Proposed Modifications of Type 17 Iris
Proposed Addition of the XX.996 Hash Field

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Agenda

- Proposed field for hash of image data

- Modifications to Type 17
  - Forensic Markup
  - Tracking modifications
  - Two compact formats
    - Lossless compression
    - Lossy compression

Chapter 1 ::
The New XX.996 Hash Field

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What is this? As drafted …

- The “Image Hash” field is added
  - To Type 10, 13, 14, 15, 16, 17, 18, 19, 20, and 99
  - But not Types 4 to 9
- It contains
  - sha256 cryptographic hash of the image data in XX.999
  - sha256 hash value has 64 alphanumeric chars

Why and why not?

- PRO: Main case… duplicate detection
  - If the field is set for all images in a set, you can detect byte-for-byte duplicates (which do occur, operationally)
- PRO: When computed at source, gives half-baked integrity protection
  - Detection of bits being flipped during transmission (channel errors)
  - Detection of clerical / unintended modifications, e.g. someone modifying the image and forgetting to update the hash.
- CONs:
  - It's not a digital signature, so offers **zero protection** against a substitution attacks.
  - For the byte-for-byte de-duplication task, it can always be computed on the ABIS / server side.
  - It takes about 25 milliseconds per megabyte of data.

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So, what to do?

- Reject
  - Insufficient value
- Accept with modifications
  - Use “md5sum” instead of “sha256”
    - 32 bytes versus 64 bytes
    - Don’t need cryptographic strength
    - 18 milliseconds per megabyte (vs. 25).
  - For DNA, use the name “18.996 Data Hash”
  - Add it for
    - The face in Type 11, and SMT in Type 10.
    - Type 9?
  - Change type for Numeric “N” to Alphanumeric “AN”

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Chapter 2 ::
Modifications to Type 17

Type 17 :: New sets of fields 1 of 7 :: Spectrum

SPV	M⇑		AN	SPECTRUM VALUE	1	1
LOW	C-SPV		N	SPECTRUM LOWER BOUND	0	1
HIG	C-SPV		N	SPECTRUM UPPER BOUND	0	1

Value	Description	Spectrum
NIR	Near-infrared acquisition	Approx. 700–850 nm
VIS	Visible full-spectrum acquisition	Approx. 380–750 nm
RED	Red portion of visible full-spectrum illumination	Approx. 620–750 nm
DEFINED	Defined acquisition spectrum, in range of nanometers rounded to the nearest 10nm, e.g. “0740-0760” or “0800-0830”. This option provides the means to specify the acquisition spectrum when known with precision. When this value is used, it	

Type 17 :: New sets of fields 2 of 7 :: SAP

» Subject acquisition profile

21.28 Field 17.031: Subject acquisition profile / SAP

This optional field lists the SAP levels associated with mobile acquisition devices. The SAP level for iris is to be entered in accordance with the latest version of the *Mobile ID Best Practice Recommendations*.

