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Volumetric Video: The "***MPEG Metadata for Immersive Video***" Distribution Format

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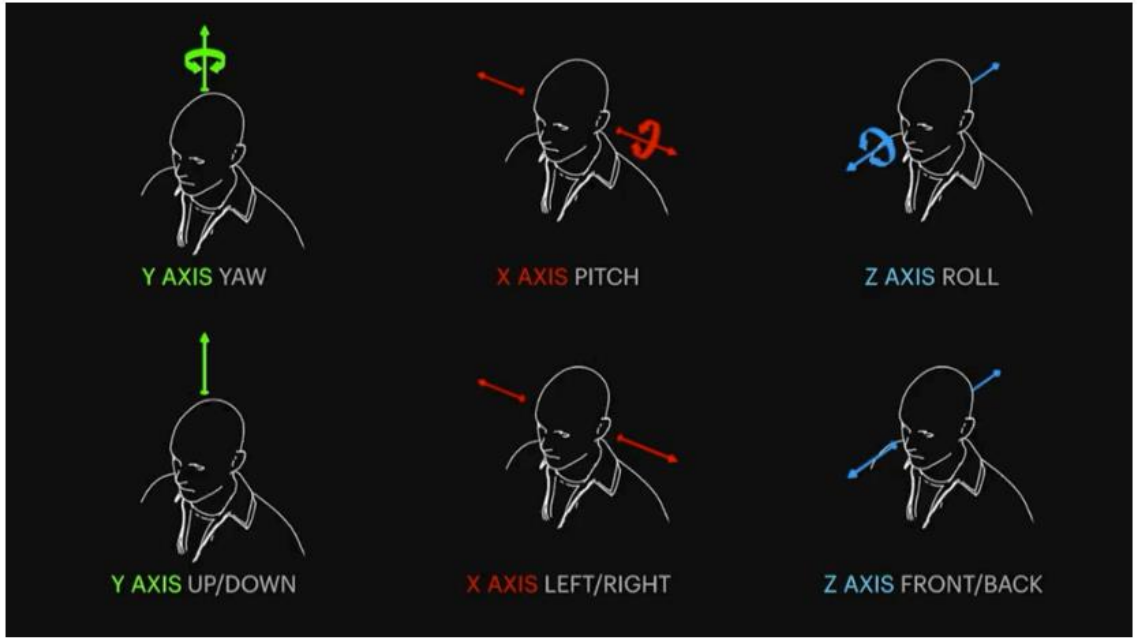
Volumetric Video Creates an Immersive Experience



- Volumetric content is the next generation of video
- Users can experience the sensations of depth and parallax
- Volumetric video enables increased immersion into a content

Experience of Parallax in VR

Volumetric Video is mandatory in VR

Users use volumetric video for:

- Up to 360° video with parallax
- Content that is not flat
- To enhance the overall video experience
  - More immersive
  - More natural
  - Less discomfort

Experience of Parallax on TV

On television, users can experience the sensation of depth and parallax using volumetric video

A key example:

- Dynamic Window Experience

Experience of Parallax on Smartphones

On smartphones, volumetric video can create new experiences on any 2D screen

Creating Volumetric Video from Multi-Views Content

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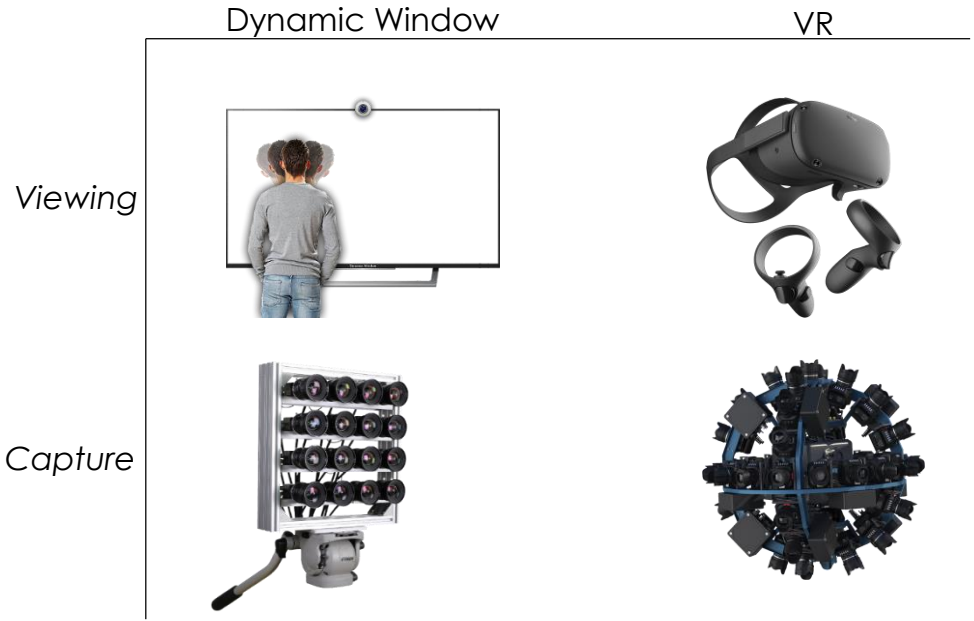
Adapt Capture Setup to the Degree of Freedom of the Experience



To create a volumetric experience, there is a strong correlation between the degree of freedom of the experience and video rig design

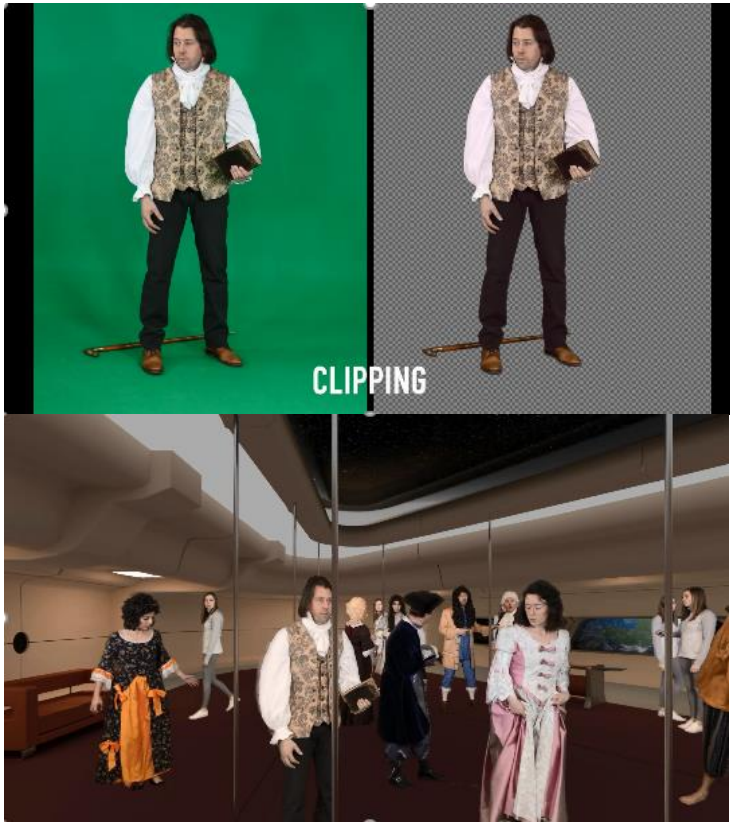
Capture Real Video

- Utilize light field camera arrays
- Leverage the relationship between degree of freedom and rig design
- Consider the challenge of capturing a large environment

Develop Computer-Generated Content

- Creating an up to 360 ° video with a virtual rig on a computer-generated (CG) scene

Create a Composite



- Develop a scene composition for non full light field capture
- Provides large field of view content
- Use VFX compositing tools

