

TSA Iris Sensor Evaluation

Biometric Consortium Conference 2005

Valerie M. Lively



Transportation
Security
Administration

Overview

- Independent Testing of Iris Recognition Technology (ITIRT)
 - 29 July 2004 – 2 May 2005
- International Biometric Group (IBG) conducted scenario evaluation
 - Independent biometric integration, consulting, and research & testing company
 - Michael Thieme, Director of Special Projects



Overview

- Background & Goals
- Test Subject/Device
- Subject/Iris Data
- Data Analysis
- Conclusion
- Final Report
 - www.biometriccatalog.org/evaluation



Test Background and Goals

- Test of sensors and interoperability
- Test of M1 Standards for iris interchange format
- Acquire samples from three sensors (LG, OKI, PAN)
- Compare samples within each vendor system and across each vendor system
- Assess transactional usability, capture rates, effort levels
- Automate data collection and application logic



Test Subject – Device Interaction

Model	Presentation Method	Acquisition Method	Imager Adjustable	Subject Feedback
LG IrisAccess 3000 EOU, ROU	L/R irises presented separately	L/R irises acquired separately	Yes	Spoken / Visual
OKI IRISPASS-WG	L/R irises presented simultaneously	L/R irises acquired separately	No	Tone / Visual
Panasonic BM-ET300	L/R irises presented simultaneously	L/R irises acquired simultaneously	Yes	Spoken / Visual



Scale: Subject and Iris Data

Acquisition Mode	Subjects	Visits	Eyes	Devices	Transactions	IrisCodes / Transaction	IrisCodes
Enrollment - 1	766	1	2	3	2	1	~9264
Recognition - 1	766	1	2	3	3	3	~41688
Enrollment - 2	458	2	2	3	2	1	~10992
Recognition - 2	458	2	2	3	3	3	~49464
						TOTAL	~111,408



Failure to Enroll Rates

	Failure to Enroll Rates (FTE)					
	LG IrisAccess 3000		OKI IRISPASS-WG		Panasonic BM-ET300	
Total Transactions	3364	--	3364	--	3364	--
Zero Irides Enrolled (FTE)	41	1.61%	85	2.53%	237	7.05%
Either Left or Right Iris Enrolled	244	8.50%	262	7.79%	324	9.63%
Both Irides Enrolled	3079	89.89%	3017	89.68%	2803	83.32%

- FTE: proportion of enrollment transactions in which zero irides were enrolled



Transaction-Level Failure to Acquire Rates

	Transaction-Level Failure to Acquire Rates (T-FTA)					
	LG IrisAccess 3000		OKI IRISPASS-WG		Panasonic BM-ET300	
Total Transactions	5040	--	5031	--	5043	--
Zero Iris Samples Acquired	35	0.69%	16	0.32%	21	0.42%
≥ 1 Left or ≥ 1 Right Iris Samples Acquired	89	1.77%	46	0.91%	55	1.09%
≥ 1 Left and ≥ 1 Right Iris Samples Acquired	4916	97.54%	4969	98.77%	4967	98.49%

- T-FTA: proportion of recognition transactions for which a device cannot acquire an iris sample of sufficient quality in any of a transaction's 6 attempts (3 left, 3 right)



Recognition Attempt Duration

	Recognition Attempt Duration (seconds)					
	LG IrisAccess 3000		OKI IRISPASS-WG		Panasonic BM-ET300	
	Min	Median	Min	Median	Min	Median
Failed Acquisition	8.56	12.29	4.27	32.28	3.34	12.63
Successful Acquisition	0.77	1.92	4.02	5.05	3.20	3.58

- Measured from operator activation of application to
 - capture of sufficient-quality iris sample
 - Samples for Panasonic due to dual-capture
 - device-declared FTA for attempt



