E-ISSN: 2395-1702 P-ISSN: 2395-0382
Volume 03- Issue 03- pp-18-23

Research Paper Open Access

RETINA BASED PERSONAL IDENTIFICATION SYSTEM USING SIFT ALGORITHM

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Abstract

Biometric methods based on iris images are believed to achieve very high accuracy, and there has been an explosion of interest in biometrics. In this paper,we use the Scale Invariant Feature Transformation (SIFT) for recognition of iris . Comparing to traditional iris recognition systems, the SIFT approach does not rely on the transformation of the iris pattern to polar coordinates, allowing less constrained image acquisition conditions. To extract feature points in scale space and perform matching based on the texture information around the feature points using the SIFT method.

Index Terms —SIFT retinal identification, pre-processing, segmentation.

I. introduction

The authentication of person based on biometrics is rapidly increasing these days as compare to conventional system which includes physical key, ID card, password, pin, token. Identification based on biometric technology includes fingerprints, face, retina, palm-print, hand geometry, voice, handwriting and iris. Among the various biometric recognition the iris is one of the most stable, reliable and has high uniqueness which means the probability of finding two iris exactly similar is almost zero and even the iris texture of left and right eye of same human is different.

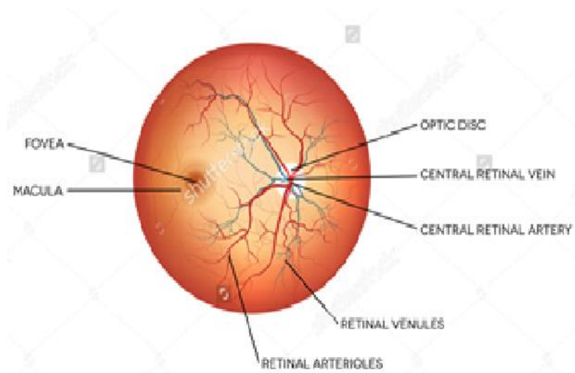

Fig 1. Human Eye

The paper is organized as follows: Section II gives the brief idea of previous literature survey. Section III defines the SIFT principle. Section IV gives the conclusion of the paper.

II. Related works

A. Identity Verification Using Iris Images: Performance of Human Examiners

We are not aware of any previous systematic investigation of how well human examiners perform at identity verification using the same type of images as acquired for automated iris recognition. This paper presents results of an experiment in which examiners consider a pair of iris images to decide if they are either (a) two images of the same eye of the same person, or (b) images of two different eyes, with the two different individuals having the same gender, ethnicity and approximate age. Results suggest that novice examiners can readily achieve accuracy exceeding 90% and can exceed 96% when they judge their decision as “certain”. Results also suggest that examiners may be able to improve their accuracy with experience.

B. How Iris Recognition Works

Algorithms developed by the author for recognizing persons by their iris patterns have now been tested in many field and laboratory trials, producing no false matches in several million comparison tests. The recognition principle is the failure of a test of statistical independence on iris phase structure encoded by multi-scale quadrature wavelets. The combinatorial complexity of this phase information across different persons spans about 249 degrees of freedom and generates discrimination entropy of about 3.2 b mm2 over the iris, enabling real-time decisions about personal identity with extremely high confidence. The high confidence levels are important because they allow very large databases to be searched exhaustively (one-to-many “identification mode”) without making false matches, despite so many chances. Biometrics that lack this property can only survive one-to-one (“verification”) or few comparisons. This paper explains the iris recognition algorithms and presents results of 9.1 million comparisons among eye images from trials in Britain, the USA, Japan, and Korea.

C. Identity Verification Using Iris Images: Performance of Human Examiners

We are not aware of any previous systematic investigation of how well human examiners perform at identity verification using the same type of images as acquired for automated iris recognition. This paper presents results of an experiment in which examiners consider a pair of iris images to decide if they are either (a) two images of the same eye of the same person, or (b) images of two different eyes, with the two different individuals having the same gender, ethnicity and approximate age. Results suggest that novice examiners can readily achieve accuracy exceeding 90% and can exceed 96% when they judge their decision as “certain”. Results also suggest that examiners may be able to improve their accuracy with experience.