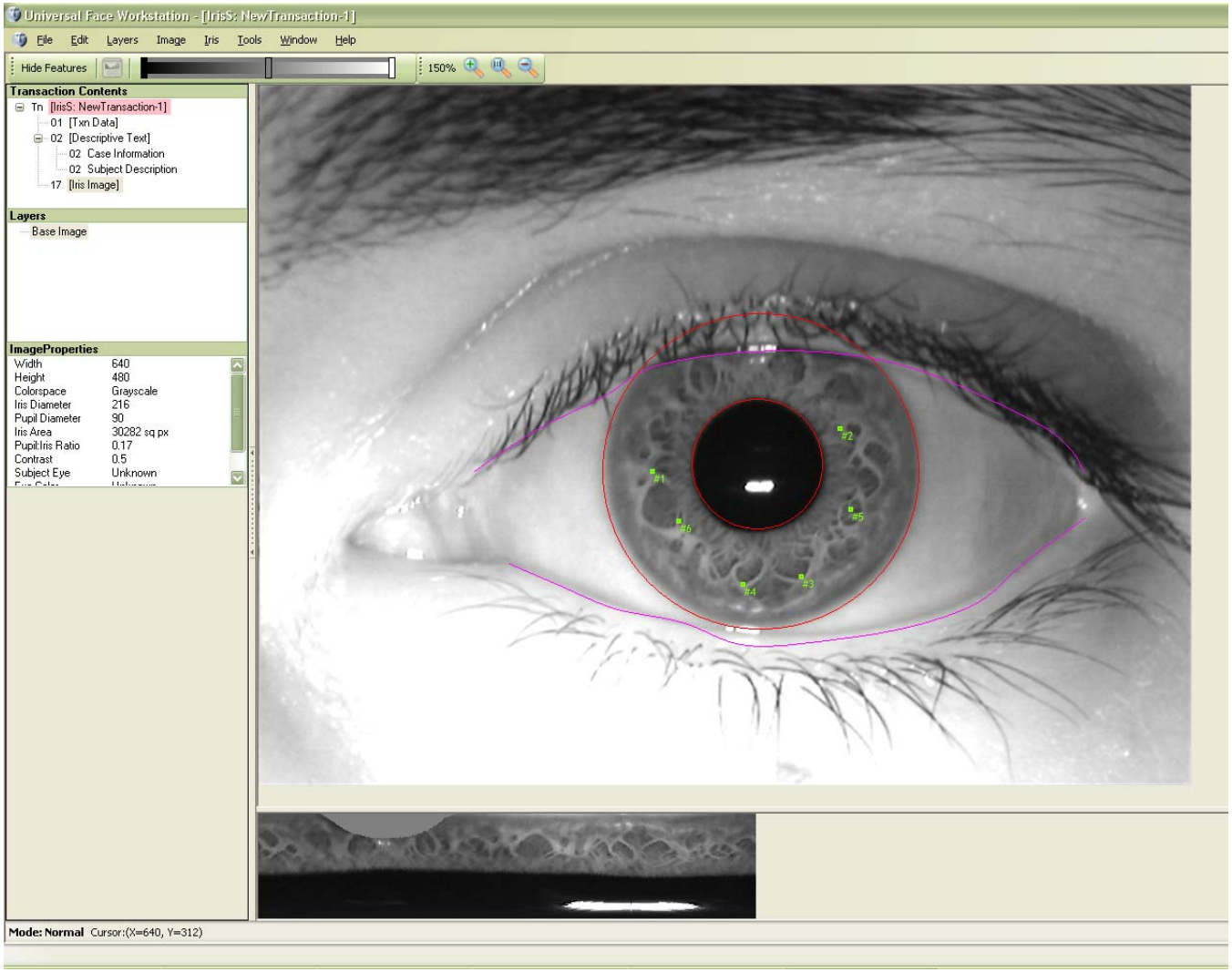
Type 17 :: New sets of fields 3 of 7 :: Localization

- Iris Pupil Boundary

IPB	O	17.033		IRIS PUPIL BOUNDARY	1	1
IPC	M⇑		A	IRIS PUPIL CODE	1	1
IPPQ	M⇑		N	TOTAL NUMBER OF POINTS	1	1
ICP	M⇑		N	CONSECUTIVE POINTS	1	IPPQ value
PHX	M⇑		N	HORIZONTAL POINT OFFSET	1	1
PVY	M⇑		N	VERTICAL POINT OFFSET	1	1

- And similarly for
  - Iris-sclera Boundary
  - Upper eyelid
  - Lower eyelid
  - Occlusions
- Encodings for
  - Circle
  - Ellipse
  - Polygon (with 4 to 99 vertices)