Error Rates at 0.33 HD

		Enrollment Comparisons		Recognition Comparisons		Recognition Transactions
		Intra-Visit	Cross-Visit	Intra-Visit	Cross-Visit	Cross-Visit
LG-LG	FNMR	0.964%	1.636%	4.784%	5.293%	T-FNMR: 1.570%
	FMR	0.00058%	0.00058%	0.00095%	0.00092%	T-FMR: 0.00875%
OKI-OKI	FNMR	1.117%	1.980%	6.655%	6.726%	T-FNMR: 1.038%
	FMR	0.00014%	0.00001%	0.00010%	0.00006%	T-FMR: 0.00035%
PAN-PAN	FNMR	0.759%	1.422%	4.039%	2.906%	T-FNMR: 0.583%
	FMR	0.00013%	0.00031%	0.00023%	0.00024%	T-FMR: 0.00129%

- 0.33 HD: threshold used for 1:1 matching
- Of note: type of comparison a larger factor than visit gap



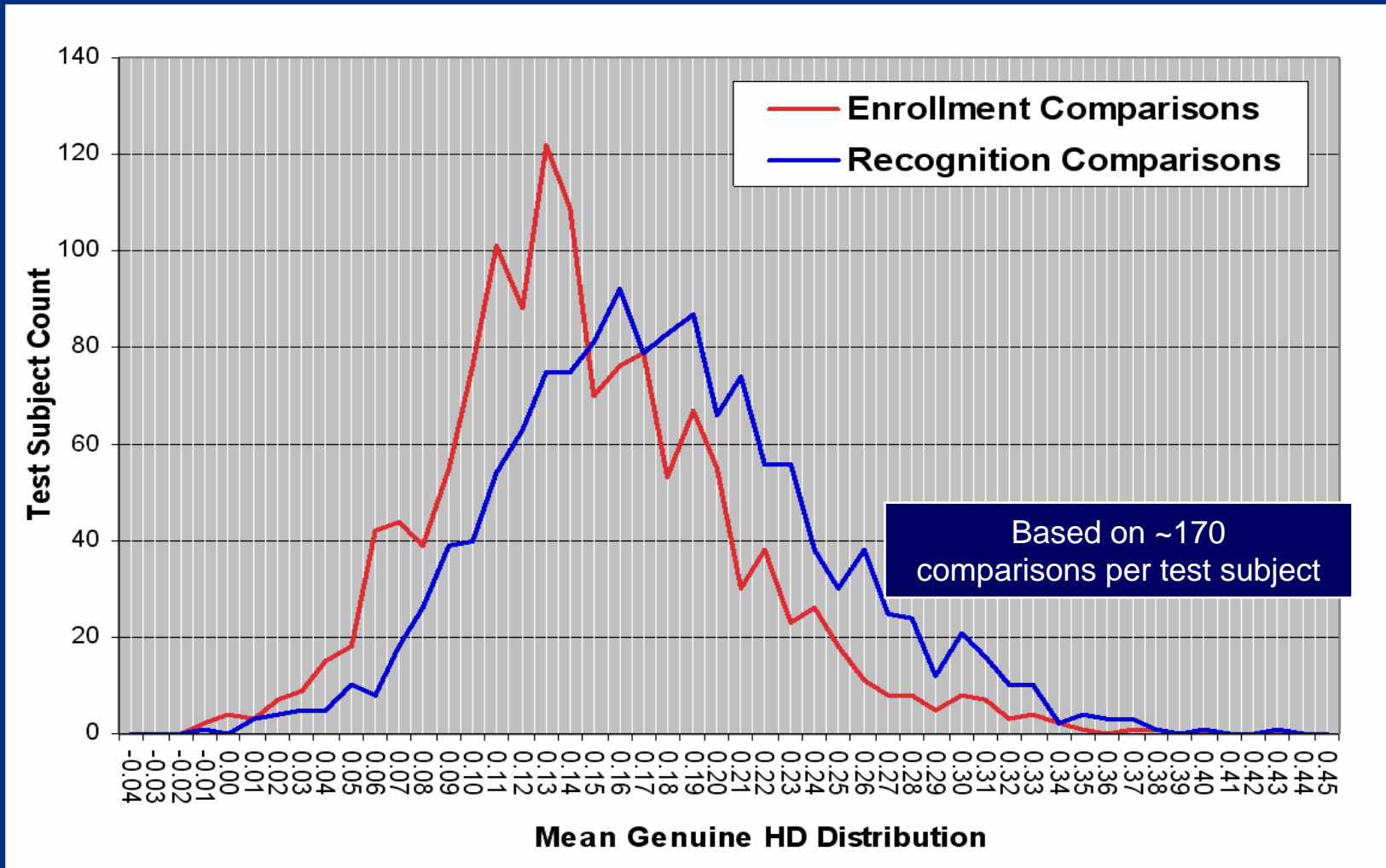
Error Rates at 0.33 HD: Cross-Device

		Enrollment Comparisons		Recognition Comparisons		Recognition Transactions