D. Iris Recognition: On the Segmentation of Degraded Images Acquired in the Visible Wavelength

Iris recognition imaging constraints are receiving increasing attention. There are several proposals to develop systems that operate in the visible wavelength and in less constrained environments. These imaging conditions engender acquired noisy artifacts that lead to severely degraded images, making iris segmentation a major issue. Having observed that existing iris segmentation methods tend to fail in these challenging conditions, we present a segmentation method that can handle degraded images acquired in less constrained conditions. We offer the following contributions: 1) to consider the sclera the most easily distinguishable part of the eye in degraded images, 2) to propose a new type of feature that measures the proportion of sclera in each direction and is fundamental in segmenting the iris, and 3) to run the entire procedure in deterministically linear time in respect to the size of the image, making the procedure suitable for real-time applications.

E. Ordinal Feature Selection for Iris and Palm print Recognition

Ordinal measures have been demonstrated as an effective feature representation model for iris and palm print recognition. However, ordinal measures are a general concept of image analysis and numerous variants with different parameter settings such as location, scale, orientation etc. can be derived to construct a huge feature space. This paper proposes a novel optimization formulation for ordinal feature selection with successful applications to both iris and palm print recognition. The objective function of the proposed feature selection method has two parts, i.e., misclassification error of intra- and inter-class matching samples and weighted sparsity of ordinal feature descriptors. Therefore the feature selection aims to achieve an accurate and sparse representation of ordinal measures. And the optimization subjects to a number of linear inequality constraints, which require that all intra- and inter-class matching pairs are well separated with a large margin. Ordinal feature selection is formulated as a linear programming (LP) problem so that a solution can be efficiently obtained even on a large-scale feature pool and training database. Extensive experimental results demonstrate that the proposed LP formulation is advantageous over existing feature selection methods such as mRMR, ReliefF, Boosting and Lasso for biometric recognition, reporting state-of-the-art accuracy on CASIA and PolyU databases.

III. Existing system

IRIS RECOGNITION BASED ON HUMAN-INTERPRETABLE FEATURES:

The iris is a stable biometric trait that has been widely used for human recognition in various applications. However, deployment of iris recognition in forensic applications has not been reported. A primary reason is the lack of human friendly techniques for iris comparison. To further promote the use of iris recognition in forensics, the similarity between irises should be made visualizable and interpretable. Recently, a human-in-the-loop iris recognition system was developed, based on detecting and matching iris crypts. Building on this framework, we propose a new approach for detecting and matching iris crypts automatically. Our detection method is able to capture iris crypts of various sizes. Our matching scheme is designed to handle potential topological changes in the detection of the same crypt in different images. Our approach outperforms the known visible-feature based iris recognition method on three different datasets. Specifically, our approach achieves over 22% higher rank one hit rate in identification, and over 51% lower equal error rate in verification. In addition, the benefit of our approach on multi-enrollment is experimentally demonstrated.

IV.proposed system

Scale Invariant Feature Transformation (SIFT) originally developed for general purpose object recognition. SIFT detects stable feature points of an object such that the same object can be recognized with invariance to illumination, scale, rotation and affine transformations. A brief description of the steps of the SIFT operator and their use in iris recognition

