HIGH LEVEL AUTHENTICATION SYSTEM USING PALM VEIN BASED ON DEEP NEURAL NETWORK

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ABSTRACT

Palm print provides a reliable source of information for automatic personal identification and has wide and important applications. This paper mainly focuses on feature analysis of palm print biometrics. And the details of palm print image preprocessing can be found in the existing publications. For palm print images, the gaps between neighboring fingers can be used as the landmark points for correction of the rotation and scale changes of palm print images and then the central region can be cropped as the input of feature analysis. The basic idea of the proposed feature selection method is to find a sparse representation of ordinal features on the condition of large margin principle. On one hand, the intra and inter-class biometric matching results are expected to be well separated with a large margin. On the other hand, the number of selected ordinal features should be much smaller than the large number of candidates.

Keyword : *- Palm print, Preprocessing, Feature analysis, Biometric, Ordinal features, Margin principle*

1. INTRODUCTION

Because of the Fast growing mobile technology, when it comes to sensitive transactions, such as financial or payment applications, it is required to follow the security in all kinds of transactions made through mobile devices. Image based biometric authentication creates good impact on security. In the Existing System the deep feature fusion network that exploits the complementary information presented in iris and periocular regions. The method first applies max out units into the convolution neural networks (CNNs) to generate a compact representation for each modality, and then fuses the discriminative features of two modalities through a weighted concatenation.In the proposed system an deep neural network based classification algorithm is used, edge detection with adaptive contour segmentation is used to segment the iris from the given image.

The quality of the image is enhanced through color equalization etc. The proposed system authenticate for a particular website access and which can be implemented in MATLAB software**.** Biometric identifiers are the distinctive, measurable characteristics used to label and describe individuals. Biometric identifiers are often categorized as physiological versus behavioral characteristics.

Physiological characteristics are related to the shape of the body. Examples include, but are not limited to fingerprint, palm veins, face recognition, DNA, palm print, hand geometry, iris recognition, retina and scent. Behavioral characteristics are related to the pattern of behavior of a person, including but not limited to typing rhythm, gait, and voice.

1.1 Purpose of Image Processing

The purpose of image processing is divided into 5 groups. They are:

- Visualization - Observe the objects that are not visible.
- Image sharpening and restoration - To create a better image.

- Image retrieval - Seek for the image of interest.
- Measurement of pattern – Measures various objects in an image.
- Image Recognition – Distinguish the objects in an image.

2. EXISTING SYSTEM

The word iris dates from classical times. As applied to the colored portion of the exterior eye, iris seems to date to the sixteenth century and was taken to denote this structure's variegated appearance. More technically, the iris is part of the middle, coat of the eye. It is a thin diaphragm stretching across the anterior portion of the eye and supported by the lens. This support gives it the shape of a truncated cone in three dimensions. At its base, the iris is attached to the eye's cilliary body. At the opposite end, it opens into the pupil, typically slightly to the nasal side and below center. The cornea lies in front of the iris and provides a transparent protective covering.

To appreciate the richness of the iris as a pattern for recognition, it is useful to consider its structure in a bit more detail. The iris is composed of several layers. Its posterior surface consists of heavily pigmented epithelial cells that make it light tight (i.e., impenetrable by light). Anterior to this layer are two cooperative muscles for controlling the pupil. Next is the stromal layer, consisting of collagenous connective tissue in arch-like processes. Coursing through this layer are radially arranged corkscrew like blood vessels. The most anterior layer is the anterior border layer, differing from the stroma in being more densely packed, especially with individual pigment cells called chromataphores. Apparently, the first use of iris recognition as a basis for personal identification goes back to efforts to distinguish inmates in the Parisian penal system by visually inspecting their irises, especially the patterning of color especially the patterning of color.

More recently, the concept of automated iris recognition was proposed by Flom and Safir It does not appear, however, that this team ever developed and tested a working system. Early work toward actually realizing a system for automated iris recognition was carried out at Los Alamos National Laboratories, CA. Subsequently, two research groups developed and documented prototype iris recognition systems. These systems have shown promising performance on diverse data bases of hundreds of iris images. Other research into automated iris recognition has been carried out in North America and Europe.

