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A Novel Iris Image Retrieval with Boundary Based Feature Using Manhattan Distance Classifier

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Abstract— Image processing enters into various sectors but still it is struggling in recognition issues. Iris recognition developed into a very significant research area concentrate on how to extract and recognize iris images. Iris recognition is an extensively used biometric application for security and identification security iris is being used for recognition of humans. A mixture of method has been proposed for iris recognition and each technique has advantages and shortcoming. The complexities in process will affects performance of existing system makes inadequate. In this paper presents iris recognition feature vector to calculate the threshold value separately and stored in feature database. The feature is generated and matching is done by Manhattan distance classifier is used to measures a distance between two images. The experimental result shows that proposed method provides better recognition rate when compared with the existing methods such as Local Binary Pattern, Local Ternary Pattern.

Keywords— LBP, LTP, Iris, Manhattan Distance.

1. INTRODUCTION

Iris recognition is a technique of biometric authentication that uses sample popularity strategies based on images of the irises of a person's eyes. Iris recognition makes use of digital camera generation and diffused IR illumination to lessen specular mirrored image from the convex cornea to create images of the detail-rich complex structures of the iris. Those particular structures are converted into digital templates. They offer mathematical representations of the iris that yield unambiguous wonderful identification of a character.

Iris reputation efficacy is not often impeded by using glasses or contact lenses. Iris era has the smallest outlier group of all biometric technology. The simplest biometric authentication generation has been designed to be used in a one-to-many search environment. A key gain of iris recognition is its stability or template longevity as barring trauma and a single enrollment can final a lifetime. The various physiological characteristics, iris is the best biometric. It has all the talents of a good biometric. Iris is the colored a part of eye that is visible while eye is open. If we study an eye fixed photograph then blackish spherical shaped element is pupil. Iris is the only inner organ which may be visible externally. Iris can be visible across the scholar and inner sclera, as shown in figure 1.1.

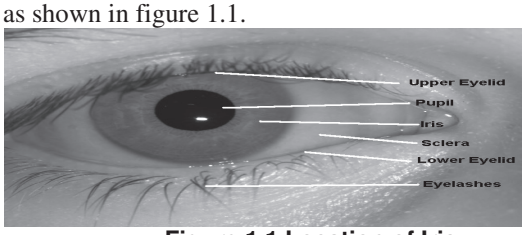

Figure 1.1 Location of Iris

Health care is a sector that has to provide services related to the general public and take care of not just their needs to make them well but also to provide the same in a better manner. Health care organizations are the ones that take care of people in their illness and so they have to be hygienic, clean and provide better services. The services provided by Health Care Centres and the Quality of services provided are the main basis on which they have to be judged, even their name is spread through word of mouth if they provide with good services. The efficiency of a Health care unit depends on the quality of service provided and to measure the same we are using Data Envelopment Analysis (DEA) as a tool.

Data envelopment analysis is a method that is based on analyzing the statistical data based on a set of inputs called Decision Making Units, and mostly used for measuring and evaluating performance of the data provided. Data Envelopment Analysis has been done by taking the following inputs – Number of Doctors, Number of Nurses, Number of beds, Number of Paramedical Staff and the Number of wards. The output of the provided input are- Average number of OPD patients per day and Average number of patients admitted per day.

2. REVIEW

The predominant research on iris popularity has been commenced inside the last decade. Iris popularity is turning into an active place of research in biometrics because of its excessive reliability for personal identification. a selection of strategies had been developed for iris localization.

Kekre et.al [1] proposed an iris popularity machine that is primarily based on vector quantization which includes Kekre's speedy Codebook era set of rules. Its overall performance is in comparison with the Discrete Cosine rework (DCT) as proposed VQ based totally device does no longer

need any pre-processing and segmentation of the iris. The KFCG set of rules calls for less computations and offers accuracy of outperforming DCT accuracy.

