

Proposals for IMG work plan

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Overview

- Contribution sent to IMG on Q3 2017.
- Rationale: lot of interest in IMG, but missing a structured work plan
- Contribution form: skeleton of a proposed work plan
- Two-phase approach:
 1. Audiovisual quality of 360VR video → Establish methodology based on existing standards
 2. Full QoE of immersive experience → Based on the findings of phase 1



Focus of the contribution

Target: raise discussion on what can we do jointly for IMG, and check who is interested

Status of standardization initiatives regarding QoE of omnidirectional media

Disclaimer: AFAIK, as of July 2017

- MPEG-I contributions:
 - State of the art of QoE modeling of 360 video
 - Monitoring points and measurements (called “metrics”) for MPEG-DASH clients playing 360VR
- MPEG ad-hoc-group on Immersive Media Quality Evaluation
 - Target: VR QoE requirements, collect test material, study assessment methods...
- Standardization of omnidirectional formats (any QoE-related activity?)
 - JPEG XT (photos), XS (video), PLENO (light field)
 - ITU-R work item on Advanced Immersive Audio Visual (AIAV)
 - IEEE formats for immersive video files and streams
- QUALINET-VQEG collaboration on Immersive Media (JQVIM) proposal of collecting media contents and tools

Work plan proposal

Use case elements to discuss

E2E Use case:

- “Promotional content”
- Short films
- Live events
- News/docs
- Training/edu
- User generated

Impairments / elements to assess:

- Stitching, projection
- Stereoscopy
- Omnidirectional audio
- Compression
- Transport schemes
- E2E delay
- Display device

Quality factors to evaluate:

- Audiovisual Q
- Depth perception
- Cybersickness
- Immersiveness
- Presence
- Engagement

Expected outputs:

- Database of sequences
- Characterization of source sequences
- Subjective methodology
- Test results DB
- Objective metrics

Proposed work plan

Two-phase approach

- The first phase keeps the evaluation target constant with respect to traditional video quality evaluation (type of content, use cases, metrics...), but it develops the specifics to address immersive media technical characteristics (projection issues, resolution issues, user behaviour, sickness, etc).
- The second phase focuses on the QoE aspects which are specific of (or particularly relevant in) immersive media: immersion, engagement, sense of presence, etc.

Phase 1: Audiovisual Quality of omnidirectional video

Objectives

- Define a subjective methodology to assess the audiovisual quality of 360VR, somehow equivalent to what ITU-T P.910, ITU-R BT.500, etc. were for traditional video.
- Gather a set of reference sequences which are “demanding, but not unduly so”.
 - Reference: professionally produced content, representative from use cases
- Create a common set of subjectively-assessed sequences, under a reasonable set of impairments, that can be used as reference for reproducible research, as well as a training set for objective metrics.
 - Impairments as expected in video streaming
 - Playout in 3DoF consumer devices
- Propose objective metrics to model audiovisual quality of 360VR video.

Specific scope depending on interest of VQEG/IMG members

Phase 1: Audiovisual Quality of omnidirectional video

Source sequence selection

- Analyze already available sequences, search for new ones
- Maintain DB of available sequences
- Source sequence characteristics
 - 60 seconds
 - Stereoscopic or monoscopic
 - Equirectangular projection, already stitched
 - High resolution, high frame rate, perceptually lossless compression
 - Directional audio
- Sequences should be stored with characterization
 - Reference depth maps
 - Image statistics (TI, SI, etc)
 - Visualization heat maps

Phase 1: Audiovisual Quality of omnidirectional video

Impairment selection

- Isotropic impairment (less interaction with user view behavior)
- Potential list of impairments to evaluate:
 - Geometric changes (projection, resolution, stitching...).
 - Stereo/monoscopic
 - Video compression
 - Adaptive streaming effects (stalling, quality variations)
 - Audio

Phase 1: Audiovisual Quality of omnidirectional video

Subjective evaluation methodology

- Test methodology
 - ACR and ACR-HR
 - 30 seconds of visualization + 5-10 seconds of voting
 - Once after X sequences, vote for sickness and immersion
- Evaluation procedures
 - 3 DoF HMDs (mobile phones). Record HMD device in each test. Clean lens after usage.
 - In-app voting menu
 - Monitoring system to check the user is viewing the correct content
 - Swivel chair
- Statistical analysis
 - Just use what it is done for other projects (SAM)
 - Minimum of X users

Phase 1: Audiovisual Quality of omnidirectional video

Objective evaluation metrics

- If there are proponents, a metric evaluation could be performed as in past projects
- Benchmark: 2D video metrics used naïvely
 - PSNR/MSE
 - VMAF, VQM, SSIM, you-name-it
- Training / calibration of metric to MOS must be done in a different content set as validation / testing.

Phase 2: QoE of immersive media

Objectives

- Go beyond A/V quality: engagement, immersiveness, sickness...
- Some aspects to consider:
 - Task-based evaluation, that can be used to evaluate interactivity, as in ITU-T P.805 or P.920.
 - Behaviour-based evaluation, instead of questionnaire-based evaluation.
 - Providing a precise definition of what is being measured (e.g. “engagement” or “immersion”) to be able to develop methodologies for them.

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