

**New field 10.024: Subject
quality score (SQS)**

[Rob Mungovan, Aware]

New field 10.024: Subject quality score (SQS)

❖ Introduction

- This optional ASCII field shall specify quality score data for facial images stored in this record. Each subfield shall contain four information items.
- 1. The first information item shall be a quantitative expression of the predicted matching performance of the biometric sample. This item contains the ASCII representation of the integer image quality score between 1 and 100 assigned to the image data by a quality algorithm. Higher values indicate better quality. An entry of "-1" shall indicate a failed attempt to calculate a quality score.

New field 10.024: Subject quality score (SQS)

❖ Introduction Cont'd

2. The second information item shall specify the alphanumeric ID value of the vendor of the quality algorithm used to calculate the quality score. NIST will maintain a Vendor Registry that will map the values in this field to registered quality algorithm vendors. The Vendor ID shall be composed of ASCII printable characters up to 16 characters in length.
3. The third information item shall specify a numeric product code assigned by the vendor of the quality algorithm. It indicates which of the vendor's algorithms was used in the calculation of the quality score. This field contains the ASCII representation of the integer product code and should be within the range 1 to 65535.


New field 10.024: Subject quality score (SQS)

❖ Introduction Cont'd

4. The fourth item shall specify the version number of the quality algorithm used. The version number shall include a major number and minor number separated by a period. The major number and minor numbers should each be the ASCII representation of integer values in the range 0 to 255.
- An example transaction for a quality score of 100 generated using a quality algorithm with a product code of 65530, version 255.255, by a vendor with a Vendor ID of "NIST" is "10.023:100 USNIST US65530 US255.255 GS".



Discussion/Voting



New field 10.025: Subject pose angles (SPA)

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❖ Introduction

- This optional ASCII field shall only be used when Field 10.020 (POS) is not present or contains an "D" to indicate a set of determined 3D pose angles of the same subject. When present, this information shall be entered as three or six information items.
- The first is the Yaw angle followed by the "US" separator, followed by the Pitch angle, followed by the "US" separator, followed by the Roll angle. The fourth, fifth and sixth information items denote the uncertainty in the Yaw, Pitch, and Roll angles respectively. If the second triple of angles is not present, then the additional three "US" separators shall still be included.

New field 10.025: Subject pose angles (SPA)

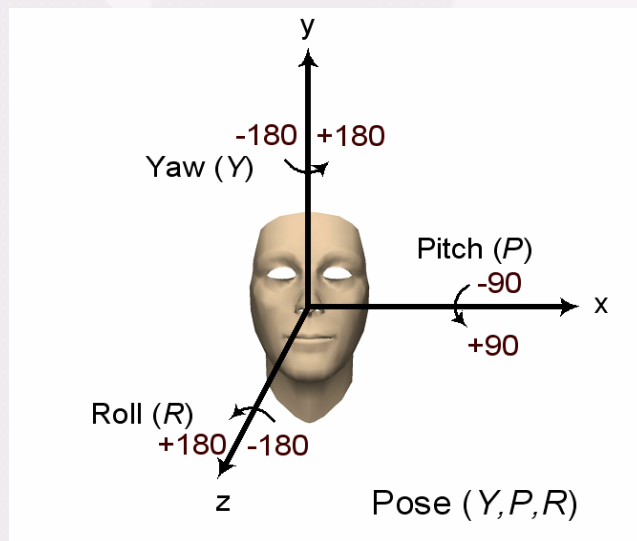
❖ Introduction

- The first three items specify the pose of the subject estimated or measured at constrained possible orientations within a sphere (See Figure 5). Each angle value shall be to the nearest integer degree.
- If both field 10.021 and this field are present, the Yaw angle of this field shall supersede the offset angle contained in Field 10.021. Note that the Yaw angle of this field has the opposite sign of the offset angle contained in Field 10.021.

New field 10.025: Subject pose angles (SPA)

❖ The definition and range of pose angle Cont'd

The angles are defined relative to the frontal view of the subject, which has angles (0, 0, 0) as shown in the figure below.

