INTERNATIONAL STANDARD ISO/IEC 13818-4:2004
TECHNICAL CORRIGENDUM 1

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Information technology — Generic coding of moving pictures and associated audio information —

Part 4: Conformance testing

TECHNICAL CORRIGENDUM 1

Technologies de l'information — Codage générique des images animées et des informations sonores associées —

Partie 4: Essais de conformité

RECTIFICATIF TECHNIQUE 1

Technical Corrigendum 1 to ISO/IEC 13818-4:2004 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

ICS 35.040 **Ref. No. ISO/IEC 13818-4:2004/Cor.1:2007(E)**

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In clause 2, "Normative references", remove the following:

IEEE Std 1180-1990, *IEEE Standard Specifications for the Implementations of 8 by 8 Inverse Discrete Cosine Transform*, December 6, 1990

In clause 2, "Normative references", add the following:

ISO/IEC 23002-1:2006, *Information technology — MPEG video technologies — Part 1: Accuracy requirements for implementation of integer-output 8x8 inverse discrete cosine transform*

In clause 3, "Terms and definitions", replace

3.209 reference IDCT [video]: Embodiment of the saturated mathematical integer-number IDCT specified in Annex A of ISO/IEC 13818-2:2000.

with:

3.209 reference IDCT [video]: The ideal integer-valued 8x8 IDCT specified in subclause 5.4 of ISO/IEC 23002-1:2006.

In subclause 6.2, "Procedure for testing bitstream compliance", replace

A verifier which does perform the IDCT transform and calculates the reconstructed samples must comply with all the arithmetic precision requirements specified in ISO/IEC 13818-2. In addition, the IDCT of such a verifier shall be an embodiment of the saturated mathematical integer-number IDCT specified in Annex A of ISO/IEC 13818-2:2000 (a software implementation using 64-bit double-precision floating-point is sufficient).

with:

A verifier which does perform the IDCT transform and calculates the reconstructed samples must comply with all the arithmetic precision requirements specified in ISO/IEC 13818-2. In addition, the IDCT of such a verifier shall be an embodiment of the ideal integer-valued 8x8 IDCT specified in subclause 5.4 of ISO/IEC 23002-1:2006 (implementation using 64-bit double-precision floating-point is sufficient).

In subclause 6.3, "Definition of video decoder compliance", replace

The reference decoder is a decoder that implements precisely the decoding process as specified in ISO/IEC 13818-2. The IDCT function that shall be used when running the reference decoder is the very accurate approximation of the mathematical saturated integer-number IDCT f '' (x, y) specified in Annex A of ISO/IEC 13818-2:2000 obtained by implementing f '' (x, y) with double-precision arithmetic.

Except for possible mismatches caused by ambiguous half-values rounding at the output of the IDCT function, the output of the reference decoder (reconstructed samples) is defined unambiguously by ISO/IEC 13818-2.

with:

The reference decoder is a decoder that implements precisely the decoding process as specified in ISO/IEC 13818-2. The IDCT function that shall be used when running the reference decoder is the very accurate approximation of the ideal integer-valued 8x8 IDCT specified in subclause 5.4 of ISO/IEC 23002-1:2006 (implementation using 64-bit double-precision floating-point is sufficient).

When using the reference IDCT, the output of the reference decoder (reconstructed samples) is defined unambiguously by ISO/IEC 13818-2 and subclause 5.4 of ISO/IEC 23002-1:2006.

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In subclause 6.3.1, "Requirement on arithmetic accuracy (without IDCT)", replace

Therefore, the following is a the requirement on the arithmetic accuracy of the decoder:

with:

Therefore, the following is a requirement on the arithmetic accuracy of the decoder:

Replace subclause 6.3.2, "Requirement on arithmetic accuracy (with IDCT)", which states the following:

6.3.2 Requirement on arithmetic accuracy (with IDCT)

When a bitstream contains some 8x8 blocks with non-zero DCT coefficients, the output of a compliant decoder may differ from the output of the reference decoder. However, because of the accuracy requirements on the IDCT transform used by the decoder, there exist some accuracy requirements on the output of a compliant ISO/IEC 13818 video decoder.

The IDCT used in a compliant decoder shall meet all the requirements defined in Annex A of ISO/IEC 13818-2:2000.

