Textural Feature Analysis Approach for Iris Detection

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Abstract - Iris recognition is an automated method of biometric identification that utilizations mathematical pattern-recognition techniques on video images of either of the irises of an individual's eyes, whose complex random patterns are unique, stable, and can be seen from some distance. Digital templates encoded from these patterns by mathematical and statistical algorithms allow the identification of an individual or somebody pretending to be that individual. To increase the accuracy of iris detection and reduce execution time, improvement in existing GLCM algorithm, feature extraction technique is being proposed. The proposed improvement will be based on applying structural tensor algorithm and improved GLCM for contrast detection. The simulation is being performed in MATLAB and it has been analyzed that performance is increased in terms of accuracy and execution time.

Keywords - Iris, GLCM, Textural features

I. INTRODUCTION

Image processing is known as the enhancement of raw images assembled from everyday lives that are gathered from any sort of sources like satellites, cameras, web, and so forth such information can be helpful either for logical results or for the criminal examinations. As seen from daily lives, images today are being utilized for sending and accepting data. The images are received from web, satellites, cameras, and numerous other developed innovations. The images that are accessible with some data in them are thought to be as raw images. These images have in them much helpful data, which can be utilized for examination purposes. There is a ton of deception and duplicating of unique information and utilizing for individual issues furthermore to destroy others protection. The information that is replicated can be utilized as a part of any path by the clients. So the information should be recognized as unique or replicated. Automatic face detection is a complex problem in image processing. Numerous methods exist to take care of this problem, for example, template matching, Fisher Linear Discriminant, Neural Networks, SVM, and MRC [1]. Success has been accomplished with every strategy to changing degrees and complexities. The expected outputs of this step are patches containing every face in the input image. With a specific end goal to make advance face recognition system more robust and simple to design, face alignment are performed to legitimize the scales and orientations of these patches. Iris recognition is an automated method of biometric identification that utilizations mathematical pattern-recognition techniques on video images of either of the irises of an individual's eyes, whose complex random patterns are unique, stable, and can be seen from some distance [2]. Retinal scanning is a different, ocular-based biometric innovation that uses the unique patterns on a person's retina blood vessels and is regularly confused with iris recognition. Iris recognition utilizes video camera innovation with unobtrusive close infrared illumination to acquire images of the detail-rich, intricate structures of the iris which are visible externally. Digital templates encoded from these patterns by mathematical and statistical algorithms allow the identification of an individual or somebody pretending to be that individual. Databases of enrolled templates are searched by matcher engines at speeds measured in the millions of templates every second per (single-core) CPU, and with remarkably low false match rates. Iridology is the science of breaking down the delicate structures of the iris of the eye [3]. The iris uncovers body constitution, inherent weaknesses, and levels of health and transitions that happen in a person's body as per the way one lives. There is an old saying that the eyes are the window of the spirit. They can likewise be a window to one's health. Like fingerprints or faces, no two irises (the colored part of the eye) are precisely indistinguishable. The iris structure is so unique it is currently being utilized for security identification at ATM machines and airports. What's more, for a considerable length of time, it has additionally been utilized to break down individuals' health – past, present and future. The investigation of the iris for medical purposes is called iridology. The iris contains detailed fibers and pigmentation that reflects our physical and psychological makeup. At the point when an organ or body system is in poor health, the nerve running from that body part will begin to recede. When it does, it draws with it different degrees of the layers of fibers which make up the color of the iris of the eyes, leaving darkened marks called lesions [4]. Iris is one the important Biometric Identification technique furthermore Iris is one of unique identifier of Human then it is stable throughout a life of the person's. Edge detection is one of the important modules of any image processing technique. The task of the classifier component appropriate of a full system is to utilize the feature vector gave by the feature extractor to dole out the object to a category. Since immaculate classification performance is frequently impossible, a more general task is to determine the probability for each of the possible categories. The abstraction gave by the feature-vector representation of the input data enables the development of a largely domain-independent theory of classification. The variability of feature values for objects in the same category might be because of complexity, and might be because of noise [5]. The noise is characterized in exceptionally general terms: any property of the sensed pattern, which is not because of the true underlying model but rather to randomness in the world or the sensors. All nontrivial decision and pattern recognition problems involve noise in some form. A classifier seldom exists in a vacuum. Rather, it is generally to be utilized to recommend actions (put this fish in this bucket, put that fish in that bucket), every action having an associated cost. The post-processor utilizes the output of the classifier to decide on the recommended action [6]. Quadratic Discriminant Analysis (QDA) is utilized as a part of machine learning and statistical classification to separate measurements of two or more classes of objects or events by a quadric surface. It is a more general version of a linear classifier. QDA is a parametric approach in supervised learning which models the probability of every class as a Gaussian circulation, then uses the posterior distributions to estimate the class for a given test point. Decision tree classifier is considered to be a decision support tool that uses a tree-like structure or model of decisions and all its possible consequences [7]. It is one way to show an algorithm. These trees are essentially utilized as a part of operations research, generally in decision analysis, to identify a strategy well on the way to achieve a goal. Naive Bayes classifier is a simple, probabilistic and statistical classifier which is based on Bayes theorem (from Bayesian insights) with strong (naive) independence assumptions and maximum posteriori hypothesis. As Bayesian classifiers are statistical in nature, they can predict the probability of a given sample having a place with a particular class.

