Quality metrics for immersive 360VR content

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Presentation scheme

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- Introduction
- Review of quality metrics on 360VR contents
- Work approach
- Test material
- Subjective assessment
  - Test session and methodology
  - Equipment and Environment
  - Presence Questionnaire (PQ)

Introduction

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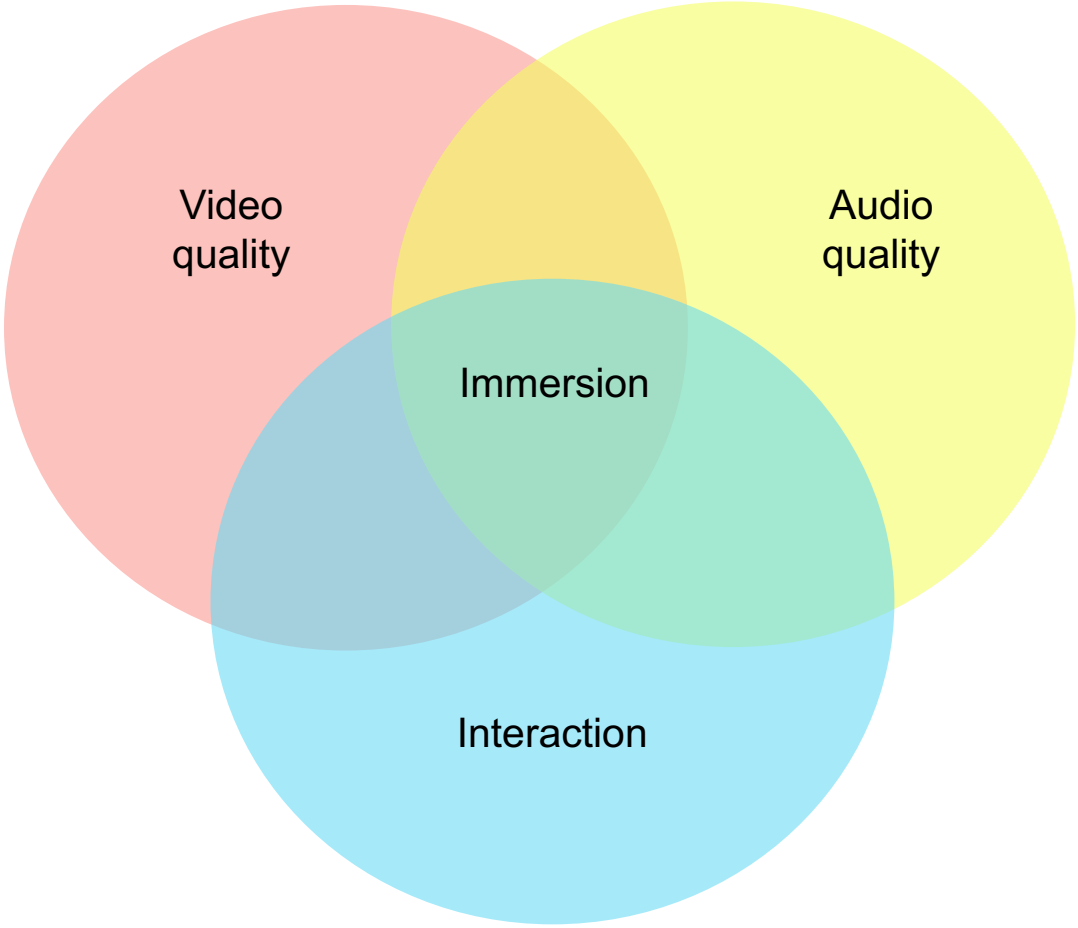
- Main challenge:
  - To find an objective quality metrics that provides high correlation with the Quality of Experience (QoE) for immersive 360VR content

Introduction – Immersive experience



Review of quality metrics on 360VR contents

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Metrics for traditional 2D contents	Metrics adapted for 360VR contents
Peak Signal-to-Noise Ratio (PSNR)	Spherical PSNR (S-PSNR)
Structural Similarity (SSIM)	Weighted Spherical PSNR (WS-PSNR)
Multi-Scale Structural Similarity (MS-SSIM)	Craster Parabolic Projection PSNR (CPP-PSNR)
Visual Information Fidelity in pixel domain (VIFp)	
Video Multimethod Assessment Fusion (VMAF)	
SpatioTemporal VMAF (ST-VMAF)	

Work approach

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- To analyze how the available objective quality metrics fit the users perception of quality in a 360 scenario guaranteeing an immersive experience.

- Research question:
  can an objective quality metric in 360VR scenario represent the QoE perceived by a user?

- Underlying hypothesis:
  - We have shown that VMAF metric offers good results in terms of quality with omnidirectional content without any specific adjustment but, what about:
    - Presence
    - Intuitive interaction
    - Sickness
    - Different devices

Work approach

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- The performance of quality metrics on 360VR contents can be carried out in three ways:

QUALITY METRICS

Metrics for traditional 2D contents

Equirectangular projection

Viewport projection

Metrics adapted for 360VR contents

Cubemap, equirectangular, pyramid, equiangular, …

Test material

Number of reference videos	6
Duration	30 seconds
Encoding	H.265/HEVC
Resolution	4K (3840x1920, 3840x2048, 3840x2160)
Hypothetical Reference Circuits (HRCs)	QP Range (22, 27, 32, 37, 42) (*)
Framerate	50/60, 25/30 fps
Number of Processed Video Sequences (PVSs):	**30**

- No scene changes within SRCs
  - So, no temporal pooling challenge
- Original resolution and framerate kept throughout the process

(*) "Common HM Test conditions and software reference configurations", JCT-VC 11th meeting, output document M27343, Shanghai, China, Oct. 2012.