Shirkeswati et al [2] explained approximately algorithms developed for recognizing person iris styles tested in lots of laboratory produces no fake fits in numerous million evaluation checks. They present a green Iris Code classifier constructed from segment capabilities of Gabor wavelets bandwidths. The very last iris classifier based on Levenshtein distance consists of a weighted contribution of vulnerable classifiers.

Savithiri et al., [3] defined about Iris popularity that has obtained increasing interest in departments which require high security. They mentioned to extract features on precise part of the iris for improving the overall performance of an iris reputation gadget. The main intention of this paper is to reveal that authentication of valid and rejection of invalid users may be carried out through the usage of the half part of in place of entire extension of the iris.

Rishabhparashar et al., [4] discussed iris popularity that is considered to be maximum comfortable biometric approach as it's far non-invasive and strong during existence. For the reason of research and development of Iris popularity generation there are few public and freely available databases to have sample photos. This iris database contributes rich quantity of iris photographs which were taken in extraordinary environments. They talk and evaluate the main traits of the general public and freely to be had iris photograph databases to locate the proper one to check function extraction method of iris reputation in non cooperative environment.

John Daugman [5] developed very efficient approach for iris reputation. Daugman's gadget, Integro-differential operator turned into used for detecting the iris boundaries and second Gabor filter out changed into used for feature extraction.

Canny filter out had been carried out for the iris localization. Haar Wavelet rework used for characteristic extraction. Neural network is used to categorize the extracted vectors. To apply getting to know vector quantization version due to low complexity and excessive mastering capability [6].

Rakesh et al., [7] defined gradient based area detection are used to localize the quantities of iris and the scholar from the eye photograph. In the characteristic extraction procedure Gabor wavelet rework and wavelet transform which are widely used for extracting functions. Haar wavelet remodel became used for optimizing the dimension of characteristic vectors as a way to lessen processing time and space.

Meenakshisundaram et al., [8] proposed iris localization the usage of round Hough transform. The matching functions probabilistic neural network is used for gray level Co incidence Matrix primarily based functions to describe an iris pattern. GLCM primarily based capabilities are broadly used for texture evaluation additionally for the matching.

Anjana Peter et al., [9] advanced iris localization using round Hough rework and normalized photograph is decomposed by means of 2-D Haar wavelet and textural capabilities are extracted then matching manner artificial Neural network with lower back propagation is used.

3. Methodology

3.1 Local Binary Pattern (LBP)

Texture is a term that characterizes the contextual belongings of an image. A texture descriptor can symbolize an image as an entire as an alternative it is able to additionally signify an image regionally on the micro degree and via worldwide texture description at the macro level. LBP method is used to label each pixel in the photo by thresholding the 8 associates of the pixel with the center pixel cost. If a neighbor pixel price is much less than the edge then a cost of zero is assigned in any other case it's 1.

3.2 Local Tetra Patterns (LTP)

Local Tetra Patterns for the application of content-based image retrieval. This method encodes the spatial relationship between the referenced pixel and its neighbors based on the first order derivatives along vertical and horizontal directions.

3.3 Proposed Methodology

The iris popularity gadget consists of an automatic segmentation device that is primarily based on the threshold detector and is able to localize the round iris and student area, occluding eyelids, eyelashes and reflections. The extracted iris region is then normalized into a rectangular block with consistent dimensions to account for imaging inconsistencies. Functions are extracted with exclusive function extraction methods to encode the precise pattern of the iris into biometric template.

An entire iris recognition system is composed of four parts: picture acquisition, iris localization, feature extraction and matching. The photograph acquisition step captures the iris photographs. Infrared illumination is utilized in maximum iris photo acquisition. The iris localization step localizes the iris vicinity in the picture. For maximum algorithms, assuming close to-frontal presentation of the scholar, the iris limitations are modeled as two circles which are not necessarily concentric. The internal circle is the pupillary boundary or iris inner boundary. The outer circle is the limbic boundary or iris outer boundary. Maximum localization algorithms are gradient primarily based on the way to locate edges between the pupil and iris and the iris and sclera.