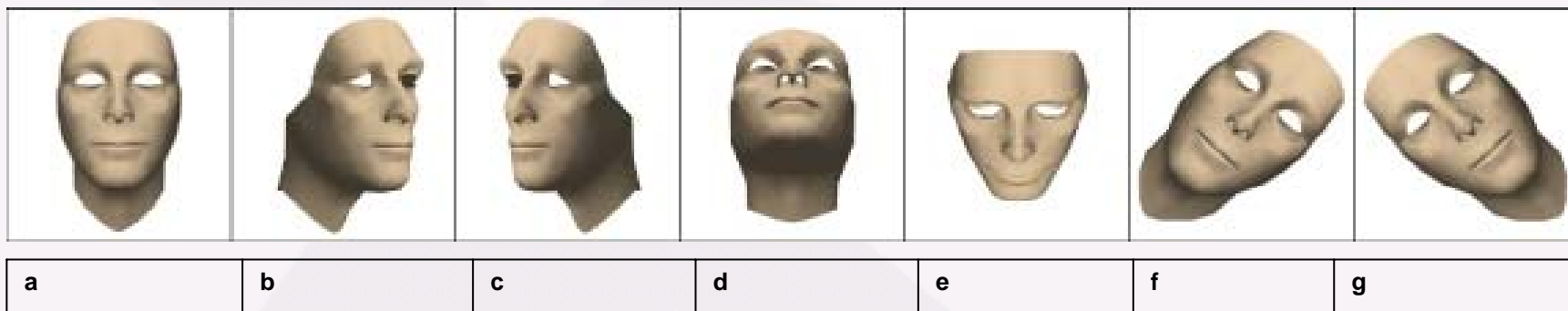


The definition of pose angle set is with respect to the frontal view of the subject

New field 10.025: Subject pose angles (SPA)

❖ The definition and range of pose angle Cont'd

- Examples of pose angles and their encodings. The pose angles (Y, P, R) of Figures (a) – (g) are given by (0, 0, 0), (+45, 0, 0), (-45, 0, 0), (0, -45, 0), (0, +45, 0), (0, 0, -45), and (0, 0, +45), respectively.





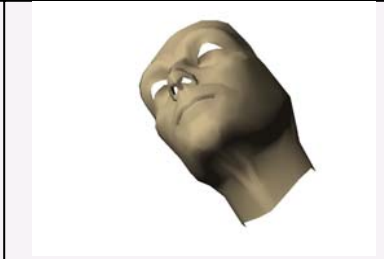
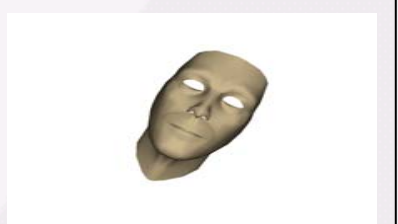


New field 10.025: Subject pose angles (SPA)

❖ The order of rotation through pose angles

- As order of the successive rotation around the different axes does matter, the encoded rotation angle shall correspond to an order of execution starting from the frontal view. This order shall be given by Roll (about the front axis), then Pitch (about the horizontal axis) and finally Yaw (about the vertical axis). The (first executed) Roll transformation will therefore always be in the image (x, y) plane. Examples are shown in the figure that follows.

New field 10.025: Subject pose angles (SPA)

❖ The order of rotation through pose angles cont'd

		
$(Y, P, R)=(0, 0, +45)$	$(Y, P, R)=(0, -30, +45)$	$(Y, P, R)=(-45, -30, +45)$
a	b	c
		
$(Y, P, R)=(0, 0, -30)$	$(Y, P, R)=(0, +20, -30)$	$(Y, P, R)=(-30, +20, -30)$
d	e	f

Examples of the order of rotation through pose angles with an origin of coordinate system at the nose tip. Figures (a)-(c) show three successive rotation steps to achieve the pose angles (Y, P, R) of $(-45, -30, +45)$. Figures (d)-(f) show three successive rotation steps to achieve the pose angles (Y, P, R) of $(-30, +20, -30)$.



Discussion/Voting



**New field 10.026: Subject
facial description (SXS)**

New field 10.026: Subject facial description (SXS)

❖ Introduction

- This optional ASCII field shall be used for the exchange of facial image data...
- This field may have one or more subfields each containing a single information item. For "Physical Characteristic", enter a characteristic as listed in Part 4 Section 13 of the Eighth (or current) Edition of the NCIC Code Manual, July 14, 1999.
- For the "Other Characteristic" enter unlisted or miscellaneous attributes as unformatted text used to describe the attribute. Multiple attributes may be listed but must be separated by the "RS" character.

