

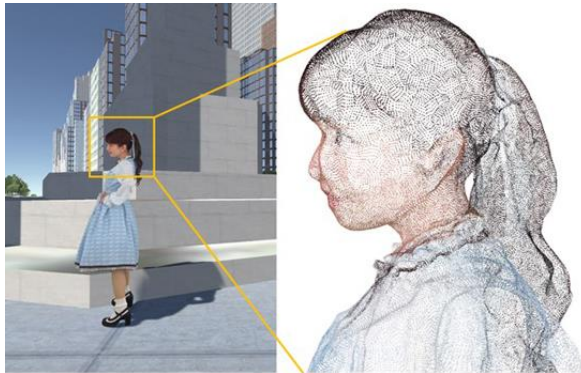
Video-base Point Cloud Compression and its Transmission for Future Television

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Two 3D object transmissions on different layers are introduced.

- Real-time transmission of 3D point cloud with V-PCC
- Cloud-based Holography Transmissions over Cable Systems

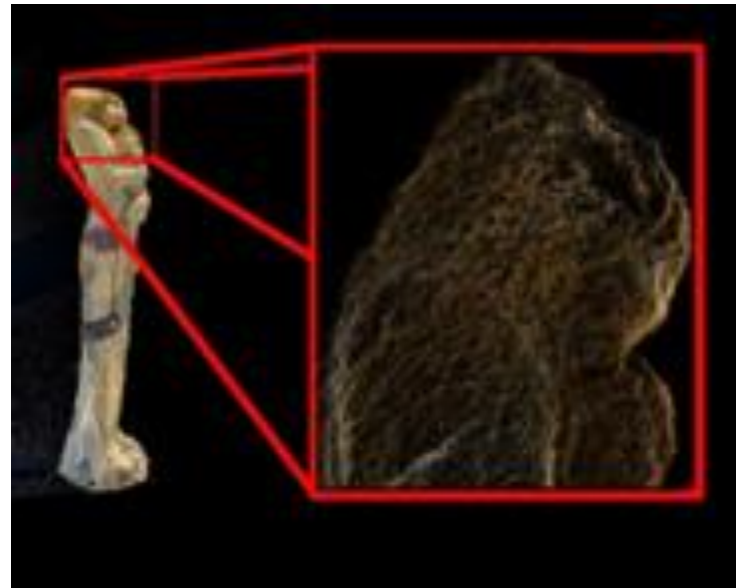


Real-time transmission of 3D point cloud with V-PCC

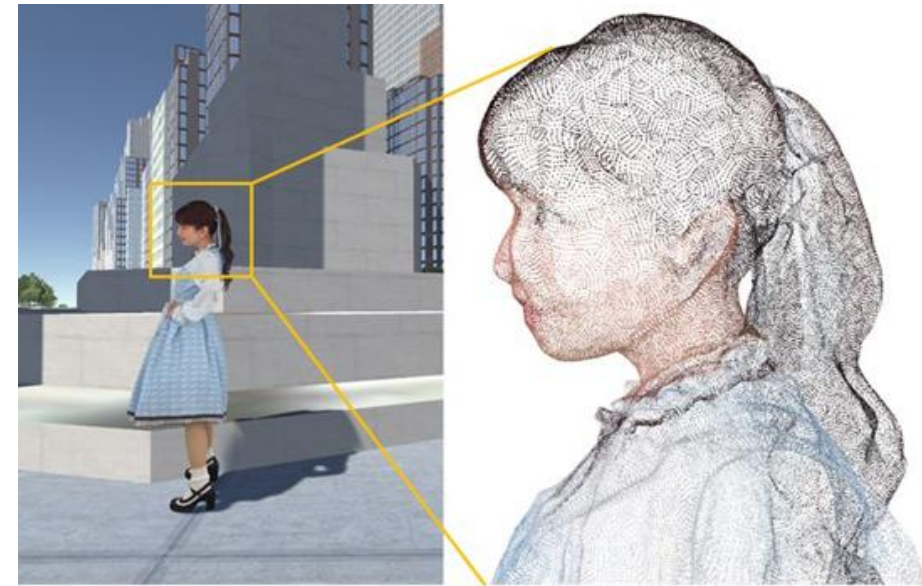
Many attractive use cases of 3D data are expected



3D free viewpoint sport replays broadcasting



Cultural heritage archive



3D immersive telepresence

Transmission of 3D data is challenging due to huge data amount.

