Evaluate and Identify the Age Related Complications Behind the Failure of Iris Based Recognition System

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Abstract: *Biometrics is an emerging field of authentication of any person's identity based upon his/her own biometric input re-examination such as finger-print, face recognition and most recently popularized iris based recognition system which provides a secure way to personal identification and also to maintain secrecy of high profile industrial as well as research premises which further provide a sense of security to the owner but recently frequent rejection have been observed during scanning phase of iris based recognition system which challenges their reliability along with their authentication, besides this problem it also decreases the user's confidence bit by bit through every rejection. To restore user's confidence and to make the iris based recognition system more reliable, user friendly and realistic the assessment of the process has been conducted to illustrate the reasons behind acute/frequent rejection which explained in this research paper. Through independent research, personal survey and literature review some reasons have been zeroed down for further scrutiny to examine their role in iris related consequences which leads to rejection and explained in brief detail.*

Keywords: biometrics, frequent-rejection, human iris, recognition, scanning, scrutiny

1. Introduction

Recognition of iris based biometric identification system widely used throughout the world, indicated its usefulness along with its reliability in the field of identification revealing. Iris based recognition system uses High-Definition image of human iris to closely examine the patterns of iris which are generally totally unique and their match with another human iris throughout the world remain impossible. The initial idea behind to select iris as basis to fix anyone's identity is to find out a middle path in between finger print based personal identification system and DNA analysis based genetic identifier because the fingerprint based method is less reliable and the chances of cheating and malfunctioning is likely to be higher but in the case of DNA analysis based recognition system time and process cost is the main matter of concern.

The DNA based genetic identification system required huge infrastructure, more investment, relatively much more time and expertise time to reveal someone's DNA profile and match with his/her existing DNA profile. This DNA identification system is secure, most reliable till date but cannot be affordable in daily basis. That is why a middle path has been followed to establish identity using Iris based recognition.
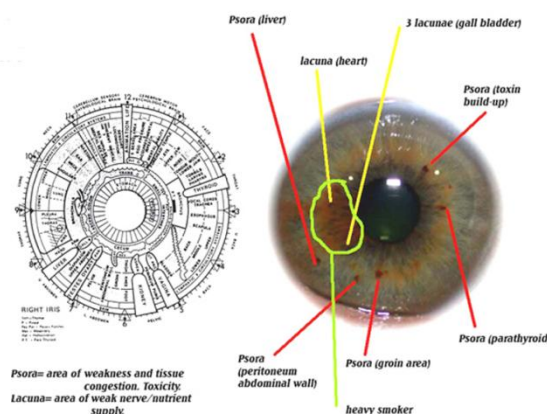

Figure 1: Internal cognition points of human iris.

The iris recognition based biometric security technology remains to be the relatively accurate, reliable, easy to use, easy to manage, non-intrusive, difficult to forge and, despite what people may understand, is actually quite a sophisticated system once initial enrolment has taken place. However, there are some factors which initiate its rejection such as colour changes in the iris template, noising during capturing of HD image of iris, graphical differences during iris recognition process etc which really a matter of illustration and analysis.
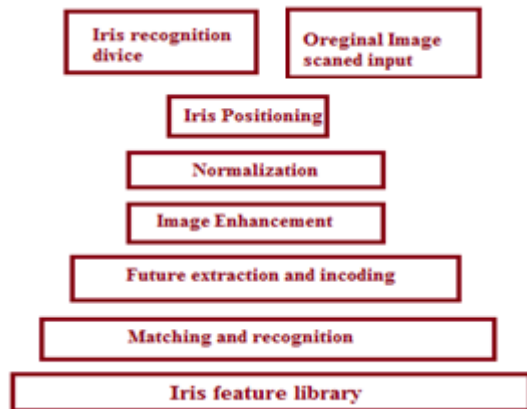
Figure 2: Flow chart displaying method of iris based security system

In proposed analytical research paper the three major reasons behind frequent rejection in iris based security system is being studied and their comparative analysis have been shown in the simulation and research through .NET language.

2. Literature Review and History

The initiation of iris based biometric recognition system is dated back in the mid 1980s when two ophthalmologists, **Dr. Leonard Flom** and **Dr. Aran Safir** found out that every individual's iris is totally non-identical from one another as far as its internal colour pattern and blood vessel's arrangement is concern and remain identical even in twins, thus making them a good biometric parameter to fix identity. This illustration above converted into belief when they carried out their clinical experience where observed the hallmarks of lilies including the ' many Collagenous fibres contraction furrows, crowns, Crypts, colour, serpentine vasculature, stretch marks, freckles, cracks and holes'. Are lots of experiments he conducted and documented their results simultaneously with the potential use of lilies as a means of identification of people? On the basis of their work and their results they were awarded a patent in 1987. They then approached Dr John Daugman, a mathematician at Harvard, in 1989 to help with the creation of the necessary mathematical algorithms for digital encoding of an image of an iris to allow comparison with an image in real time. By 1994 the algorithms had been developed and patented and are now used as "the basis for all iris recognition systems and products"3 currently being developed and sold. These processes are owned by Iridian Technologies who develop products and license the processes to other companies.

3. Principal

Iris recognition based biometric system follow the principle of conjunction points identification and exact matching of these points each time of identification. As per the research almost 200 conjunctions points have been identified in human iris which form the base of identification which also includes rings, rectangles, triangles, furrows, freckles, etc shapes inside the iris. There are a well developed software applications which actively engage into iris HD image comparison on the basis of pre-identified and determined conjunction points.

