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# Abstract

This document collects following candidate technologies for the High Efficiency Image File Format (HEIF) (ISO/IEC 23008-12).

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# Topics expected to move to an Amendment

## Progressive HEIF rendering

Discussion available under:

<http://mpegx.int-evry.fr/software/MPEG/Systems/FileFormat/HEIF/-/issues/59> (MPEG#136)

It is proposed to add the following new section to the HEIF specification

**6.X Progressive rendering**

**6.X.1 Progressive Entity Group**

The ‘prgr’ entity group signals a set of image items that can be used for a progressive rendering of one of these image items.

The semantics of the ‘prgr’ entity group are that the image items included in a ‘prgr’ entity group are listed in increasing quality order from the lowest quality to the highest quality. All the image items inside a ‘prgr’ entity group shall correspond to similar images albeit with different quality levels. In this way, a first image item occurring earlier in the list than a second image item can be used as a temporary replacement of the second image item for a progressive rendering of this second image item.

The data corresponding to the image items included in a ‘prgr’ entity group shall be stored in the same order as the one used for the image items inside the ‘prgr’ entity group, such that a renderer progressively obtaining a file can perform a progressive display as item data becomes available.

A ‘prgr’ entity group shall only contain image items, not tracks.

Image items of the same 'prgr' entity group shall be members of the same 'altr' entity group

NOTE This requirement guarantees that legacy players without capability of processing ‘prgr’ entity groups treat the image items as alternatives to be displayed.

**6.X.2 Progressive Derived Image Item Property**

**6.X.2.1 Definition:**

The progressive derived image item property describes progressive rendering steps associated with a derived image item. Each progressive rendering step specifies which input image items to use for the reconstruction of the derived image item and is described as a difference from the previous step.

NOTE the ‘prdi’ item property is intended to be used with derived image items using several input images.

**6.X.2.2 Syntax**:

aligned(8) class ProgressiveDerivedImageItemInformationProperty

extends ItemFullProperty('prdi', version = 0, flags = 0) {

unsigned int(8) step\_count;

for (i=0; i < step\_count; i++) {

unsigned int(16) item\_count;

}

}

**6.X.2.3 Semantics**:

* step\_count: number of progressive steps for the associated derived image item.
* item\_count: number of input image items added by the progressive step.

# Other topics under consideration

## Matrix-based transformation for image items

*[[ Ed. (FD): MPEG#129: it was questioned:”* Should we also add ‘matrix’ as an image derivation in the HEIF? “. It was warned that “We would need to be clear about the meaning of outputs that don’t have horizontal and vertical sides; if that’s overlaid, the meaning is clear, but what if it’s supposed to be displayed?”*]]*

## Signaling for pre-derived coded image items

*Replace the clause 6.4.7 with the following text:*

**6.4.7** **Pre-derived coded images**

[Ed. (FD): In the following, differences with HEIF 2nd edition (w18310) are highlighted in blue]

If a coded image has been derived from others — for example, a composite HDR image derived from exposure-bracketed individual images, or a panorama derived from a set of images — then it shall be linked to those images by item references of type 'base'. Item references may be from the coded image to all images it derives from, or when unique IDs are used, from the coded image to all entity groups or images it derives from. When unique IDs are used, a to\_item\_ID value in the SingleItemTypeReferenceBox or SingleItemTypeReferenceBoxLarge is resolved to an item identifier whenever the embedding MetaBox contains an item with such identifier, and is resolved to an entity group identifier otherwise.

An image item including a 'base' item reference is referred to as a pre-derived coded image.

NOTE In this version of this document, the exact derivation process used to produce the image is not described.

[[Ed. (FD): At MPEG#129, it was commented that “The slight snag here is defining what it means when the entity group does NOT imply a single output (e.g. a slide show); what does pre-derivation mean? ]]

*Add the following clause as section 6.4.7.1:*

**6.4.7.1 Signaling of the derivation method for pre-derived coded image items**

A pre-derived coded image shall be linked to images it derives from by an item reference of type 'base' to the entity group containing all images the pre-derived coded images derives from. The grouping\_type of the EntityToGroupBox specifies the purpose of grouping and implicitly signals the type of the derivation operation which was applied to generate the pre-derived coded image.

[[Ed. (FM): At MPEG#126, it was commented that “we somehow need to indicate the derivation operation, rather than the nature of the input set”]]

[[Ed. (FD): At MPEG#129, it was commented that “We could allow a pre-derivation of the implied derivation of that entity group.”]]

## Possible optimization for region annotations

Discussion available under:

<http://mpegx.int-evry.fr/software/MPEG/Systems/FileFormat/HEIF/issues/20>

Revised text for HEIF CDAM3 contains a dedicated item definition for describing regions using a single construct (square, circle, etc…). At 1st WG03 meeting, m55123 proposed the use of an array of constructs to enable efficient storage of regions which may be associated with the same annotation (e.g. face, person, car, pet, etc.). It would also enable “instantiation” by only listing one region in the array (e.g. “Bob”, “My car”, “my dog”, etc.).

Question was raised on a potential conflict on cases where a region is

* a group of single constructs where the region is the union of the geometries (e.g. you 'frame' a complex shape by laying a lot of rectangles over it)
* a group, where the statements about the region apply to each geometry independently.

## Comparative analysis of storing 10 annotation regions in an image

The following table provides a comparative analysis of storing 10 regions which belong to faces in an image.

|  |  |
| --- | --- |
| **Storage as deductive information (m55123)** | **Storage with a ‘rgan’ item (revised CDAM3)** |
| 1 URI item (with an array of 10 region data structures)  1 iloc entry  1 iinf entry  1 iref 'cdsc' (to image item)  1 UUID item property (indicating that stored information are faces)  1 ipco entry  1 ipma entry  (‘dpnd’ not needed in this example) | 10 'rgan' items (with one region data each)  10 iloc entries  10 iinf entries  10 iref 'cdsc' entries (from region item to the image item)  1 UserDescriptionProperty (for tagging that the annotations are faces)  1 ipco entry  1 ipma entry |
|  | **Conclusion: 9 additional items, iloc and iref entries stored (total of 27 additional entries)** |