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Evolution of Biometric System –Analytical Study between Chieloscopy, Finger Print and Retina Scanning Evaluation

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Abstract: **Over the last few years a new area of engineering science has been established whose products are likely to create a large market in the near future. It has been called" biometrics". The pioneers of this new domain intend to construct devices which would allow identification of a person on the basis of his/her "biological" characteristics: voice, dynamics of movements, features of face and other parts of the body, retina or iris pattern. Nature has made human beings with different characteristics which may vary from one person to another. This property is made use of by Bio-metric technology to distinctly identify each person. The aim of this project is to build a multilevel security system using different bio-metric like voice, retina, fingerprint, chieloscopy, etc. Such kind of system is used only in highly secure places like defense, scientific laboratory. By integrating some of the bio metrics in our proposed system, the level of security will increase.**

Keywords: **Cheiloscopy, Sulcilabiorum, Edge Detection, Feature Extraction.**

I. INTRODUCTION

With the rapid growth of the information age, electronic activities of many kinds are becoming more common. The need for protection and security in this environment has never been greater. The conventional approach to security has been to enforce a system-wide policy, but this approach will not work for large distributed systems where entirely new security issues and concerns are emerging. We argue that a new model is needed that shifts the emphasis from system as enforcer to user-definable policies in which the cost scales with the degree of security required. Users ought to be able to select the level of security they need and pay only the overhead necessary to achieve it. Moreover, ultimately, they must be responsible for their own security.

Bio-metric system is essentially a pattern recognition system which recognizes a user by determining the authenticity of a specific physiological or behavioral characteristic possessed by the user. Several important issues must be considered in designing a practical Bio-metric system. First, a user must be enrolled in the system so that his Bio-metric template can be captured. This template is securely stored in a central database or a smart card issued to the user. The template is retrieved when an individual needs to be identified. Depending on the context, a Bio-metric system can operate either in verification (authentication) or an identification mode.

Bio-metrics refers to the automatic identification of a person based on his/her physiological or behavioral characteristics. This method of identification offers several advantages over traditional methods involving ID cards (tokens) or PIN numbers (passwords) for various reasons: (i) the person to be identified is required to be physically present at the pointof-identification; (ii) identification based on Bio-metric techniques obviates the need to remember a password or carry a token. With the increased integration of computers and Internet into our everyday lives, it is necessary to protect sensitive and personal data. By replacing PINs (or using Bio-metrics in addition to PINs), Bio-metric techniques can potentially

prevent unauthorized access to ATMs, cellular phones, laptops, and computer networks. Unlike Bio-metric traits, PINs or passwords may be forgotten, and tokens like passports and driver's licenses may be forged, stolen, or lost.

II. APPLICATIONS

Multilevel Bio-metric Security System has the following applications:

Bank Lockers

ATM Machines

Highly Secured Laboratories/ Military defense Systems.

III. TYPES OF BIO-METRIC

The types of Bio-metric used in the proposed system are mentioned below:

I. Finger print

II. Lip print

III. Iris

A. Algorithm:

The first and foremost step for recognition is image acquisition. Once the image is acquired, noise reduction is required, if any present. Further to increase the contrast of the image and for better distribution of intensity, the image undergoes histogram equalization. Then fast Fourier transform of the image is taken. The optimal value for FFT is 0.45. After FFT, binarization is done to convert gray scale image to a monochrome image. Further ROI (Region of Interest) is selected, where thinning of images takes place. And for feature extraction to take place, H-breaks and spikes are removed. Minutiae based matching algorithm further provides the matching between samples and the given input image.

IV. FINGERPRINT

Fingerprint recognition or fingerprint authentication refers to the automated method of verifying a match between two human fingerprints. Fingerprints are one of many forms of Biometrics used to identify individuals and verify their identity.

The analysis of fingerprints for matching purposes generally requires the comparison of several features of the print pattern. These include patterns, which are aggregate characteristics of ridges, and minutia points, which are unique features found within the patterns. It is also necessary to know the structure and properties of human skin in order to successfully employ some of the imaging technologies. The three basic patterns of fingerprint ridges are the arch, loop, and whorl:

- Arch: The ridges enter from one side of the finger, rise in the center forming an arc, and then exit the other side of the finger.
- Loop: The ridges enter from one side of a finger, form a curve, and then exit on that same side.
- Whorl: Ridges form circularly around a central point on the finger.