Iris popularity has been an energetic studies area for the previous few years due to its excessive accuracy and the encouragement of each the authorities and private entities to replace traditional security structures, which go through substantial margin of mistakes. However, early research was obstructed by the dearth of iris photographs. Now numerous free databases exist on the internet for testing utilization

.

3.3.1 Iris Localization Method

In iris localization, pupil boundary is detected by using the following methods. The schematic diagram of iris localization system is shown in Figure 1.3. First step in the iris localization method is detection of pupil which is followed by localization of the pupil in which parameters of pupil are determined and non-circular boundary is calculated. After that, iris outer boundary is localized in which iris parameters are found. Detection of pupil boundary is the first step towards

iris localization. Pupil parameters (center and radius) are calculated by assuming pupil as a circular region.

Pupil boundary is not circular due to non-linear behavior of iris muscles with respect to different illumination conditions, even if the images are acquired at orthogonal to the eye. After finding the pupil center and radius, following method/procedure is adopted to get the non-circular pupil boundary.

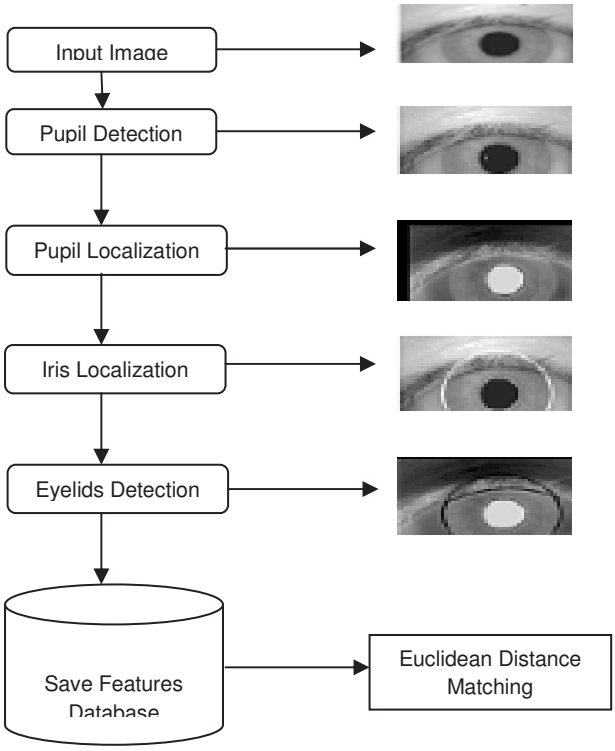

Fig.1.3 Iris Recognition System

3.3.2 IRIS BOUNDARY DETECTION

The iris localization, iris outer boundary detection is the most difficult step because the contrast between iris and sclera is low as compared to the contrast between iris and pupil. This contrast is low that sometimes it is hardly possible to detect the boundary by human eye observation.

3.3.3 EYELIDS LOCALIZATION

After localizing the iris with non-circular pupil boundary and circular iris boundary, now eyelids are to be detected and removed for further processing. So the region of interest is inside the iris boundary. Eyelids outside the iris boundary have no effect on the system. Both upper and lower eyelids are checked for their presence inside the iris. Upper eyelashes are normally heavy and affect the eyelid boundary detection process. To detect the lower eyelids, same algorithm is used but with minor differences. The Vertically cropped lower half iris image from the center of pupil is used for lower eyelid detection.

4. ALGORITHM

// generating feature sets //

Input: Input image of size (M x N) from IDB.
Output: Feature database.

Begin

Step1: Read an image (Ii) from the image database (IDB) of size (M x N).

Step2: Partitioning the input image into k non-overlapped blocks, each of size (n x n).

Step3: Perform Procedure pupil boundary detection_feature ( )

Step4: Perform Procedure to find the iris boundary_feature ( )

Step5: Repeat step 3 through step 4 for all blocks of the input image.

Step 6: Store the feature set into the feature database.

Step7: Repeat Step 1 through Step 6 for all the images in IDB.