2.1 Iris recognition principle

The border of these two areas is termed the collarette; it appears as a zigzag circumferential ridge resulting as the anterior border layer ends abruptly near the pupil. The cilliary zone contains many interlacing ridges resulting from stromal support. Contractile lines here can vary with the state of the pupil.

Additional meridional striations result from the radiating vasculature. Other assorted variations in appearance owe to crypts (irregular atrophy of the border layer), nevi (small elevations of the border layer), and freckles (local collections of chromataphores). In contrast, the pupillary zone can be relatively flat.

However, it often shows radiating spoke-like processes and a pigment frill where the posterior layer's heavily pigmented tissue shows at the pupil boundary. Last, iris color results from the differential absorption of light impinging on the pigmented cells in the anterior border layer. When there is little pigmentation in the anterior border layer, light reflects back from the posterior epithelium and is scattered as it passes through the stroma to yield a blue appearance. Progressive levels of anterior pigmentation lead to darker colored irises. Additional details of iris structure can be found in the biomedical literature. Claims that the structure of the iris is unique to an individual and is stable with age come from two main sources. The second source of evidence is developmental biology. There, one finds that while the general structure of the iris is genetically determined, the particulars of its minutiae are critically dependent on circumstances (e.g., the initial conditions in the embryonic precursor to the iris).

Therefore, they are highly unlikely to be replicated via the natural course of events. Rarely, the developmental process goes awry, yielding only a rudimentary iris or a marked displacement or shape distortion of the pupil.

Developmental evidence also bears on issues of stability with age. Certain parts of the iris (e.g., the vasculature) are largely in place at birth, whereas others (e.g., the musculature) mature around two years of age.

2.2 Ordinal Measures

The ordinal measures come from a simple and straightforward concept that we often use. For example, this could easily rank or order the heights or weights of two persons, but it is hard to answer their precise differences. This kind of qualitative measurement, which is related to the relative ordering of several quantities, is defined as ordinal measures (or OM for short). For computer vision, the absolute intensity information associated with an object can vary because it can change under various illumination settings. However, ordinal relationships among neighboring image pixels or regions present some stability with such changes and reflect the intrinsic arrow points from the darker region to the brighter one. (a) Region A is darker than B, i.e. A≺ B. (b) Region A is brighter than B, as shown.

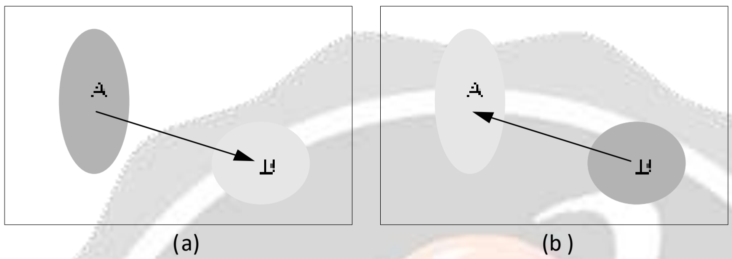

Fig-1: Ordinal Measures

A simple illustration of ordinal measures where the symbols denote the inequality between the average intensities of two image regions.

Many computer vision researchers have enjoyed the effectiveness of ordinal measures. Sinha was probably the first to introduce ordinal measures to visual object representation. Based on the fact that several ordinal measures on facial images, such as eye-forehead and mouth-cheek are invariant with different persons and imaging conditions, Sinha developed a ratio-template for face detection, which could be automatically learned from examples. Combining qualitative spatial and photometric relationships together, Lipson et al. applied ordinal measures to image database retrieval. Bhat and Nayar employed the rank permutation of pixel intensity values in image windows for stereo correspondence.

3.PROPOSED SYSTEM

The high level authentication using palm vein can be implemented by the following methods,

3.1 Palm vein authentication

The deep neural network based classification algorithm is used, edge detection with hough transform is used to segment the palm print from the given image. The quality of the image is enhanced through color equalization etc. The proposed system authenticate for a particular website access and which can be implemented in MATLAB software. The authentication is used to provide access to open a secret locker etc.