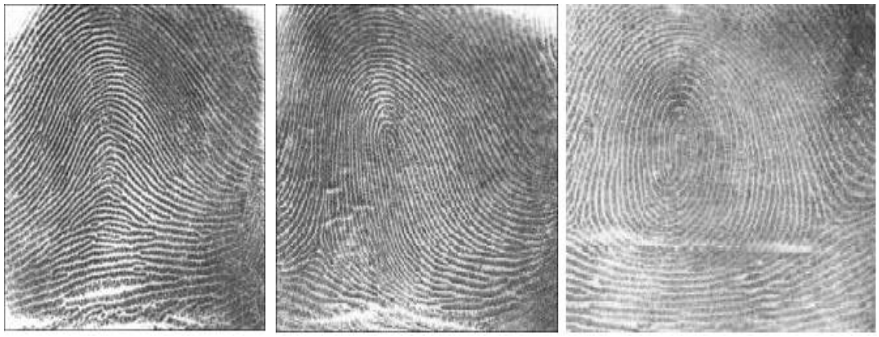


Fig 1 Finger Print

IV. LIP PRINT

In forensic identification, lip print patterns can lead us to important information and helps in person's identification. The grooves present on human lips (Sulci labiorum) are unique to each person and can be used to determine identity. Lip prints are normal lines and fissures in the forms of wrinkles and grooves present in the zone of transition of human lip, between the inner labial mucosa and outer skin, examination of which is known as Cheiloscopy. This is unique for individuals, as finger prints. Fingerprints, post-mortem reports, and of late, DNA fingerprinting, have been successful in person identification in the field of forensic science. Just as in these methods, lip prints can be instrumental in identifying a person positively.

A. Motivation and Traditional:

Approach of Analysis:

The traditional practice of analysis of lip print is manual and involves subjective test .Lip prints are extracted by applying lip-stick on the lips and lip impression is made on the cello tape or white paper. This print is studied under magnifying glasses.

According to the classification made by Suzuki K and Tsuchihashi Y[1]:

Type I: clear cut vertical grooves that run across the entire lips.

Type I': similar to type i but that do not run across the entire lip.

Type II: branched groove (branched Y pattern).

Type III: intersected grooves.

Type IV: reticular grooves.

Type V: undetermined.

Six patterns discussed were purely derived by human inspection.

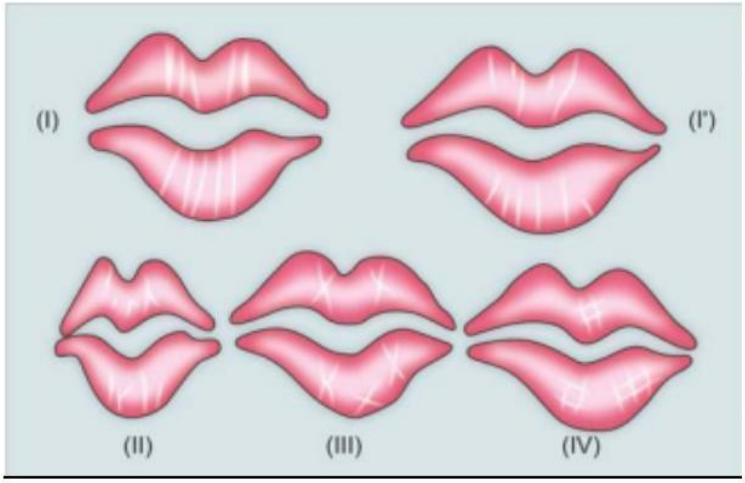


Fig 2 Suzuki's Classification

Subjective tests of individual lip prints resulted categorization of genders according to lip print patterns along with unique personal identification:

Type i and i' pattern dominant: female

Type i and ii pattern dominant: female

Type iii pattern dominant : male

Type iv pattern: male

Type v patterns: male

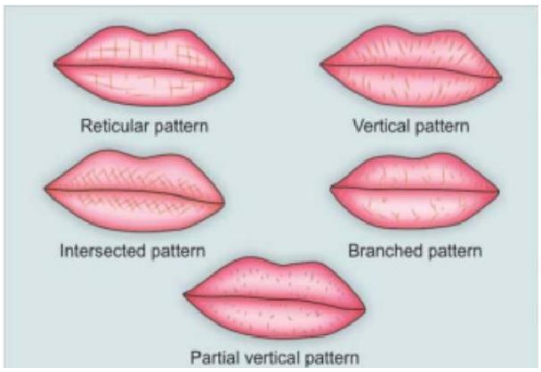


Fig 3 Different patterns of lip grooves and print

Fig 4 Image of lip print

Introducing digital techniques to overcome manual Investigation is motivation to improve. Different Edge detection operators were used to detect edges of lip groove.

