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Information technology — Coded Representationrepresentation of Immersive Media — immersive media —

Part 20: Conformance Testing for Visual Volumetric Video-based Coding (V3C) with Video-based Point Cloud Compression (V-PCC)

FDIS stage

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: + 41 22 749 01 11
~~Email~~E-mail: copyright@iso.org
Website: ~~www.iso.org~~www.iso.org

Published in Switzerland

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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 ISO documentsdocument 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 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

A list of all parts in the ISO 23090 series can be found on the ISO websiteand IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.htmlwww.iso.org/members.html and www.iec.ch/national-committees.

Introduction

This document outlines the conformance testing specification for ISO/IEC 23090-5.

Information technology — Coded representation of immersive media —

Part ~~5: Visual Volumetric Video-based Coding (V3C) and Video-based Point Cloud Compression (V-PCC).~~ 20: Conformance for V-PCC

Information technology — Coded Representation of Immersive Media — Part 20: Conformance Testing for Visual Volumetric Video-based Coding (V3C) with Video-based Point Cloud Compression (V-PCC)

31 Scope

This document specifies a set of tests and procedures designed to indicate whether encoders or decoders meet the normative requirements specified in ISO/IEC 23090-5.

42 Normative references

4.1 General

The following document contains provisions which, through reference in this text, constitute provisions of this document. At the time of publication, the editions indicated were valid. All Standards are subject to revision, and parties to agreements based on this document are encouraged to investigate the possibility of applying the most recent edition of the Standards listed in this document.

4.2 Identical Recommendations | International Standards

None

4.3 Paired Recommendations | International Standards equivalent in technical content

The following documents are referred to in the text in such a way that some or all of their content constitutes the requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 23090-5: in force[1], *Information technology — Coded representation of immersive media — Part 5: Visual Volumetric Video-based Coding (V3C) and Video-based Point Cloud Compression (V-PCC).)*

ISO/IEC 23090-19: in force, *Information technology — Coded representation of immersive media — Part 19: Reference Software for V-PCC.*

53 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 23090-5 apply, and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obphttps://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/https://www.electropedia.org/

3.1
bitstream
sequence of bits that conforms to specified syntax requirements or sequence of bits to be tested for conformance to such syntax requirements

[1] Under preparation. Stage at the time of publication: ISO/IEC FDIS 23090-5:2023.

3.2
decoder
embodiment of the decoding process to be tested for conformance to such a decoding process specification

Note 1~~:~~ to entry: The decoder does not include the rendering and display process, which are outside the scope of this document.

3.3
encoder
embodiment of a process, not specified in this document (except in respect to identification of the reference software encoder~~)~~, that produces a *bitstream* ~~(3.1).~~(3.1).

3.4
reference software decoder
particular *decoder* ~~(3.2)~~(3.2) provided as a software package for use as an example available for study, as a potential starting basis for the development of other decoders, as a way of testing *bitstreams* ~~(3.1)~~(3.1) for conformance to a decoding process specification, or as a reference for comparison with the behaviour of other decoders.

3.5
reference software encoder
particular *encoder* ~~(3.3)~~(3.3) provided as a software package for use as an example available for study, as a potential starting basis for the development of other encoders, or as a reference for comparison with the behaviour of other encoders.

3.6
V3C output unit
particular structure containing decoded and normalized V3C components that correspond to a specific composition time.

3.7
V-PCC reconstruction
particular recommendation of the reconstruction process to be tested for conformance to such a reconstruction process specification.

~~6~~4 ~~Abbreviations~~Abbreviated terms and acronyms

~~For the purposes of this document,~~The relevant ~~abbreviations~~abbreviated terms and acronyms are specified in Clause 4 of ISO/IEC 23090-5~~.~~:—.

~~7~~5 Conventions

~~For the purposes of this document,~~The relevant conventions are specified in Clause 5 of ISO/IEC 23090-5~~.~~:—.

~~8~~6 Conformance for ISO/IEC 23090-5

~~8.1~~6.1 Introduction

The following clauses specify normative tests for verifying the conformance of V3C bitstreams as well as decoders. Those normative tests make use of test data (bitstream test suites) provided ~~as an electronic~~

~~annex to this document~~[2]at https://standards.iso.org/iso-iec/23090/-20/ed-1/en/ and the reference software decoder specified in ISO/IEC 23090-5~~:2021~~.

~~8.2~~6.2 Bitstream conformance

The bitstream conformance ~~of ISO/IEC 23090-5~~ is specified by Clause E.4 of ISO/IEC 23090-5~~:2021~~[3]~~.~~:—.

~~8.3~~6.3 Decoder conformance

The decoder conformance ~~of ISO/IEC 23090-5~~ is specified by Clause E.5 of ISO/IEC 23090-5~~:2021.~~:—.

~~8.4~~6.4 Reconstruction conformance

The reconstruction conformance of ISO/IEC 23090-5 is specified by Annex B and H.10, H.11, and H.12 according to the chosen reconstruction profile indicated in ISO/IEC 23090-5~~,~~:—, H.15. The voxelized representation of the decoded point cloud shall be used for conformance testing. Therefore, the adaptation process specified in the ISO/IEC 23090-5~~,~~:—, H.13 shall be ignored.

Decoders conforming to a V-PCC profile with a reconstruction profile component shall perform reconstruction operations required by this reconstruction profile component. Conformance is assessed at conformance point A, as shown in ~~Figure 1 —~~,Figure 1, examining the decoded attribute, geometry, and occupancy bitstreams together with the decoded atlas and appropriate information that can associate the decoded patch metadata with the decoded video signal (e.g., patch to block map information). For conformance point A, conformance is exact.

Conformance is assessed at conformance point B, as shown in ~~Figure 1 —~~,Figure 1, when the decoder selects to operate in a particular reconstruction profile. Associated reconstruction information to a specific reconstruction profile is provided as reference only. A conformant V-PCC decoder to a particular reconstruction profile may implement alternative processes that produce similar or better visual quality. The definition of similar or better visual quality is outside the scope of this document.

For conformance testing, post-decoding conversion of the decoded V3C video components to a nominal video format is performed.

~~Note 2:~~ The process specified in Annex B of ~~the~~ ISO/IEC 23090-5~~ specification~~ is recommended to be used for the decoded to the nominal video format conversion. The reconstruction process follows a specified order of operations for reconstruction conformance. It is suggested to follow the implementation in ~~the~~ ISO/IEC 23090-19~~ specification [2]~~.

The process of synchronizing the V3C components is specified in Annex B of ISO/IEC 23090-5. An example containing a detailed description of the V3C component synchronization process can be found in~~[1].~~ Reference [1].

It is a recommendation of this document that the decoded V3C output units are stored in an intermediate buffer for reconstruction purposes. The decoded V3C output units may be placed into the intermediate buffer at the output time of the corresponding V3C output unit processing. The reconstruction process can start when all required V3C units are available for processing.

~~[2] This document includes an electronic attachment containing the conformance bitstreams identified within the text. The bitstreams can also be downloaded from the MPEG git, or MPEG file sharing system.~~

~~[3] ISO/IEC 23090-5:2021 Information technology — Coded representation of immersive media — Part 5: Visual Volumetric Video-based Coding (V3C) and Video-based Point Cloud Compression (V-PCC)~~