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REVIEW PAPER ON WORKING OF IRIS BASED BIOMETRIC DEVICE

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ABSTRACT: Biometrics is technology of identifying uniquely human subjects by means of measuring & analyzing more than one intrinsic behavioral / physical traits. Such human body characteristics consisting fingerprints, eye retinas voice patterns & irises, facial patterns & hand measurements. Biometric systems consist of applications making use of biometric technologies & that allow identification automatically, verification / authentication of a natural person. In principle, processing of personal data involving use of a biometric system is considered by privacy experts to be only justified within places demanding a high level of security & strict identification procedures. The iris-scan process begins with a photograph. A specialized camera, typically very close to subject, not more than three feet, uses an infrared image(picture) to illuminate eye & capture a very high-resolution photograph. This process takes 1 to 2 seconds.

Keywords: Iris Recognition, Retinal Scan, Finger Print, Biometric Devices, Hand Measurement

[1] INTRODUCTION

The iris-scan process begins with a photograph. A specialized camera, typically very close to subject, not more than three feet, uses an infrared image(picture) to illuminate eye & capture a very high-resolution photograph. This process takes 1 to 2 seconds .**Iris recognition** is an automated method of biometric identification that uses mathematical pattern-recognition techniques on video image(picture) of one / both of irises of an individual's eyes, whose complex random patterns are unique, stable, & could be seen from some distance. Not to be confused with other, less prevalent, ocular-based biometric technologies such as retina scanning, iris recognition uses video camera technology with subtle near infrared illumination to acquire images of detail-rich, intricate structures of iris that are visible externally. Digital templates encoded from Such patterns by mathematical & statistical algorithms allow identification of an individual / someone pretending to be that individual. Databases of enrolled templates are searched by matcher engines at speeds measured within millions of templates per second per (single-core) CPU, & with remarkably low false match rates. Several hundred millions of persons within several countries around world have been enrolled within iris recognition systems, for convenience purposes such as passport-free automated border-crossings, & some national ID systems based on this technology are being deployed. A key advantage of iris recognition, besides its speed of matching & its extreme resistance to false matches, is stability of iris as an internal & protected, yet externally visible organ of eye. **Iris as a powerful identifier**

Iris is focus of a relatively new means of biometric identification. Iris is called living password because of its unique, random features. It is always with you & cannot be stolen / faked. Iris of each eye is absolutely unique. Probability that any two irises

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could be alike is one within 10 to 78^{th} power entire human population of earth is roughly 5.8 billion. So no two irises are alike within their details, even among identical twins. Even left & right irises of a single person seem to be highly distinct. Every iris has a highly detailed & unique texture that remains stable over decades of life. Because of texture, physiological nature & random generation of an iris artificial duplication is virtually impossible. Properties of iris that enhance its suitability for use within high confidence Identification system are those following:

1. Extremely data rich physical structure about 400 identifying features
2. Genetic independence no two eyes are same.
3. Stability over time.
4. Its inherent isolation & protection from external environment.
5.impossibility of surgically modifying it without unacceptable risk to vision.
6. Its physiological response to light, that provides one of several natural tests
against artifice.
7.ease of registering its image(picture) at some distance forms a subject without
physical contact. unobtrusively & perhaps inconspicuously
8. It intrinsic polar geometry that imparts a natural co-ordinate system & an origin of co-ordinates
9.high levels of randomness within it pattern inter subject variability spanning 244 degrees of freedom - & an entropy of 32 bits square million of iris tissue.

[2]Literature Review

The concept of using iris pattern for identification was first proposed by Ophthalmologist Frank Burch within 1936 (Iradian Technologies, 2003). During 1960, first semi-automatic face recognition system was developed by Woodrow W. Bledsoe, that used location of eyes, ears, nose & mouth on photographs for recognition purposes. In same year, first model of acoustic speech production was created by a Swedish Professor, Gunnar Fant. His invention is used within today's speaker recognition system (Woodward et al, 2003).

By 1980 idea had appeared within James Bond films, but it still remained science fiction & conjecture. In 1987, two other ophthalmologists Aram Safir & Leonard Flom patented this idea & within 1987 they asked John Daugman to try to create actual algorithms for this iris recognition.

These algorithms that Daugman patented within 1994 are basis for all current iris recognition systems & products. Daugman algorithm are owned by Iridian technologies & process is licensed to several other Companies who serve as System integrators & developers of special platforms exploiting iris recognition within recent years several products have been developed for acquiring its images over a range of distances & within a variety of applications.