		Intra-Visit	Cross-Visit	Intra-Visit	Cross-Visit	Cross-Visit
LG-OKI	FNMR	4.504%	5.551%	8.912%	9.384%	T-FNMR: 2.454%
	FMR	0.00021%	0.00025%	0.00028%	0.00032%	T-FMR: 0.00161%
LG-PAN	FNMR	3.915%	4.276%	8.460%	8.520%	T-FNMR: 2.301%
	FMR	0.00035%	0.00023%	0.00043%	0.00038%	T-FMR: 0.00199%
OKI-LG	FNMR	4.141%	4.900%	10.779%	11.283%	T-FNMR: 3.240%
	FMR	0.00021%	0.00019%	0.00019%	0.00016%	T-FMR: 0.00090%
OKI-PAN	FNMR	4.209%	4.031%	9.763%	9.037%	T-FNMR: 2.297%
	FMR	0.00018%	0.00015%	0.00015%	0.00012%	T-FMR: 0.00062%
PAN-LG	FNMR	3.572%	4.371%	7.518%	6.971%	T-FNMR: 2.676%
	FMR	0.00036%	0.00034%	0.00033%	0.00029%	T-FMR: 0.00154%
PAN-OKI	FNMR	4.200%	5.382%	8.212%	7.313%	T-FNMR: 2.641%
	FMR	0.00023%	0.00022%	0.00016%	0.00016%	T-FMR: 0.00083%