Annex A of ISO/IEC 13818-2:2000 defines additional requirements above those defined by the IEEE Std 1180-1990 standard. In order to claim that the IDCT transform used by the decoder conforms to the specification of Annex A, the IDCT transform shall comply with the IEEE Std 1180-1990 standard and pass successfully the following test:

The test is derived from the specification given in the IEEE Std 1180-1990 standard, with the following modifications:

1) In item (1) of subclause 3.2 of the IEEE specification, the last sentence is replaced by: <<Data sets of 1 000 000 (one million) blocks each should be generated for (L=256, H=255), (L=H=5) and (L=384, H=383).>>

2) The text of subclause 3.3 of the IEEE specification is replaced by : <<For any pixel location, the peak error shall not exceed 2 in magnitude. There is no other accuracy requirement for this test.>>

3) Let F be the set of 4096 blocks Bi[y][x] (i=0..4095) defined as follows :

a) Bi[0][0] = i - 2048

b) Bi[7][7] = 1 if Bi[0][0] is even, Bi[7][7] = 0 if Bi[0][0] is odd

c) All other coefficients Bi[y][x] other than Bi[0][0] and Bi[7][7] are equal to 0

For each block Bi[y][x] that belongs to set F defined above, an IDCT that claims to conform to the specification of Annex A of ISO/IEC 13818-2:2000 | ITU-T Rec. H.262 shall output a block f[y][x] that as a peak error of 1 or less compared to the reference saturated mathematical integer-number IDCT f''(x,y). In other words, | f[y][x] - f''(x,y)| shall be <= 1 for all x and y.

Successfully passing the conformance test defined in this document only provides a strong presumption that the IDCT transform is compliant, i.e. that it does meet all the requirements specified in Annex A of ISO/IEC 13818-2:2000.

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Additional tests may be necessary to check more thoroughly that the IDCT implements properly all the requirements and recommendations specified in Annex A of ISO/IEC 13818-2:2000.

with:

6.3.2 Requirement on arithmetic accuracy (with IDCT)

When a bitstream contains some 8x8 blocks with non-zero DCT coefficients, the output of a compliant decoder may differ from the output of the reference decoder. However, because of the accuracy requirements on the IDCT transform used by the decoder, there exist some accuracy requirements on the output of a compliant ISO/IEC 13818-2 video decoder.

The IDCT used in a compliant decoder shall meet all the requirements defined in Annex A of ISO/IEC 13818-2:2000, including all tests specified therein.

In subclause 6.4.3, "Specification of the test bitstreams", replace

All the bitstreams in the test suite must be such that the output of the non-saturated integer number mathematical IDCT f ' (x, y), as defined in Annex A of ISO/IEC 13818-2:2000, has values within the range [-384, 383] for each coded block.

with:

All the bitstreams in the test suite must be such that the output of the ideal integer-valued 8x8 IDCT specified in subclause 5.4 of ISO/IEC 23002-1:2006 has values within the range [-384, 383] for each coded block.

Replace subclause 6.4.3.19, "Test bitstream #19", which states the following:

6.4.3.19 Test bitstream #19

Specification: A bitstream implementing a test close to the IEEE 1180 IDCT mismatch test, to test the decoder's IDCT statistical accuracy. Can be done using P-pictures with a flat custom intra quantization matrix with all 16, and a quantizer stepsize of 0.5. Use whatever number of frames are required to satisfy statistic count. Note that because of saturation in [0, 255], the test cannot emulate exactly the IEEE 1180 IDCT test.

Functional stage: IDCT

Purpose: Check IDCT decoder accuracy. This is not a drift test since all macroblocks are of type Intra.

with:

6.4.3.19 Test bitstream #19

Specification: A bitstream implementing a test close to the ISO/IEC 23002-1 main body IDCT mismatch test, to test the decoder's IDCT statistical accuracy. The test can be performed using I-pictures with q_scale_type equal to 1, a flat custom quantization matrix with all entries $W[w][v][u]$ equal to 16, and a quantiser_scale_code equal to 1. Use whatever number of frames are required to satisfy a statistic count corresponding to the requirements of Annex A of ISO/IEC 13818-2:2000 for use in ISO/IEC 23002-1 IDCT testing. Note that because of saturation to the range [0, 255], the test cannot exactly emulate the ISO/IEC 23002-1 main body IDCT test.

Functional stage: IDCT

Purpose: Check IDCT decoder accuracy. This is not a drift test since all macroblocks are of type Intra.

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Replace subclause 6.4.3.25, "Test bitstream #25", which states the following:

6.4.3.25 Test bitstream #25

Specification: Bitstream causing maximum saturation of the inverse quantization by creating the greatest amplitude combinations of macroblock quantization (code 31), visual weighting matrix (value 255), and DCT coefficient (value -2047 or 2047).