- Point cloud is a representation format of 3D data as a set of points (position and color)
- Uncompressed data amount is very huge (more than 1 Gbps)



Example of point cloud

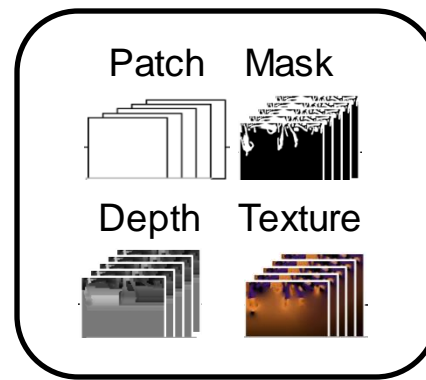
MPEG promotes standardization of video-based 3D compression

- Key ideas of video-based point cloud compression (V-PCC) are
 - Projection from 3D point clouds onto 2D images, and
 - Rapid implementation by applying 2D video compression technology
- MPEG developed V-PCC in 2020.



Point cloud

Projection onto
2D videos



2D videos as defined by V-PCC

2D video coding
(HEVC etc.)

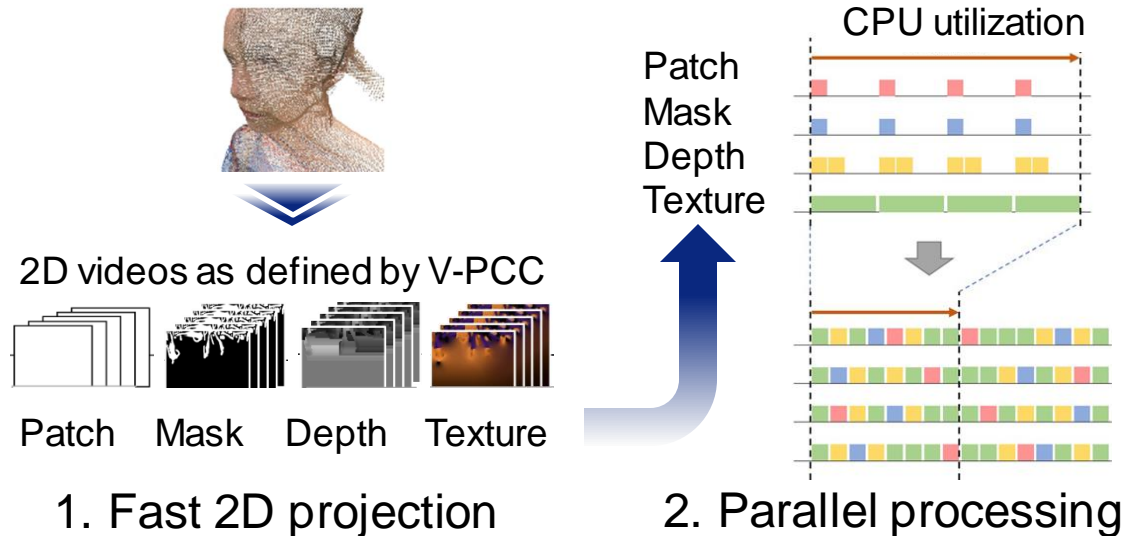


Compressed 2D videos

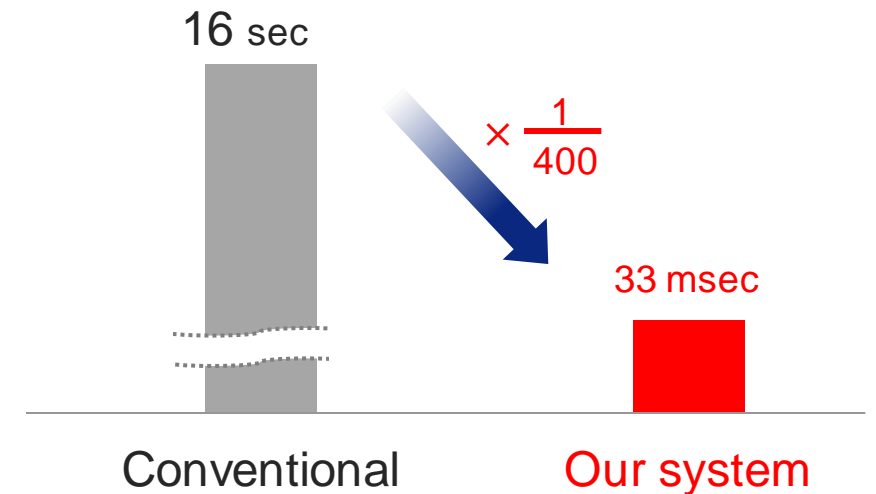
