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Information technology — Scalable compression and coding of continuous-tone still images —

Part 6:
IDR Integer Coding

Technologies de l'information — Compression échelonnable et codage d'images plates en ton continu —

Partie 6: Codage de nombre entier par IDR

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

ISO/IEC 18477 contains the following parts under the general title *Information technology — Scalable compression and coding of continuous-tone still images*:

— *Part 1: Scalable compression and coding of continuous-tone still images*

— *Part 2: Extensions for high dynamic range images*

— *Part 3: Box file format*

— *Part 6: IDR Integer Coding*

— *Part 7: HDR Floating-Point Coding*

— *Part 8: Lossless and Near-lossless Coding*

— *Part 9: Alpha Channel Coding*

The following parts are under preparation:

— *Part 4: Conformance testing*

— *Part 5: Reference software*

Introduction

This part of ISO/IEC 18477 specifies a coded codestream format for storage of continuous-tone high and low dynamic range photographic content. JPEG XT part 6 is a scalable image coding system supporting multiple component images consisting of integer samples of a bit precision between 9 and 16 bits. The format itself is based on the Box Based format specified in ISO/IEC 18477-3, which ensures that legacy applications conforming to Rec. ITU-T T.81 | ISO/IEC 10918-1 are able to reconstruct a lower quality, low dynamic range, eight bits per sample version of the image.

Today, the most widely used digital photography format, a minimal implementation of JPEG (specified in ITU Recommendation T.81 | ISO/IEC 10918-1), uses a bit depth of 8; each of the three channels that together compose an image pixel is represented by 8 bits, providing 256 representable values per channel. For more demanding applications, it is not uncommon to use a bit depth of 16, providing 65 536 representable values to describe each channel within a pixel, resulting on over $2,8 \times 10^{14}$ representable colour values.

Most common photo and image formats use an 8-bit or 16-bit unsigned integer value to represent some function of the intensity of each colour channel. While it might be theoretically possible to agree on one method for assigning specific numerical values to real world colours, doing so is not practical. Since any specific device has its own limited range for colour reproduction, the device's range may be a small portion of the agreed-upon universal colour range. As a result, such an approach is an extremely inefficient use of the available numerical values, especially when using only 8 bits (or 256 unique values) per channel. To represent pixel values as efficiently as possible, devices use a numeric encoding optimized for their own range of possible colours or gamut.

JPEG XT is primarily designed to provide coded data containing intermediate dynamic range and wide colour gamut content while simultaneously providing 8 bits per pixel low dynamic range images using tools defined in ISO/IEC 18477-1, which is itself a subset of Rec. ITU-T T.81 | ISO/IEC 10918-1. The goal is to provide a backwards compatible coding specification that allows legacy applications and existing toolchains to continue to operate on codestreams conforming to this part of ISO/IEC 18477.

JPEG XT has been designed to be backwards compatible to legacy applications while at the same time having a small coding complexity; JPEG XT uses, whenever possible, functional blocks of Rec. ITU-T T.81 | ISO/IEC 10918-1 to extend the functionality of the legacy JPEG Coding System. It is optimized for storage and transmission of intermediate dynamic range and wide colour gamut images while also enabling low-complexity encoder and decoder implementations.

This part of ISO/IEC 18477 is an extension of ISO/IEC 18477-1, a compression system for continuous tone digital still images which is backwards compatible with Rec. ITU-T T.81 | ISO/IEC 10918-1. That is, legacy applications conforming to Rec. ITU-T T.81 | ISO/IEC 10918-1 will be able to reconstruct streams generated by an encoder conforming to this part of ISO/IEC 18477, though will possibly not be able to reconstruct such streams in full dynamic range, full quality or other features defined in this Recommendation| International Standard.

This part of ISO/IEC 18477 is itself based on ISO/IEC 18477-3 which defines a box-based file format similar to other JPEG standards. The aim of this part of ISO/IEC 18477 is to provide a migration path for legacy applications to support, potentially in a limited way, coding of intermediate dynamic range images, that is images represented by sample values requiring 9 to 16 bits precision. While the legacy Rec. ITU-T T.81 | ISO/IEC 10918-1 already defines a coding mode for 12 bit sample precision, images encoded in this mode cannot be decoded by applications implementing only the 8 bit mode. Unlike the legacy standard, this part of ISO/IEC 18477 defines a scalable coding engine supporting all bit depths between 9 and 16 bits per sample while also staying compatible with legacy applications. Such applications will continue to work, but will only able to reconstruct an 8 bit standard low dynamic range (LDR) version of the full image contained in the codestream. This part of ISO/IEC 18477 specifies a coded file format, referred to as JPEG XT, which is designed primarily for storage and interchange of continuous-tone photographic content.

Information technology — Scalable compression and coding of continuous-tone still images —

Part 6: IDR Integer Coding

1 Scope

This part of ISO/IEC 18477 specifies a coding format, referred to as JPEG XT, which is designed primarily for continuous-tone photographic content.

2   Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 18477-1:2015, *Information technology — Scalable compression and coding of continuous-tone still images — Part 1: Scalable compression and coding of continuous-tone still images*

ISO/IEC 18477-3:2015, *Information technology — Scalable compression and coding of continuous-tone still images —Part 3: Box-based file format*

Rec. ITU-T T.81 | ISO/IEC 10918-1, *Information technology — Digital compression and coding of continuous tone still images — Requirements and guidelines*

Rec. ITU-T BT.601, *Studio encoding parameters of digital television for standard 4:3 and wide screen 16:9 aspect ratios*