PROJECT WORK:

A. Flow Chart:

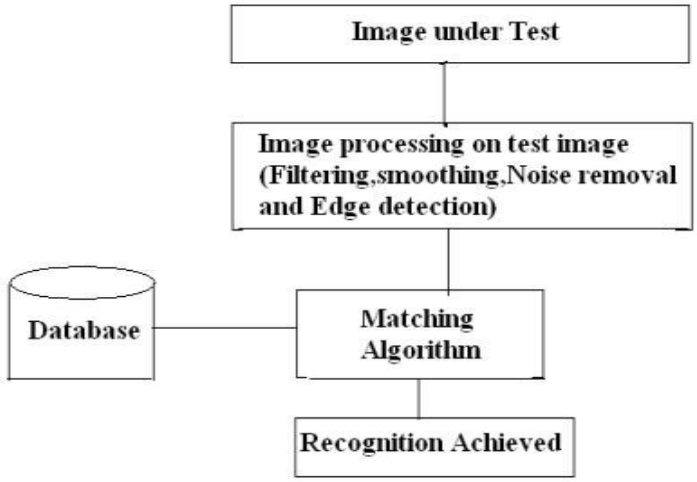


Fig 5 Sobel Operator Output

Complemented image with noise removal is done by applying median filter on the image.

B. Approach and Execution Steps for Image Processing:

Edge detection, noise removal and feature extraction is used to execute image processing on the lip print image. Image of the Lip print is taken which has information of grooves and ridges. Matlab Software is used to perform image processing on the image. Colorful image is converted to gray-scale and different noise removal filters are operated on the image. Median Filter is employed to remove salt and pepper noise. Moreover, Edge detection is used to highlight the discontinuities and highlight the grooves.

We tried the same above technique with other sample images, but results were not upto the mark. So we applied different combinations of the edge detection and noise removal techniques. The results with the median filter along with the sobel gradient and robert mask with salt and pepper noise gave the best result comparatively.

VI. IRIS

The human iris is rich in features which can be used to quantitatively and distinguish one eye from another. The iris contains many collage nous fibers, contraction furrows, coronas, crypts, color, serpentine vasculature, striations, freckles, rifts, and pits. Measuring the patterns of these features and their spatial relationships to each other provides other quantifiable parameters useful to the identification process.

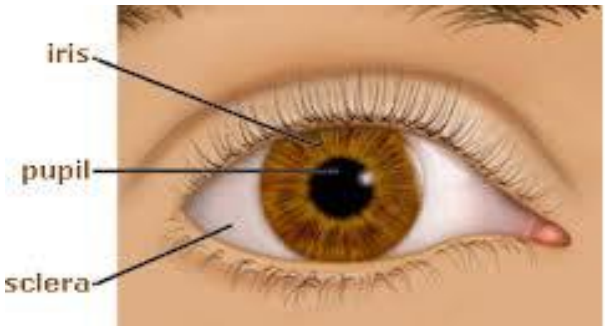


Fig 6 Human Eye

A. Algorithm:

Iris Recognition System uses the following algorithm: We have provided the images to the system from CASIA V1, where all the images are captured from NIR range and the reflections have been removed. Iris segmentation includes detection of pupil and detection of iris boundaries. Circular Though transform is used to find iris and pupil boundaries. For feature extraction, we perform Dougmans Rubber Sheet Model that remaps each point in terms of (x,y) co-ordinates from (r,).

For matching purpose we use Euclidean distance of the polarimage. Each vector d is calculated and a threshold is set for which matching takes place.

