

Immersive Video

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Light Fields:
Directional light

6DoF-VR: image-based Free Navigation

3DoF+

Omnidirectional-6DoF

Windowed-6DoF

Dense Light Fields

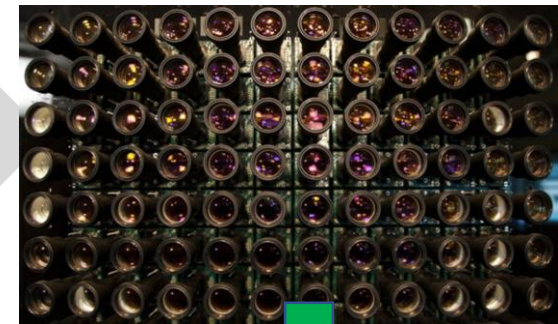
Panorama
+ depth



Multiview
+ depth
15-30 Mbps
& RoI
streaming



Multiview
(+ depth)



100-300 Mbps

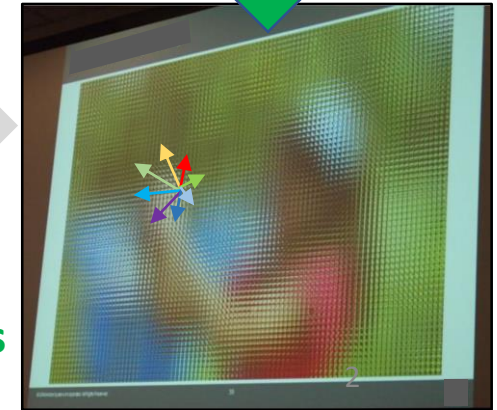
Challenges:

- Depth estimation
- View synthesis
- **DIBR compression**



Challenge:

- **Gigantic # views**
- **Compression**



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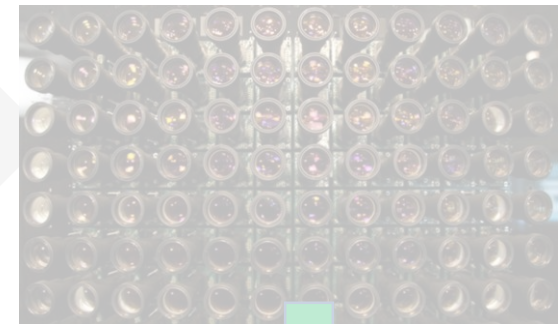
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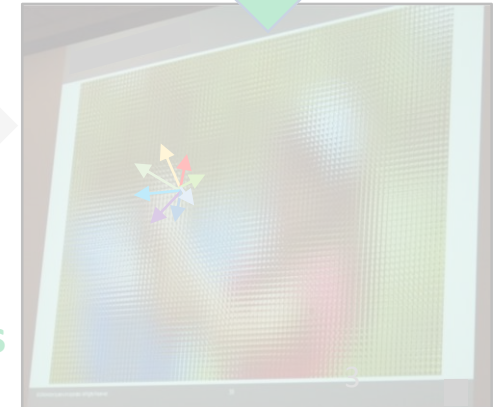
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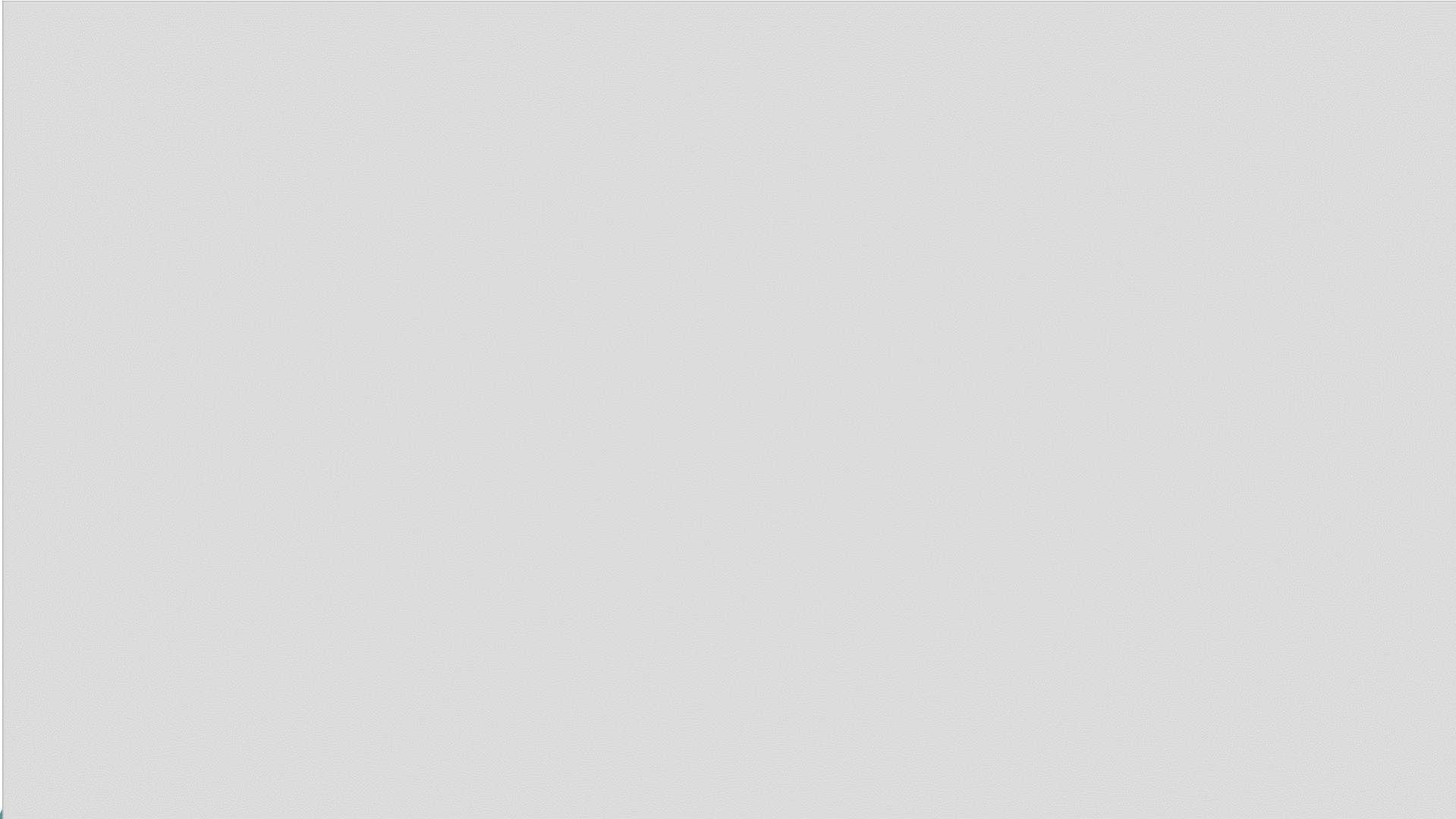
Omnidirectional, 3DoF+/6DoF: Parallax and occlusion handling