We successfully achieved real-time compression of 20 million points/second (1 Gbps)

1. Fast projection of point clouds onto the same format as 2D video
2. Improved CPU utilization with parallel processing suitable for V-PCC

Proprietary high-speed processing



Compression processing time



Comparison between the original and V-PCC

Original (1Gbps)



PCC (25Mbps)



Decoder on a smartphone



Objective

Implementation and optimization of V-PCC codec and demonstration of real-time transmission.

Challenge

Fast 2D projection and parallelization of V-PCC enable processing of 2 million points/second.

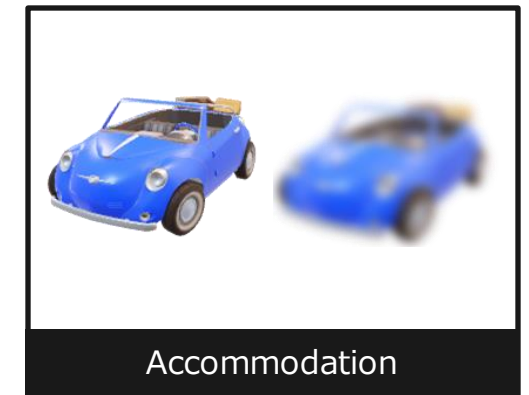
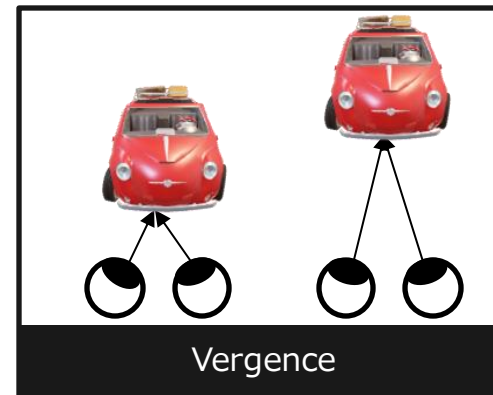
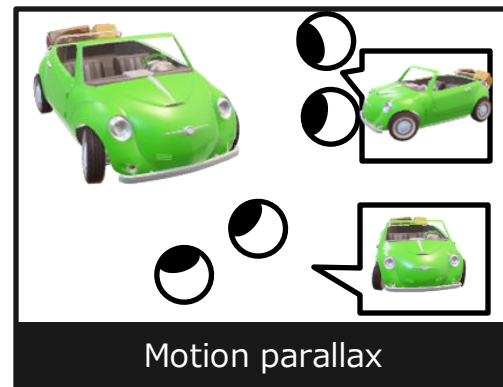
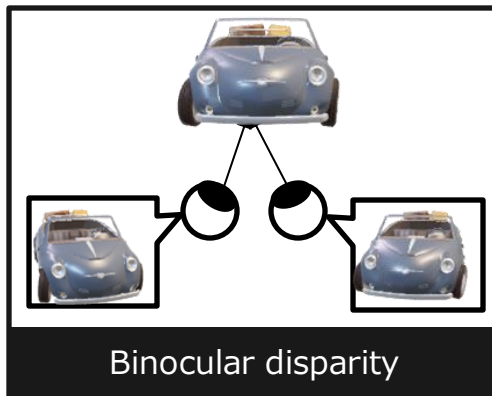
Future

