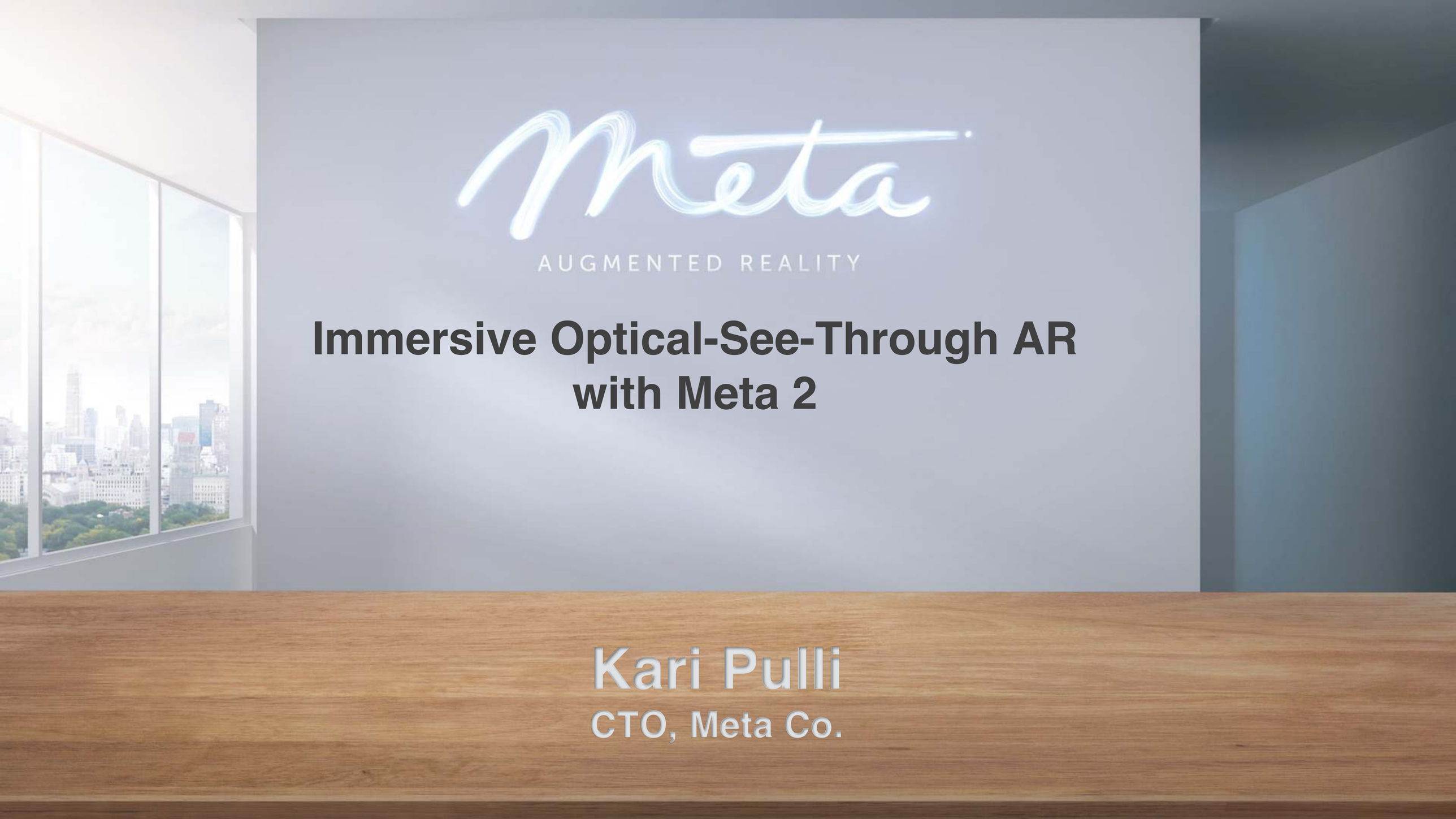
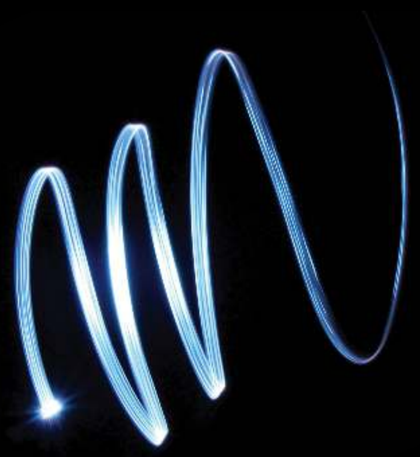


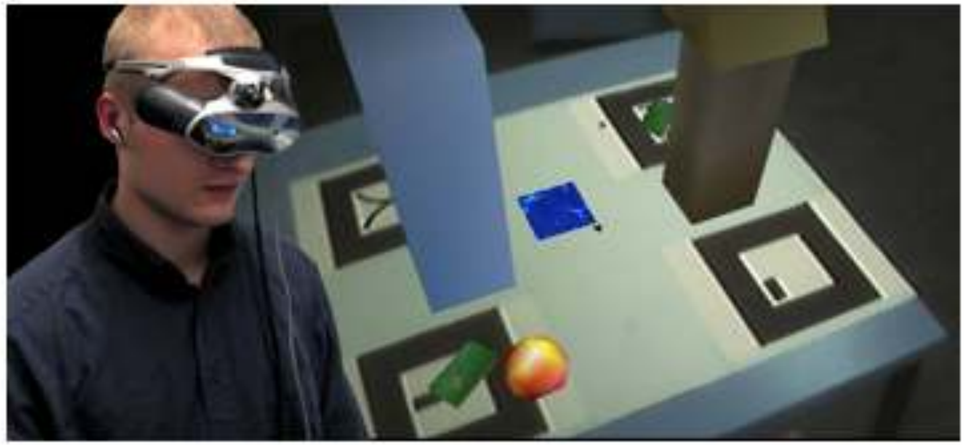
Immersive Optical-See-Through AR with Meta 2

Kari Pulli
CTO, Meta Co.

