

Coding of medical mixed content and medical visual content with bit depth beyond 10 bits (m30935/JCTVC-00173)

Geneva, Switzerland
Oct. 22 – Nov. 1, 2013

Peter Amon, Andreas Hutter (Siemens Corporate Technology, Imaging and Computer Vision)

Uwe-Erik Martin, Nikolaus Wirsz (Siemens Healthcare, Imaging and Therapy Systems)

Use case 1: Interactive browsing in medical image content with bit depth beyond 10 bits

- Medical content for this use case
 - Computed tomography (CT) and magnetic resonance image data: 12-bit, 14-bit, or 16-bit monochrome, continuous-tone 3D image volumes (i.e., sequences of 2D slices)
 - Note: 3D volume data without specific timing requirements
- Compression requirements
 - Browsing: near-lossless / visually-lossless compression
 - Diagnosis: lossless compression
 - Storage (at the server): lossless compression

Use case 2: Transmission and storage of medical mixed content

- Medical content for this use case
 - Ultrasound (US) image data
 - Format: 8-bit RGB
 - Example: monochrome or colorized US data
 - Medical mixed content (medical content + screen content)
 - Format: 8-bit RGB
 - Examples: Screen content overlays (patient data, scale information, annotations, UI elements, etc.) on US data, volume-rendered computed tomography image data
- Compression requirements
 - Transmission: near-lossless / visually-lossless compression
 - Storage: lossless compression
 - Simultaneous compression of continuous-tone medical content and screen content

Summary of requirements for coding of medical mixed content and medical visual content with bit depth beyond 10 bits

- Support for efficient lossless and near-lossless/visually-lossless compression of 12-bit, 14-bit, and 16-bit monochrome, continuous-tone image content
- Support for efficient lossless and near-lossless/visually-lossless compression of 8-bit RGB image content
- Support for efficient compression of 2D+t image data as well as 3D image volume data
 - Note: still image coding of slices can be one solution for coding 3D image volumes

Proposed future profiles

Overview

| Profile | Chroma Formats | | | | Maximum bit depth | Prediction | | Lossless coding | Signed coding |
|---------------------|----------------|-------|-------|-------|----------------------|------------|-------|--------------------|------------------|
| | 4:0:0 | 4:2:0 | 4:2:2 | 4:4:4 | | Intra | Inter | | |
| High 12 Intra 4:0:0 | Yes | No | No | No | 12 | Yes | No | Yes | Yes |
| High 12 4:0:0 | Yes | No | No | No | 12 | Yes | Yes | Yes | Yes |
| High 16 Intra 4:0:0 | Yes | No | No | No | 16 | Yes | No | Yes | Yes |
| High 16 4:0:0 | Yes | No | No | No | 16 | Yes | Yes | Yes | Yes |
| RGB 4:4:4 | No | No | No | Yes | 8 | Yes | Yes | Yes | No |

Further remarks and properties

- No necessity of specific conformance points for 14-bit compression
- No minimal compression ratio should be defined (other than that the coded bitstream should not exceed the size of the source video)
- Profile on RGB coding can well be developed within the context of screen content coding (if lossless coding is supported)