II. LITERATURE REVIEW

N. Pattabhi Ramaiah, et.al, (2016) designed a domain adaptation framework to address this problem and introduces another algorithm utilizing Markov random fields (MRF) model to significantly improve cross-domain iris recognition [8]. The proposed domain adaptation framework based on the credulous Bayes nearest neighbor order utilizes a real-valued feature representation which is fit for learning domain knowledge. Our approach to gauge corresponding visible iris patterns from the combination of iris patches in the near infrared iris images achieves outperforming results for the crossspectral iris recognition. It was displayed reproducible experimental results from three publicly available databases; PolyU crossspectral iris image database, IIITD CLI and UND database, and achieved outperforming results for the cross-sensor and cross spectral iris matching.

Yang Hu, et.al, (2016) presented the iris code calculation from the point of view of optimization [9]. The traditional iris code is the solution of an optimization problem which minimizes the distance between the feature values and iris codes. It was investigated using two additional objective terms. The main objective term exploits the spatial relationships of the bits in different positions of an iris code. The second objective term mitigates the influence of less reliable bits in iris codes. The two objective terms can be applied to the optimization problem individually, or in a combined scheme. We lead experiments on four benchmark datasets with fluctuating image quality. The experimental results demonstrate that the iris code produced by solving the optimization problem with the two additional objective terms achieves a generally improved performance in comparison to the traditional iris code calculated by binarizing feature values based on their signs.

Peter Chondro, et.al, (2016) aimed to introduce an algorithm that particularly enhances maxillary sinuses utilizing a novel contrast enhancement technique based on the adaptive morphological texture analysis for occipitomental see radiographs [10]. As indicated by the experimental results, the proposed method can increase the diagnosis accuracy by 83.45% compared with the figured tomography methodology as the gold standard. The proposed ToMA was thoroughly tested and compared with two other representative enhancement schemes. The results revealed the proposed ToMA can improve the contrast of SXR better than prior methods while having the lowest computational complexity. To some extent, ToMA can be implemented in a parallel programming scheme to increase the software efficiency with conceivable application on the generally utilized picture archiving and communication system (PACS).

Iliana V. Voynichka, et.al, (2016) proceeded with our investigation into how certain factors influence facial recognition by investigating what are the most statistically significant pixel-features in an image that differentiate a given individual face from whatever is left of the individual faces in a given data set [11]. Specifically, we propose an algorithm to infer a mask of the pixels with the highest statistical significance levels to identify a given face based on this mask. Our investigation demonstrates that making a mask utilizing the two-sample t-test, chooses the pixels that are most representative of a given individual face physiognomy when compared to face images of whatever is left of the individuals in a given database.

Manisha Parlewar, et.al, (2016) proposed a novel quantized gradient based local feature descriptor, named Local Quantized Gradient Direction (LQGD) descriptor and the subsequent Partitioned Gradient Histogram, for facial image representation [12]. The subsequent novel partitioned histogram based feature detection utilizing the proposed descriptor offers separation in feature space resulting in recognition performance improvement. The technique is likewise robust to rotation, scale variations and noise because of typical preprocessing, background minimization and the descriptor itself. Spatial and transform domain feature level fusion is utilized for further performance improvement. The benchmarking of the proposed technique has been done utilizing publicly accessible YEL and JAFFE databases with other contemporary techniques. The proposed technique beats the other published contemporary techniques.

Hsien-Chih Hu, et.al, (2016) presented a modified algorithm of the original LBP proposal together with other as of late proposed LBP extensions [13]. In this paper, LBP feature extraction edge face detection, strengthen image characteristics, in the light of with human face discrimination influence different angles test recognition efficiency. Experimental results demonstrated the effectiveness and robustness of the described texture descriptors for images that are subjected to geometric or radiometric changes. Combined with FS, TSS image search method to search for a face texture blocks by the experimental results compared in different environments and light changes, It doesn't influence the output of the image can be identification correct image blur effortlessly recognize errors.