AR at Nokia (2000)



AUGMENTED REALITY



Augmented Reality enables

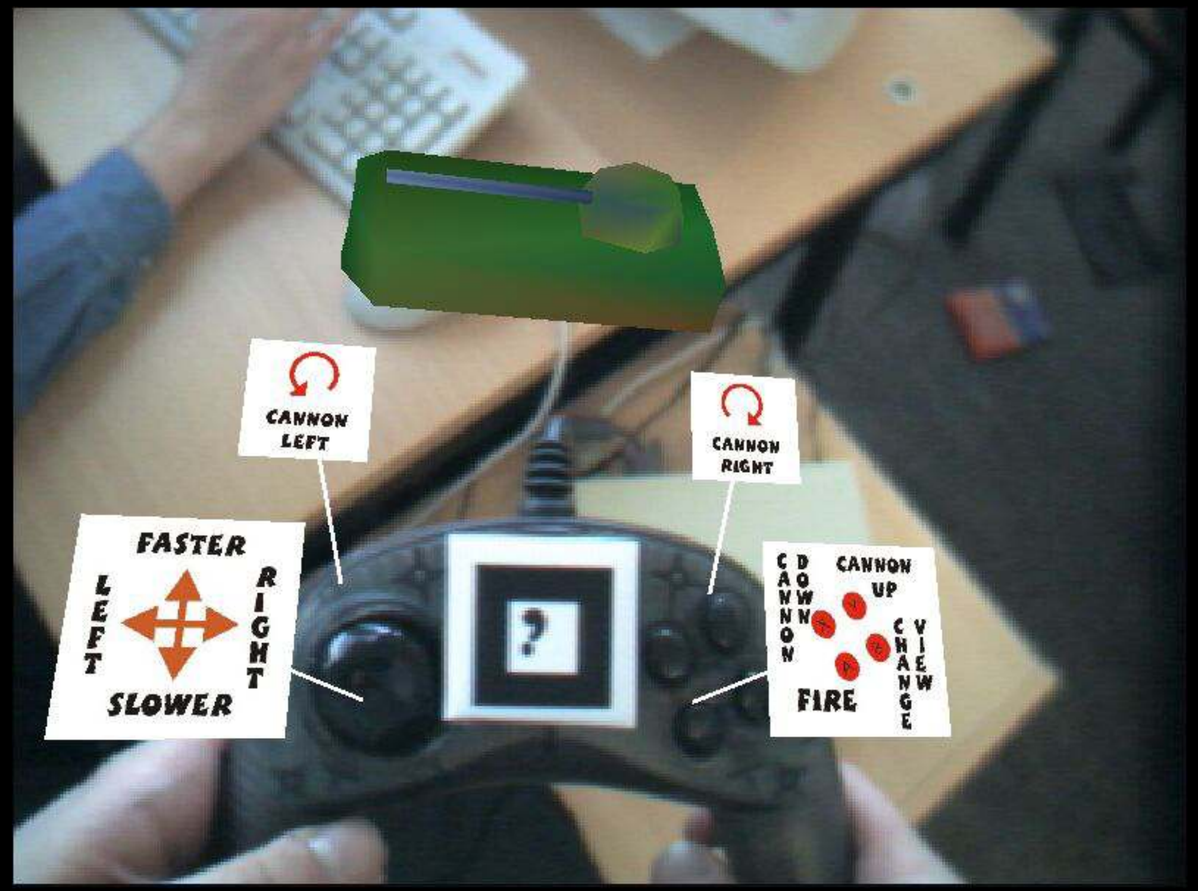
- annotating, adding to, and modifying
- user's impressions of real world
- with computer generated imagery

- Key technologies
  - *tracking* real objects
  - *generating* synthetic images
  - *mixing* the two

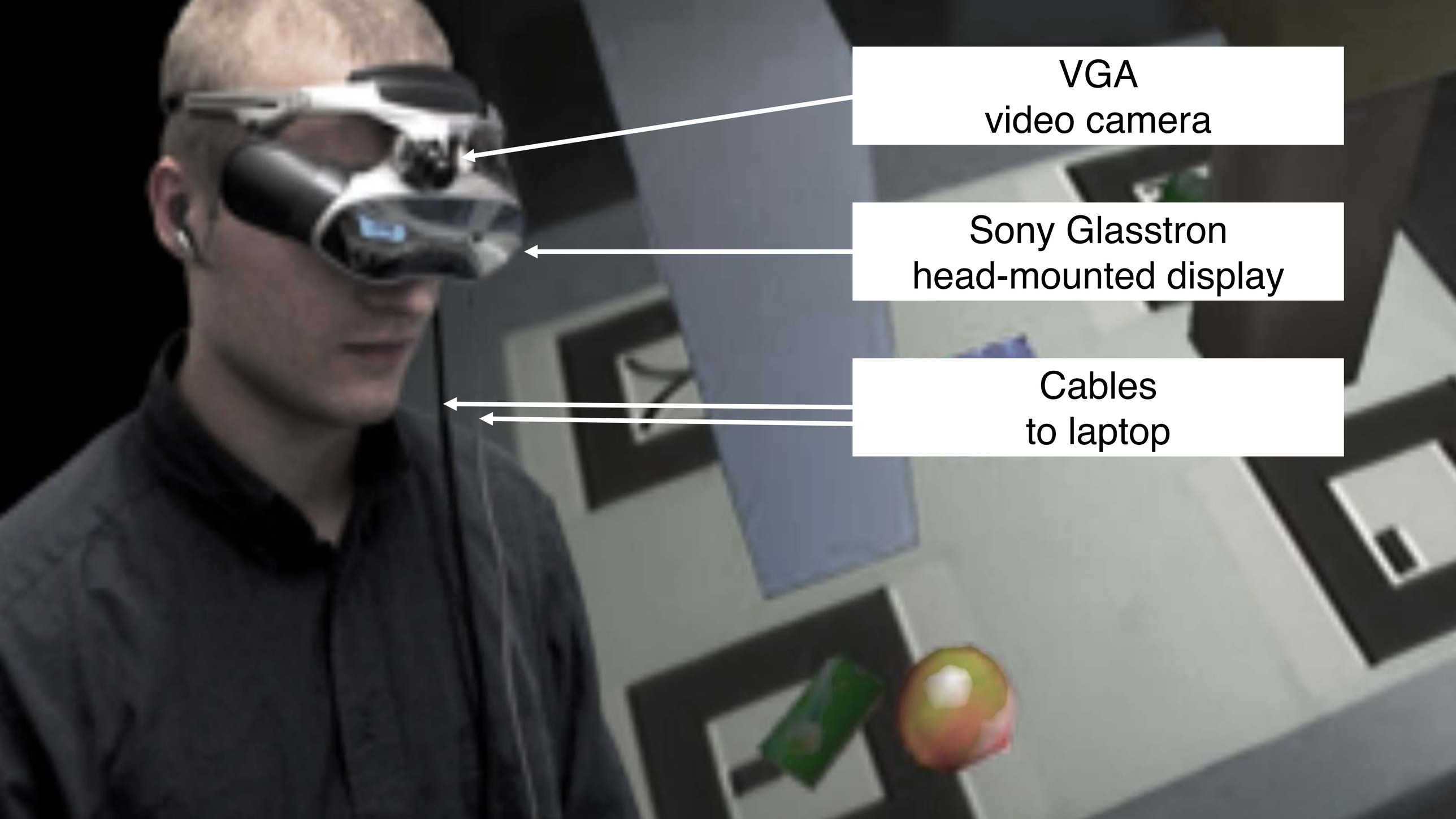
"Browsing Tomorrow" - Technology Day

RTA
Research and
Technology Access

AR at Nokia (2000)

