Many Faces of Iris Quality
Iris Quality Calibration and Evaluation (IQCE)

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IREX II – IQCE
motivation

- Deploying iris recognition technology is rapidly gaining acceptance and support in government identity management applications.

- ISO/IEC JTC 1 SC 37 initiated Iris image quality standard (ISO/IEC 29794-6) in July 2009.

- The problem of iris quality is still lacking research and evaluation.
  - No established requirements on software or hardware capturing iris images
  - No established requirements on iris image covariates
  - Claims need empirical validation

IQCE is …

- The 2nd activity under **irex** IRIS EXCHANGE

- Funded by DHS S+T
  - *Project "Radical improvement in iris quality assessment and maturing multimodal biometric utilization"*

- An evaluation based program for development of clear, implementable, and interoperable iris quality standard ISO/IEC 29794-6.

IQcE

raw image

Cropped
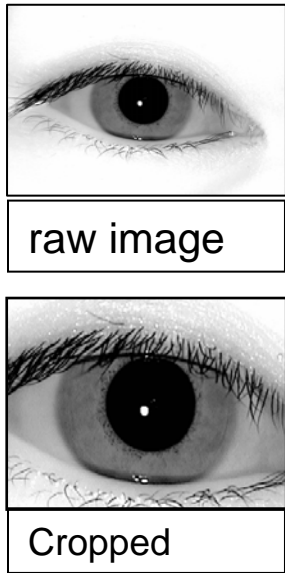
VENDOR SUPPLIED IMAGE QUALITY ASSESSMENT ALGORITHM (IQAA)

QUALITY VECTOR

Table 4. IQAAs output format.
The range of each metric shall be [0,254], a value of 255 means that the quality metric is not computed.

Position	Metric
1	Scalar overall quality
2	Gray level spread
	Iris radius (in pixel)
4	Pupil iris ratio (ratio of pupil diameter over iris diameter)
6	Iris-sclera contrast
7	Iris-pupil contrast
	Iris sclera boundary shape (iris shape)
9	Iris pupil boundary shape (pupil shape)
10	Margin (image scale in N3331)
12	Motion blur
13	Signal to noise ratio
14	Magnification
15	Head rotation
16	Gaze angle
17	Interlace
18- 32	Reserved for future standardized quality metric
33 … 64	Vendor-defined quality measurements

1   **Scalar quality**

2 .. 17   **Defined (standard) quality metrics**

18..32   **Reserved**

33..64   **Vendor-defined quality metrics**

Q

FNMR
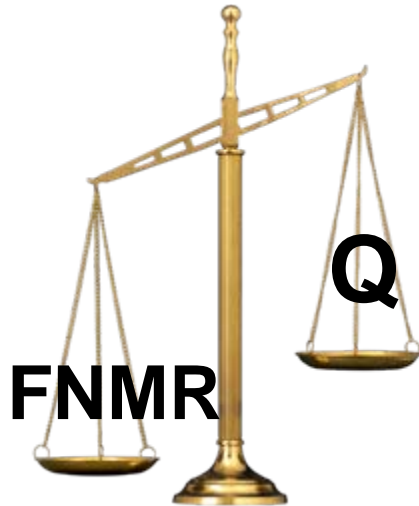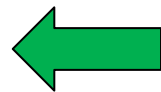
Purpose
Push towards zero-error biometrics

- Radically improve USG / DHS capability to
  - Identify samples that are likely to cause failures
    - Quality by design
  - Bring multi-biometrics to operational maturity
    - Focusing on applied biometrics

- Impact
  - Enabling scientific progress in iris image quality definition and assessment
    - Improve requirement planning and system design (influential on procurement)
  - Expand marketplace of interoperable products
    - Quantitative support for development of international iris quality standard (ISO/IEC 29794-6)
  - Expand NIST's image corpora + reference implementation
    - Iris tool box.