4 fisheye cameras, extract depth out of 2 or 3, and synthesize a virtual view to get stereoscopic viewing (Multiview + depth)

Hong Shiang Lin, Ming Ouhyoung: Graphics Group, Communications & Multimedia Laboratory, National Taiwan University, 2017

Fraunhofer IIS: Image-based parallax on GPU shaders



**Less than ten
views and
depth map**

Windowed-6DoF: Image-based (two views)

Synthesize a
virtual view
from 2 views by
shifting pixels
by their depth,
2 Mpix

Challenge:
Occlusions
when large
movements
→ Inpainting is
needed



6DoF Point Cloud/Mesh-based

**500 camera views to
extract a proper point
cloud in pre-processing**

**2.4 million vertices,
500 MB uncompressed**



Poznan University of Technology: Fencing, image-based

From 5 pairs of
cameras
synthesize a
virtual view,
2 Mpix

Poznań Fencing virtual view synthesis



Chair of Multimedia Telecommunications and Microelectronics,
Poznań University of Technology, Poznań, Poland



More cameras & pre-processing: point clouds and meshes

Augmented reality: Holoportation with meshes



Meshes from hundreds of cameras



Dense Light Fields

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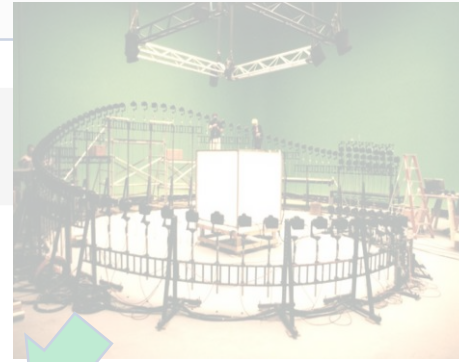
Windowed-6DoF

Dense Light Fields

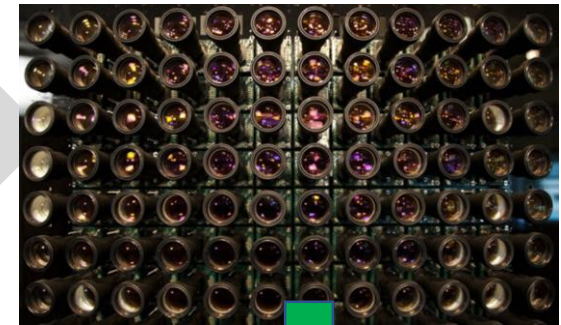
Panorama
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Multiview
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15-30 Mbps
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Multiview
(+ depth)