3.2 Adaptive Multimodal

A highly secure systems that utilize multi-sensor fusion to improve the security level of a system by combining biometric modalities. An algorithm is presented that adaptively derives the optimum Bayesian fusion rule as well as individual sensor operating points in a system. The algorithm base sits design on system requirements, which may be time-varying.

Other researchers have published numerous experimental results demonstrating the effectiveness of fusion in biometrics. Ad hoc techniques have been demonstrated to be effective but not all ways optimum in terms of accuracy .For example, the BioID system chooses from different fusion strategies to vary the system security levels. The fusion options, however, contain only a few fusion rules, typically the “and” and “or” rules, severely restricting the rule search.

The decision thresholds or operating points for individual sensors are fixed in these systems, which fixes the false acceptance rate (FAR) and false rejection rate (FRR). This approach successfully reduces FAR or FRR but not both. In contrast, the adaptive, multimodal biometric management algorithm (AMBM), which is presented in this paper, comprehensively considers all fusion rules and all possible operating points of the individual sensors.

The optimum Bayesian fusion rule is designed based on the current situation as it is defined by the Bayesian error costs. As the situation changes with time, AMBM revises the fusion rule and the sensor operating points. .

3.3 Feature extraction

The process of feature parameter extraction is a process of abstracting the motion of a gesture in time and space into a number that can be used for calculation.

Although the point coordinate position on the gesture trajectory curve can be used as a salient feature of the gesture trajectory recognition, since the coordinate point position of the trajectory changes even with the same gesture, it is not suitable as the feature value.

Since the trajectories drawn by the hand center are composed of sequences of tangential angle changes at different times, the changes are continuous, and the range if calculated one by one, not only the calculation amount is large, the delay is serious, and the processing effect is not necessarily good.

3.4 Hough Transform

The Hough transform is a technique which can be used to isolate features of a particular shape within an image. Because it requires that the desired features be specified in some parametric form, the classical Hough transform is most commonly used for the detection of regular curves such as lines, circles, ellipses, etc.

Despite its domain restrictions, the classical Hough transform retains many applications as most manufactured parts contain feature boundaries which can be described by regular curves. The main advantage of the Hough transform technique is that it is tolerant of gaps in feature boundary descriptions and is relatively unaffected by image noise.

The method attributes a logical label (set of parameter values defining a line or quadric) to an object that, until then, existed only as a collection of pixels therefore it can be viewed as a segmentation procedure.

The idea behind the method is simple: parametric shapes in an image are detected by looking for accumulation points in the parameter space. If a particular shape is present in the image, then the mapping of all of its points into the parameter space must cluster around the parameter values which correspond to that shape.

This approach maps distributed and disjoint elements of the image into a localized accumulation point, which is both a benefit and a drawback.

3.5 Neural network

The various methods used in neural network are, feed-forward ANNs allow signals to travel one way only; from input to output. There is no feedback (loops) i.e. the output of any layer does not affect that same layer. Feed-forward ANNs tend to be straight forward networks that associate inputs with outputs. They are extensively used in pattern recognition. This type of organization is also referred to as bottom-up or top-down. The feed forward network is shown in figure 3.2,

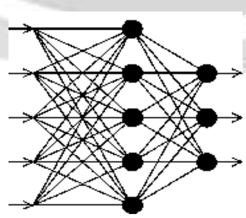

Fig-2: Feed-forward network

Feedback networks as shown in figure 3.3 can have signals traveling in both directions by introducing loops in the network. Feedback networks are very powerful and can get extremely complicated. Feedback networks are dynamic; their 'state' is changing continuously until they reach an equilibrium point. They remain at the equilibrium point until the input changes and a new equilibrium needs to be found. Feedback architectures are also referred to as interactive or recurrent, although the latter term is often used to denote feedback connections in single-layer organizations.