Functional stage: inverse quantization

Purpose: Test that decoder implements properly the saturation of the inverse quantization (before the mismatch control).

with:

6.4.3.25 Test bitstream #25

Specification: Bitstream causing maximum saturation of the inverse quantization by creating the greatest amplitude combinations of macroblock quantization (code 31), visual weighting matrix (value 255), and DCT coefficient (value -2048 or 2047).

Functional stage: inverse quantization

Purpose: Test that decoder implements properly the saturation of the inverse quantization (before the mismatch control).

Replace subclause 6.4.3.34, "Test bitstream #34", which states the following:

6.4.3.34 Test bitstream #34

Specification: A bitstream in which the output of the non-saturated integer number mathematical IDCT f ' (x, y), as defined in Annex A of ISO/IEC 13818-2:2000, has large absolute values but values within the range [-384, 383] for each coded block. If decoder under test uses the same IDCT for decoding ISO/IEC 11172-2 and ISO/IEC 13818-2 bitstreams, then this test bitstream can be implemented as an ISO/IEC 11172-2 constrained parameter bitstream.

Functional stage: IDCT

Purpose: Check that IDCT decoder accuracy meets the requirements defined in Annex A of ISO/IEC 13818-2:2000. The peak error for a compliant decoder shall be less or equal to than 2 when decoding this bitstream. Note that for blocks where f ' (x, y) has values within the range [-300, 300], decoders that have a peak error larger than 1 may not be compliant with the IEEE 1180 IDCT specification.

with:

6.4.3.34 Test bitstream #34

Specification: A bitstream in which the output of the ideal integer-valued 8x8 IDCT specified in subclause 5.4 of ISO/IEC 23002-1:2006 has large absolute values within the range [-384, 383] for each coded block. If the decoder under test uses the same IDCT for decoding ISO/IEC 11172-2 and ISO/IEC 13818-2 bitstreams, then this test bitstream can be implemented as an ISO/IEC 11172-2 constrained parameter bitstream.

Functional stage: IDCT

Purpose: Check that IDCT decoder accuracy meets the requirements defined in Annex A of ISO/IEC 13818-2:2000. The peak absolute error for a compliant decoder shall be less than or equal to 2 when decoding this bitstream. Note that for blocks where ideal integer-valued 8x8 IDCT specified in subclause 5.4 of

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ISO/IEC 23002-1:2006 has values within the range [-300, 300], decoders that have a peak absolute error larger than 1 may not be compliant with the main body of ISO/IEC 23002-1.

In the Bibliography, replace reference [13], which states the following:

[13] A.W.Johnson, T.Sikora and T.K. Tan, "Filters for Drift Reduction in Frequency Scalable Video Coding Schemes" <*Transmitted for publication to Electronic Letters.*>

with:

[13] A.W. Johnson, T. Sikora, T.K. Tan, and K.N. Ngan, "Filters for Drift Reduction in Frequency Scalable Video Coding Schemes", IEE Electronic Letters, Vol. 30, No. 6, pp. 471-472, June 1994

In the Bibliography, replace reference [14], which states the following:

[14] R.Mokry and D.Anastassiou, "Minimal Error Drift in Frequency Scalability for Motion-Compensated DCT Coding". IEEE Transactions on Circuits and Systems for Video Technology, <*accepted for publication*>

with:

[14] R. Mokry and D. Anastassiou, "Minimal Error Drift in Frequency Scalability for Motion-Compensated DCT Coding". IEEE Transactions on Circuits and Systems for Video Technology, Vol. 4, No. 4, pp. 392-406, August 1994

In the Bibliography, replace reference [19], which states the following:

[19] A. Puri "Video Coding Using the MPEG-2 Compression Standard", <to appear> Proc SPIE Visual Communications and Image Proc '93 Boston MA November, 1993

with:

[19] A. Puri, "Video Coding Using the MPEG-2 Compression Standard", Proc SPIE Visual Communications and Image Proc '93, Vol. 1199, SPIE, Boston, Mass., pp. 1701-1713, November 1993

In the Bibliography, replace reference [20], which states the following:

[20] A. Puri and A. Wong "Spatial Domain Resolution Scalable Video Coding", <to appear> Proc SPIE Visual Communications and Image Proc '93 Boston MA November, 1993

with:

[20] A. Puri and A. Wong, "Spatial Domain Resolution Scalable Video Coding", Proc SPIE Visual Communications and Image Proc '93, Vol. 1199, SPIE, Boston, Mass., pp. 718-729, November 1993.

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