New field 10.026: Subject facial description (SXS)

Facial description attribute	Attribute code
Expression unspecified	UNKNOWN
Neutral (non-smiling) with both eyes open and mouth closed)	NEUTRAL
Smiling where the inside of the mouth and/or teeth is not exposed (closed jaw).	SMILE
Subject Having Mouth open	MOUTH OPEN
Having Teeth visible	TEETH VISIBLE
Raising eyebrows	RAISED BROWS
Frowning	FROWNING
Looking away from the camera	EYES AWAY
Squinting	SQUINTING
Subject Wearing Left Eye Patch	LEFT EYE PATCH

New field 10.026: Subject facial description (SXS)

❖ Table cont'd

Subject Wearing Clear Glasses	CLEAR GLASSES
Subject Wearing Dark or Visible Colored Glasses (medical)	DARK GLASSES
head covering/hat	HAT
Wearing Scarf	SCARF
Having Moustache	MOUSTACHE
Having Beard	BEARD
Ear(s) obscured by hair	NO EAR
Blinking (either or both eyes closed)	BLINK
Having Distorting Medical Condition impacting Feature Point detection	DISTORTING CONDITION
Physical Characteristics	<From NCIC Code Manual>
Other Characteristics	<Unformatted Text>



Discussion/Voting



**New field 10.027: Subject
eye color (SEC)**

New field 10.027: Subject eye color (SEC)

❖ Introduction

- This optional ASCII field shall be used for the exchange of facial image data. When present, it shall describe the eye color of the subject as seen in the photograph. If unusual or unnatural such as may be the case when colored contact lenses are present and the “real” eye color cannot be ascertained, then the color should be labeled as “UNKNOWN”.

New field 10.027: Subject eye color (SEC)


❖ Introduction Cont'd

An example transaction for subject blue eyes is "10.027:Blue GS

Eye color attribute	Attribute code
Unspecified	UNSPECIFIED
Black	BLACK
Blue	BLUE
Brown	BROWN
Gray	GRAY
Green	GREEN
Multi-Colored	MULTI-COLORED
Pink	PINK
Unknown (e.g. can not be determined from image, monochrome image)	UNKNOWN



Discussion/Voting



New field 10.028: Subject hair color (SHC)

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❖ Introduction

- This optional ASCII field shall be used for the exchange of facial image data. When present, it shall describe the hair color of the subject as seen in the photograph. If unusual or unnatural color such as blue or orange is present and the “real” color cannot be ascertained, then the color should be labeled as “UNKNOWN”
- If the subject is completely bald, or has a completely shaved head, then the hair color shall be labeled as “BALD”. When the subject is predominantly bald, but hair color is discernable, then the appropriate hair color attribute code shall follow “BALD” (separated by the “RS” character).

New field 10.028: Subject hair color (SHC)