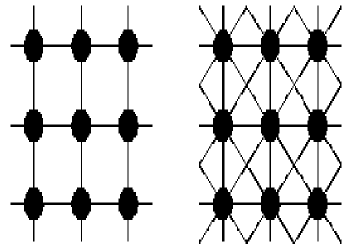

Fig-3:Feed-back networks

4. RESULTS AND DISCUSSIONS

The result of high level authentication using palm vein based on deep neural networks is given below,

4.1 Simulation output

There are consists of the following steps: Image acquisition from the database and Pre-Processing, Finding of Region of interest, Extraction of Palm Vein pattern Features and Matching. Prior to the palm vein recognition, vein extraction is generally required for a better recognition. In this paper we propose a vein extraction method modified of the Local Binary Pattern (LBP) combining with Probabilistic Neural Network (PNN) for matching. The aim of the proposed system is to improve the accuracy of palm vein recognition. The figure shows the simulation output.

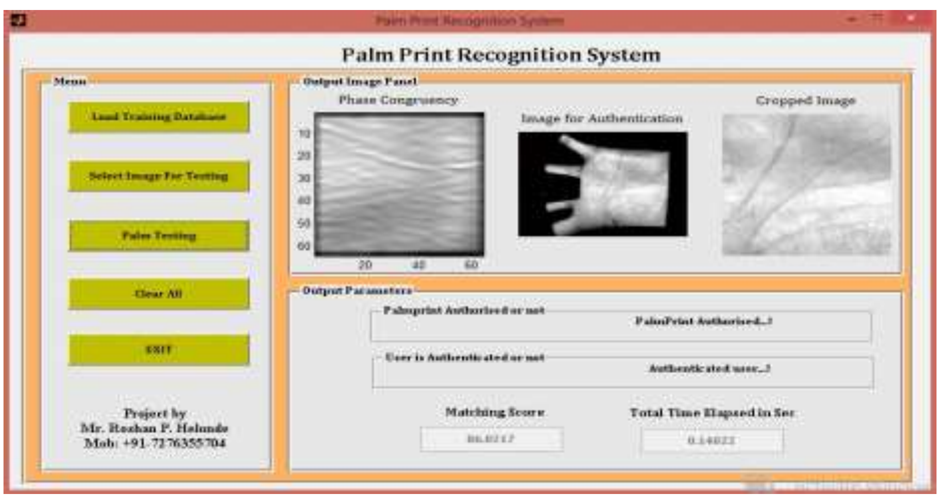

Fig-4: Recognition System

The comparison graph shows the different levels of authentication where the pam vein authentication has the least false rate compared to the other technology of finger print, iris scanner and voice recognition. In this way the palm vein authentication does not have any false acceptance rate and false rejection rate and the overall process of the authentication is limited to very minimal to 0.001% of the overall FRR. The availability of such complementary features (palm lines and veins) allows for increased discrimination between individuals. Moreover, the palm vein features are also useful for live ness detection for the prevention of spoof attacks.

The vein images are usually in poor contrast due to irregular shading caused by various thicknesses of skins and bones. Vein pattern authentication as shown in figure 5.3 requires a normalized and enhanced vein image in the matching procedure

$$g(s^2) = \frac{1}{1+s^2\lambda^2} \quad (5)$$

(x_i',y_i'). Based on the determined edge mask, verify for each pixel to which line it belongs