Test material

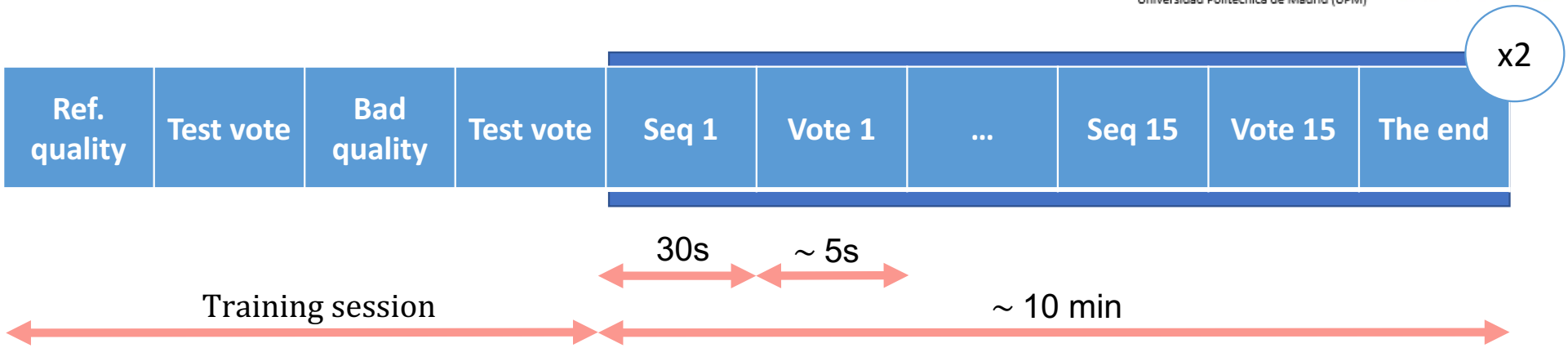
SI

TI

Spatial Information (SI) and Temporal (TI) Information indicators

- A wide range of contents selected with different features in terms of color, texture, camera motion, composition, and content in the scenes

Subjective assessment – Test session (I)



Methodology

ACR - HR

Five Grade Scale - Quality	
5	Excellent
4	Good
3	Fair
2	Poor
1	Bad

- All videos are viewed and scored by each subject
- Duration ~ **20 minutes** (assuming 5 seconds for evaluation)
- **Number of observers based on our last VMAF research**

Subjective assessment – Test session (II)

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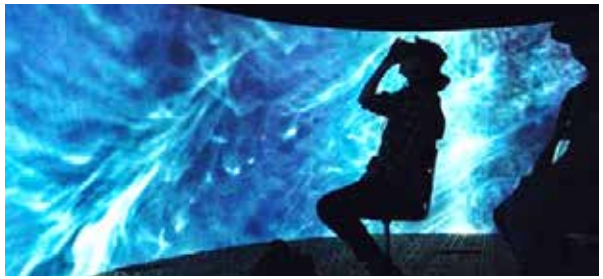
Equipment

Lenovo Mirage Solo

VS

Samsung GearVR2 + Samsung S8

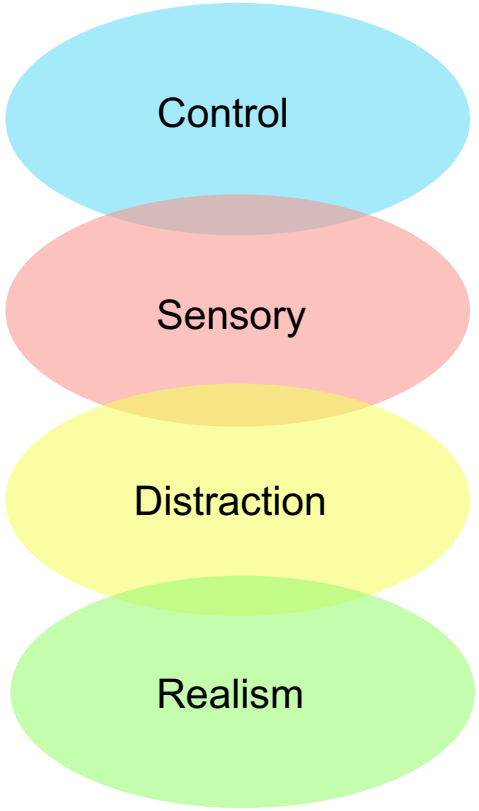
Environment



Content randomization

Subjective assessment – Presence Questionnaire (PQ)

- ✓ How quickly did you adjust to the virtual environment experience?
- ✓ How closely were you able to examine objects?
- ✓ How aware were you of events occurring in the real world around you?
- ✓ To what degree did you feel confused or disoriented at the beginning of breaks or at the end of the experimental session?



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Questions – Discussion – Debate - …

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