The software firstly locate the inner and outer boundaries of human iris in an high definition image of whole eye and then distinguish other parts of eye from the iris which finally get normalised using rubber sheet model to compensate for pupil dilation to finally approach the bit pattern encoding the information needed to compare two iris images.

The proposed principle is almost applied in every iris recognition technique but due to aging or any other external injury or disease may damage the pattern of iris which leads to frequent rejection which is an emerging issue and to study the impact of these factors **Harcascade.Xml** software is used in this research to compare two images of iris and the difference occurred in iris morphology with reference to aging.

4. Methodology

First of all a HD image of whole eyes is been sorted for conjunction point identification which act as a reference identification benchmark. So explore randomly theme reference **Harcascade.Xml** image using software to compare with the same individual test is performed to obtain images. Simulation is been done using .NET as coding language to detect any changes in the pattern of iris or verify the present picture of iris
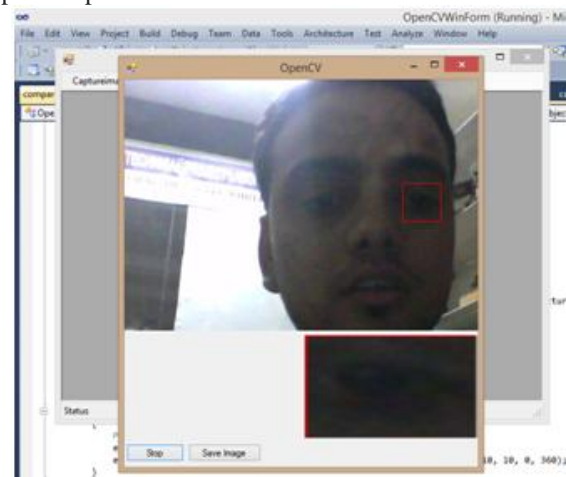

Figure 3: Harcascade.Xml window for iris recognition.

Results have been observed in the form of graphical as well as analytical assessments. To understand the actual ground level situation of the failure of iris based recognition system a survey questionnaire based approach has been implemented to find out difficulties in recognition system in the form of selective bunch of questions and statistical analysis.

Hardware specification

PROCESSOR	32 BIT, Pentium – IV
RAM	1 GB
HARD DISK	1 GB
MONITOR	SVGA Monitor (800 * 600RESOLUTIONS)
CLOCK SPEED	266 MHz

Software Specification

OPERATING SYSTEM	: Windows 2000/XP,7,8,8.1.
FRONT END	: ASP.NET
BACK END	SQLServer2008

5. Observation

As per the methodology the experiment have been conducted and following observations are obtained-

1) In prima-facia observation it is very hard to find any changes into the colour between reference image and the test image of iris.
2) Noising in the test image leads to frequent rejection as due to noising the test points may nit been clearly identified by the software.
3) Exercise, late night working in front of computer screen, stress etc may resulted into the swelling of blood vessels inside the iris which in some cases deform the iris pattern and leads to immediate rejection.
4) The change in shape of the iris is detected in this research by using Mathematical Induction, Pattern recognition algorithms (like Morphological Algorithm, Dilation & Image Erosion are being used here).
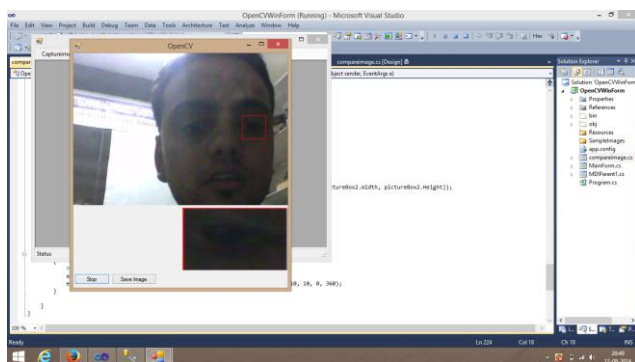

Figure 4: Test window showing captured iris image of the subject
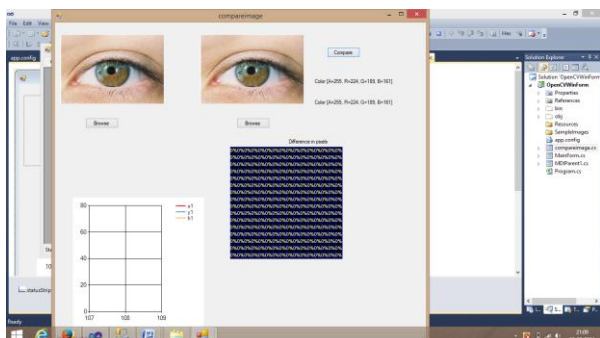
6. Result

Figure 5: Comparison window showing final three results of colour mismatch, pixels and graphical analysis

The overall research experiment using **Harcascade.Xml** software as a tool and .NET language as a simulation coding language remain fruitful and conclusive to the extent of satisfaction. The results clearly indicates that colour of iris, noising in test image, pixels and other physical transformation leads to frequent rejection as the iris based recognition system identify the internal morphology and physiology of eyes by predefining conjunction points in reference image which is enough sensitive towards even 0.01% of change into iris pattern.

7. Conclusion

The iris based person identification system is reliable enough to be deployed in high security areas as well as military and research purposes but it should not be forgotten that aging and other physical, disease oriented or situation oriented minor changes into the iris of an individual may become critical problem which leads to its rejection in any form. So it is mandatory to change reference image which is saved into the software for comparison must be updated early basis and in special cases when the user get any physical accident, or recover from any disease to avoid further complications.

8. Acknowledgement

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