



ISO/IEC JTC 1/SC 29/WG 11
Coding of moving pictures and audio
Convenorship: UNI (Italy)

Document type: Approved WG 11 document

Title: Press Release of 126th MPEG Meeting

Status: Approved

Date of document: 2019-03-29

Source: Convenor

Expected action: INFO

No. of pages: 6

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Committee URL: <http://mpeg.chiariglione.org>

**INTERNATIONAL ORGANISATION FOR STANDARDISATION
ORGANISATION INTERNATIONALE DE NORMALISATION
ISO/IEC JTC 1/SC 29/WG 11
CODING OF MOVING PICTURES AND AUDIO**

**ISO/IEC JTC 1/SC 29/WG 11 N18325
Geneva, CH – March 2019**

Source: Convenor of MPEG
Status: Approved by WG11
Subject: MPEG Press Release
Date: 29 March 2019



MPEG starts strongly in coding and compression for Three Degrees of Freedom Plus (3DoF+)

Geneva, Switzerland – The 126th MPEG meeting was held in Geneva, Switzerland, from 25 – 29 March 2019

Three Degrees of Freedom Plus (3DoF+) – MPEG evaluates responses to the Call for Proposal and starts a new project on Metadata for Immersive Video

Support for 360-degree video, also called omnidirectional video, has been standardized in the Omnidirectional Media Format (OMAF; ISO/IEC 23090-2) and Supplemental Enhancement Information (SEI) messages for High Efficiency Video Coding (HEVC; ISO/IEC 23008-2). These standards can be used for delivering *immersive visual content*. However, rendering flat 360-degree video may generate visual discomfort when objects close to the viewer are rendered. The interactive parallax feature of Three Degrees of Freedom Plus (3DoF+) will provide viewers with visual content that more closely mimics natural vision, but within a limited range of viewer motion. A typical 3DoF+ use case is a user sitting on a chair (or similar position) looking at stereoscopic omnidirectional virtual reality (VR) content on a head mounted display (HMD) with the capability to move her head in any direction.

At its 126th meeting, MPEG received *five responses* to the Call for Proposals (CfP) on 3DoF+ Visual. Subjective evaluations showed that adding the interactive motion parallax to 360-degree video will be possible. Based on the subjective and objective evaluation, a new project was launched, which will be named *Metadata for Immersive Video*. A first version of a Working Draft (WD) and corresponding Test Model (TM) were designed to combine technical aspects from multiple responses to the call. The current schedule for the project anticipates Final Draft International Standard (FDIS) of ISO/IEC 23090-7 Immersive Metadata in July 2020.

Neural Network Compression for Multimedia Applications – MPEG evaluates responses to the Call for Proposal and kicks off its technical work

Artificial neural networks have been adopted for a broad range of tasks in multimedia analysis and processing, such as visual and acoustic classification, extraction of multimedia descriptors or image and video coding. The trained neural networks for these applications contain a large number of parameters (i.e., weights), resulting in a considerable size. Thus, transferring them to a number of clients using them in applications (e.g., mobile phones, smart cameras) requires compressed representation of neural networks.

At its 126th meeting, MPEG analyzed *nine technologies* submitted by industry leaders as responses to the Call for Proposals (CfP) for Neural Network Compression. These technologies address compressing neural network parameters for networks trained with multimedia data in order to reduce their size for transmission and the efficiency of using them, while not or only moderately reducing their performance in specific multimedia applications.

After a formal evaluation of submissions, MPEG identified *three main technology components* in the compression pipeline, which will be further studied in the development of the standard. A key conclusion is that with the proposed technologies, *a compression to 10% or less of the original size can be achieved with no or negligible performance loss*, where this performance is measured as classification accuracy in image and audio classification, matching rate in visual descriptor matching, and PSNR reduction in image coding. Some of these technologies also result in the reduction of the computational complexity of using the neural network or can benefit from specific capabilities of the target hardware (e.g., support for fixed point operations).

MPEG expects that the *compression of neural networks for multimedia content description and analysis* (ISO/IEC 15938-17) to reach Final Draft International Standard (FDIS) in April 2021.

Low Complexity Enhancement Video Coding – MPEG evaluates responses to the Call for Proposal and selects a Test Model for further development

At its 126th meeting, after evaluating several responses to the Call for Proposals (CfP) issued last October, MPEG commenced work on a new standard to be known as Low Complexity Enhancement Video Coding (LCEVC). The new standard is aimed at bridging the gaps between two successive generations of codecs by providing a codec-agile extension to existing video codecs that improves coding efficiency and can be readily deployed via software upgrade and with sustainable power consumption.

The target is to achieve *(i)* coding efficiency close to High Efficiency Video Coding (HEVC) Main 10 by leveraging Advanced Video Coding (AVC) Main Profile and *(ii)* coding efficiency close to upcoming next generation video codecs by leveraging HEVC Main 10. This coding efficiency should be achieved while maintaining overall encoding and decoding complexity lower than that of the leveraged codecs (i.e., AVC and HEVC, respectively) when used in isolation at full resolution. This target has been met, and one of the responses to the CfP will serve as starting point and test model for the standard.

The new standard is expected to become part of the ISO/IEC 23094 (General Video Coding) suite of codecs as Part 2 Low Complexity Enhancement Video Coding and its development is expected to be completed in 2020.

