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Performance of Iris databases for Authentication

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***Abstract*— Biometrics are a widely used concept for authentication. Biometrics widely uses Irises for this purpose. Iris matching takes into account the various concepts and parameters. The aim here is to compare various database/datasets of Irises and to record the findings. This would give a clear understanding of the noise, disturbance, and environment of where the images have been taken and whether it affects the Iris image or not. In the last, we conclude that due to aging, the biometric test conducted on Iris can give wrong results too.**

***Index Terms*—Authentication, Biometrics, Grayscale, Irises,**

I. INTRODUCTION

Iris recognition is a very common method in Bio metrics nowadays. It is used for authentication of a person just like fingerprints, voice recognition etc. It is considered as one of the most reliable method for testing whether a person is same or different. In this paper, different Irises collected will be compared and the datasets collected will be checked on different parameters

II. METHODOLOGY

A tool GIRIST (Grus IRIS tool) is used in this paper to compare the different Irises and to check their efficiency in authenticating the iris. GIRIST (Grus IRIS Tool) is a freely available commercial application from GruSoft which is a GUI front end that demonstrates the commercial Giris SDK In this tool, different iris datasets were judged on various parameters. All the datasets were freely online available. The different datasets are mentioned below:

A. CASIA (Chinese Academy of Sciences, Institute of Automation) Iris V1

The database includes 756 iris images from 108 eyes. For each eye 7 images are captured in 2 sessions with a self –developed device CASIA closeup iris camera.

B. UBIRIS (Unconstrained Biometrics: Iris)

Its composed of 1877 images collected from 241 persons in 2 different sessions. This is worlds one of the largest database available online.

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C. CUHK (Chinese University of Hong Kong)

This iris database comes from the Chinese university.

D. UCI

The data set contains 3 classes of 50 instances each, where each class refers to a type of iris plant

E. *IITD (Indian Institute of Technology, Delhi)*

All the subjects in the database[1][2] are in the age group 14-55 years comprising of 176 males and 48 females. The resolution of these images is 320 x 240 pixels and all these images were acquired in the indoor environment.

F. *SGGSIE&T Iris Image database*

Created database includes 1200 iris images from 60 eyes of 30 persons. For each eye, 20 gray scale images of size 240x200 pixels are captured.

G. UBIID

This database is from the University of Bath Iris Image Database [4].

H. UTIRIS (University of Tehran Iris)

UTIRIS [3][6] is a hybrid database containing two sessions of Iris biometric images in Visible Wavelength (VW) and Near Infra-Red (NIR) from the same individuals. The database includes 79 individuals from both Right and Left eyes resulting in 158 classes in total.

III. IMPLEMENTATION

The steps for implementation done are mentioned below:

A. Collect all the online freely available databases.
B. Making two folders, each for left and right irises.
C. With the help of the tool GIRIST, build the library for each database.
D. Graph will be made for each library, representing its performance.

For the graph, the parameters can be changed according to requirement. The graph gives the Hamming Distance distributions and ROC curves. It also gives the extraction time and matching speed of one iris to the other.

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IV. FINDINGS

The graphs obtained from the tool help in understanding many parameters. Below are the graphs for all the listed databases:

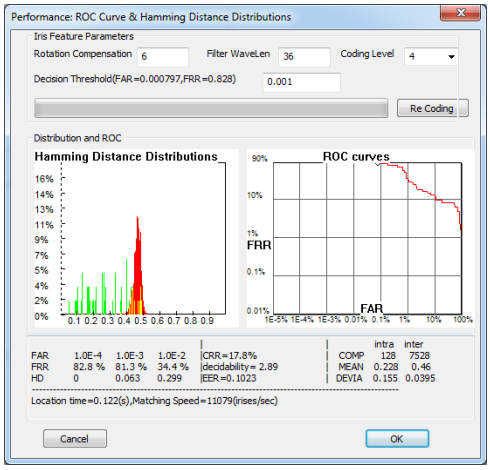

Fig 1: Graph for CUHK

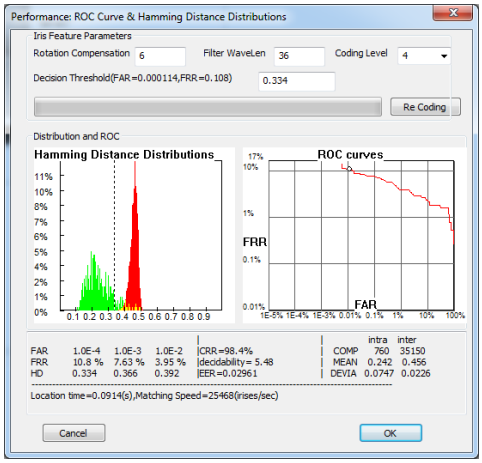

Fig 2: Graph for UCI

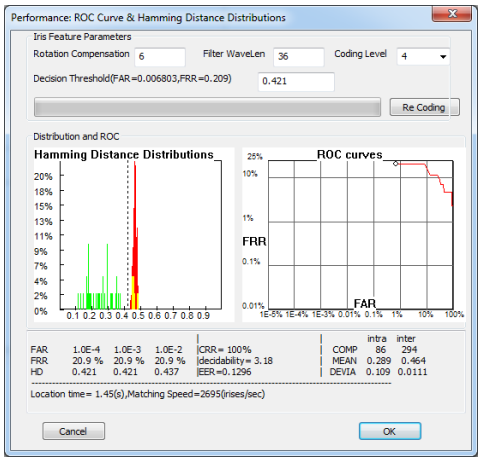

Fig 3: Graph for UBIID

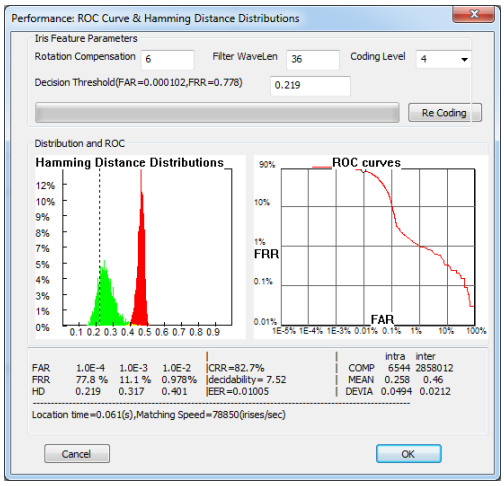

Fig 4: Graph for UBIRIS

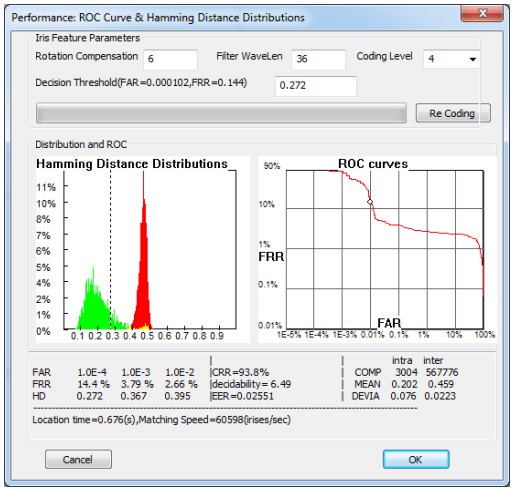

Fig 5: Graph for UTIRIS

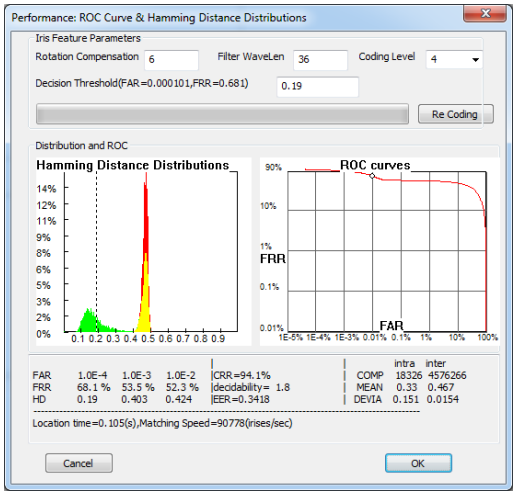

Fig 6: Graph for IITD

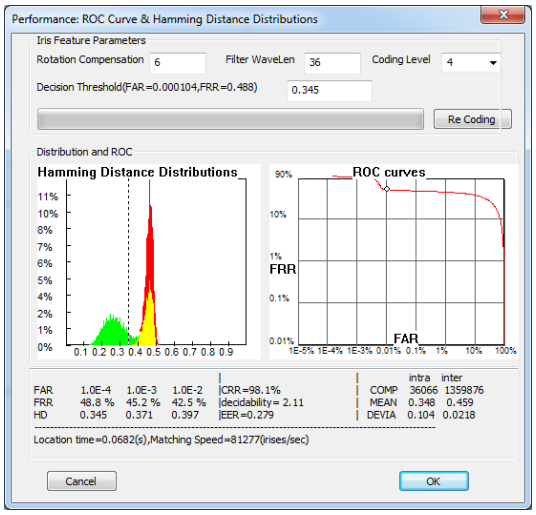

Fig 7: Graph for SGGSIE&T

The different database are judged on various parameters like:

A. CRR

Correct Recognition Rate

B. FAR

The false accept rate (FAR), measures the probability of an individual being wrongly identified as another individual.

C. FRR

The false reject rate (FRR), measures the probability of an enrolled individual not being identified by the system.

D. Decision Threshold

If the hamming distance of two irises greater than this threshold, they are from different eye. Otherwise they are from the same eye.

E. ROC (receiver-operating characteristic)

ROC is a graphical depiction of the relationship between the FRR and FAR. ROC curve helps to demonstrate how increasing or decreasing the decision threshold's value affects tradeoffs between FRR and FAR. The ROC curve is represented in a logarithmic scale.

F. EER (Equal Error Rate)

When increase threshold value, the FAR will increase and FRR will decrease. ERR is the value which FAR=FRR.

G. Decidability

$$d' = \frac{|\mu_s - \mu_d|}{\sqrt{(\sigma_s^2 + \sigma_D^2)}} \quad (1)$$

Equation (1) tells about Decidability d' is a distance measured in standard deviations and is a function of the magnitude of difference between the mean of the intra-class distribution μD, and the
mean of the inter-class distribution μs, and also the standard deviation of the intra-class and inter-class distributions, $S D$ σ ,σ respectively. The higher the decidability, the greater the separation of intra-class and inter-class distributions, which allows for more accurate recognition.

H. Extraction time