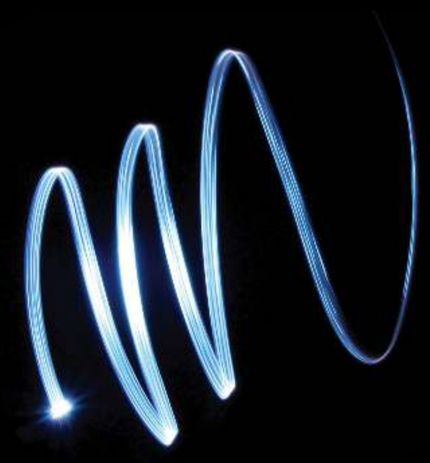


AR at Nokia (2000)


VGA
video camera
Sony Glasstron
head-mounted display
Cables
to laptop

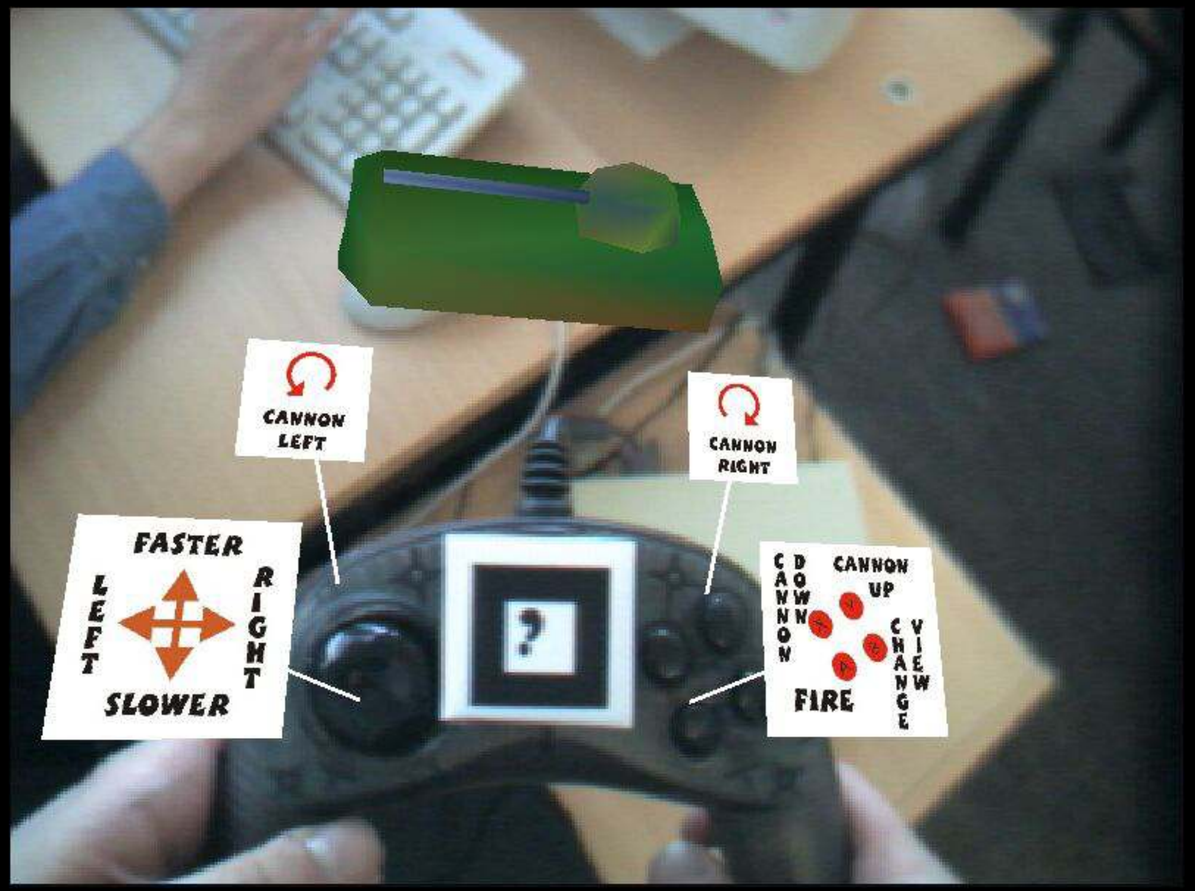
Video-See-Through AR

- Use a VR (occluding) display
  - Camera captures image
  - Analyze image
  - Draw graphics
  - Display both the capture background and the graphics



