Analysis: Type 10 vs. ANSI 385

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Topics / Questions

- Type 10s can consist of face images denoted by the “FAC” IMG entry.
- ANSI 385 encodes face image data and factors present in the image and during image creation.
- What is the overlap between type 10 and ANSI 385?
- What additional capabilities would be achieved by adding more fields to type 10?
- What is in 385 that is a candidate for inclusion into a new type 10?
- Is there a logical “fit” between type 10 and 385 or should 385 be added whole elsewhere?

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Image Information

Image Information

Type 10

- Photo Date
- Width/Height
- Scale Units
- Color Space
  - YCC
  - RGB 888
  - Grayscale
- Compression
  - JPEG
  - JPEGL (Lossless)

ANSI 385

- Photo Date (from CBEFF)
- Width/Height
- Not present
- Color Space
  - YUV 422 (Specific YCC)
  - RGB 888
  - Grayscale
- Compression
  - JPEG
  - JPEG2000

Image Info in 385 not in Type 10

- Source Type
  - Unknown Photo
  - Digital Camera
  - Scanner
  - Video Frame Analog
  - Video Frame Digital
  - etc
- Device Type
  - Vendor ID
- Quality
  - Placeholder intended to represent expected match performance

- Some usefulness in identifying the video vs. film to compensate for log-gamma differences between video and still photography
- Interlacing artifacts can be removed from video when source is identified
- Interlaced video frame capture can be explicitly forbidden using application profiles (PIV).

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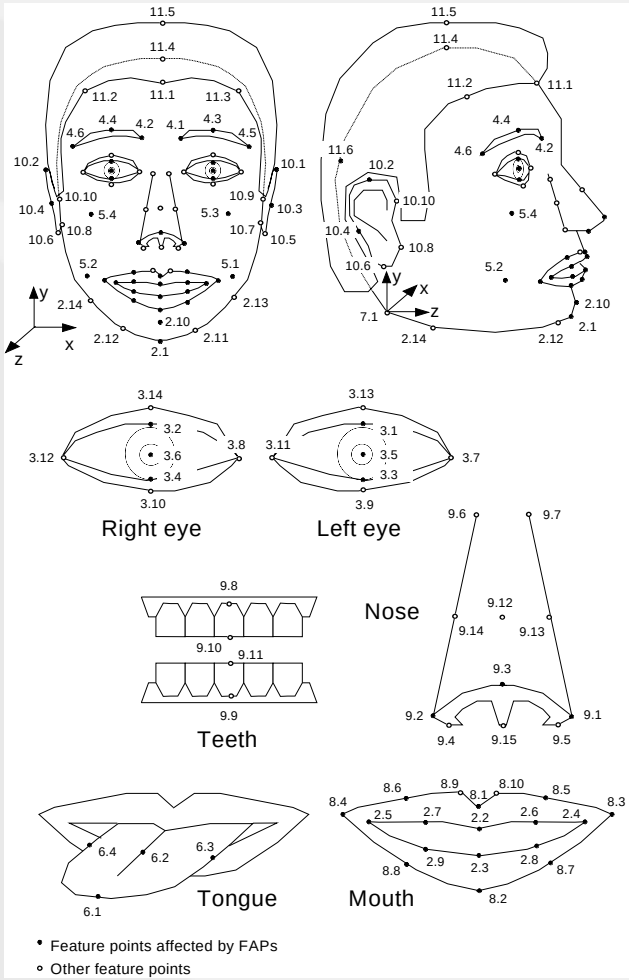
Feature Points



Why include feature points?

- “Minutia” of the face
  - Required for all face matching algorithms (at least the eye positions at minimum for 2D matching)
  - Can be automatically determined with good quality (mainly frontal face) data.
  - Can be difficult to determine in low-res video or with significant pose
- Future Forensic Face Applications
  - Submitting non-frontal non-high-quality face images for searching will require feature point determination on the client
  - Similar to minutia markup of latents with investigator workstations

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On Forensic Face

- Applications are being developed where face images are used for lookup either fused with finger or stand-alone investigations.
- Significant manipulation of the face image may be required – sharpening, gamma correction, noise removal, frame merging, pose correction.
- Landmarks and pose information are likely to be submitted along with the face image data to aid the search system(s).
- Functionality requires additions to ANSI/NIST-ITL-2000 – feature points, new pose angles.