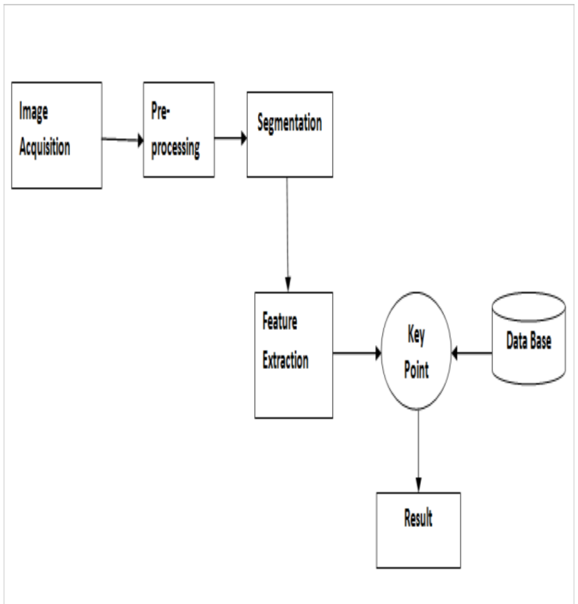

Fig 2. Block Diagram

Feature extraction. Stable keypoints are extracted by using the SIFT algorithm, the key points can characterize the uniqueness of each class. Matching. Find the number of matched pairs in two retinal images. In the image formation process, several unknown variables play a role in varying the image properties, i.e., viewing angle, illumination, lens distortion, and so forth. Among these image variations, the perspective difference between frames constitutes a significant factor, especially when the baseline is large between the views. The scale invariant feature transform (SIFT) to extract key points from a captured image frame.

A. PREPROCESSING

Background information. This step normalizes the no uniformly distributed background by removing the bias field like region, which is acquired by convolve the original image with the template, from the original retinal images. Then the intensity of the new image is normalized to values from 0 to 255. Smoothing. Reduce the noise in homogeneous regions using the iterated spatial anisotropic smooth method. What's more, small structures of retinal vessels are enhanced. Image pre-processing is used to reduce the noise. Usually ultrasound images are affected by the many artifacts like speckle noise, reflection etc hence it is necessary to pre-process the image. There are so many image pre-processing techniques are available to remove the noise and to enhance the image. Feature extraction. Stable key points are extracted by using the SIFT algorithm, the key points can characterize the uniqueness of each class. Matching. Find the number of matched pairs in two retinal images.

B. SEGMENTATION

Image segmentation is a process of dividing an input digital image into multiple parts or regions. It does the separation of boundaries from an interested organ. Goal of segmentation is to make an image simpler to analyze by representing only a required object or a region. Region growing is the simple segmentation technique. There must be region criterion on what basis the region needs to grow like intensity, gray image etc. It is one of the region based segmentation technique. In our work we find the seed point automatically. Segmentation process starts from the seed point, it checks the neighboring pixel to decide whether it belongs to seed point region or not. If it belongs to the seed region then is added to the set called seed. If the seed max is reached then new mean is calculated from that point.

C. FEATURE EXTRACTION

Feature extraction is the process of defining a set of features, or image characteristics, which will most efficiently or meaningfully represent the information that is important for analysis and classification. The retina image and it can be seen that the optic disc is the brightest region in the retina images. Because of the existence of rotation in the retina image of a person in different situations and images, rotation invariant features are the best features for recognition. Corners are rotation invariant, and they can be used as features for recognition. Therefore, SIFT method is used for feature extraction. SIFT-based identification based on the original retinal images has an undesirable performance. define template for image intensities in the neighborhood around a pixel, then after being convolved by the template, and additive bias field in obtained from the original image. The image contrast is greatly enhanced after eliminating the bias field from the original image with the unrecognizable capillary vessels being clarified. This step normalizes the non-uniformly distributed background by removing the bias field like region, which is acquired by convolve the original image with the template, from the original retinal images. The estimation of the background is the result of a filtering operation with a large arithmetic mean kernel. The image processed by the SIFT has a stronger gray level contrast than the original retinal image, and has a substantially uniform grayscale distribution.

V. SYSTEM REQUIREMENTS

HARDWARE REQUIRMENTS

- Processor - Pentium-IV
- Speed - 1.1 Ghz
- RAM - 256 MB(min)
- Hard Disk - 20 GB

SOFTWARE REQUIRMENTS

- Tool - MATLAB R2012
- Operating system - Windows Xp, 7

Conclusion

Retinal identification based on retinal vasculatures provides the most secure and accurate authentication means among biometrics. In this paper, presented a robust retinal identification method based on SIFT. SIFT is invariant to rotations and scale changes. In this work, contribute with the analysis of the influence of SIFT parameters on the verification perfonnance, including of false matches with geometric constraints, as proposed for the case of iris recognition. The method proved to be effective for the identification based on retinal images. The SIFT-based identification based on the original retinal images has an undesirable performance.

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