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COMPARISON OF IRIS DATABASE PERFORMANCE USING GIRIST

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ABSTRACT

Identification of the human can be performed either manually or systematically. Biometrics is the systematic identification of an individual based on their characteristic features. Biometric using human iris takes the lead compared to any other metrics like fingerprint, face recognition. Iris identification, verification and authentication are implemented using the grus iris tool. Various databases are collected and tested using tool. The results shown the findings of performance of each database comparison over the parameters used in it.

1. INTRODUCTION

IRIS BIOMETRIC SYSTEM

Human identification is conventionally exercised in many ways. Biometrics is the one used widely for the identification of human by checking physical or behavioral of an individual. There available various human traits, in which human iris used extensively for biometrics and it provides the unique pattern over every individual. Even a human's left and right iris shows the difference, so iris is accepted broadly as a key to authenticate and identification of a person. Therefore, biometrics is seen as one of the reliable and accurate method to identify an individual. Recognition of human can be done using iris biometrics system.

HUMAN IRIS

Iris is a thin circular surface which place between the sclera and the pupil of the eye. The iris diameter average is 12 mm and its thickness varies [1]. Human iris is the one which is unique and highly stable over the human life time [3]. It is a protected internal organ and the colored part of the eyes. Hence it is visible enough for collecting the information of human iris. The human iris can be tested frequently throughout time, it is permanent and invariant only when the individual is not consumed alcohol. It is very much useful for biometric identification because each and every individual comprises of unique iris pattern.

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Even the left and right iris of an individual varies.

Iris recognition based personal identify authentication system are known to be reliable over biometric methods. Identifying two people with same pattern probability is more over zero [4].

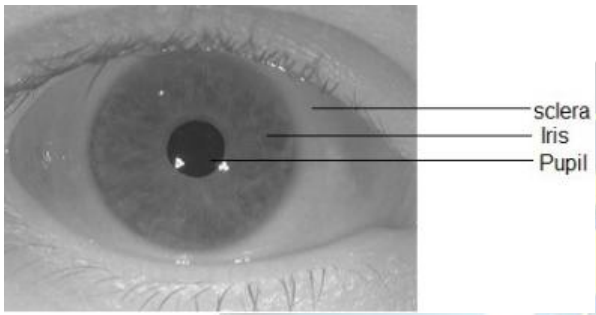

Figure 1.1: Human Eye with parts specified

These days, iris recognition is considered as a common method for biometrics. It is helpful to authenticate, identify and match the iris of an individual. In this work, different sets of irises are collected from different databases and compared based on its performance parameters. [5] proposed a system which uses intermediate features of maximum overlap wavelet transform (IMOWT) as a pre-processing step. The coefficients derived from IMOWT are subjected to 2D histogram Grouping.

2. METHODOLOGY

In this work, a tool namely GIRIST (Grus IRIS Tool) is used to compare the performance of the datasets of different databases which was collected. Therefore it is freely available online sdk from grusoft.

By using the tool various datasets collected were compared based on different parameters. The datasets taken are freely available online which databases mentioned as follows:

IITD:

Indian Institute of Technology Delhi (IITD) database [6] comprises of 2240 iris images acquired from 224 individual. The iris images are of bitmap image file format. In which it consists of left and right iris image of an individual. Therefore these images are taken in an indoor environment [2].

UBIRIS:

Unconstrained Biometrics IRIS (UBIRIS) is a database which has two distinct sessions. It is totally consists of 1877 images collected from 241 individual [8]. Therefore this iris images are of the jpg file format.

CUHK:

The Chinese university of Hong Kong (CUHK) database consists of 252 iris images and is of bitmap image file format [7].

UTIRIS:

University of Tehran IRIS (UTIRIS) v.1 database composed of 1580 images taken at two different sessions namely near infrared (NIR) and visible wavelength (VW). NIR images are of bmp file format and VW images are of jpg file format [9]. It includes

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79 individuals from both left and right eyes of 158 classes in total.

3. IMPLEMENTATION

Algorithmic steps for the proposed work as follows:

i) Download freely available iris image database online
ii) Store every database in a separate folder
iii) If the database contains left and right iris image, need to separate into each folder for left and right iris images
iv) Build the library for each database with its name using the tool girist
v) To analyze the performance of each database, graph generated is used to compare each database

The generated graph shows the distributions of the hamming distance and the plot of ROC curves.