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Facial Information

Differences in Philosophy

Type 10

- Can denote “unique” permanent physical characteristics of body per NCIC code manual
  - Moles
  - Scars
  - Tattoos
  - Missing body parts
  - Eye color
  - Hair color
- Encapsulates some temporary characteristics
  - Pose
  - Hat/scarf
  - glasses

ANSI 385

- Encapsulates permanent properties of the face image discernable by examination of the photograph
  - Eye color
  - Hair color
  - Observed Gender
- Encapsulates temporary face properties associated with face match performance
  - Expression
  - Blinking
  - 3D pose angles
  - glasses

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Permanent Physical Characteristics

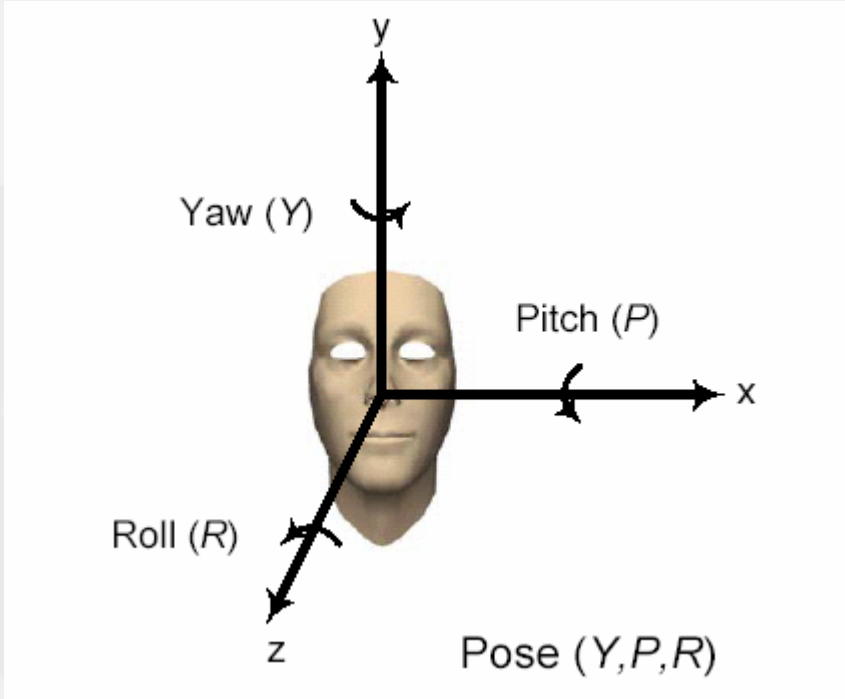
- Type 10, via NCIC code manual, allows for a much richer encoding of these characteristics
  - Unlikely that 385 can contribute new indicators
  - Organization could be improved to allow for easier input by users...

Temporary Image Characteristics

- For the face, 385 offers a richer parameterization of these indicators due to focus on face match performance
  - Teeth visible
  - Mouth open
  - Smile (closed jaw)
  - Smile (mouth open)
  - Raised eyebrows
  - Eyes looking away from camera
  - Squinting
  - Frowning
- Useful indicators for forensic face applications

Pose angles in 385

- Superset of Type 10
  - Encoding difference need to be addressed
- 3D pose angles in 385
  - Yaw: same angle as subject pose in type 10
  - Pitch: difficult issue for face match algorithms
  - Roll: easier to compensate for using image processing
- Will typically be required manual input for forensic face applications



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On Quality

Activity / Status

- NIST (Grother) is working to develop face quality methodology
- Identix and others are developing quality metrics
- Placeholders in ANSI and ISO formats
- However, not ready to mandate a universal face quality score for frontal face images
- And not ready to certify face quality modules

Resolution (Image Size)
Under Exposured (Brightness)
Good Contrast (Entropy)
Well Focused (Sharpness)
Others (Half-tone patterns, ...)