❖ Introduction Cont'd

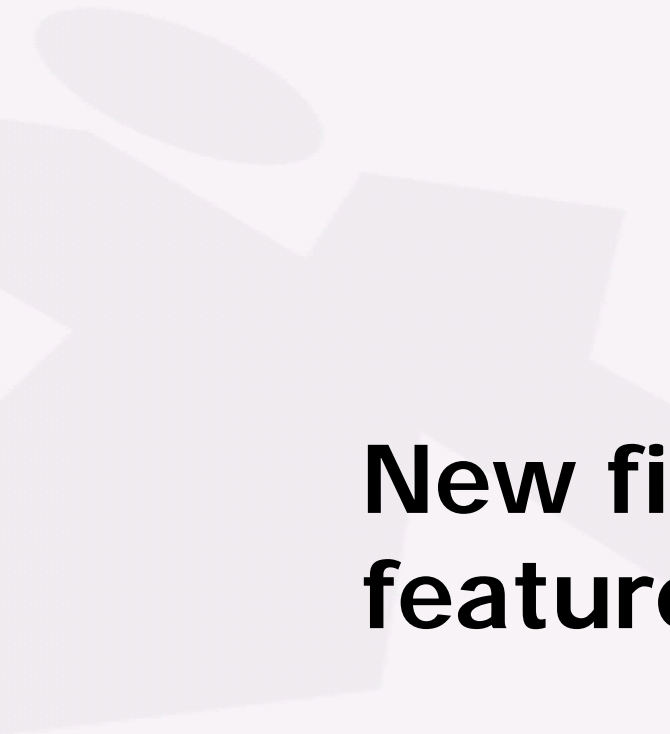
Hair Color codes

Hair color attribute	Attribute code
Unspecified	UNSPECIFIED
Bald	BALD
Black	BLACK
Blonde	BLONDE
Brown	BROWN
Gray	GRAY
White	WHITE
Red	RED
Unknown	UNKNOWN

An example transaction for subject is bald and having gray hair is "10.028:BALDRSGRAYGS".



Discussion/Voting



**New field 10.029: Subject
feature points (SFP)**

New field 10.029: Subject feature points (SFP)

❖ Introduction

- The optional ASCII field shall be used for the exchange of facial image data. When present, it shall describe special attributes of manually or automatically detected facial feature points of the captured facial image.
- This information shall be entered as four information items described in Table 10. The first is Feature Point Type, followed by the "US" separator character. The second is Feature Point Code, followed by the "US" separator character. The third is the X coordinate of a Feature Point, followed by the "US" separator character. The fourth and final item is the Y coordinate of a Feature Point in the facial image.
- Multiple facial points may be listed...

New field 10.029: Subject feature points (SFP)

❖ Introduction Cont'd

- Feature points shall be included in the record format if they have been accurately determined, thereby providing the option that that these parameters do not have to be re-determined when the image is processed for face recognition tasks.
- Typically a computer algorithm will either accurately determine the position of the feature point or completely fail and provide either clearly erroneous or no landmark information.
- Therefore, a method for accurate determination is the use of computer-automated feature point determination followed by human verification and potential override of the computer determined feature points

New field 10.029: Subject feature points (SFP)

❖ Introduction Cont'd

The Subject Feature Point Field

Item	Size	Value	Notes
Feature Point Type	1 character	1	Denotes a 2D Feature Point. All other values are reserved.
Feature Point Code	5 characters	A.B in ASCII text A and B are specified in Section 15.2.	The maximum values of A and B are 15.
X coordinate	1-4 characters	•Horizontal pixel count from upper left pixel.	Count starts at 0.
Y coordinate	1-4 characters	•Vertical pixel count from upper left pixel.	Count starts at 0.

New field 10.029: Subject feature points (SFP)

❖ Subject feature point type

- The Feature Point stored in the Feature Point block. This field shall be set to "1" to denote the version 1 of feature point type that the position of the Feature Point is represented by the coordinate of the image. All other field values The Subject Feature Point Type item represents the type of are reserved for future definition of Feature Point types.

New field 10.029: Subject feature points (SFP)

❖ Subject feature point code

MPEG4 Feature Points:

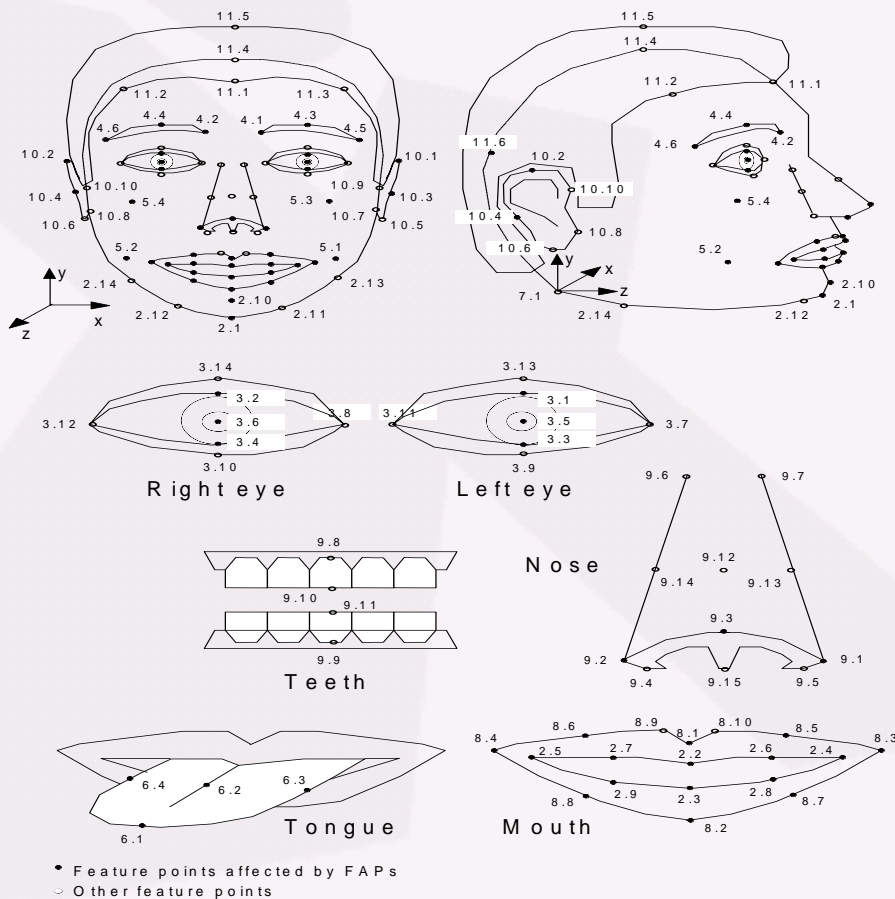
- The Subject feature point code item shall specify the Feature Point that is stored in the Feature Point block. The codes of the Feature Points in Section 15.2.1, taken from the MPEG4 standard and defined as MPEG4 Feature Points, or the additional eye and nostril Feature Points in Section 15.2.2 shall be stored in this field. Each Feature Point code is represented by a notation A.B using a major (A) and a minor (B) value. The encoding of the Feature Point code is given by the numeric ASCII representation of the value of A.B.
- Figure that follows denotes the Feature Point codes associated with Feature Points as given by Annex C of ISO/IEC 14496-2.

New field 10.029: Subject feature points (SFP)

❖ Subject feature point code

MPEG4 Feature Points:

Each Feature Point code in Figure is given by major value A and minor value B. For example, the code for the left corner of the left eye is given by major value 3 and minor value 7.



New field 10.029: Subject feature points (SFP)

❖ Subject feature point code

Eye and nostril centre Feature Points:

Cont'd

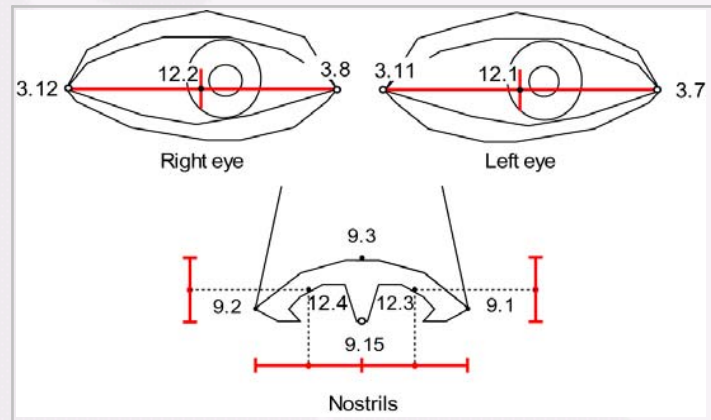


Figure above – The eye and nostril center Feature Points are defined by midpoints of MPEG4 Feature Points.

New field 10.029: Subject feature points (SFP)

❖ Subject feature point code

Eye and nostril centre Feature Points:

Cont'd

Eye and nostril center Feature Point codes

Center Feature Point	Midpoint of Feature Points		Feature Point code
Left Eye	3.7, 3.11		12.1
Right Eye	3.8, 3.12		12.2
Left Nostril	Horizontal	Vertical	12.3
	9.1, 9.15	9.3,9.15	
Right Nostril	Horizontal	Vertical	12.4
	9.2, 9.15	9.3,9.15	

An example transaction for representing two feature points of eye centers is "10.029:1^{US}12.2^{US}120^{US}130^{RS}1^{US}12.1^{US}240^{US}129^{GS}".



Discussion/Voting



End (Whew!)