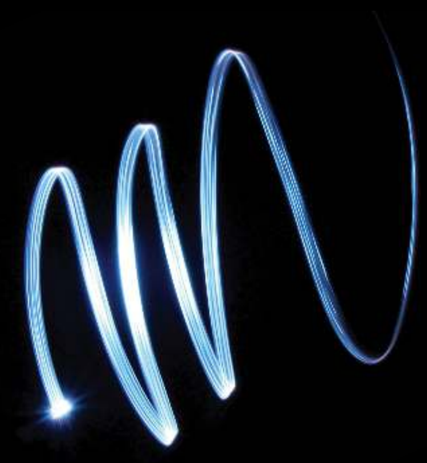
Video-See-Through AR: Benefits

- Accurate overlays
- Full occlusion



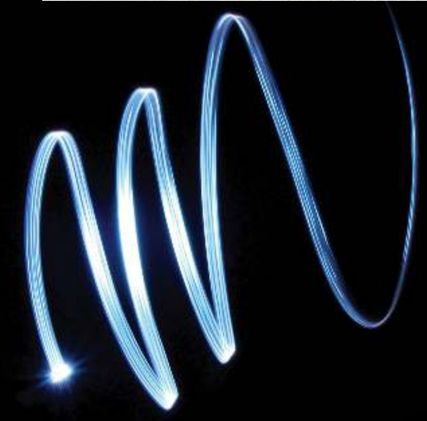
Video-See-Through AR: Problems

- Camera and display resolution



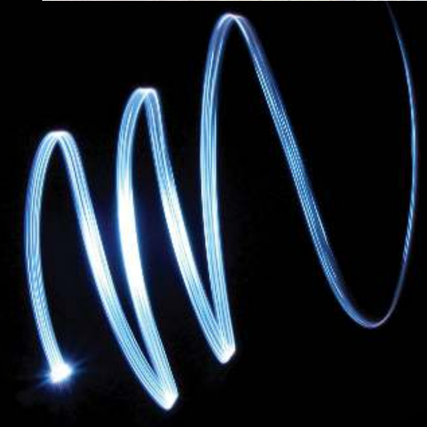
Video-See-Through AR: Problems

- Camera and display resolution, dynamic range



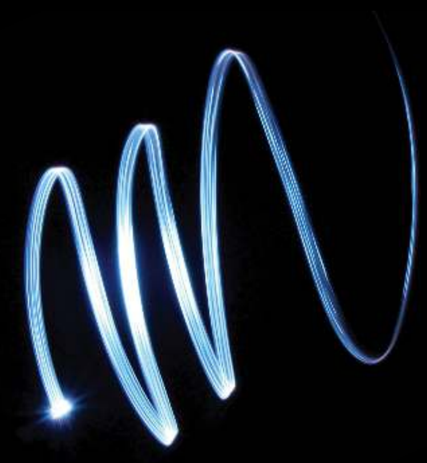
Video-See-Through AR: Problems

- Camera and display resolution, dynamic range, (motion) blur



Video-See-Through AR: Problems

- Camera and display resolution, dynamic range, (motion) blur
- Latency (= delay)



Video-See-Through AR: Problems

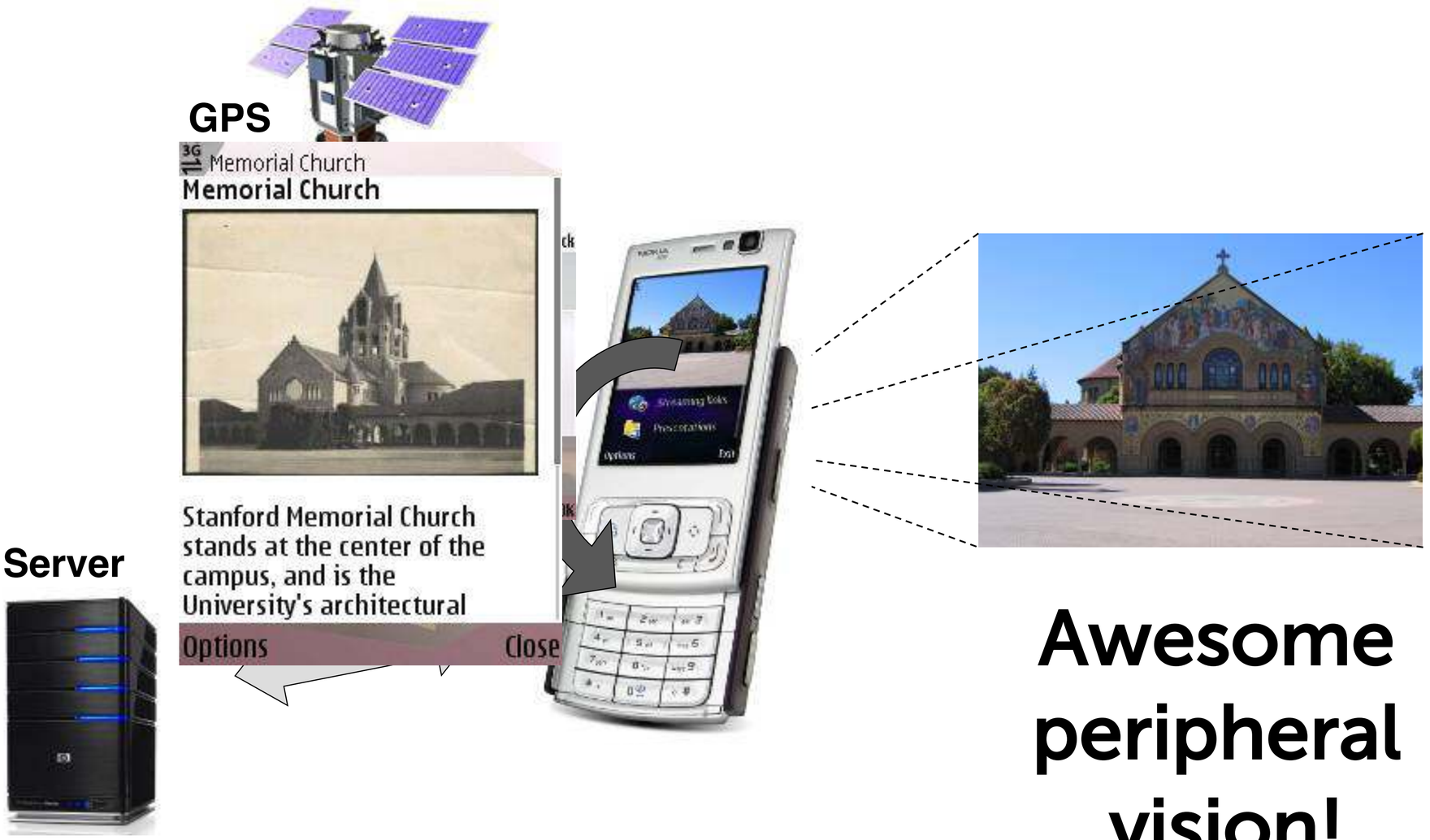
- Camera and display resolution, dynamic range, (motion) blur
- Latency -> motion sickness