4. OBSERVATION

The graph generated for the collected database for the respected datasets using the tool [10] as shown below:

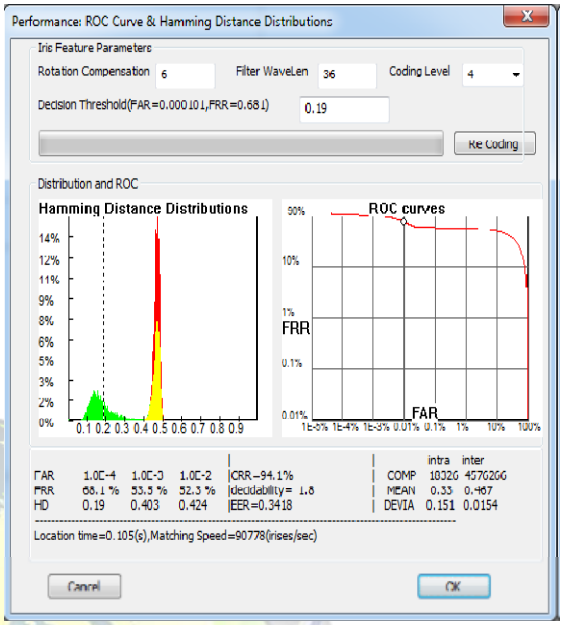

Figure 4.1: Performance HD Distributions graph and ROC plot of IITD

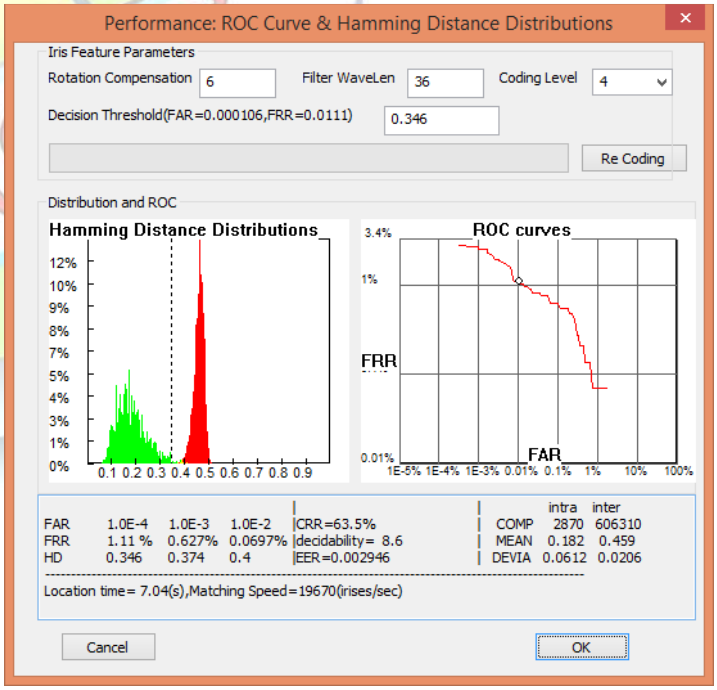

Figure 4.2: Performance HD Distributions graph and ROC plot of UBIRIS

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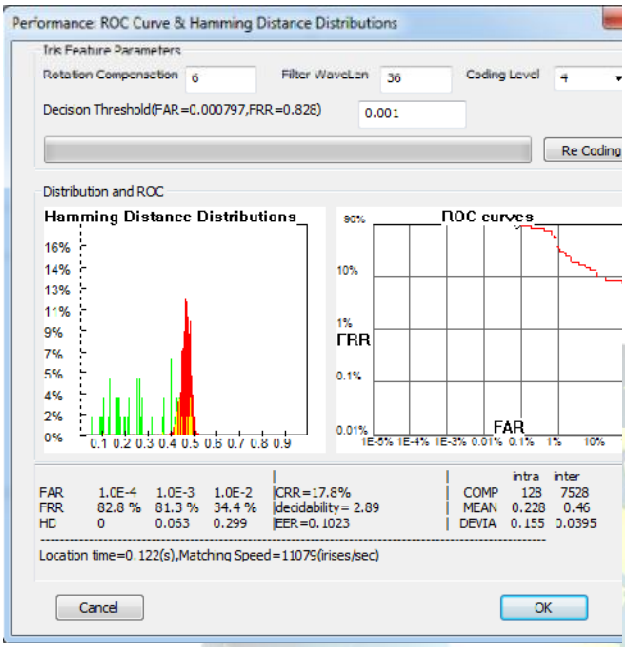