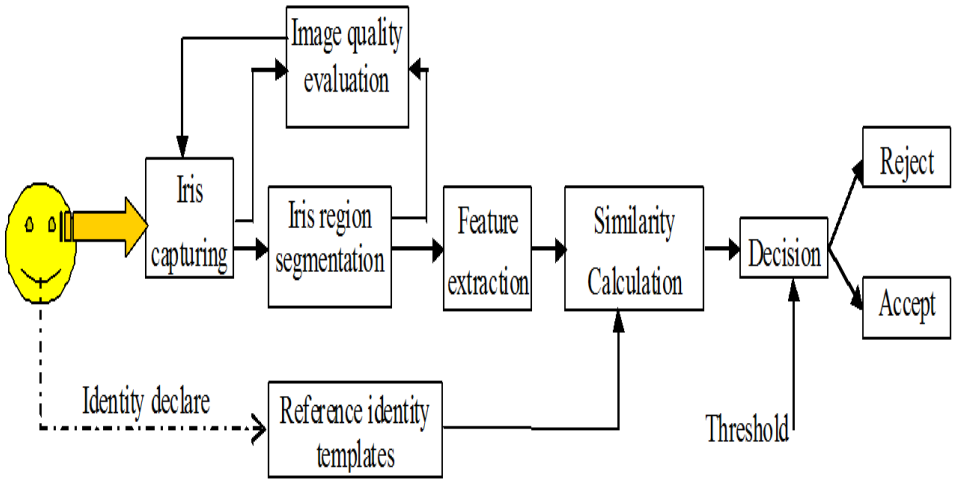


Fig. 7 Iris Algorithm

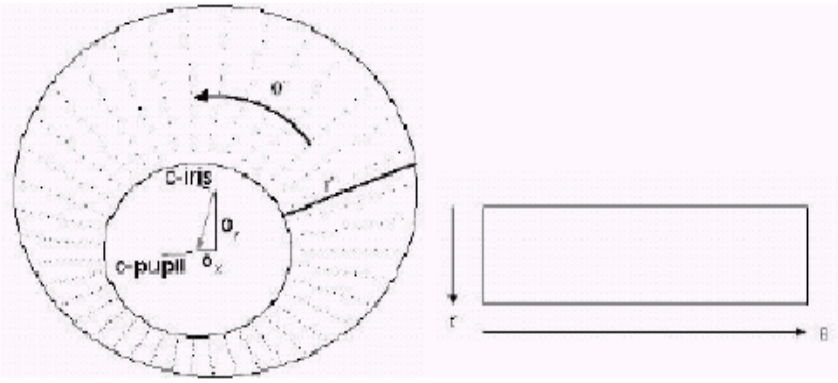


Fig. 8 Daugman's Rubber Sheet Model

VI. PROPOSED

Thus we have proposed a security system that will increase the level of security. The algorithm for the system is as follows:

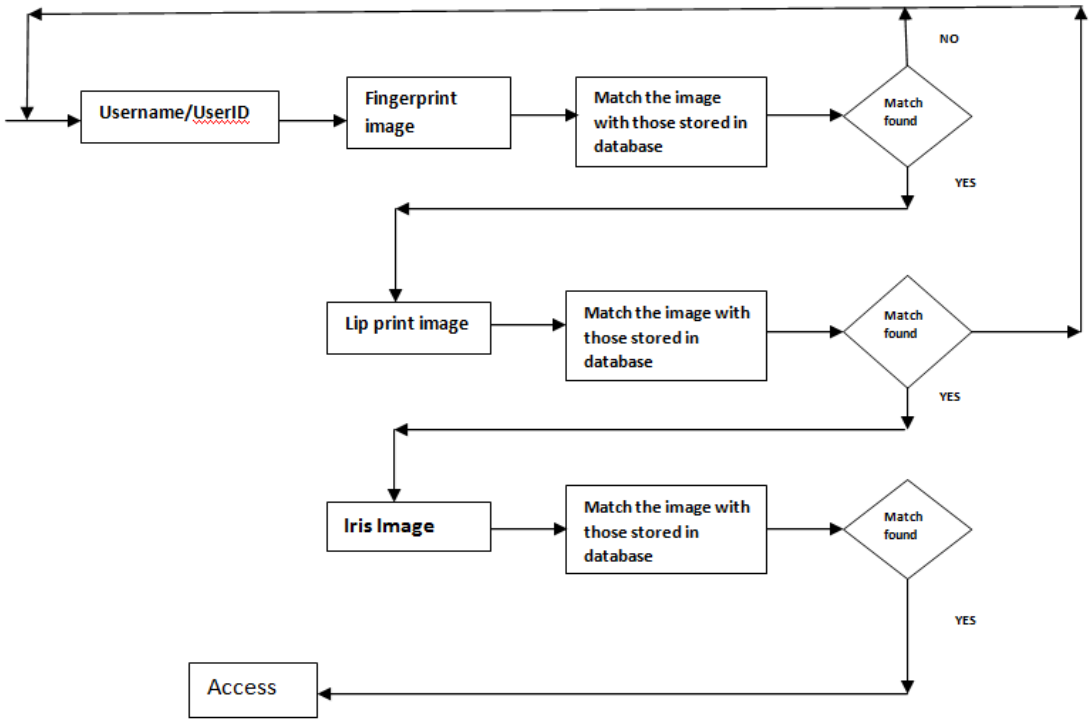


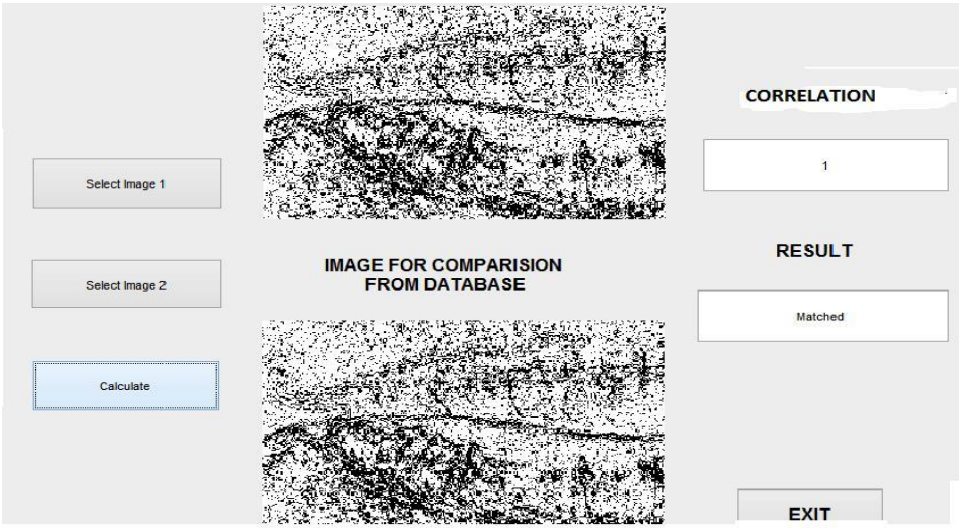
Fig. 9 Algorithm

VII. RESULT ANALYSIS

The proposed system was implemented and simulated using MATLAB R2014a.

VI. CONCLUSION

Logic of correlation is used for matching. The correlation coefficient has the value r=1 if the two images are absolutely identical, r=0 if they are completely uncorrelated, and r=-1 if they are completely anti-correlated, for example, if one image is the negative of the other. Hence, here we propose a system that not only increases the standards of security but also reduces the human efforts of memorizing PINs and passwords and to carry accessories required for accessing a locker or an ATM machine.



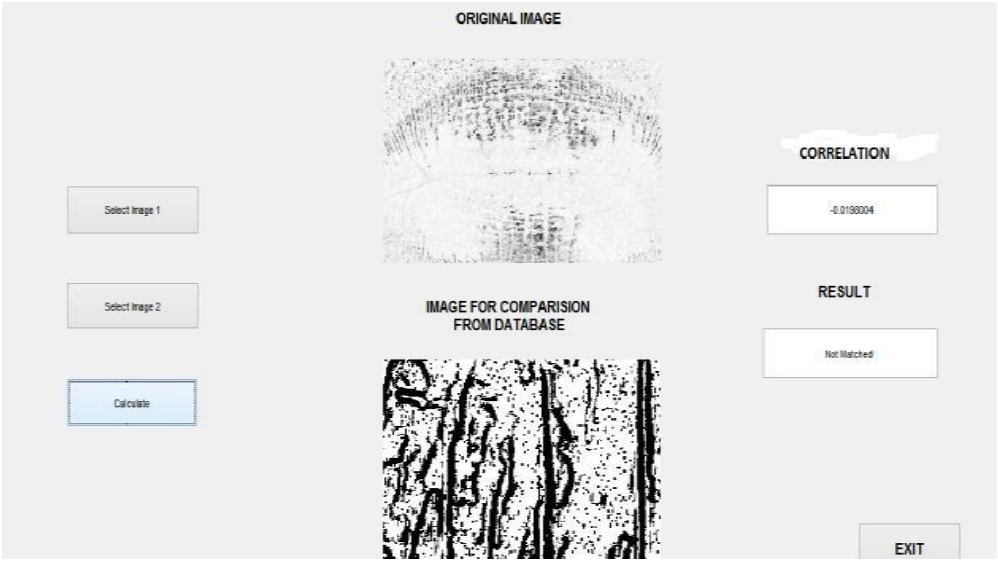


Fig 10 Matched Outputs

AKNOWLEDGEMENT

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