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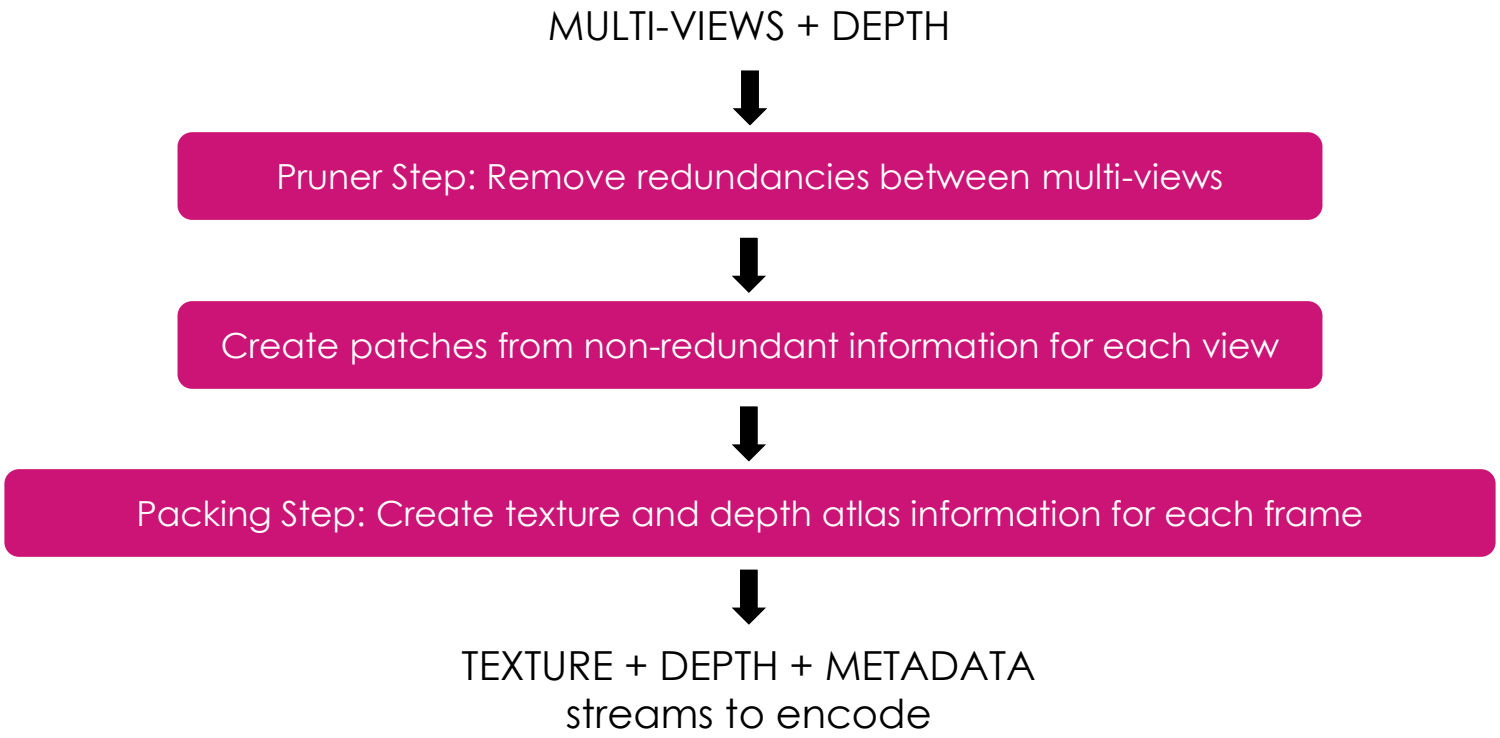
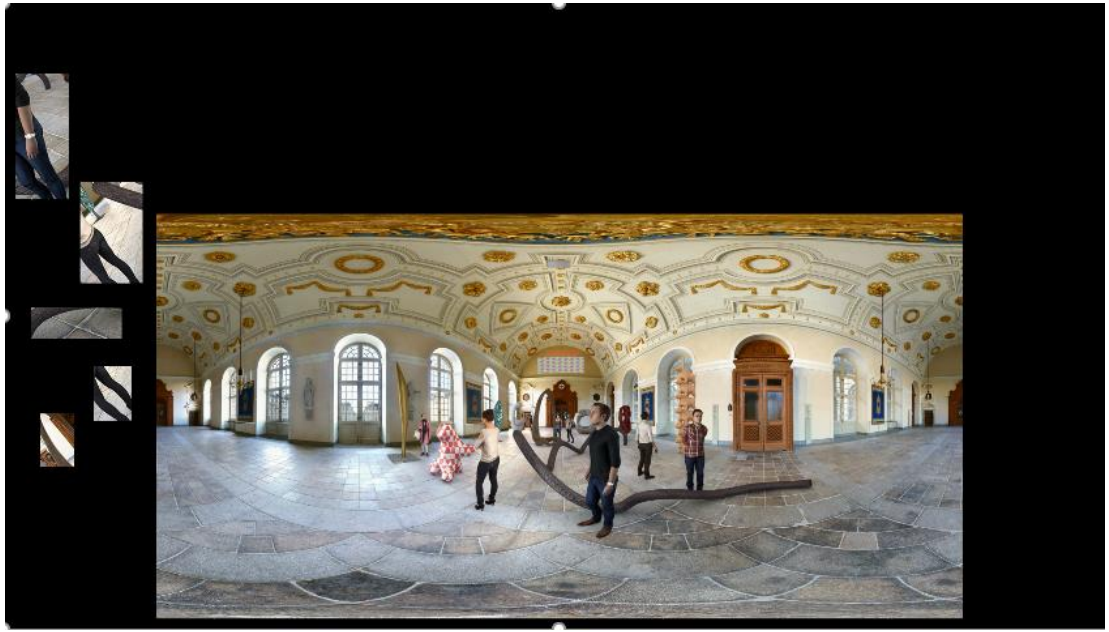
The Encoder Pre-Processing Steps