III. RESEARCH METHODOLOGY

The iris detection is the technique which is applied to detect the iris part from the eye image. The iris detection consists of following steps:-

1. Input image - In the first phase, the image is given as input from which the iris need to be detected and apply technique of bilateral filter to remove noise from the input image

2. Iris Localization - The Iris localization is the technique which detects the boundary of the iris part from the eye. In the base paper, technique the canny edge detector is applied with the circular houge transformation for the iris detection. In the proposed technique, the canny edge detector is applied which will mark the boundary of the eyes. The structural tensor technique is applied with canny edge detector the mark the portion of iris. The structural tensor is the distance based algorithm which will calculate the distance from the outer boundary and mark the whole iris from the eye image

3. Normalization and feature extraction - In the last phase of the process the normalization is applied on the detected iris portion. To detect the textural features of the iris portion technique of glcm is applied in the base paper which detect contrast, homogeneity, energy and entropy of the image. In the proposed technique improvement in the existing algorithm is done by applying formula mentioned in the algorithm phase which increase contrast level of the detect image.

IV. EXPERIMENTAL RESULTS

The proposed work is implemented in MATLAB and the results are evaluated by making comparisons against proposed and existing techniques in terms of various parameters.

```
glcms =

  Columns 1 through 7

       76038          52          35          71          48          14           2
          47           6           2           1           2           0           0
          33           0           1           1           3           0           0
          74           0           1          13           8           1           0
          51           0           0           8          11           5           0
          15           0           0           2           3           1           0
           0           0           0           1           1           0           0
           4           0           0           0           0           0           0

  Column 8

           2
           0
           1
           0
           1
           0
           0
           1
```

Figure 1: Detection of iris portion

As shown in figure 9, as glcm algorithm is been applied which will extract the textural features of the input image.

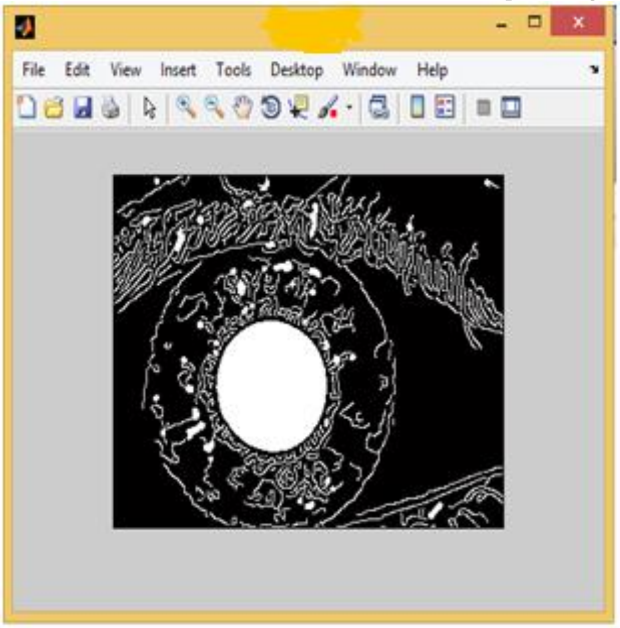

Figure 2: Iris Localization

As shown in figure 10, the technique of structural tensor is applied which will localize the iris from the image. The structure tensor algorithm will mark the boundaries of the iris for the localization.

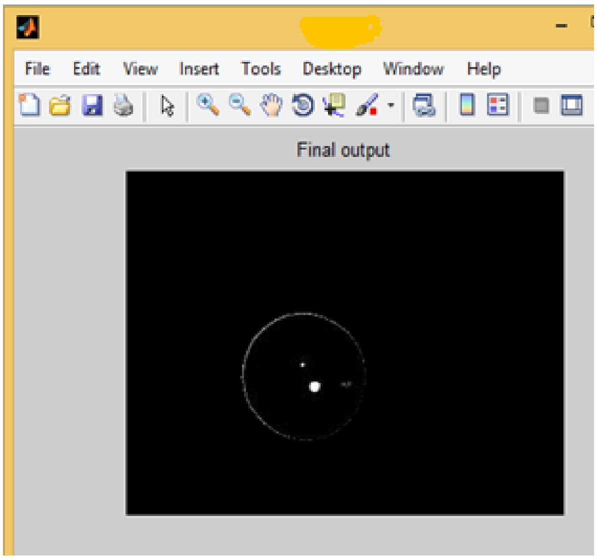

Figure 3: Output of Structural Tensor

As shown in figure 11, the algorithm of structural tensor is applied which will mark the boundaries of the iris. The technique will calculate the distance and mark the whole iris part from the image.

V. CONCLUSION

In this work, it has been concluded that iris detection consists of two phases. In the first phase the iris boundary is detected and in the second phase features of the detected iris is extracted. In the base paper, the Circular-Hough transformation is applied with Canny-edge detection for boundary detection of iris. The GLCM algorithm is applied to extract the features of the detected iris. In the proposed work, the Circular-Hough transformation is replaced by Structural tensor algorithm which reduces execution time. The GLCM algorithm is improved to increase accuracy of iris detection. The simulation results show variations in the execution time and accuracy of proposed algorithm as compared to existing algorithm.

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