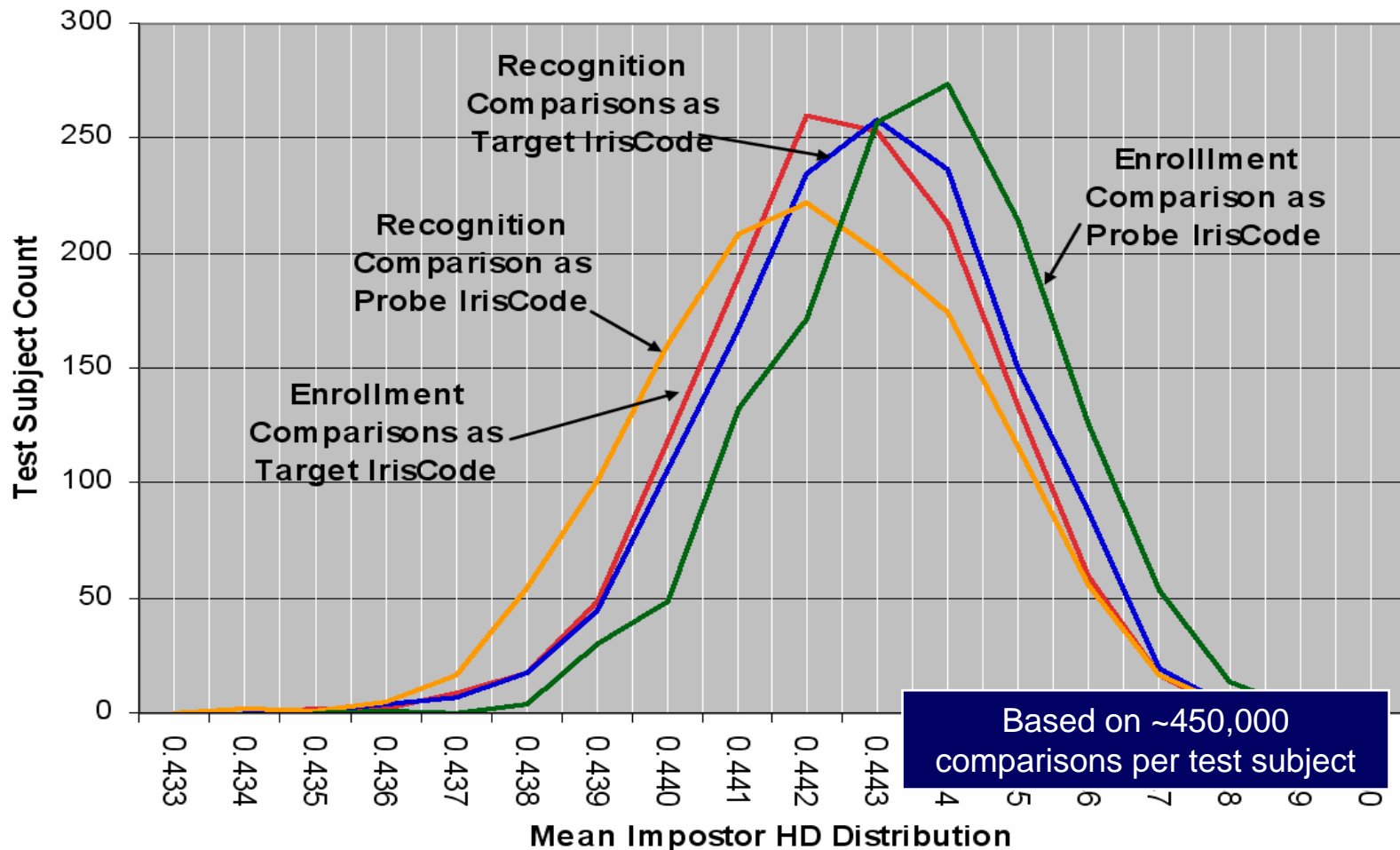
- LG-OKI = LG probes vs. OKI gallery, and so on



Mean Genuine HD Distribution



Mean Impostor HD Distribution



Conclusions

- Technologies appears to be roughly as resistant to FMR as was shown in previous tests
 - 1 in several hundred thousand, generally
 - Certain devices appear more resistant to FMR than others
 - Results compare very favourably to other modalities in similar testing
- Both FNMR and capture failures (FTA, FTE) are an issue
 - Certain devices and capture methods reduce these error rates more effectively than others
- Samples are interoperable across devices
 - Genuine errors increase relative to same-device performance
- Certain test subjects have high genuine error rates
- All subjects have consistently low impostor error rates



Areas for Further Study

- Iris quality
 - What are the factors that make a high-quality iris?
 - Why were there substantial genuine error rates, even with enrollment IrisCodes?
 - What is the relationship between iris quality and matching?
- Test subject-specific trends
 - Why are certain people outliers – behaviour or physiology?
- Eye colour and ethnicity
 - Does any data suggest that eye colour or ethnicity are associated with better / worse performance?
- Alternative algorithms against the IRIRT dataset
- Multimodal testing with ITIRT subjects to examine multi-modal correlation



Contact Information

Valerie M. Lively

Department of Homeland Security

Transportation Security Laboratory

Bldg. 315

William J. Hughes Technical Center

Atlantic City International Airport, NJ 08405

609-813-2721 (voice)

609-383-1973 (fax)

Valerie.Lively@faa.gov

Valerie.Lively@dhs.gov



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