- Support development of iris image quality standard (ISO/IEC 29794-6)
  - Strengthening the science behind the claims
  - Preventing over-prescriptive statements
  - Introducing tolerance bounds on iris image covariates

Progress so far

- ÷ Developed test scope, protocol, API (Oct – Dec 2009)
  - In consultation with industry and SC 37 WG 3
- ÷ Invited participation (Jan 2010)
  - Either as a provider of image quality assessment,
  - Or as a provider of generators AND matchers,
  - Or both
- ÷ Technology supplied to NIST as SDK (Jan – Aug 2010)
  - With IQCE API
  - Rounds of testing
    - ÷ Evaluated 11 SDKs - produced 3 intermediate reports
- ÷ Data preparation
  - Uncompressed raw images - type VGA or CROPPED as defined in ISO/IEC 19794-6
  - Offline archived datasets at NIST + new data
    - Dedicated data collection with specific image impairments
      - Clarkson Q-FIRE (extracting frames + making TYPE_CROPPED)
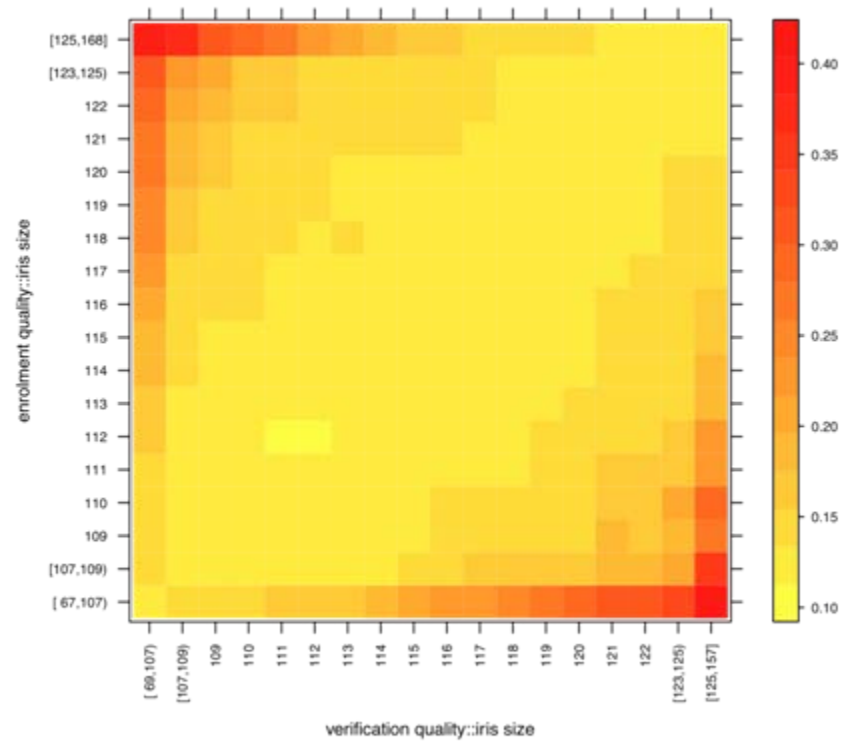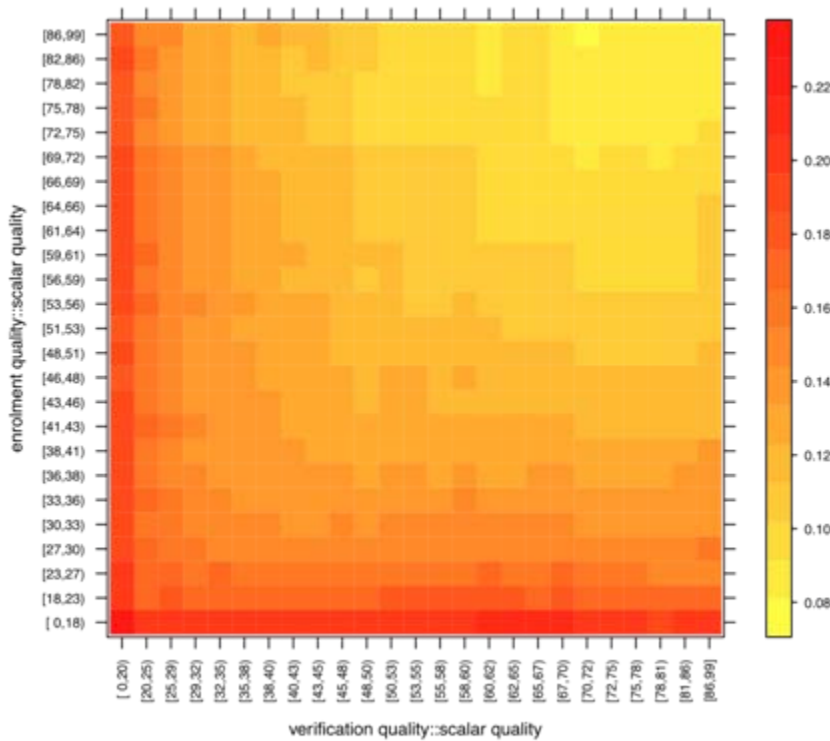- ÷ Devise metrics + analysis of results (Jan – present)
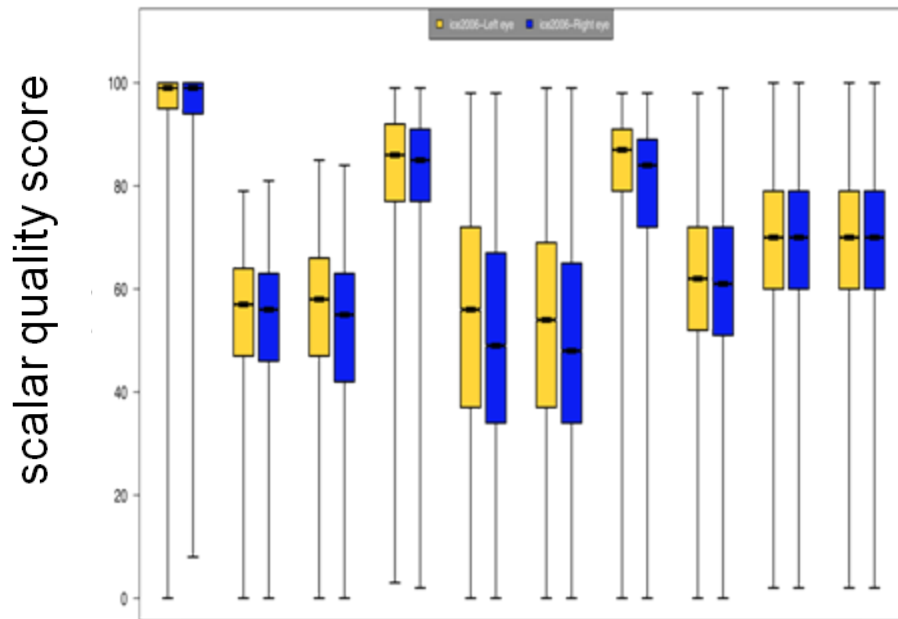
Progress so far – 2
IQCE :: metrics
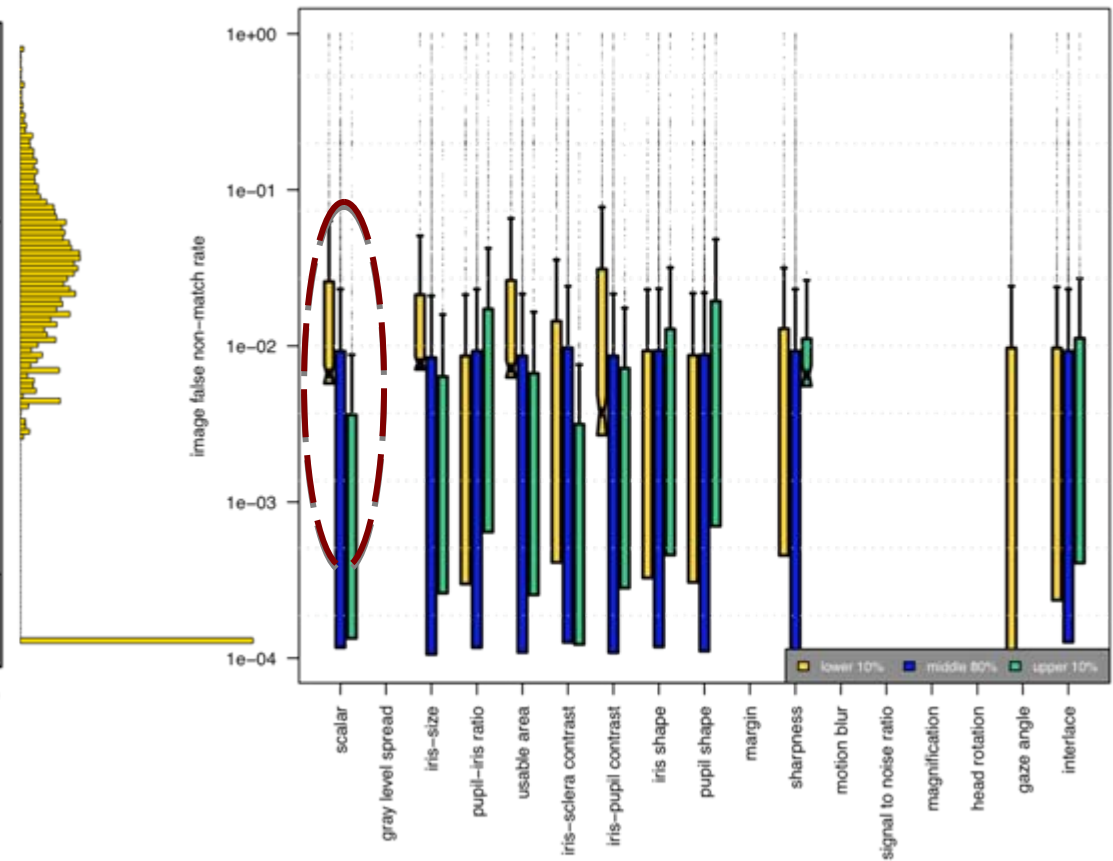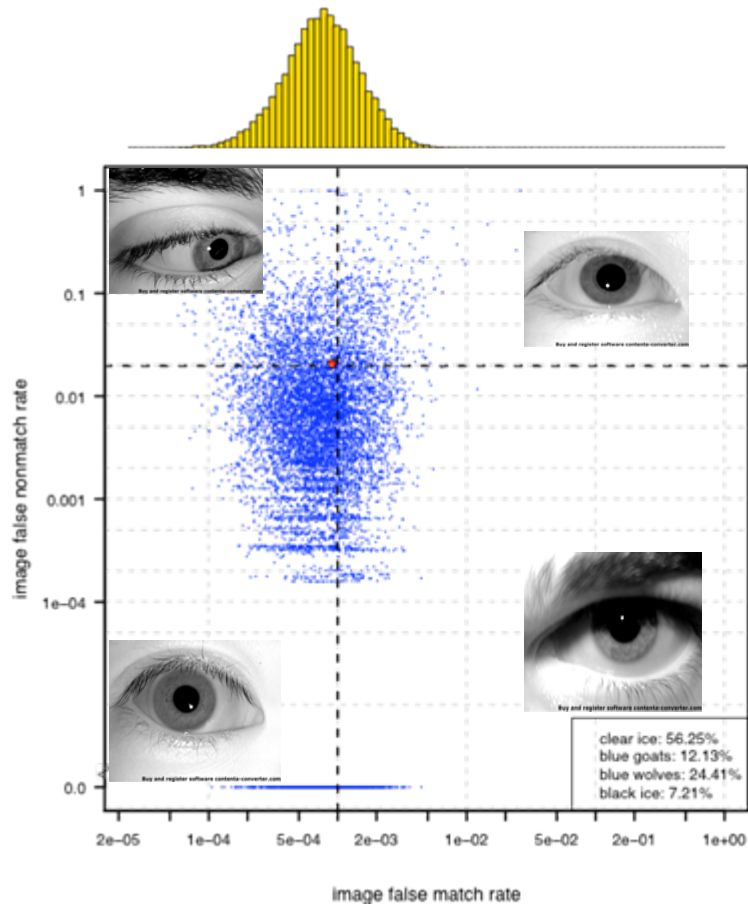
Tabassi, Image specific error rate:
A Biometric performance measure
Proceedings of ICPR 2010