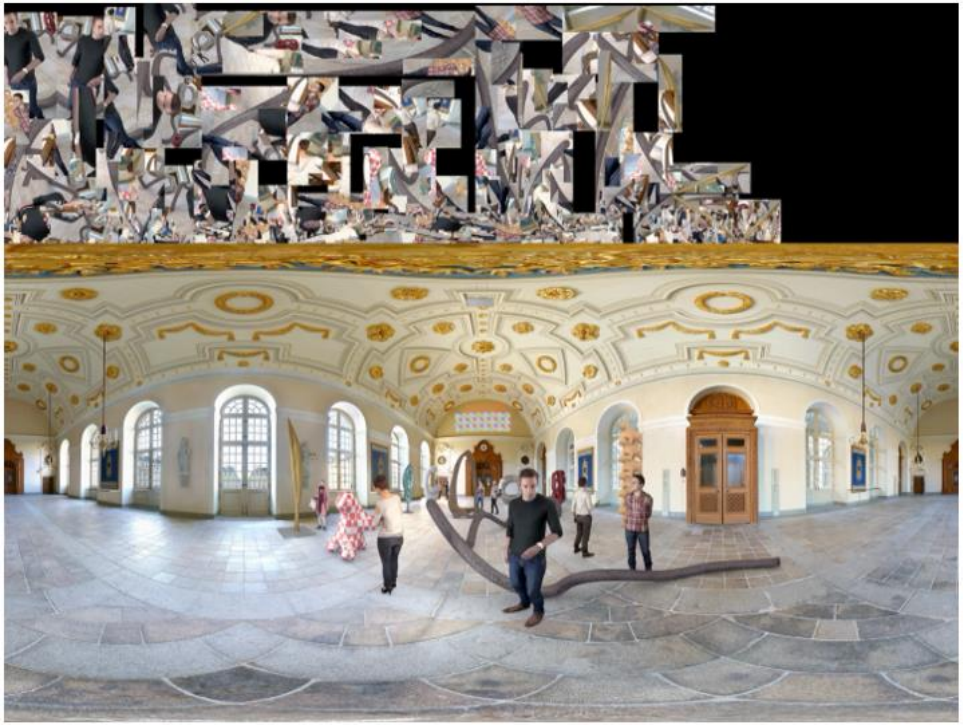
Transforming Multi-Views and Depth Information into Video Streams