Point Cloud Compression – MPEG promotes its Geometry-based Point Cloud Compression (G-PCC) technology to the Committee Draft (CD) stage

At its 126th meeting, MPEG promoted its ISO/IEC 23090-5 *Geometry-based Point Cloud Compression (G-PCC)* standard to Committee Draft (CD) stage. G-PCC addresses *lossless and lossy coding of time-varying 3D point clouds with associated attributes* such as color and material properties. This technology is appropriate especially for sparse point clouds. ISO/IEC 23090-9 Video-based Point Cloud Compression (V-PCC), which reached the CD stage in October 2018, addresses the same problem but for dense point clouds, by projecting the (typically dense) 3D point clouds onto planes, and then processing the resulting sequences of 2D images with video compression techniques. G-PCC's generalized approach, which directly codes the 3D geometry to exploit any redundancy found in the point cloud itself, is complementary to V-PCC and particularly useful for sparse point clouds representing large environments.

Point clouds are typically represented by extremely large amounts of data, which is a significant barrier for mass market applications. However, the relative ease to capture and render spatial information compared to other volumetric video representations makes point clouds increasingly popular to present immersive volumetric data. The current implementation of a lossless, intra-frame G-PCC encoder provides a compression ratio up to 10:1 and acceptable quality lossy coding of ratio up to 35:1.

By providing high-level immersiveness at currently available bitrates, the G-PCC standard will enable several applications such as 3D mapping, indoor navigation, autonomous driving, advanced augmented reality (AR) with environmental mapping, and cultural heritage.

The G-PCC CD can be found at <http://mpeg.chiariglione.org/meetings/126>.

MPEG Media Transport (MMT) – MPEG approves 3rd Edition of Final Draft International Standard

At its 126th meeting, MPEG has approved the 3rd edition of Final Draft International Standard (FDIS) of MPEG Media Transport (ISO/IEC 23008-1). It will introduce two important technologies to this standard: *(i)* enhancements for mobile environments and *(ii)* support of Contents Delivery Networks (CDNs). The support for multipath delivery will enable delivery of services over more than one network connection concurrently, which is specifically useful for mobile devices that can support more than one connection at a time. Additionally, support for intelligent network entities involved in media services (i.e., Media Aware Network Entity (MANE)) will make MMT-based services adapt to changes of the mobile network faster and better. Understanding the support for load balancing is an important feature of CDN-based content delivery, messages for DNS management, media resource update, and media request is being added in this edition. This edition is scheduled to be published within 2019. Furthermore, ongoing developments within MMT will add support for the usage of MMT over QUIC (Quick UDP Internet Connections) and support of FCAST in the context of MMT.

MPEG-G standards reach Draft International Standard for Application Program Interfaces (APIs) and Metadata technologies

The extensive usage of high-throughput deoxyribonucleic acid (DNA) sequencing technologies opens up new perspectives in the treatment of several diseases and enables the implementation of a new approach to healthcare known as “precision medicine”. DNA sequencing technologies produce extremely large amounts of raw data which are stored in different repositories worldwide. The processing, analysis, and comparison of such distributed data is a fundamental element for the effective usage of sequencing data for clinical and scientific purposes. Standard Application Program Interfaces (APIs) and Metadata, obviously, are the basis for interoperable and automated data access and processing systems that can efficiently operate on the worldwide available sets of sequencing data.

The MPEG-G standard jointly developed by MPEG and ISO Technical Committee for biotechnology standards (ISO TC 276/WG 5), is the first international standard to address and solve the problem of efficient and cost-effective handling of genomic data by providing, not only new compression and transport technologies (ISO/IEC 23092-1/2), but also a standard specification associating relevant information in the form of metadata and a rich set of APIs for data access and mining, for building a full ecosystem of interoperable applications capable of efficiently processing sequencing data.

At its 127th meeting, MPEG promoted its third part of the MPEG-G specifications, Application Program Interfaces and Metadata (ISO/IEC 23092-3) to Final Draft International Standard (FDIS) stage. Such part of the standard will enable the industry to rely on a final specification in October 2019.

How to contact MPEG, learn more, and find other MPEG facts

To learn about MPEG basics, discover how to participate in the committee, or find out more about the array of technologies developed or currently under development by MPEG, visit MPEG’s home page at <https://mpeg.chiariglione.org/>. There you will find information publicly available from MPEG experts past and present including tutorials, white papers, vision documents, short articles and requirements under consideration for new standards efforts. You can also find useful information in many public documents by using the search window including publicly available output documents of each meeting (note: some may have editing periods and in case of questions please contact Dr. Christian Timmerer).

Examples of tutorials that can be found there include tutorials for: High Efficiency Video Coding, Advanced Audio Coding, Universal Speech and Audio Coding, and DASH to name a few. A rich repository of white papers can also be found and continues to grow. You can find these papers and tutorials for many of MPEG’s standards freely available. Press releases from previous MPEG meetings are also available.

Journalists that wish to receive MPEG Press Releases by email should contact Dr. Christian Timmerer at christian.timmerer@itec.uni-klu.ac.at or christian.timmerer@bitmovin.com or subscribe via <https://lists.aau.at/mailman/listinfo/mpeg-pr>. For timely updates follow us on Twitter (<https://twitter.com/mpeggrou>).

Further Information

Future MPEG meetings are planned as follows:

No. 127, Gothenburg, SE, 08 – 12 July 2019

No. 128, Geneva, CH, 07 – 11 October 2019

No. 129, Brussels, BE, 13 – 17 January 2020

No. 130, Alpbach, AT, 20 – 24 April 2020

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