One active imaging system developed within 1996 by licensee Sensar deployed special cameras within bank ATM to capture IRIS images at a distance of up to 1 meter. This active imaging system was installed within cash machines both by NCR Corps & by Diebold Corp within successful public trials within several countries during I997 to 1999.

New & smaller imaging device is low cost Panasonic Authenticam digital camera for handheld, desktop, e-commerce & other information security applications. Ticket less air travel, check-in & security procedures

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based on iris recognition kiosks within airports have been developed by eye ticket. Companies within several, countries are now using Daughman algorithms within a variety of products.

The rapid development of information technology has directly impacted on techniques within image(picture) processing techniques & implementation of survey processing systems. This main development has been shifted from mainframe system to PC platform. User now could easily perform all kind operations & processing techniques ranging from small scale to large scale statistical operations.

The research framework & methodology complies with ADDIE model [4,5].

ADDIE model is generic process traditionally used by instructional designers & training developers. The five phases including Analysis, Design, Development, Implementation, & Evaluation represent a dynamic, flexible guideline for building effective training & performance support tools. Our work starts with conducting a survey to new learners/students about their understanding on Biomedical Image(picture) Processing course to identify any problems / issues of how difficult to them to understand Biomedical Image(picture) Processing course. To make meaningful to Such new learners, we are going to develop user friendly Biomedical Image(picture) Processing software package, that new learners could do some Biomedical Image(picture) Processing analysis through various methods that have been taught within Biomedical Image(picture) Processing course.

[3] TOOLS AND TECHNOLOGIES USED

Mathematical Explanation

An Iris Code is constructed by demodulation of iris pattern. This process uses complex-valued 2D Gabor wavelets to extract structure of iris as a sequence of phasors, whose phase angles are quantized to set bits within first code. This process is performed within a double dimensionless polar co-ordinate system that is invariant to size of iris, & also invariant to dilation diameter of pupil within iris. The demodulating wavelets are parameterized with four degrees-of-freedom: Size, orientation & two positional co-ordinates. They span several octaves within size, within order to extract iris structure at many different scales of analysis. Because information extracted from iris is inherently described within terms of phase, it is insensitive to contrast, camera gain & illumination level. The phase description is very compact, requiring only 256 bytes to represent each iris pattern. Such 2D wavelets are optimal encoders under inherent Heisenberg Weyl uncertainty relation for extraction of information within conjoint spatial-spectral representations. The recognition of irises by their recodes is based upon failure of a test of statistical independence. Any given Iris Code is statistically guaranteed to pass a test of independence against any Iris Code computed from a different eye; but it would uniquely fail same test against eye from that it was composed. Thus key to iris recognition is failure of a test of statistical independence.

Accuracy The Iris Code constructed from Such Complex measurements provides such atremendous wealth of data that iris recognition offers level of accuracy orders of magnitude higher than biometrics. Some statistical representations of accuracy follow: The odds of two different irises returning a 75% match (i.e. having Hamming Distance of 0.25): 1

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within 10 Equal Error Rate (the point at that likelihood of a false accept & false reject are same): 1 within 12 million. The odds of two different irises returning identical Iris Codes: 1 within 10 Other numerical derivations demonstrate unique robustness of Such algorithms. A person right & left eyes have a statistically insignificant increase within similarity: 0.0048 on a 0.5 mean. This serves to emonstrate hypothesis that iris shape & characteristic are phenotype - not entirely; determined by genetic structure. The algorithm could also account for iris: even if 2/3 of iris were completely obscured, accurate measure of remaining third would result within an equal error rate of 1 within 100000. Iris recognition could also accounts for those ongoing changes to eye & iris that are defining aspects of living tissue. The pupil expansion & contraction, a constant process separate from its response to light, skews & stretches iris. The algorithms account for such alteration after having located at boundaries of iris.

Dr. Daugman draws analogy to a homogenous rubber sheet which, despite its distortion retains certain consistent qualities. Regardless of size of iris at any given time, algorithm draws on same amount / data, & its resultant Iris Code is stored as a 512 byte template. A question asked of all biometrics is there is then ability to determine fraudulent samples. Iris recognition could account for this within several ways detection of pupillary changes, reflections from cornea detection of contact lenses atop cornea & use of infrared illumination to determine state of sample eye tissue.

