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**INTERNATIONAL ORGANIZATION FOR STANDARDIZATION**

**ORGANISATION INTERNATIONALE DE NORMALISATION**

**ISO/IEC JTC 1/SC 29/AG 5**

**MPEG VISUAL QUALITY ASSESSMENT**

**ISO/IEC JTC 1/SC 29/AG 5 N42**

**October 2021, Virtual**

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| **Title** | **Report on MPEG AG 5 Workshop on Quality of Immersive Media: Assessment and Metrics** |
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The Quality of Experience (QoE) is well-defined in QUALINET white papers[[1]](#footnote-1),[[2]](#footnote-2) but its assessment and metrics are subject to research. The aim of this workshop on “Quality of Immersive Media: Assessment and Metrics”[[3]](#footnote-3) is to provide a forum for researchers and practitioners to discuss the latest findings in this field. The scope of this workshop is *(i)* to raise awareness about MPEG efforts in the context of quality of immersive visual media and *(ii)* invite experts (outside of MPEG) to present new techniques relevant to this workshop.

Quality assessments in the context of the MPEG standardization process typically serve two purposes: *(1)* to foster decision-making on the tool adoptions during the standardization process and *(2)* to validate the outcome of a standardization effort compared to an established anchor (*i.e.*, for verification testing).

This document provides a report of this workshop (from October 5, 2021, 1500-1700 UTC) comprising the slides attached to this document..

**Program/Speakers/Abstract**:

* **15:00-15:10: Joel Jung & Christian Timmerer (AhG co-chairs)**: Welcome notice
* **15:10-15:30: Mathias Wien (AG 5 convenor)**: MPEG Visual Quality Assessment: Tasks and Perspectives

**Abstract**: The Advisory Group on MPEG Visual Quality Assessment (ISO/IEC JTC1 SC29/AG5) has been founded in 2020 with the goal to select and design subjective quality evaluation methodologies and objective quality metrics for the assessment of visual coding technologies in the context of the MPEG standardization work. In this talk, the current work items as well as perspectives and first achievements of the group are presented.

* **15:30-15:50: Aljosa Smolic**: Perception and Quality of Immersive Media

**Abstract**: Interest in immersive media increased significantly over recent years. Besides applications in entertainment, culture, health, industry, etc., telepresence and remote collaboration gained importance due to the pandemic and climate crisis. Immersive media have the potential to increase social integration and to reduce greenhouse gas emissions. As a result, technologies along the whole pipeline from capture to display are maturing and applications are becoming available, creating business opportunities. One aspect of immersive technologies that is still relatively undeveloped is the understanding of perception and quality, including subjective and objective assessment. The interactive nature of immersive media poses new challenges to estimation of saliency or visual attention, and to development of quality metrics. The V-SENSE lab of Trinity College Dublin addresses these questions in current research. This talk will highlight corresponding examples in 360 VR video, light fields, volumetric video and XR.

* **15:50-16:00: Break/Discussions**
* **16:00-16:20: Jesús Gutiérrez**: Quality assessment of immersive media: Recent activities within VQEG

**Abstract**: This presentation will provide an overview of the recent activities carried out on quality assessment of immersive media within the Video Quality Experts Group (VQEG), particularly within the Immersive Media Group (IMG). Among other efforts, outcomes will be presented from the cross-lab test (carried out by ten different labs) in order to assess and validate subjective evaluation methodologies for 360º videos, which was instrumental in the development of the ITU-T Recommendation P.919. Also, insights will be provided on the current plans on exploring the evaluation of the quality of experience of immersive communication systems, considering different technologies such as 360º video, point cloud, free-viewpoint video, etc.

* **16:20-16:40: Alexander Raake**: **Perceptual evaluation of Immersive Media - from video quality towards a holistic QoE perspective**

**Abstract:** Immersive visual media spans from higher-resolution video with increased field of view to fully interactive extended reality (XR) systems based on VR, AR, or MR technology. Here, quality and Quality of Experience (QoE) evaluation are key to ensure valuable experiences for the users and thus successful technology developments. The talk presents some work in ITU-T SG 12 on the assessment of immersive media, and corresponding contributions and other related research activities by the Audiovisual Technology (AVT) group at TU Ilmenau. In the first part of the talk, the quality model series P.1203 and P.1204 for resolutions of up to 4K/UHD1 will be presented, with a primary focus on the bitstream-based models P.1203.1 and P.1204.3. Besides their application to 2D video, their usage for gaming-video and 360° video quality assessment are addressed. In the second part, the talk discusses aspects of QoE for immersive media that go beyond visual quality. Research is presented on the exploration behavior of users for 360° video, showing the influence due to the content as well as the task given to the subjects. Furthermore, some recent work on presence and cybersickness evaluation for 360° video is discussed. The talk concludes with an outlook on using indirect methods and cognitive performances as evaluation criteria for audiovisual IVEs.

* **16:40-17:00**: **Laura Toni: Understanding user interactivity for immersive communications and its impact on QoE**

**Abstract**: A major challenge for the next decade is to design virtual and augmented reality systems for real-world use cases such as healthcare, entertainment, e-education, and high-risk missions. This requires immersive systems that operate at scale, in a personalized manner, remaining bandwidth-tolerant whilst meeting quality and latency criteria. This can be accomplished only by a  fundamental revolution of the network and immersive systems that has to put the interactive user at the heart of the system rather than at the end of the chain. With this goal in mind, in this talk, we provide an overview of our current researches on the behaviour of interactive users in immersive experiences and its impact on the next-generation multimedia systems. We present novel tools for behavioural analysis of users navigating in 3-DoF and 6-DoF systems, we show the impact and advantages of taking into account user behaviour in immersive systems. We then conclude with a perspective on the impact of users behaviour studies into QoE.

* **17:00: Conclusions**

1. <http://qualinet.epfl.ch/resources/qualinet-white-paper/> [↑](#footnote-ref-1)
2. <https://arxiv.org/abs/2007.07032> [↑](#footnote-ref-2)
3. <https://multimediacommunication.blogspot.com/2021/08/mpeg-ag-5-workshop-on-quality-of.html> [↑](#footnote-ref-3)