End

Procedure pupil boundary detection _feature ( )

{

Step 1: Input M, N size of input image
Step 2: Read the iris image.
Step 3: Find a point in the pupil.
Step 4: Initialize previous centroid with the point in pupil.
Step 5: Repeat until single pixel accuracy is achieved by select the region and obtain centroid.
Step 6: Compare the previous centroid with current by using step 5.
Step 7: Calculate radius of the pupil.
Step 8: Repeat step3 to step7 for all images in the database.
Step 9: Return

}

Procedure to find the iris boundary_feature ( )

{

Step 1: Input M, N size of input image
Step 2: Read the iris image.
Step 3: Center of the pupil two virtual circles depending upon the radius of pupil are drawn, boundary between iris and sclera lies in these circles.
Step 4: Initialize previous centroid with the point in pupil.
Step 5: An array of pixels is picked from lines radially outwards within the virtual circles.
Step 6: Each array of convolved lines, three points with highest gradient are chosen to draw the circle of iris.
Step 7: Redundant points are discarded by using step 5 and step 6.
Step 8: Repeat step3 to step7 for all images in the database.
Step 9: Return

}

5. EXPERIMENTATION & RESULTS

The experimentation is carried out by MATLAB. It stands for MATrix LABoratory. MATLAB® is a high-performance language for technical computing. It integrates computation, visualization and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.

6. PERFORMANCE EVALUATION

To find the similarity measures between the images, various metrics are used to measure the distance between features of the images. Some of the well known distance metrics used in for image retrieval is presented below. The iris image is experimented with the images collected from the standard database and generated feature set considered.

6.1 Manhattan Distance

It is a distance between two points measured along axes at right angles. It is also known as rectilinear distance or city block distance. It requires less computation than many other distance metrics. The Manhattan distance $d_m(x_1, x_2)$ is calculated as below

$$d_m(x_1, x_2) = \sum_{i=1}^{i=n} \left[x_1(i) - x_2(i) \right] \quad \text{-- > (6.1)}$$

6.2 Chi-square Distance

Chi-square is a statistical test used to compare expected data with the collected data. There is a large difference between collected numbers and expected numbers. Statistically significant means the difference in the results did not occur by random chance.

$$x^2 (I,T) = \sum \frac{(I_i - T_i)^2}{(I_i + T_i)^2} \quad \text{-- > (6.2)}$$

From the below Table.1 shows that recognition percentage of iris images gives the experimental results the proposed produces higher recognition accuracy of 85.51% for iris recognition. The performance was evaluated using the Manhattan classification by analysis of the values in the table the proposed method is better for recognition of iris images.

Table.1 Comparison Values

Methods	Chi-Square Distance	Manhattan Distance
LBP	78.25%	81.29%
LTP	73.06%	80.35%
Proposed	74.19%	85.51%

From the below figure shows the pictorial representation of the performance evaluated. By analysing the obtained results the proposed method produced the best results.

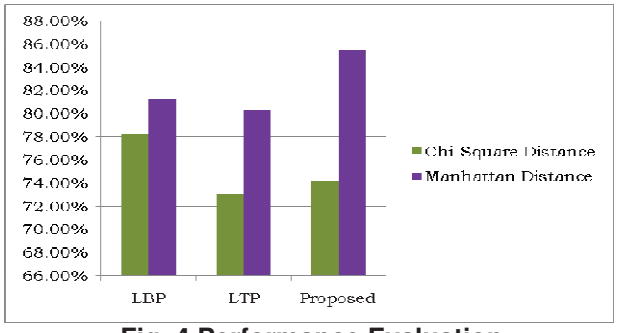

Fig. 4 Performance Evaluation

7. CONCLUSION

In this paper, the iris recognition and distance based retrieval with geometrical feature extraction images based on LBP, LTP models has been presented. The experimental result proves the effectiveness of the proposed methods provides good recognition rate and Manhattan distance gives better for retrieval of iris images when compared to existing methods. The proposed method produces better results with 85.51% accuracy compared with existing methods Local Binary Pattern and Local Ternary Pattern. Moreover, the computational cost of the algorithm is very low also used for face recognition and retrieval.

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