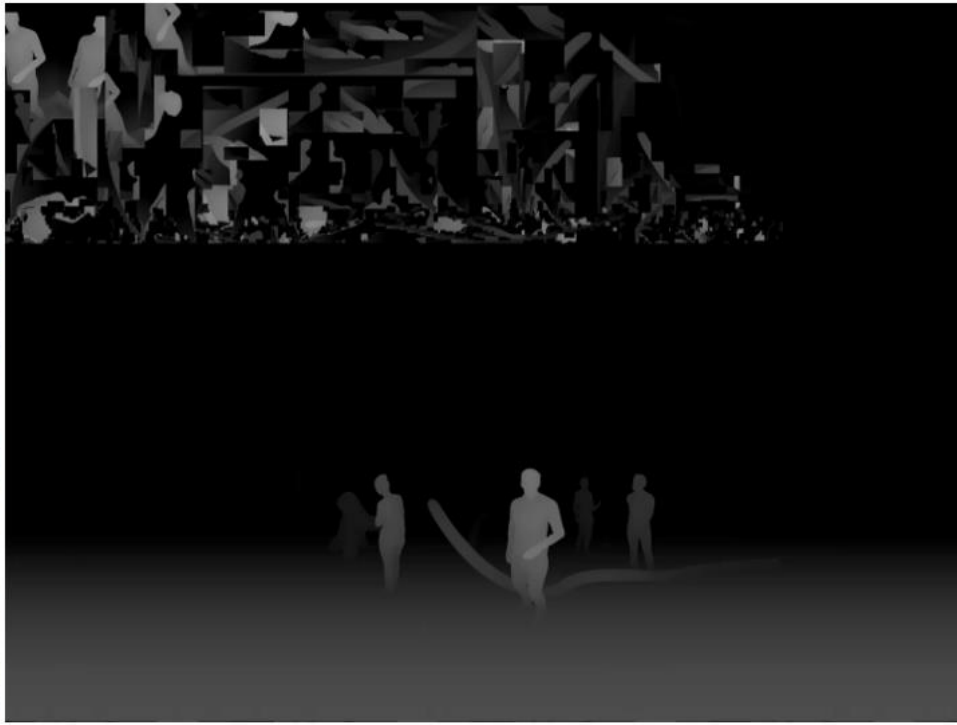


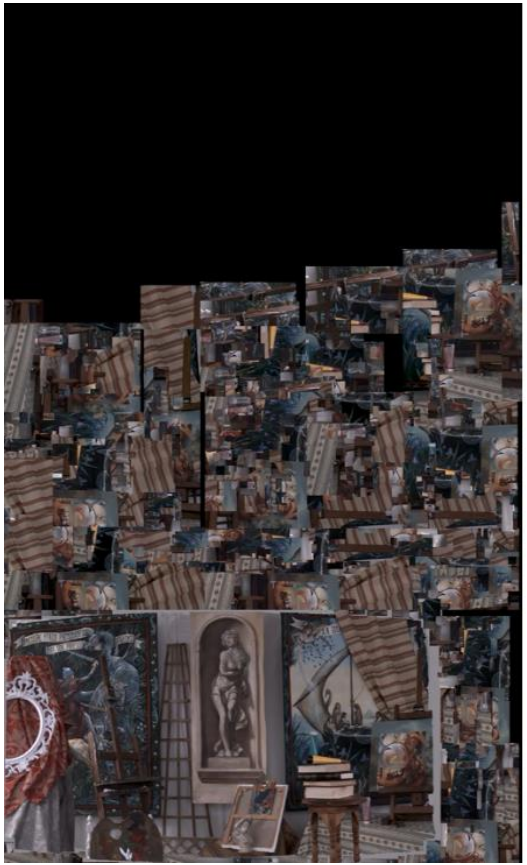
Finding Redundancies Between Multi-Views



- The Pruner Step
- The Packing Step







Understanding the MPEG Metadata for Immersive Video (MIV) Distribution Format

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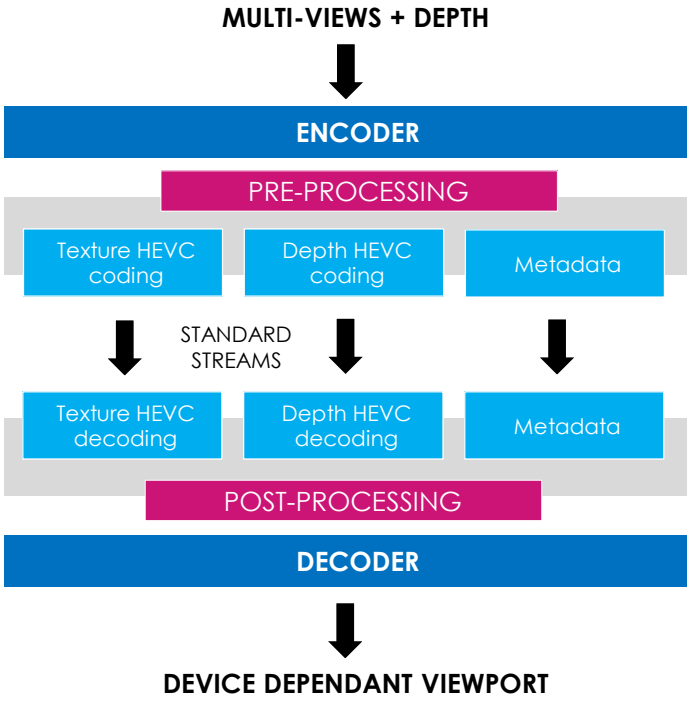
MPEG Metadata for Immersive Video Format



