Biometric Performance Values

Literature Research

IREX 10 Leaderboard

https://pages.nist.gov/IREX10/

Single-eye Accuracy:

	Developer	Accuracy (FNIR) ▲	Template Size (bytes)	FTE Rate
1	NEC (Aug 2022)	0.0096 ± 0.0005	9 148 ± 0	0
2	Thales (Dec 2022)	0.0103 ± 0.0005	21 681 ± 0	0
3	Hikvision (Nov 2022)	0.0103 ± 0.0006	5 654 ± 0	0
...				
27	PayEye (Sep 2022)	0.336 ± 0.002	391 ± 0	0
28	Irisian (Jul 2022)	0.884 ± 0.002	2 506 ± 1 841	0

Accuracy Metric : FNIR (i.e., "miss rate") at an FPIR of 0.01(± 90% confidence)
Dataset: Operational Dataset 4th pull
Samples used: One eye
Enrolled Population: 1M irides (500K people)
Enrollment Method: One enrollment session per eye

[screenshot @ 2023-01-10 9:10am CET]

gallery size N = 1e6
FNIR = 0.0096
FPIR = 0.01

with assumption: "1:N = N x (1:1)"
➡ FNIR ~ FNMR = 0.0096
➡ FPIR ~ FMR x N
➡ FMR ~ FPIR/N = 0.01/1e6 = 1e-8

Where does this model based on 1-to-1 matching breakdown?

- **Timing**
  - Scaling behavior not clear
    - One-time latencies
    - Threading efficiency
    - Scoring overhead
- **Accuracy**
  - When gallery normalization is used
  - When multiple matchers are used selectively

https://www.nist.gov/system/files/documents/2021/08/26/martinb_brian_I-1.idmodels.20100304.sano_.pdf

IREX 10 Leaderboard

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Two-eye Accuracy:

	Developer	Accuracy (FNIR) ▲	Search Time (sec)	Template Creation Time (sec)	Template Size (bytes)	FTE Rate
1	NEC (Dec 2022)	0.0022 ± 0.0004	12 ± 3	1.03 ± 0.06	18 280 ± 0	0
2	NEC (Aug 2022)	0.0028 ± 0.0004	12 ± 2	1.04 ± 0.07	18 280 ± 0	0
3	Thales (Dec 2022)	0.0030 ± 0.0004	14 ± 6	1.6 ± 0.6	43 362 ± 0	0
28	KTnC (Dec 2021)	0.457 ± 0.003	196 ± 1	0.12 ± 0.02	513 ± 0	0
29	Irisian (Jul 2022)	0.830 ± 0.002	46.1 ± 0.5	0.7 ± 0.4	5 008 ± 3 680	0

Accuracy Metric : FNIR (i.e., “miss rate”) at an FPIR of 0.01(± 90% confidence)
Dataset: Operational Dataset 4th pull
Samples used: Both eyes
Enrolled Population: 500K people
Enrollment Method: One enrollment session per person

[screenshot @ 2023-01-10 9:10am CET]

gallery size N = 500e3
$FNIR_{DUAL}$ = 0.0022
$FPIR_{DUAL}$ = 0.01

with assumption: “1:N = N x (1:1)”
(should be used carefully)
➡ $FNIR_{DUAL}$ ~ $FNMR_{DUAL}$ = 0.002
➡ $FPIR_{DUAL}$ ~ FMR_{DUAL} x N
➡ FMR_{DUAL} ~ $FPIR_{DUAL}$/N = 0.01/500e3 = 2e-8

assume that OR rule was used here:
➡ FNMR = sqrt($FNMR_{DUAL}$) = 0.045
➡ FMR ~ FMR_{DUAL} / 2 = 1e-8