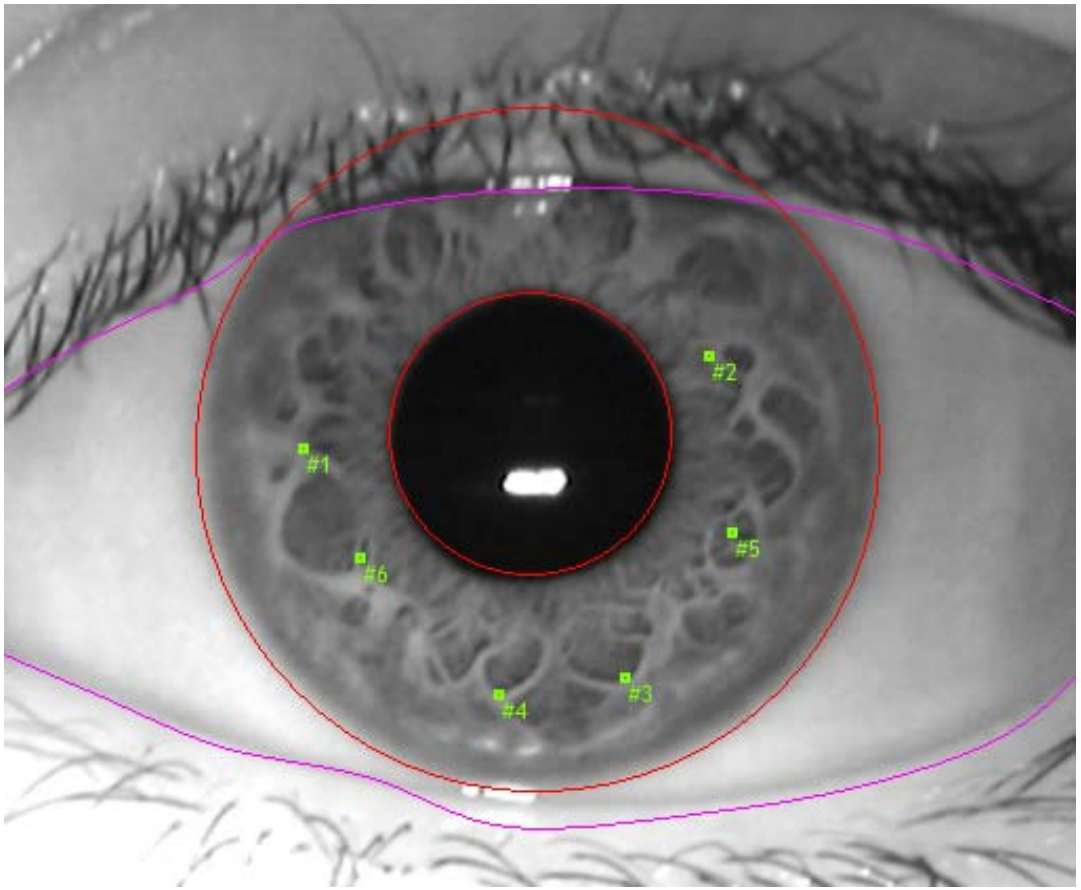
Iris Markup :: UFW Example 1 of 2



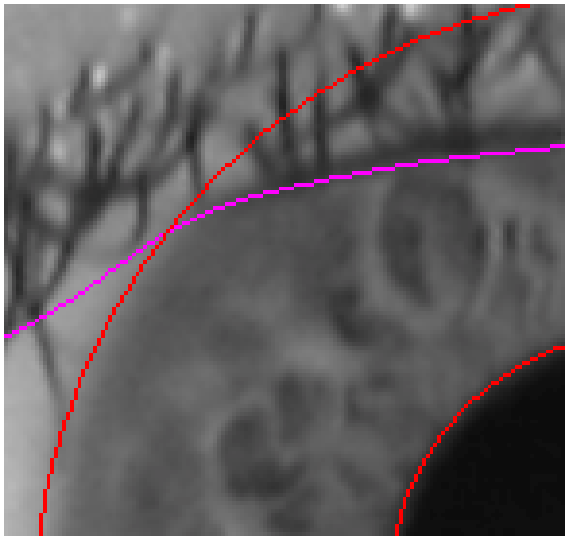
Screenshot from the Universal Face Workstation

Thanks to Noblis for this image

Iris Markup :: UFW Example 2 of 2



Zoomed part of screenshot from the Universal Face Workstation



Thanks to Noblis for this image

Type 17 :: New sets of fields 4 of 7 :: Transformation

Value	Description
AGE	Age progressed
AXIS	Off-axis image rectification / Angle correction
COLORSHIFT	Color shifted
CONTRAST	Contrast stretched
CROP	Cropped
DIST	Distortion corrected (e.g. fisheye correction)
DOWNSAMPLE	Down-sampled
GRAY	Grayscale from color
ILLUM	Illumination transform
IMGFUSE	Image-level fusion of two or more images
INTERPOLATE	Up-sampled
MULTCOMP	Multiply compressed
MULTIVIEW	Multi-view image
POSE	Face-specific pose correction
ROTATE	Rotated (in-plane)
SNIR	Simulated Near IR
SUPERRES	Super-resolution image, derived from multiple lower resolution images
WHITE	White-balance adjusted

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The Iris Exchange (IREX) Program Supporting IRIS Interoperability