Decision Environment

The performance of any biometric identification scheme is characterized by its Decision Environment. This is a graph superimposing two fundamental histograms of similarity that test generates: one when comparing biometric measurements from SAME person (different times, environments, / conditions), & other when comparing measurements from DIFFERENT persons. When biometric template of a presenting person is compared to a previously enrolled database of templates to determine Persons individuality, a criterion threshold (which could be adaptive) is applied to each similarly score. Because this determines whether any two templates are deemed to be same / different, two fundamental distributions should ideally be well separated as any overlap between them causes decision errors. One metric for decidability, / decision making power, is d. This is defined as separation between means of two distributions, divided by square root of their average variance. One advantage of using for comparing, decision-making power of biometrics is fact that it does not depend on any choice about decision threshold used. that of course could vary from liberal to conservative when selecting trade-off between False Accept Rate (FAR) & False Reject Rate (FRR)? The metric is a measure of inherent degree to that any decrease within one error rate should be paid for by an increase within other error rate, when decision thresholds are varied. It reflects intrinsic separability of two distributions.

[4]PROPOSED IMPLEMENTATION

PROPOSED METHOD FOR IRIS RECOGNITION

1. **Image acquisition**: within this stage, a photo is taken from iris.

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2. **Pre-processing:** involving edge detection, contrast adjustment & multiplier.

3. **Segmentation:** including localization of iris inner & outer boundaries & localization of boundary between iris & eyelids.

4. **Normalization:** involving transformation from polar to Cartesian coordinates & normalization of iris image.

5. **Feature extraction:** including noise removal from iris image & generating iris code.

6. **Classification & matching:** involving comparing & matching of iris code with codes already saved within database. **Image acquisition**

Taking a photo from iris is within initial stage of an iris-based recognition system. Success of other recognition stages is reliant on quality of images(pictures) taken from iris during image acquisition stage. if visible light is used during imaging for those individuals whose iris is dark, a slight contrast comes to existence between iris & pupil that makes it hard to separate Such two areas

Pre-processing

In order to improve & facilitate later processing, a primary processing is performed on iris images(pictures). In pre-processing stage, Canny edge detection is used to enhance iris outer boundary that is not recognized well within normal conditions, & a multiplier function is used to enhance Canny iris points, also image contrast adjustment is performed to make its pixels brighter.

Segmentation

Precise iris image segmentation plays an important role within an iris recognition system since success of system within upcoming stages is directly dependent on precision of this stage. The main purpose of segmentation stage is to localize two iris boundaries namely, inner boundary of iris-pupil & outer one of iris-sclera & to localize eyelids.

Localization of iris inner boundary (the boundary between pupil & iris).

Regarding that illumination intensity is very different within pupillary inner & outer parts, & pupil is darker compared with iris, use of Canny edge detection within pre-processing stage results within determining points within iris-pupil boundary. Following figure shows results of performing Canny edge detection on an eye image as pre-processing output. As it could be observed, pupillary boundary is almost completely detected. After determining edge points, by use of circular Hough Transform, center & radius of iris circle are obtained.

[5] FUTURE SCOPE AND CONCLUSION

Future Scope

In future iris recognitions process is found most secure as compared to other biometric techniques. And it could be useful to enhance secure transaction within banks & other financial organization. However there are many challenges within frequent use of this technology but within future due to advent of new technology it would be possible to use this technology easily. Enterprise & government both acknowledge convergence of physical & information security environments, but there are new security challenges on horizon - just-in-time inventory control, sophisticated supply chain management, & even a phenomenon called "coopetition"-in that companies that compete within some areas, cooperate within others. Managing this convergence of physical & information security requirements now drives

security system architecture design & implementation, & is an increasingly key factor within biometric technology selection. Managing convergence would only become a more complex task because as IT & communications becomes increasingly wireless, need for robust individuality management would become more acute. Iris ID sees iris technology as a natural "fit" for within physical, infosec, & wireless arenas. We envision a day when iris recognition technology would be deployed within ways that eliminate fraud, provide non-repudiation of sales, authenticate funds transfers, provide signature verification, credit card authorization, & authorized access to healthcare records, intellectual property, & so much more. This growing need, as well as Iris ID competence within iris technology, coupled with core interests within IT & wireless, provides impetus for design efforts for future - & makes Iris ID one to watch for new developments within individuality management tomorrow & beyond.

Conclusion

The technical performance capability of iris recognition process far surpasses that of any biometric technology now available. Iris identification process is defined for rapid exhaustive search for very large databases: distinctive capability required for authentication today. The extremely low probabilities of getting a false match enable iris recognition algorithms to search through extremely large databases, even of a national / planetary scale. As iris technology grows less expensive, it could very likely unseat a large portion of biometric industry, e-commerce included; its technological superiority has already allowed it to make significant inroads into identification & security venues that had been dominated by other biometrics. Iris-based biometric technology has always been an exceptionally accurate one, & it could soon grow much more prominent.

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