Video-See-Through AR: Problems

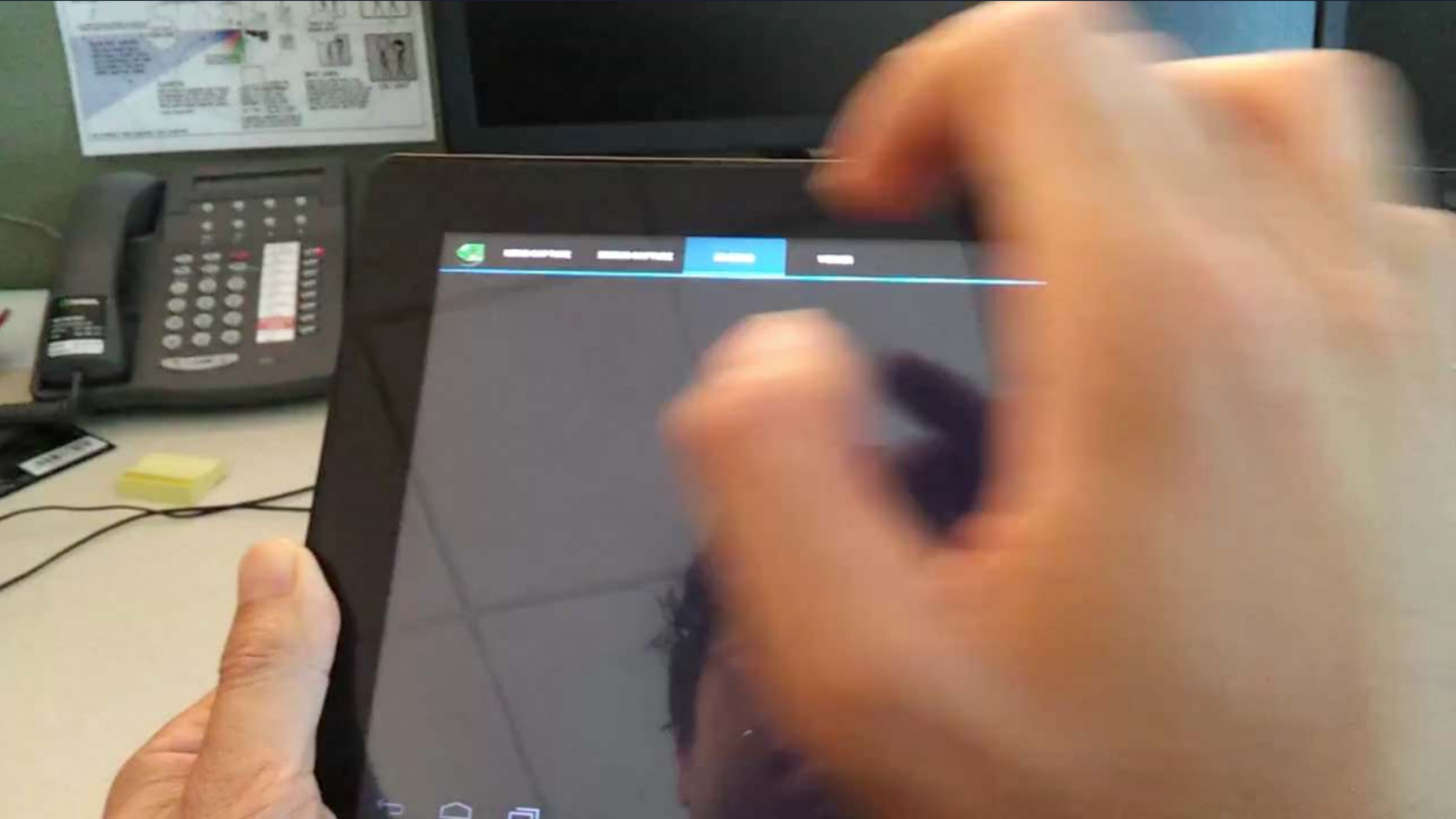
- Camera and display resolution, dynamic range, (motion) blur
- Latency -> motion sickness
- No eye contact -> not social
- Camera viewpoint is not the eye viewpoint
- Loss of peripheral vision

Augmenting Information

System Overview



Awesome peripheral vision!



Prototype: 2012

Meta 1: 2014

Wide FOV
High Resolution
Direct Manipulation
Natural Collaboration
Clarity within 1.5m

2017 Meta @AWE. Confidential & Proprietary.

Wide FOV	90 degrees
High Resolution	
Direct Manipulation	
Natural Collaboration	
Clarity within 1.5m	

2017 Meta @AWE. Confidential & Proprietary.

Wide FOV	90 degrees
High Resolution	2.5K Display
Direct Manipulation	
Natural Collaboration	
Clarity within 1.5m	

2017 Meta @AWE. Confidential & Proprietary.

Wide FOV	90 degrees
High Resolution	2.5K Display
Direct Manipulation	✓
Natural Collaboration	
Clarity within 1.5m	

2017 Meta @AWE. Confidential & Proprietary.

Wide FOV	90 degrees
High Resolution	2.5K Display
Direct Manipulation	✓
Natural Collaboration	✓
Clarity within 1.5m	

2017 Meta @AWE. Confidential & Proprietary.

Wide FOV	90 degrees
High Resolution	2.5K Display
Direct Manipulation	✓
Natural Collaboration	✓
Clarity within 1.5m	✓