IREX I – Compact Formats + Compression

IREX II – Image Quality

http://iris.nist.gov/irex

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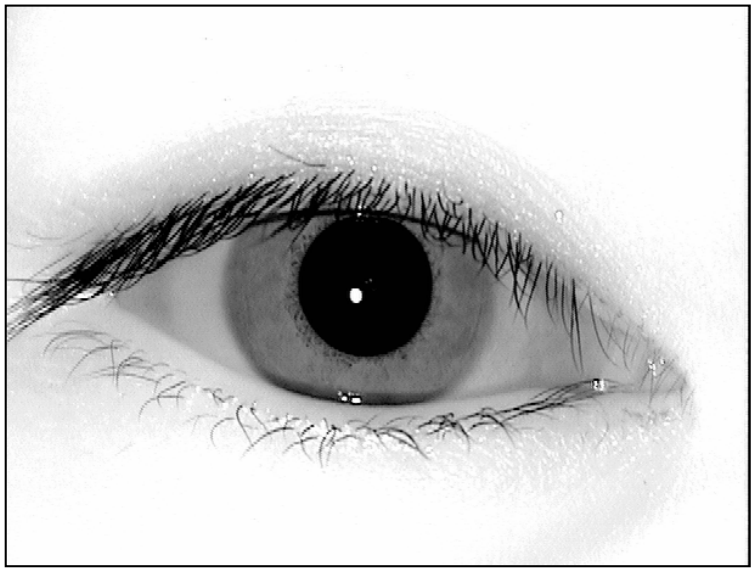
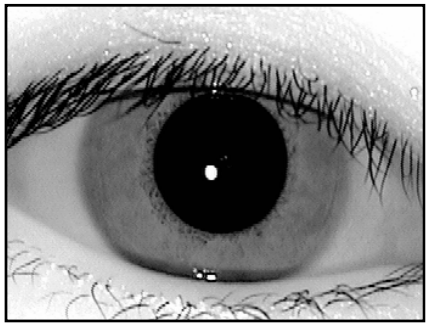
Type 17 :: New sets of fields 5 of 7 :: Compact

ISF	O	17.032	N	COMPACT STORAGE FORMAT	1	1



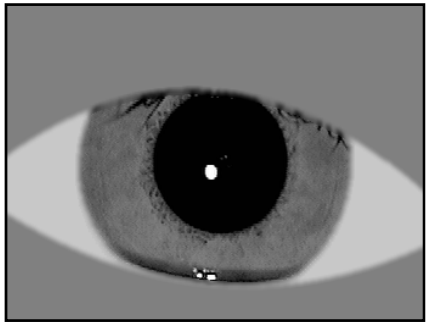
Parent image from camera

KIND 1



Cropped image

KIND 3



Cropped and masked image

KIND 7

Specialized image formats are standardized in forthcoming **ISO/IEC 19794-6:2011 Iris Image Format**

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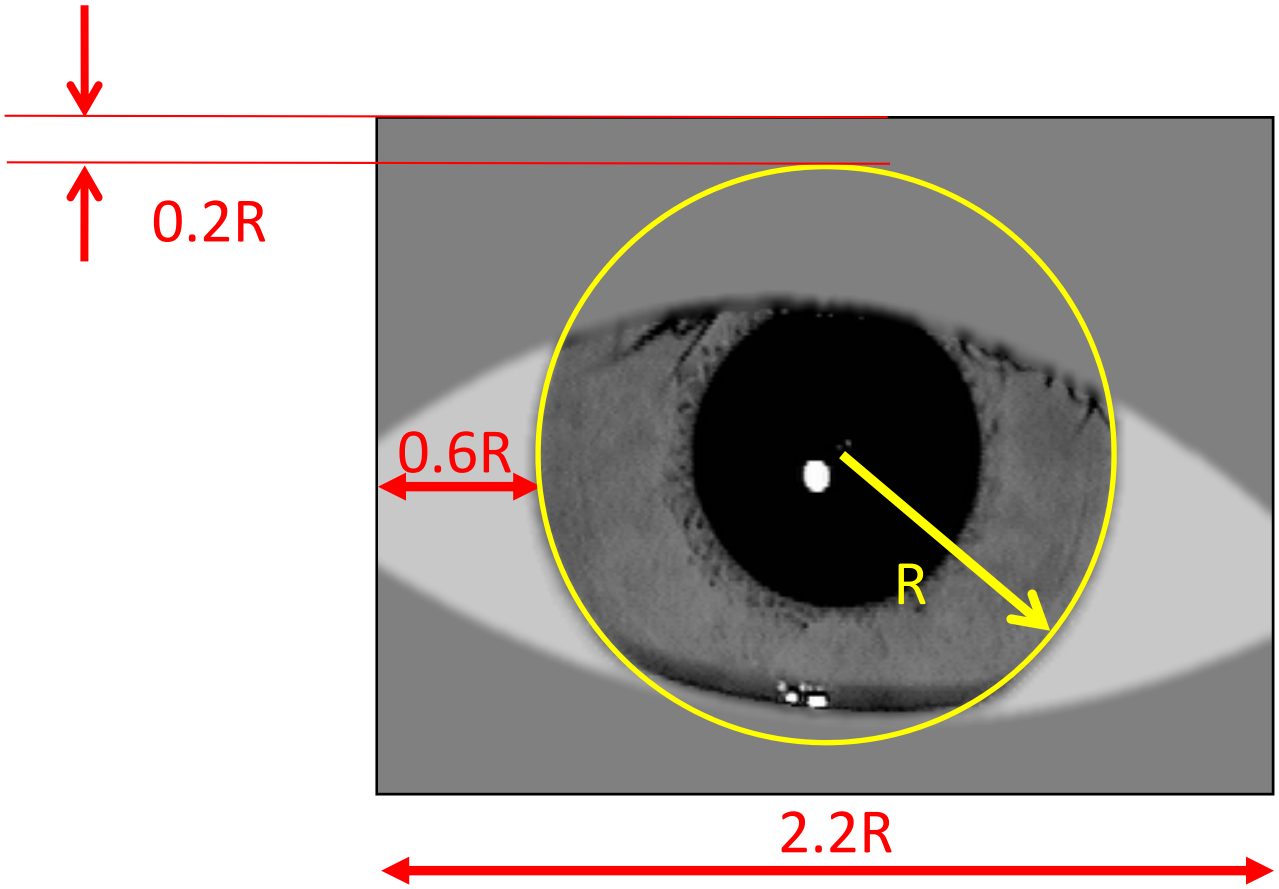
Compact Forms :: Geometric Requirements