Set-top-box is a new target of immersive experience via V-PCC.

Cloud-based Holography Transmissions over Cable Systems

Computer generated holography can provide ultra-high realistic 3D experience

- Holography satisfies all the cues of human depth perception.
- It avoids adverse effects for user;
 - Eye fatigue,
 - the conflict between convergence and accommodation.



Human depth perception cues

Computer generated holography can enrich the experience of remote communication

Work style



Remote collaboration on design / discussion

Remote communication using 3D images that make you feel like you're next to someone

Education



Immersive e-learning

Immersive e-learning opportunities through 3D images that are safe for children

Healthcare

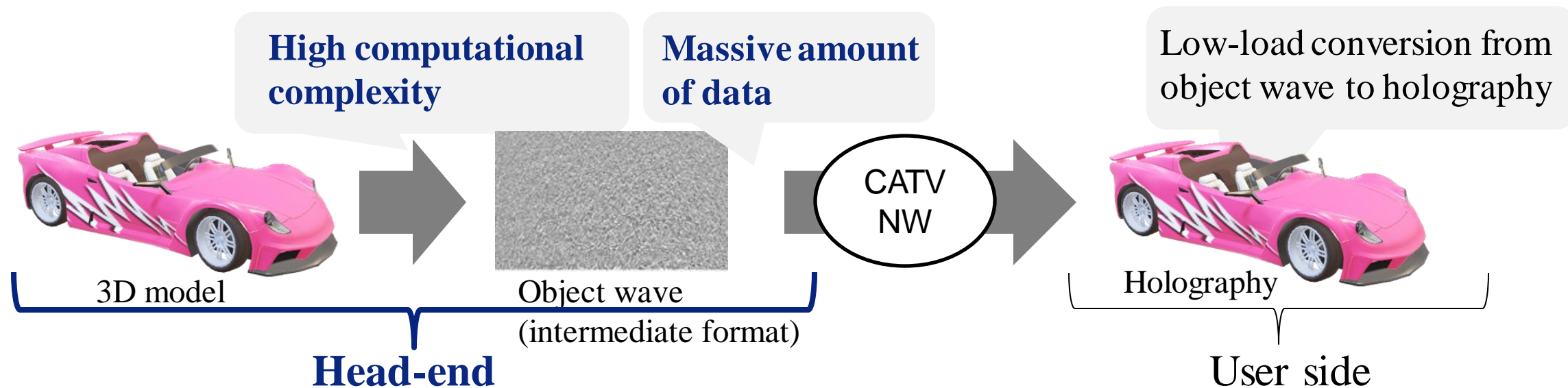


Telemedicine

Remote surgery with intuitive and accurate 3D images

The key feature of proposal is taking advantage of CATV head-end for holography transmissions

- Holography reproduction involves high computational load and massive data
- The solution for user-side reproduction is "object wave" as an intermediate format



New recommendation is expected to accelerate practical communication service based on holography

- Holography is a promising technology for visual experiences in the Beyond 5G era
- Holography is expected to realize several remote communication with realistic user experience
- Challenges for realizing the remote communication are clarified
 - Massive amount of data
 - Computational complexity
- Implementation on cable systems
 - Head-end system
 - Cable network system
 - User equipment

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