100-300 Mbps

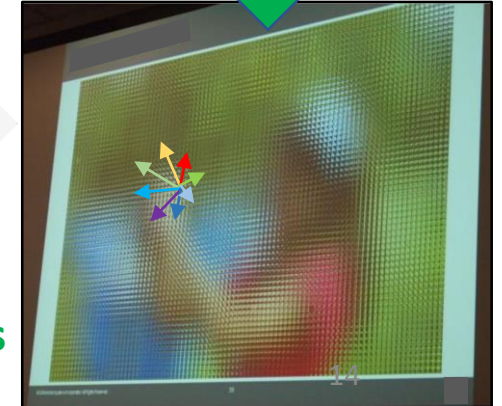
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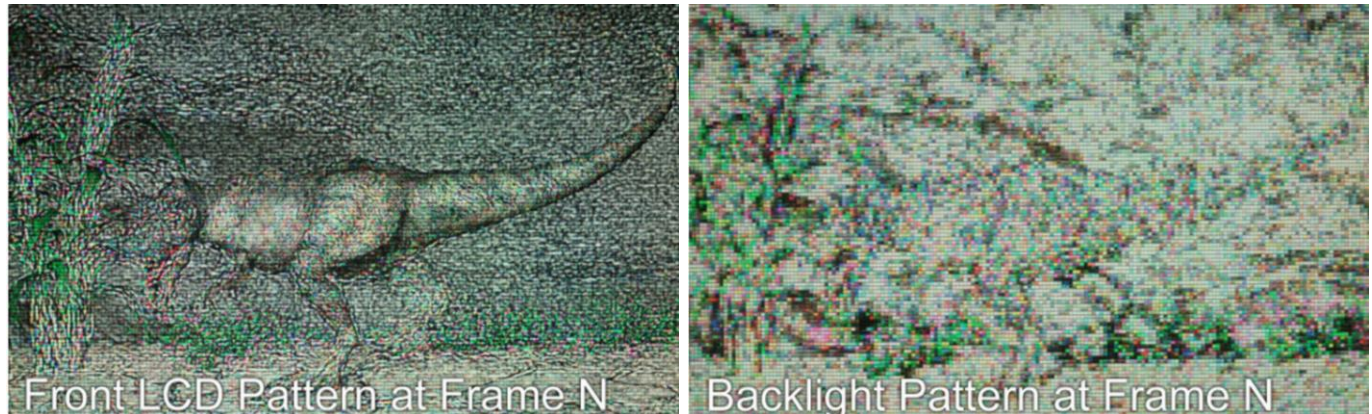
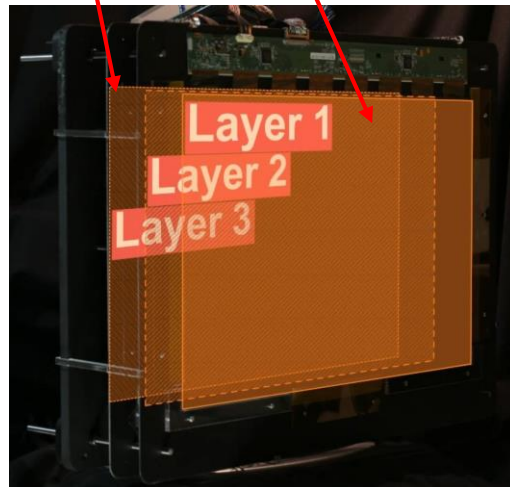
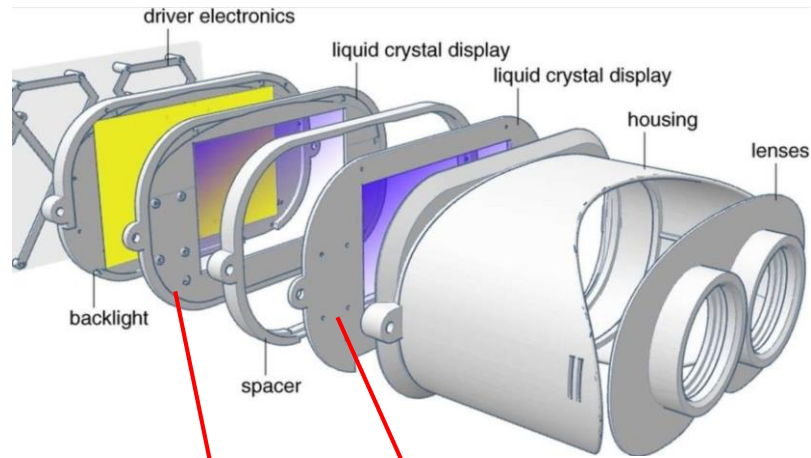