2017 Meta @AWE. Confidential & Proprietary.

Meta 2: 2017

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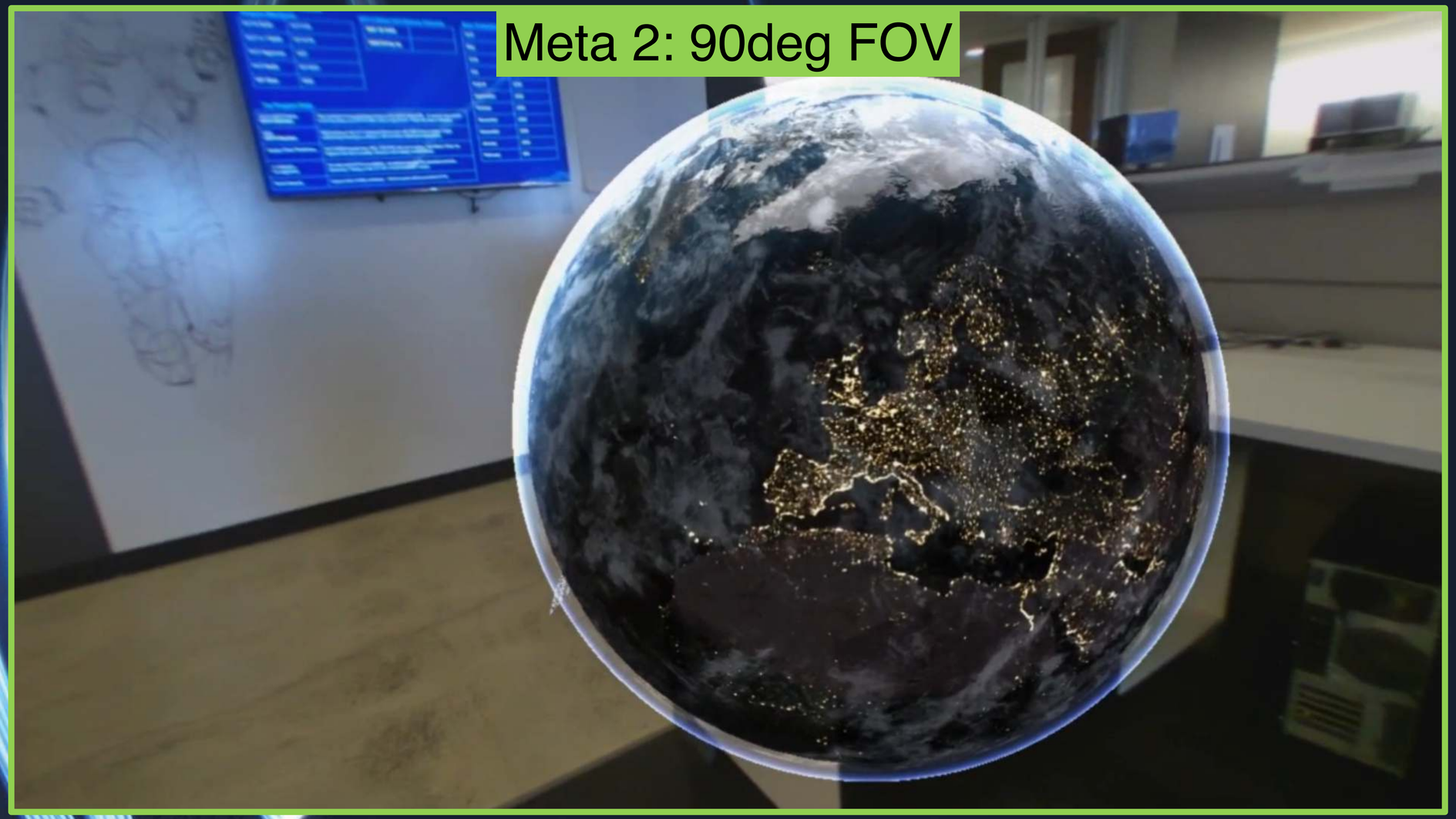
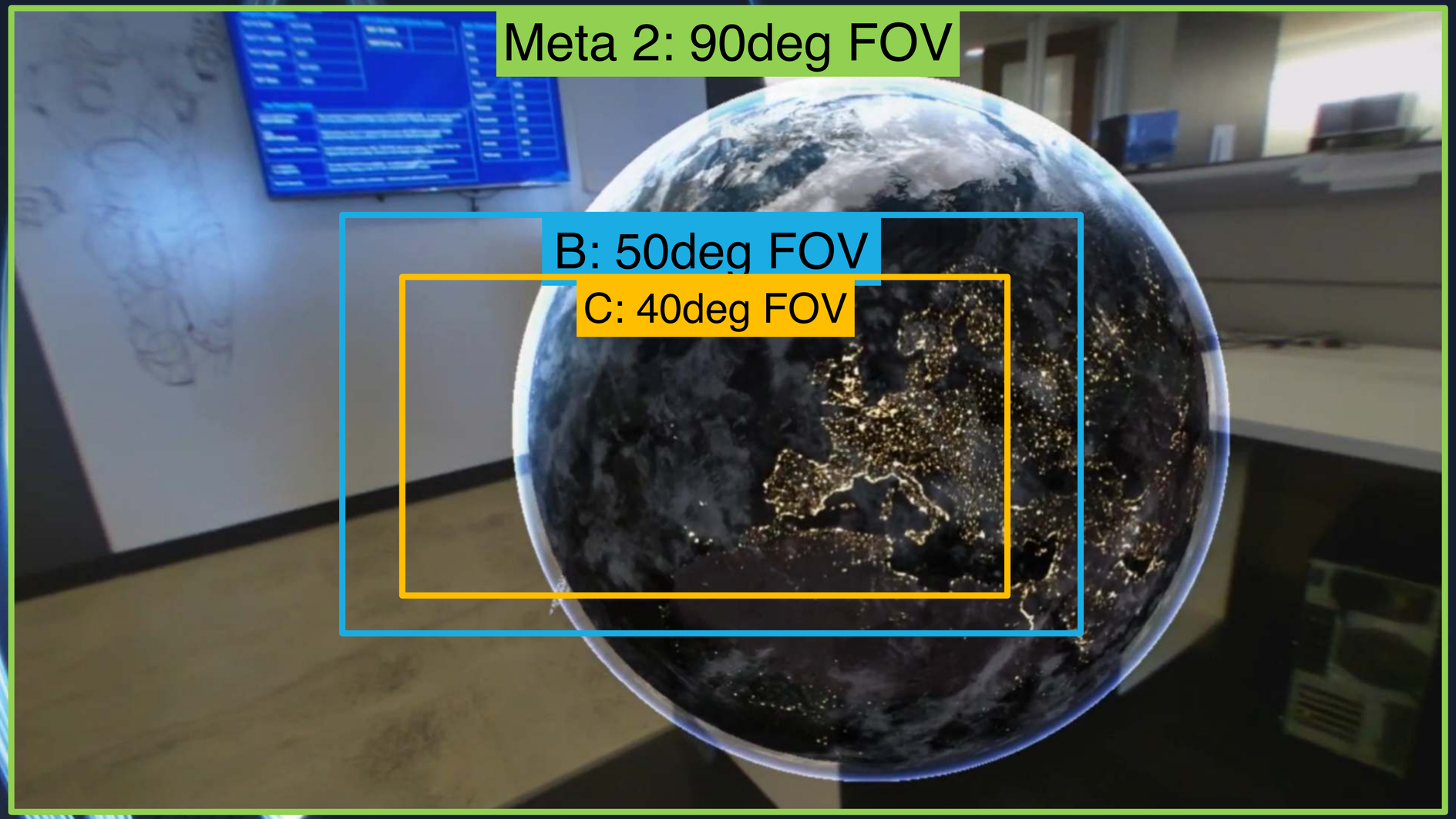
Huge Field of View



