Point Cloud Compression

MPEG’s First Standard for Immersive Media

Danillo Graziosi, Ph.D.
US Research Center
Sony Corporation of America
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Industry trends for immersive content

- **Video Tech.**
  - LDR, HDR
  - HD, Full HD, 4K, 8K
  - Stereoscopy

- **Point Cloud**
  - Easy to produce
  - High quality
  - Interactivity
  - Immersion
  - Geometric primitives

- **Gaming Tech.**
Point Cloud

A set of \textit{unordered} 3D points:
- (X, Y, Z)
- (R, G, B) or (Y, U, V)
- reflectance, transparency, ...

\begin{itemize}
  \item HD \@ 30fps $\rightarrow$ 1.5 Gbps (fixed viewpoint)
  \item 800,000 points \@ 30fps $\rightarrow$ 2.88 Gbps
\end{itemize}

Compression is required in order to make PC useful
Sport viewing with point clouds

360° background

3D objects

HoloLens Mixed Reality Capture

3 Gbps per object
Environment mapping for autonomous driving

~20 million points

- 2,020,734,515 bytes
Point Cloud Compression

MPEG initiated the work on PCC

In April 2017 MPEG issued a Call for Proposals

First Committee Draft issued in October 2018

9 technology leading companies responded and MPEG evaluated them in October 2017

V-PCC Video-based PCC

G-PCC Geometry-based PCC
Video-based Point Cloud Compression (V-PCC or ISO/IEC 23090-5)

Encoding 3D point clouds as a set of 2D videos: color, depth and occupancy map

100,000 points @ 30fps → 360 Mbps (uncompressed)
→ 1 Mbps (MPEG PCC 2018)
Geometry-based Point Cloud Compression (G-PCC or ISO/IEC 23090-9)

Encoding 3D point clouds in their native format

100,000 points @ 10 fps → 110 Mbps (uncompressed)

24 Mbps (lossless)
CONCLUSION

Novel capturing systems and interactive 3D viewing experiences are creating *new opportunities* for future networks and technologies.

*Point Cloud Compression* enables interactive high quality 3D content by providing manageable bitrates and also reducing requirements in creation, transmission and rendering of 3D content.

Furthermore, V-PCC leverages the *existing hardware and software* infrastructure for rapid deployment of new immersive experiences.

PCC provides a solid framework for the *convergence* between natural and *synthetic* 3D graphics.