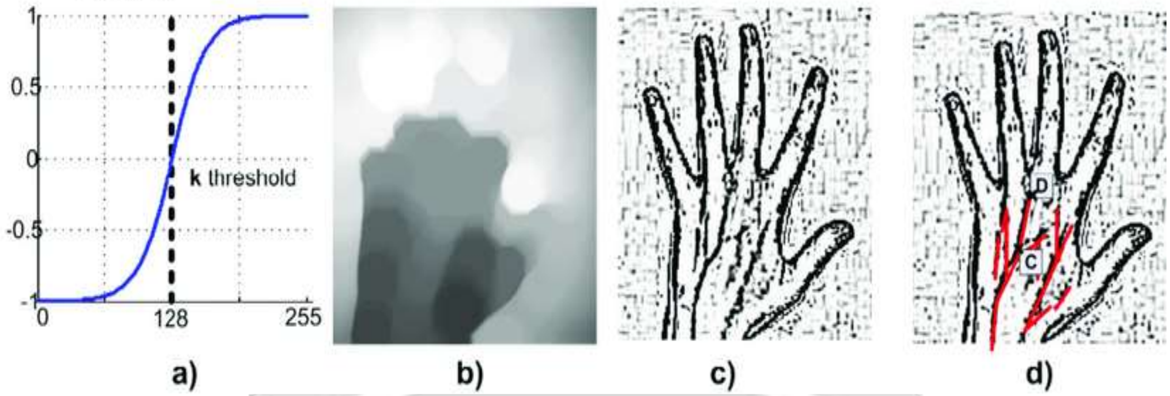

Fig-5: Palm vein scanning systems

Palm vein scanning systems, like those for finger vein ID, use a technology based on the use of near-infrared rays and the way hemoglobin in the veins reacts to them. The blood's hemoglobin is oxygenated in the lungs and the arteries then carry the oxygenated blood to deliver oxygen to tissues throughout the body. The veins carry deoxygenated blood back to the heart.

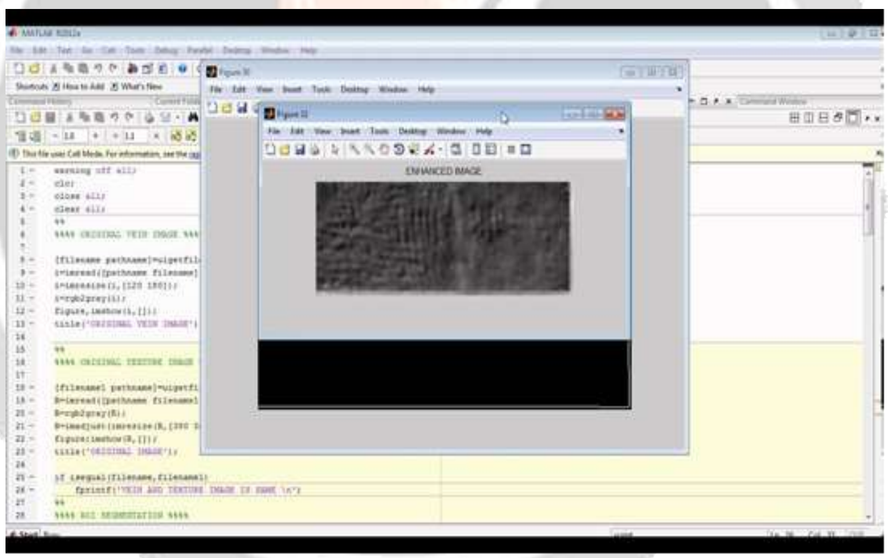

Fig-6: Output

Palm recognition is considered a strong form of the inherence biometric authentication factor and is currently used or being considered for an increasing number of user identification and authentication applications, including onland onsite authentication, automobile security, employee time and attendance tracking, computer and network authentication, healthcare identification, end point security and ATM machine.