Huge Field of View

Huge Field of View

Huge Field of View



metavision.com

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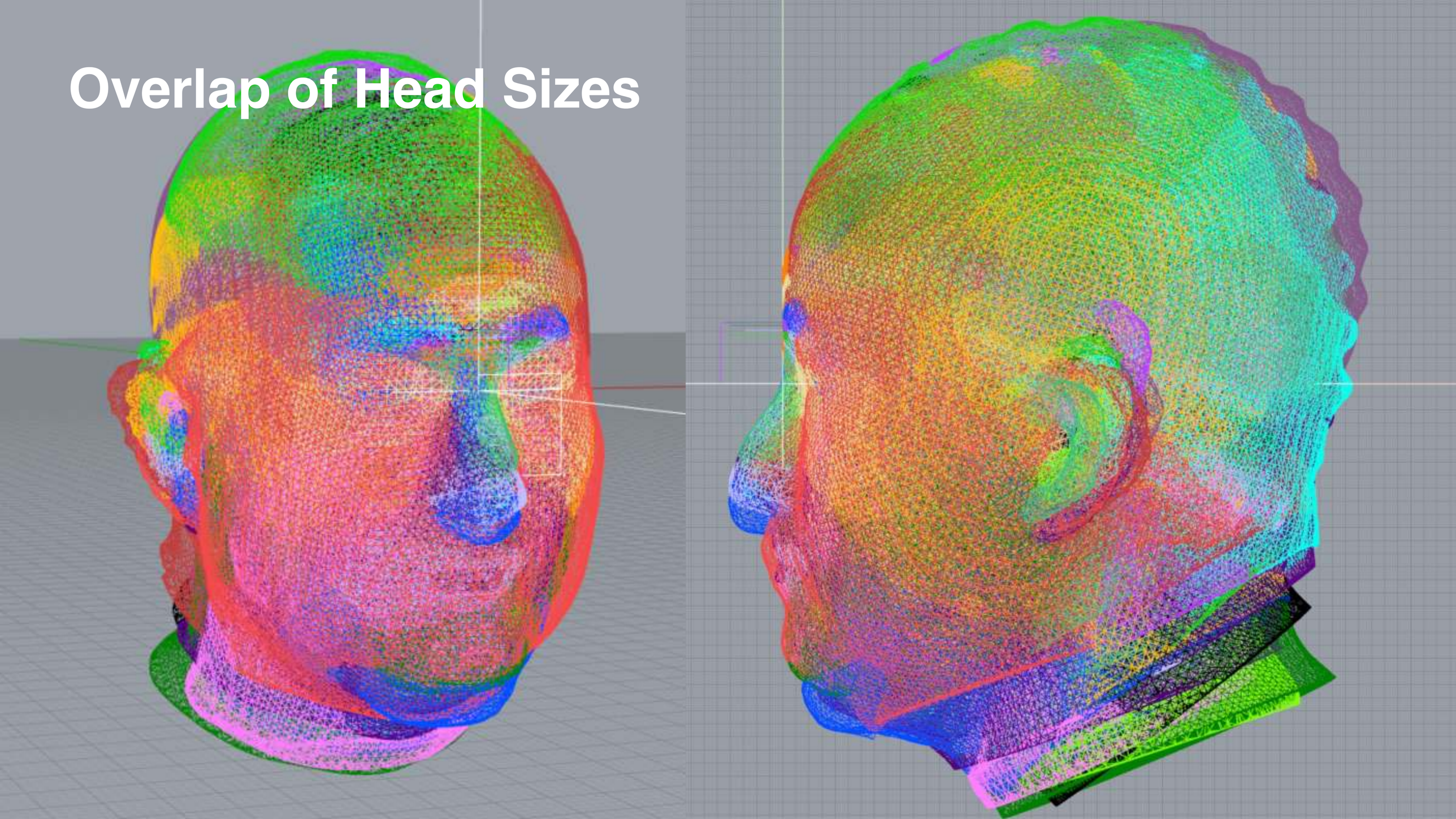
Designed for Ergonomics

“Meta is the only AR headset I’ve ever worn that didn’t feel like it was slipping down my face”