This set of specifications is not in the current A/N draft - It needs to be.

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Compression Requirements

- PNG is allowed
  - Recommended for 1:N
  - Lossless (preserves iris texture)
  - Standardized ISO/IEC 15948, free
- JPEG 2000 for higher compression
  - But is lossy (ultimately damages iris texture)
  - Standardized as ISO/IEC 15444
- JPEG is bad, banned, verboten, not a good idea
  - Don’t do it!

This set of specifications is not in the current A/N draft - It needs to be.

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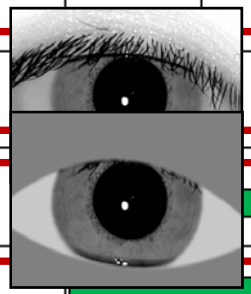
Compression + Format Recommendations

- Compression – Avoid it when you can!
  - Lossy compression does incremental damage to images.
  - Either no compression, or lossless may be sufficient.

	Recommended		Target Record Size								
Role	Format	Compressor	2KB	4KB	8KB	16KB	32KB	64KB	128KB	256KB	307KB
All	KIND 1	Uncompressed									
All	KIND 3	Uncompressed									
All	KIND 7	Uncompressed									
All	KIND 3	PNG Lossless									
All	KIND 7	PNG Lossless									
1:N	KIND 3	JPEG 2000 Lossy									
1:N	KIND 7	JPEG 2000 Lossy									
1:1	KIND 3	JPEG 2000 Lossy									
1:1	KIND 7	JPEG 2000 Lossy									



45KB

18KB

Type 17 :: New sets of fields 5 of 7 :: Compact

21.29 Field 17.032: Compact storage format[60] / ISF

This optional field is used when an iris image is stored using one of the following compact storage formats. The codes are shown in **Table 72**.

Type Code	Description
0	Unconstrained
1	Raw 640 x 480
3	Cropped
7	Cropped and masked

This line is not in the draft – it should be

Type 17 :: Modified text for some fields

- Scalar image quality value
- Image flip
- Sensor identification

Type 17 :: New sets of fields 6 of 7 :: View

- Field 17.041: Lens angle of view / LAV
  - This optional field describes angular extent of a given scene (off frontal angle) imaged by a camera, measured in degrees.

Type 17 :: Revise field 14 :: Rotation ??

- Regarding 17.014: Rotation Angle of Eye (RAE)
  - Currently encodes in-plane rotation *"This optional field shall indicate the rotation angle of the eye".*
- But could be extended
  - Restate using Tait-Bryan (Y, P, R)
  - Reword as "This optional field gives an estimate of the angle between the optical axis of the eye and the optical axis of the camera, measured in degrees."

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Thank You

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