Light Field display with correct eye accommodation

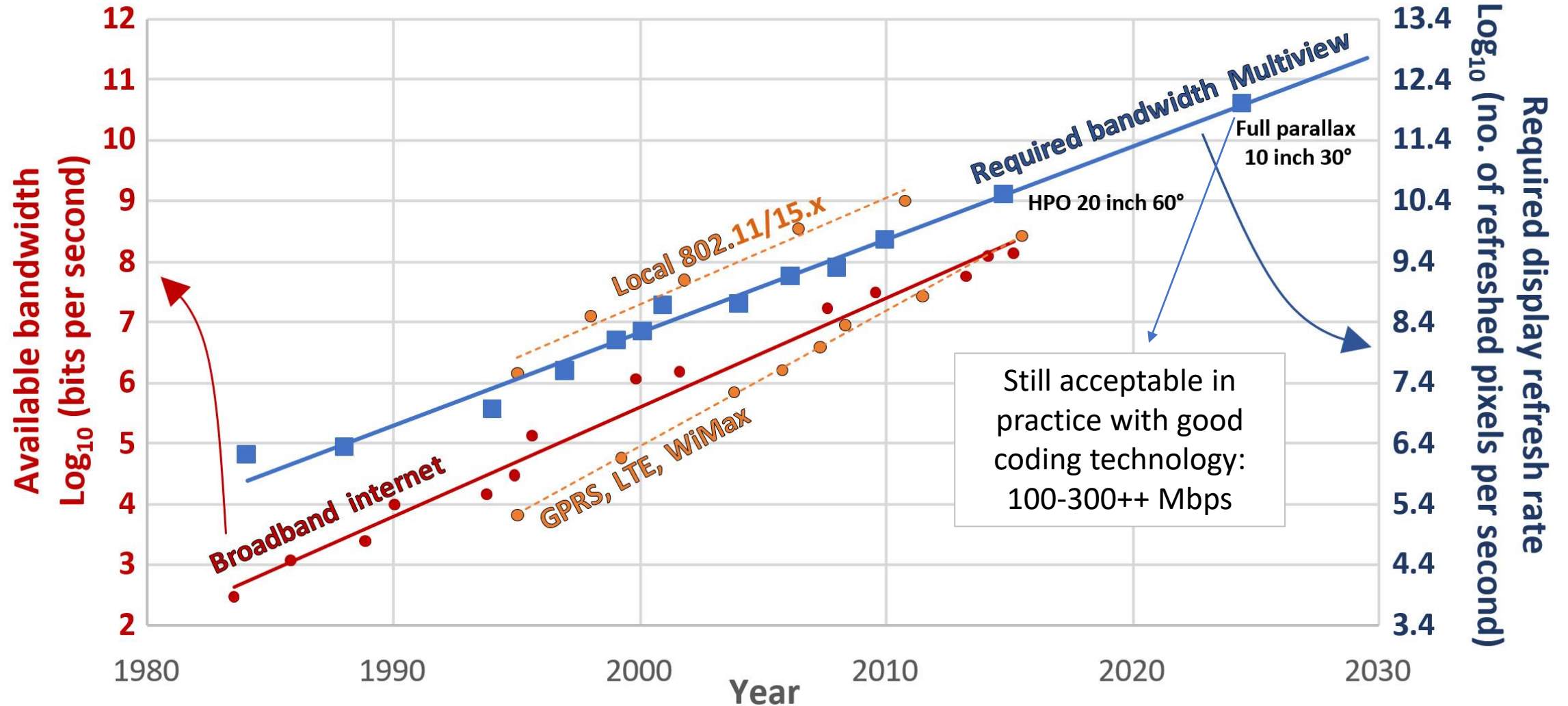


F.C. Huang, et al., "The Light Field Stereoscope: Immersive Computer Graphics via Factored Near-Eye Light Field Displays with Focus Cues," Siggraph 2015

Continuum between VR-HMD and goggle-free 3D displays



High bandwidth requirements for Dense Light Fields



A. Hinds, D. Doyen, P. Carballeira, G. Lafruit, "Toward the realization of 6DoF with compressed Light Fields", ICME 2017

Conclusions: image-based VR

- Small number of cameras (<10):
 - Restricted 6DoF @ 15-30 Mbps (if all views instantaneously transmitted)
- Large number of cameras (>100):
 - 6DoF with point clouds @ 15 Mbps (per object)
 - A lot of pre-processing to create the point cloud
- Large number of cameras (>100):
 - Glasses-free VR with Light Field displays
 - 100-300++ Mbps