"Derivation"

$$FMR_{DUAL} = 2FMR(1-FMR) + FMR \overset{FMR \ll 1}{\approx} 2FMR$$

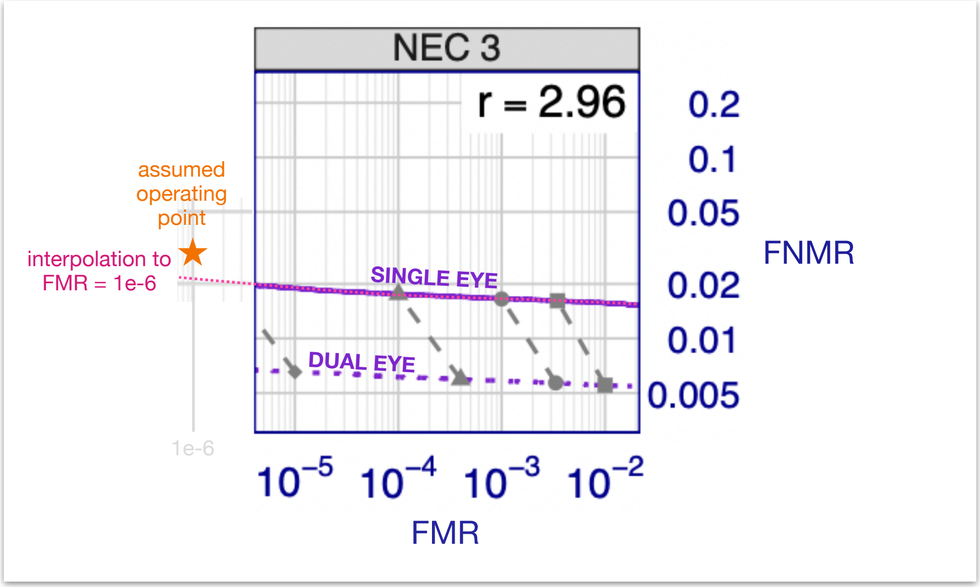
$$\Rightarrow FMR \approx FMR_{DUAL}/2$$

$$FNMR_{DUAL} = FNMR^2$$

$$\Rightarrow FNMR = \sqrt{FNMR}$$

IREX 9 Report

https://www.nist.gov/publications/irex-ix-part-one-performance-iris-recognition-algorithms



➡ FNMR = 0.03
➡ FMR = 1e-6

Screenshot Fig 3.18

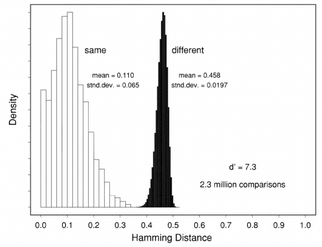
How Iris Recognition Works

https://www.robots.ox.ac.uk/~az/lectures/est/iris.pdf

How Iris Recognition Works

John Daugman

Invited Paper



tion is the stable asymptotic form both in the case of well imaged irises (Fig. 10) and poorly imaged irises (Fig. 9). Imaging quality determines how much the same-iris distribution evolves and migrates leftward, away from the asymptotic different-iris distribution on the right. In any case, we note that for the 7070 same-iris comparisons shown in Fig. 9, their highest HD was 0.327 which is below the smallest HD of 0.329 for the 9.1 million comparisons between different irises. Thus a decision criterion slightly below 0.33 for the empirical data sets shown can perfectly separate the dual distributions. At this criterion, using the cumulatives of (11) as tabulated in Table I, the theoretical false match probability is 1 in 4 million.

- FNMR < 1/7070 = 0.00014
- FMR < 1/9.1e6 = 1.1e-7

FMR = number of estimated matches / number of true matches
FNMR = number of estimated non-matches / number of true non-matches

Summary

		FMR	FNMR	
A	IREX 10 NEC (Single-Eye) [2022]	1e-8	0.0096	
B	IREX 10 NEC (Two-Eye) [2022]	1e-8	0.045	←
C	IREX 9 NEC Algorithm [2018]	1e-6	0.03	
D	Daugman Paper	1.1e-7	0.00014	←
	Conservative Estimation	1e-6	0.005	←