- The MPEG MIV format has three streams:
  - ✓ Texture
  - ✓ Depth
  - ✓ Metadata
- Content is encoded using standard compression codec (HEVC)
- Metadata includes camera parameters and patch list

ROADMAP

- Reference Software V1 available
- MPEG Committee draft begins in 2020 (MPEG-I Part 12)

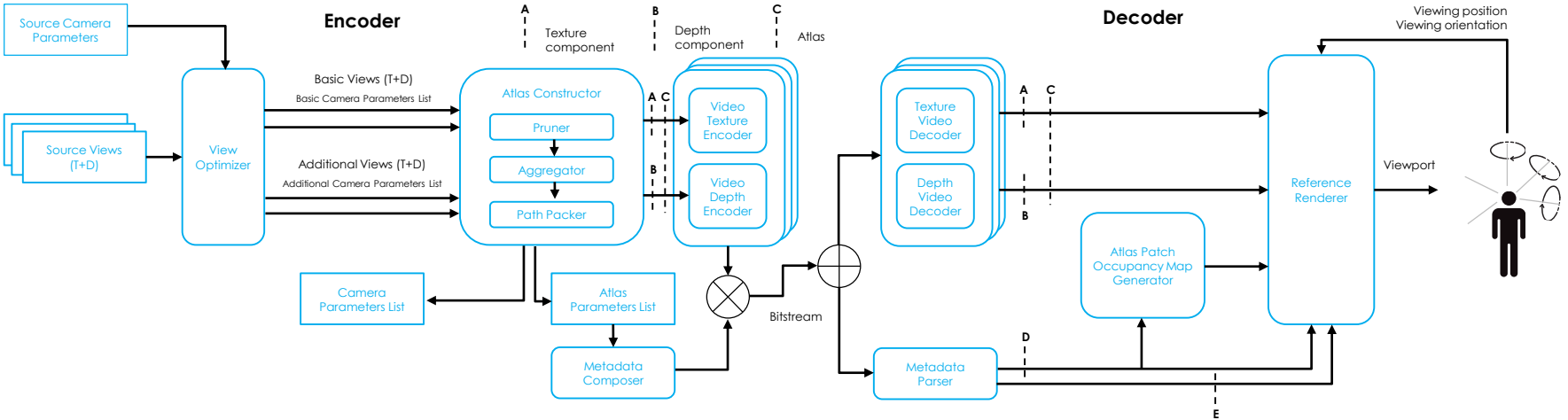
MPEG Metadata for Immersive Video Format: Full Workflow

Encoder

- From Multi-views + depth
- To input streams for compression

Decoder

- From decoded streams
- To device specific viewport



MPEG MIV encoder block diagram

MPEG MIV decoder block diagram

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View Interpolation

- View interpolation takes sparse information to create a smooth rendering of immersive content
- View interpolation is an important quality assessment point for the user