Progress This Year - 3

Iris Quality Calibration

– Goal: interpretation of quality by providing context

– Value: improved interoperability

– The calibrated quality should reflect the utility of the sample within a biometric system

  –: estimated using the observed false non-match rates from a set of leading commercial matching algorithms computed at some fixed threshold using large set of operational data

What is next

- Final Report (NIST IR) (End of Nov 2010)
  - Evaluation of iris image quality assessment algorithms
    - 24 (15 final + 9 intermediate) submissions from 9 organizations
  - A refined list of iris image quality metrics possibly with tolerance bounds
  - Calibration curve per quality assessment algorithm
  - Quantitative support to ISO/IEC 29794-6

- Iris image quality tool box
  - Bibliography of technical papers
  - Software implementations
    - open source or proprietary compiled libraries

Final Outcome

- Guidance document
  - Identifying procurement ready requirements and specification in support of one-to-many multi-biometric systems.

- International Standard
  - Submit technical contribution to SC 37 WG 3 towards ISO/IEC 29794-6

- Iris processing toolbox
  - Expand NIST's existing implementation of
    - standards, reference open-source software
    - Image corpora.

More Upcoming Plans

IREX III

Large scale one-to-many evaluation

Early 2011

IBPC 2012

Gaithersburg, MD

March 2012

NFIQ 2.0

Thank you for you attention.
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IREX :: http://iris.nist.gov

IBPC :: http://www.nist.gov/itl/iad/ig/ibpc2010.cfm