The time of iris location and feature extraction.

I. Matching rate

The number of iris comparisons in a second.

V. EXPERIMENTAL RESULTS

The performance of the above given databases is concluded below. Table1 gives details about the databases and Table 2 tells the results obtained from the tool GIRIST

Table 1 Iris Databases

Database	No of images	No of classes	Image size	Intra class comparisons	Inter class comparisons
CUHK	252	36	310x364	128	7528
UCI	200	20	320X240	760	35150
UBIID	20	5	1280X960	86	294
UBIRIS	1877	241	2560X1704	6544	2858012
UTIRIS	790	158	1000X776	3004	567776
IITD	2240	224	320X240	18326	4576266
SGGSIE&T	1200	30	240X200	36066	1359876

Table 2 Results

Database	CRR	FAR/FRR			Decidability	Extraction time(sec)	Matching rate	EER
		0.01 %	0.1 %	1%				
CUHK	17.8 %	0	0.063	0.299	2.89	0.122	11079	0.10
UCI	98.4 %	0.334	0.366	0.392	5.48	0.91	25468	0.02
UBIID	100 %	0.421	0.421	0.437	3.18	1.45	2695	0.12
UBIRIS	82.7 %	0.219	0.317	0.401	7.52	0.061	78850	0.01
UTIRIS	93.8 %	0.272	0.367	0.395	6.49	0.676	60598	0.025
IITD	94.1 %	0.19	0.403	0.424	1.8	0.105	90778	0.34
SGGSIE&T	98.1 %	0.35	0.371	0.397	2.11	0.068	81277	0.279

VI. CONCLUSION

The paper concludes that different databases have different characteristics for the [6]authentication of the Irises and

there are parameters to be judged. The extraction rate depends on the number of irises in the database and the image quality too is dependent on it.
UBIRIS database has all the indexes (almost) lower as compared to others. It has the best decidability factor and least extraction time amongst all.

VII. FUTURE WORK

This paper used the tool GIRIST for the different Irises performance to be judged. But the constraint with it is that it only accepts Grayscale images. UPOL database could not be used because it did not have Grayscale images. The future work can be done on any other tool that deals with all images and do not have constraint like in GIRIST.

ACKNOWLEDGEMENT

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