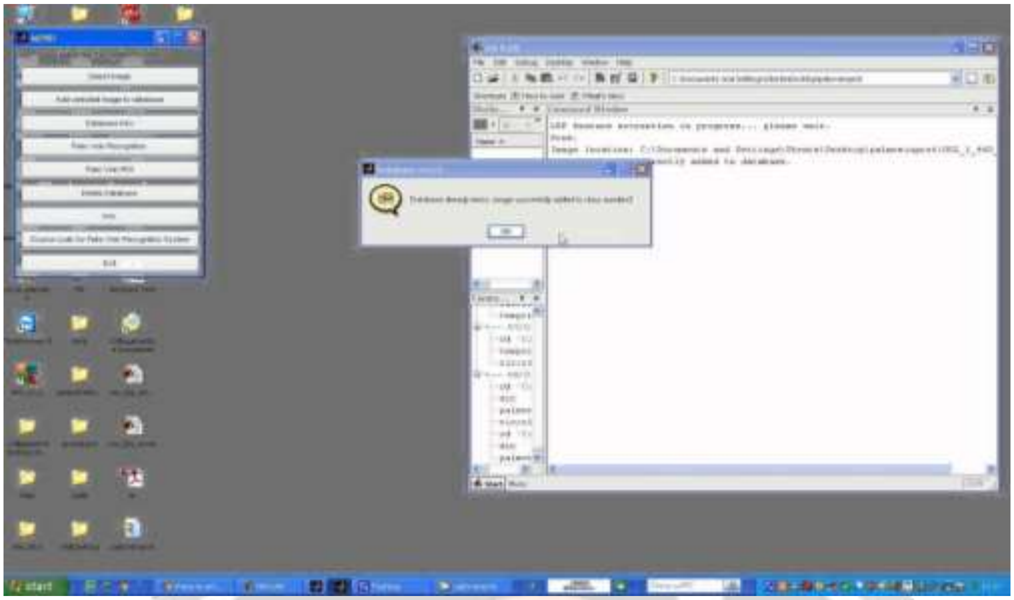

Fig-7: Simulation output

4.2 Palm Vein Recognition

Fig-8: Palm vein recognition

To use a vein recognition system, you simply place your finger, wrist, palm or the back of your hand on or near the scanner. A camera takes a digital picture using near-infrared light. The haemoglobin in your blood absorbs the light, so veins appear black in the picture. As with all the other biometric types, the software creates a reference template based on the shape and location of the vein structure.

Fig-9: Palm vein scanner

The haemoglobin in your blood contains oxygen when it is transported from your lungs to the tissues in your body by your arteries. By the time the blood flows back to your heart via different arteries this oxygen has been released. Vein pattern recognition uses this difference between deoxidised and oxygenated haemoglobin. Deoxidised haemoglobin absorbs infrared light, making the vein pattern visible if you use a scanner to illuminate it with infrared light.

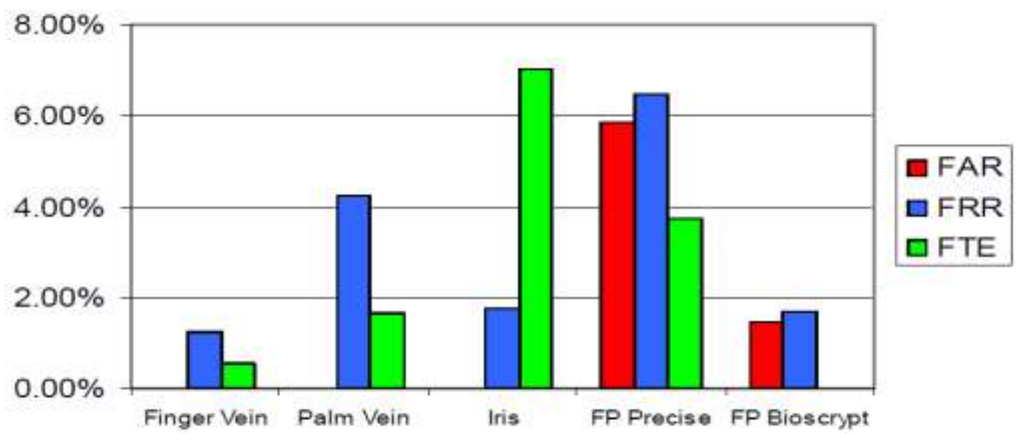

Chart-1: Comparison of Accuracies

5. CONCLUSION

As a result of the research using data from 140,000 palms (70,000 individuals), has confirmed that the FAR (false acceptance rate) is 0.00008% and the FRR(false rejection rate) is 0.01%, with the following condition: a person must hold the palm over the sensor for three scans during registration, and then only one final scan is permitted to confirm authentication . Palm vein authentication technology offers contactless authentication and provides a hygienic and non invasive solution, thus promoting a high-level of user acceptance believes that a vein print is extremely difficult to forge and therefore contributes a high level of security, because the technology measures hemoglobin flow through veins internal to the body.

6. REFERENCES

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