Figure 4.3: Performance HD Distributions graph and ROC plot of CUHK

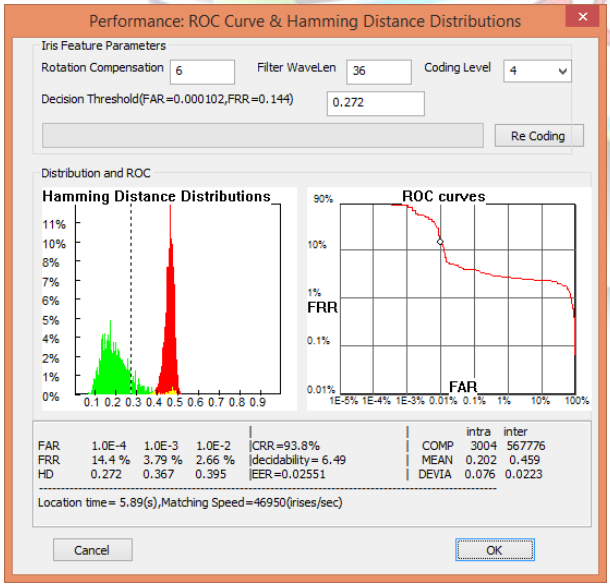

Figure 4.4: Performance HD Distributions graph and ROC plot of UTIRIS

Parameter Description:

The description of various parameters in graph as follows

Decision Threshold

The HD of the both eyes are differ from each other means, they are from different eye else both from the same eye. The default value is 0.36 which is from experimental result.

CRR

It expands Correct Recognition Rate

FAR

It expands False Accept Rate, probability measure of a person wrongly identified as another.

FRR

It expands False Reject Rate, probability measure of a individual in database is not identified.

ROC

It expands Receiver operating characteristic, shows the plot of FRR vs FAR and represented in log scale.

ERR

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It expands equal error rate, where FAR equals to FRR.

Decidability

Distance measured in SD (d') is equated (1) as differences of mean of inter and intra class distributions by root of SD of inter and intra class.

$$d' = \frac{|\mu_S - \mu_D|}{\sqrt{(\sigma_S^2 + \sigma_D^2)}} \longrightarrow (1)$$

Extraction Time

The extraction varies based on the size of an image and it shows the time taken to locating and extracting the feature of the iris image.

Matching rate

The matching rate value shows number of irises compared in a second.

5. RESULT AND DISCUSSION

The Comparison of various database based on its performance results is given in the below table 2 and the table 1 gives the used database details. Followed by pie chart for the CRR and Extraction time of respected databases.

Table 5.1: Database Details

Data base	No. of Images	No. of Classes	Image Size	Intra class comparisons	Inter class comparisons
IITD	2240	224	320X240	26522	4953070
UBIRIS	1877	241	2560X1704	2870	606310
UTIRIS	1580	158	1000X776	3004	567776
CUHK	252	36	310X364	128	7528

Table 5.2: Parameter Values for each database respectively

Database	CRR	FAR/FRR			Decidability	Extraction Time (S)	Matching Rate	ERR
		0.01%	0.1%	1%				
IITD	94.1%	0.19	0.4043	0.4244	1.8	0.105	90788	0.34
UBIRIS	63.5%	1.11	0.627	0.0697	8.6	7.04	19670	0.002946
UTIRIS	93.8%	14.44	3.79	2.66	6.49	5.89	56950	0.02551
CUHK	17.8%	0	0.063	0.299	2.89	0.122	11079	0.10

Chart 5.1: Pie-chart shows the Comparison of CRR of every database

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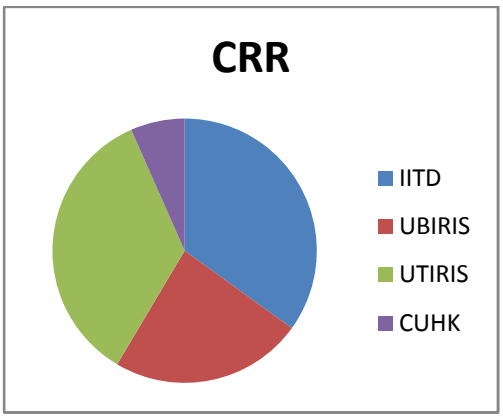
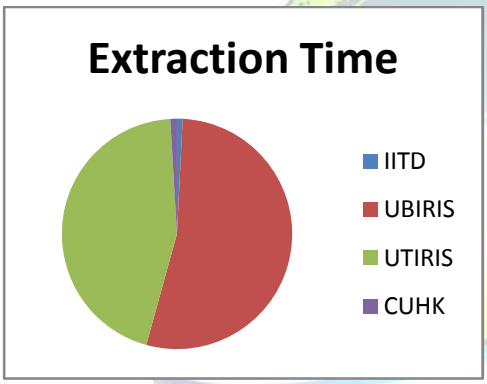


Chart 5.2: Pie-chart shows comparison of Extraction time of each database



6. CONCLUSION

Therefore the above results show each and every database performance changes on various parameters. The performing system may change the result that is based memory storage system. The extraction time changes based on system memory performance, number of iris and the image quality.

FUTURE WORK

In this work, the girist tools have been used to detect performance results. In this tool, identification and verification and matching can be performed with only grayscale images. Else need to convert the image into grayscale and used further. The tool which accepts all type of images and with additional features can make the future work.

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