatenating the histograms of these two binary patterns for each cell.

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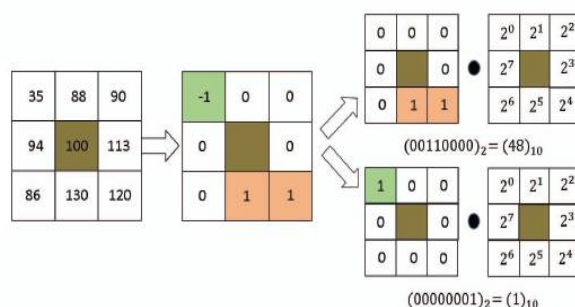


Figure.3. Local ternary pattern

V.RESULT AND DISCUSSION

The feature extraction of iris, fingerprint and face recognition for verification purpose using local ternary pattern. In the Local Binary Pattern feature extraction technique, each pixel is characterized by the decimal numbers which are called Local Binary Patterns or LBP codes. These LBP codes encode the local structure around each pixel. The safety measure level for each of this recognition has been analyzed through the MATLAB simulation. Image matching compares the features extracted from an image with the test image stored in database. The image with highest percentage of match success is retrieved as output result.

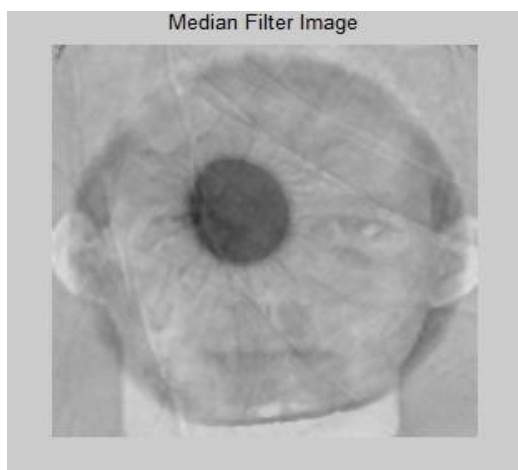


Figure.4.Noise Removal Image

This figure represents after normalization process LTP based features have been computed from the image. Mask has been moved pixel by pixel and centered pixel value with threshold has been compared with neighbor pixel value. On the basis of pixel value comparison upper and lower ternary codes have been generated for single patch of the images. Upper and lower ternary codes has been based 3 values that are computed on the basis of neighbor pixel difference with centre pixel values. These codes have been generated for all the patches by rotating mask on all pixels available in the image. Codes from all the patches are concatenated using histogram concatenation approach. Histogram concatenation approaches combines all upper and lower ternary codes can histogram values vector has been created that is used for computation LTP based features from face image

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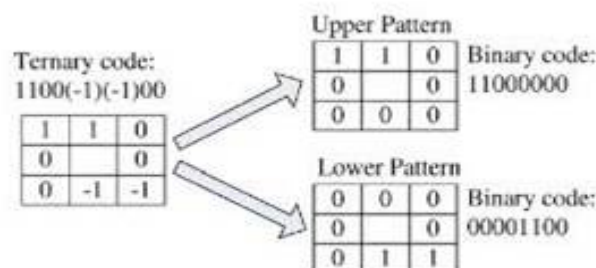


Figure.5.LTP upper pattern and Lower pattern

LTP based features extraction from face, Finger print and iris image is shown in figure 6.

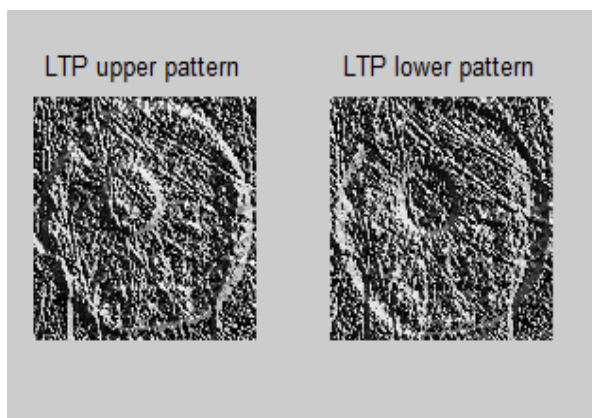


Figure.6.LTP based features extraction from face, Finger print and iris image

After extraction of face and finger images features feature level fusion has been done for combining of face and fingerprint features. In feature level fusion feature dimension has been made equal and magnitude and the phase has been measured for individual feature set. These features set have been combined tighter to form a new feature vector that contains properties of face and fingerprint features. After process of fusion histogram based distance computation approach has been used for computing distance between testing samples features and dataset samples features. On the basis of minimum distance recognition index has been measured. At which point minimum distance between testing and dataset features has been measured that is maximum matched point for purposed system. After matching various performance evaluation parameters have been measured for purposed system. Figure 7 indicate the accuracy curve.



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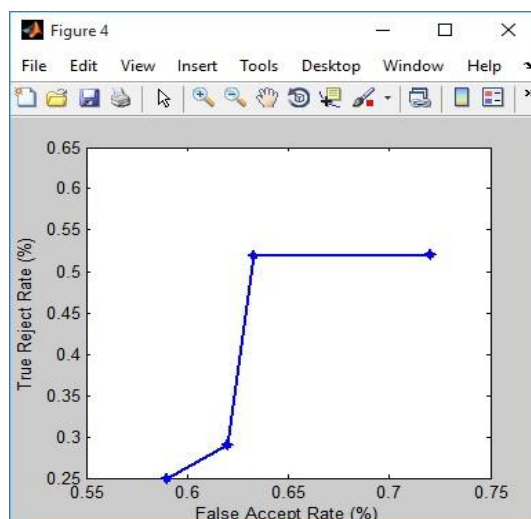


Figure.7.FAR and TRR curve

VI.CONCLUSION

Biometric system utilize in various system for the identification or authentication approval. Biometric authentication system utilizes various biometric traits for the matching between various biometric traits. Various approaches have been used for the extraction of features from various types of biometric traits. In the proposed work the biometric traits utilize are face, fingerprint and iris. Single Biometric trait system is fail to provide accuracy for the authentication of different identities because due to single biometric trait the chances of mis-matching increases. So to overcome these disadvantages of single trait biometric system, multimodel biometric system come into existence. Multimodel biometric system use face and finger images for the development of proposed system. feature from each biometric credential has been extracted and fused on the basis of score level fusion to reduce feature dimension. Local ternary pattern used to high accuracy result. This provides better security than other biometric system because illegal availability of all the traits of single person is not available to match and perform any illegal operation. So one can conclude that multimodel biometric system provides a better result when compare to single biometric trait system.

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