Detectable Eyes (Confidence)
Face Presency (Faceness)
Face Geometry (Size, Position)
Wearing Eyeglasses (Clear eyes, Glare)
High Resolution (Texture)
Proper Lighting (Face & Background)
Head Viewpoint (Pose)
Others (Natural Expression, Liveness, ...)

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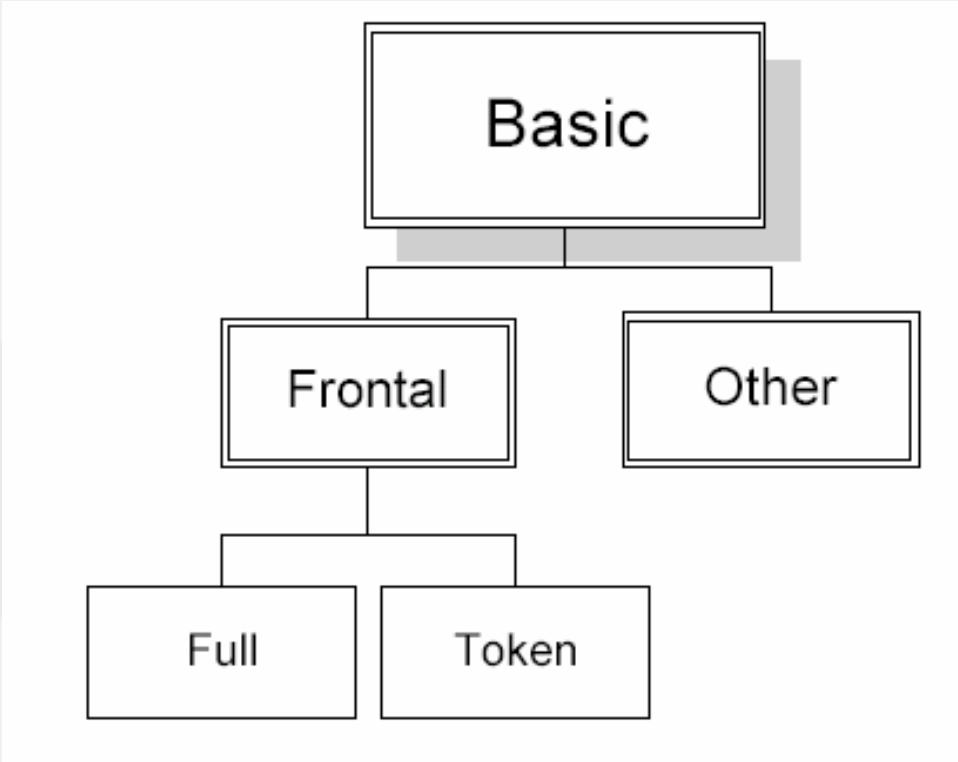
On Face Image Types



Full Frontal Face Image Type

- A single “application profile”, the frontal image type encapsulates most requirements for superior mug shot capture
  - The PIV application profile starts with this and improves by mandating compression and source constraints
- This is not present in Type 10, which relies upon other “best practice” documentation
- Similar concept to 381 finger image data levels 31 requirements with WSQ 15:1 and appendix F
- Similar to Mike McCabe’s photo mug shot best practices
  - Lists Detailed requirements for scene, lighting, subject, format.
  - Compression requirements extremely important

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Recommendations

Options to Extend Type 10 (part 1)

1. Add color JPEG2000 as an allowed image format
    1. Superior human examination quality for fixed compression compared to JPEG
2. Add source type to aid in artifact removal and gamma (gain) correction.
3. Add quality measure with algorithm source identifier
4. Add feature point(s) Facial Image Attribute
    1. Essential for face search applications.
    2. Possible use for skull forensics

Options to Extend Type 10

5. Add 3D pose angle set.
    1. Essential for face investigator workstations
6. Add Frontal Mug Shot Application Profile
    1. Including compression limits
    2. Including capture source requirements
    3. Make into the improved Mug Shot capture standard
7. Add Temporary Face Image Attributes
    1. Expression, blinking, etc.
    2. Helpful to face match algorithms.

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Thank You. Questions?