MIV Distribution Format: The Results

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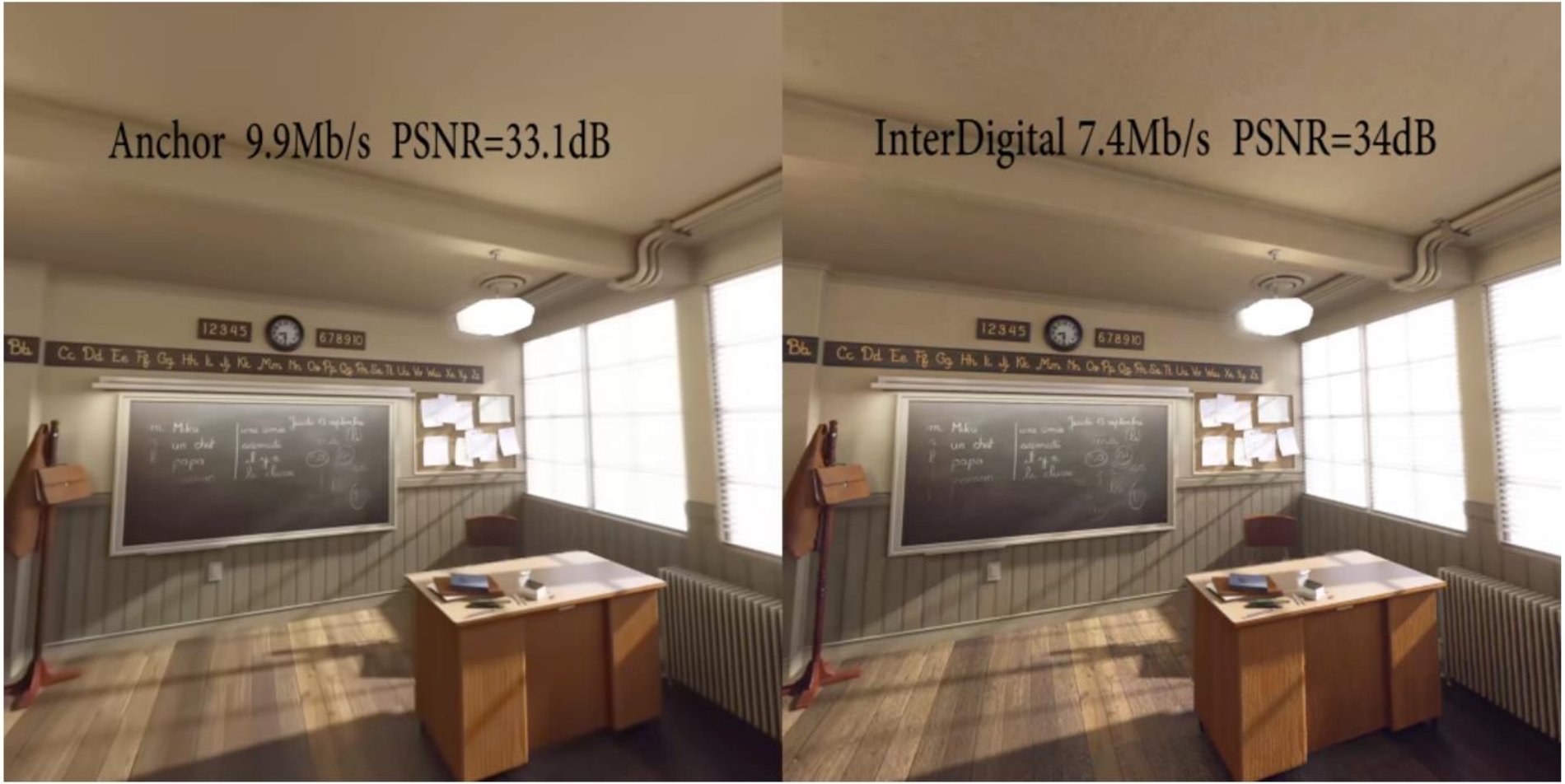
Anchor 9.9Mb/s PSNR=33.1dB
InterDigital 7.4Mb/s PSNR=34dB

Anchor 40Mb/s PSNR=32.1dB
InterDigital 37Mb/s PSNR=32.8dB

Adam Content,
Unity

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Unlocking the Potential of Volumetric Video

To achieve the benefits and opportunities of volumetric video we must:

- **Identify new content types** where volumetric essence is core
- **Develop editing tools** to ingest true volumetric content
- **Create deep-learning** solutions to scale content creation & unlock rendering technologies
- **Implement encoding and rendering tools** for the next generation of capture and display devices
- **Develop video formats & distribution solutions** that are adapted to diverse use cases and market timelines and show a path to extended immersive experiences