Volumetric Video: The “MPEG Metadata for Immersive Video” Distribution Format
Volumetric Video: Key Use Cases
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
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
How to Create Specific Volumetric Streams
The Encoder Pre-Processing Steps
Transforming Multi-Views and Depth Information into Video Streams

MULTI-VIEWS + DEPTH

Pruner Step: Remove redundancies between multi-views

Create patches from non-redundant information for each view

Packing Step: Create texture and depth atlas information for each frame

TEXTURE + DEPTH + METADATA streams to encode
Finding Redundancies Between Multi-Views

- The Pruner Step
- The Packing Step
Understanding the MPEG Metadata for Immersive Video (MIV) Distribution 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

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MPEG MIV encoder block diagram

MPEG MIV decoder block diagram
How to Render Volumetric Video
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
Anchor 9.9Mb/s  PSNR=33.1dB

InterDigital 7.4Mb/s  PSNR=34dB
What's Next for MPEG MIV Format and Volumetric Video?
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