- Adi Robertson, The Verge

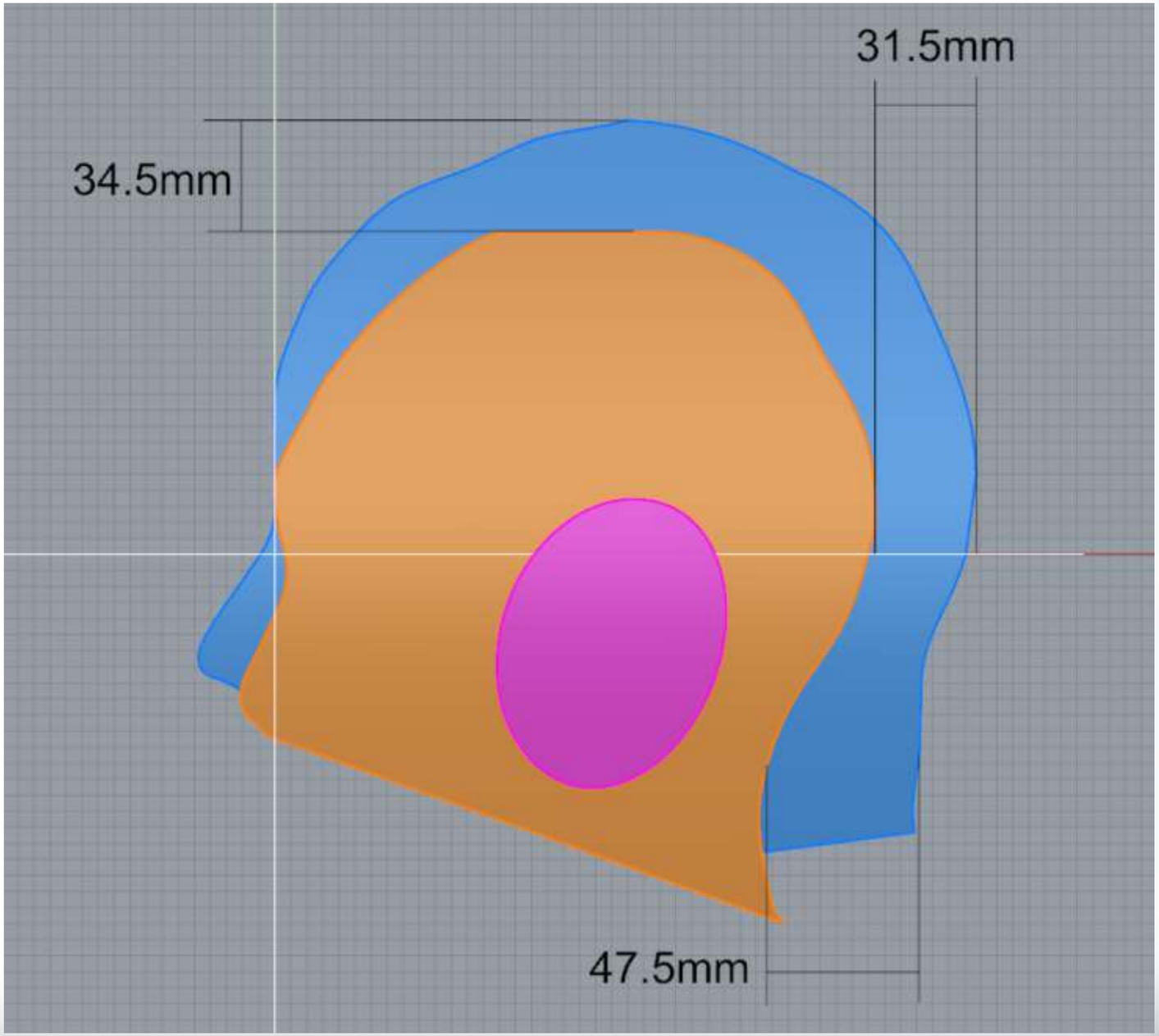
Meta
AUGMENTED REALITY

Overlap of Head Sizes

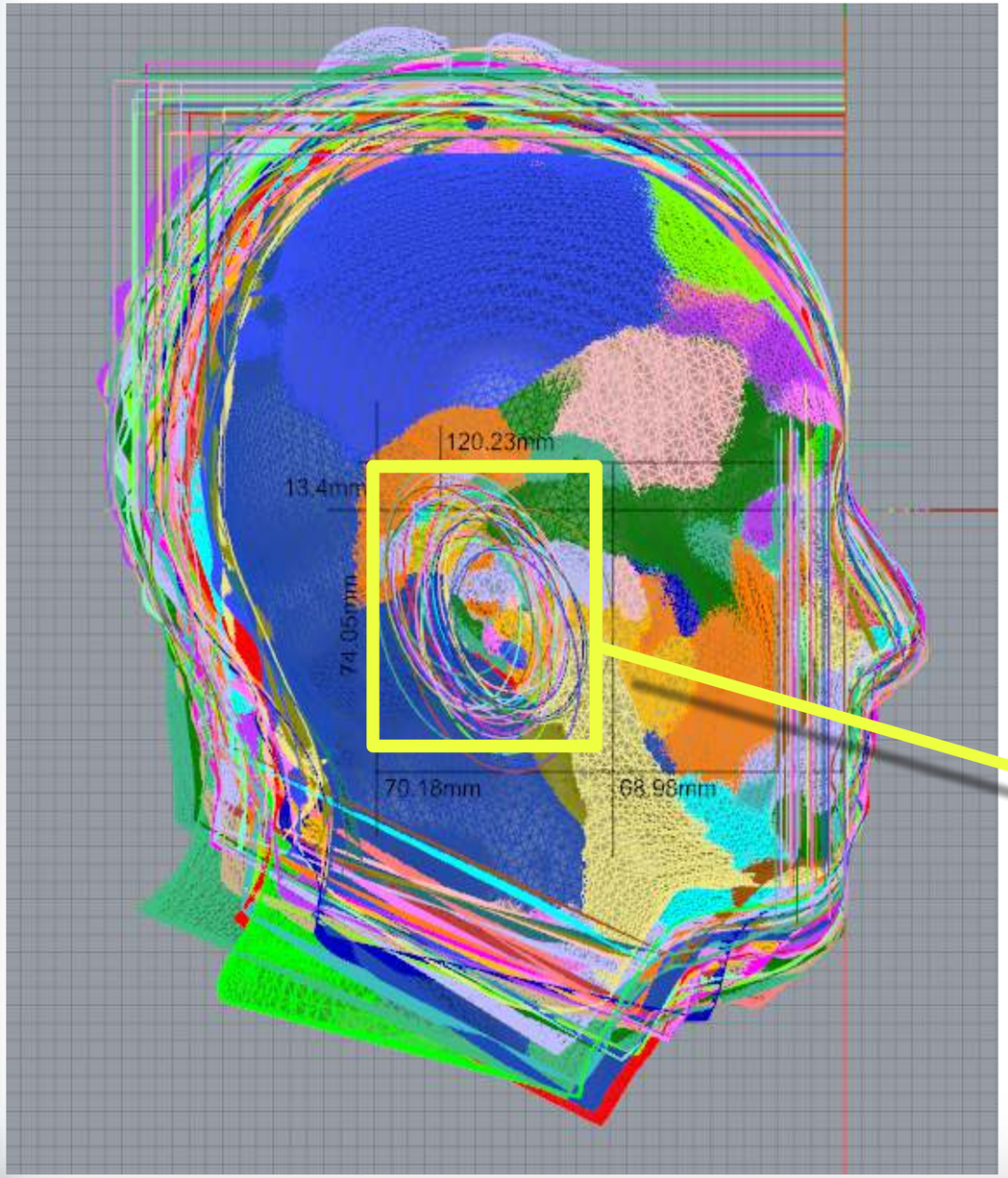


Designed to Fit

- Range of adjustability
- Innermost smallest
- Outermost largest
- Ear keep-out zone

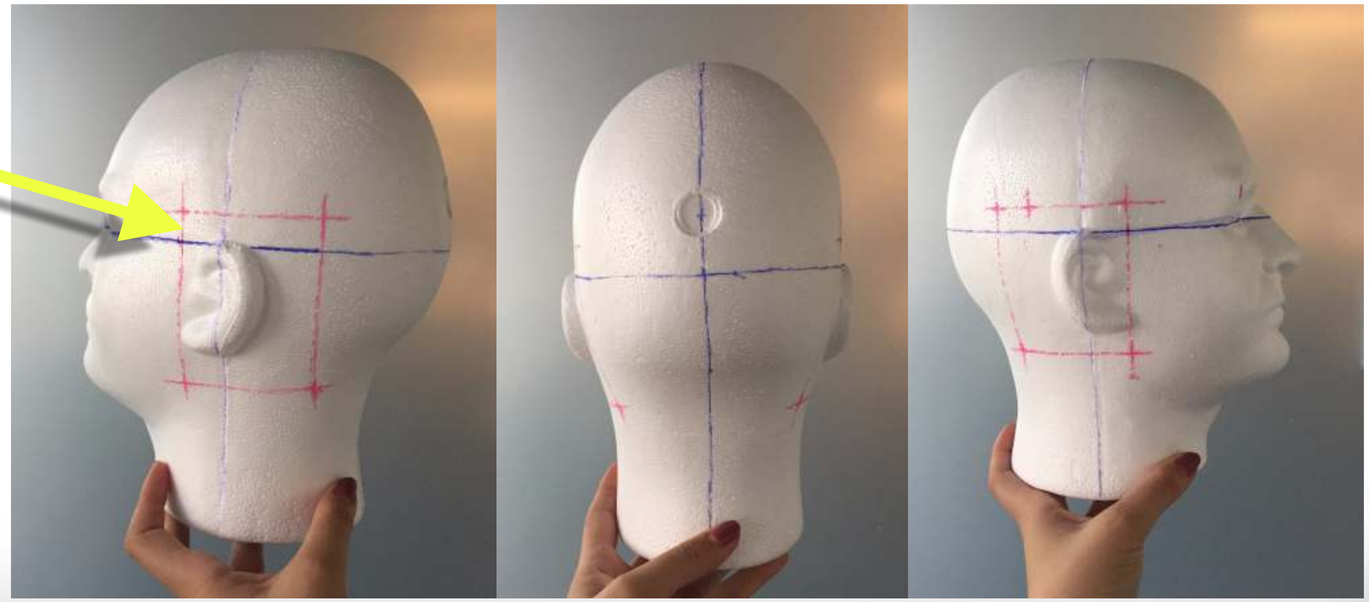


Meta
AUGMENTED REALITY

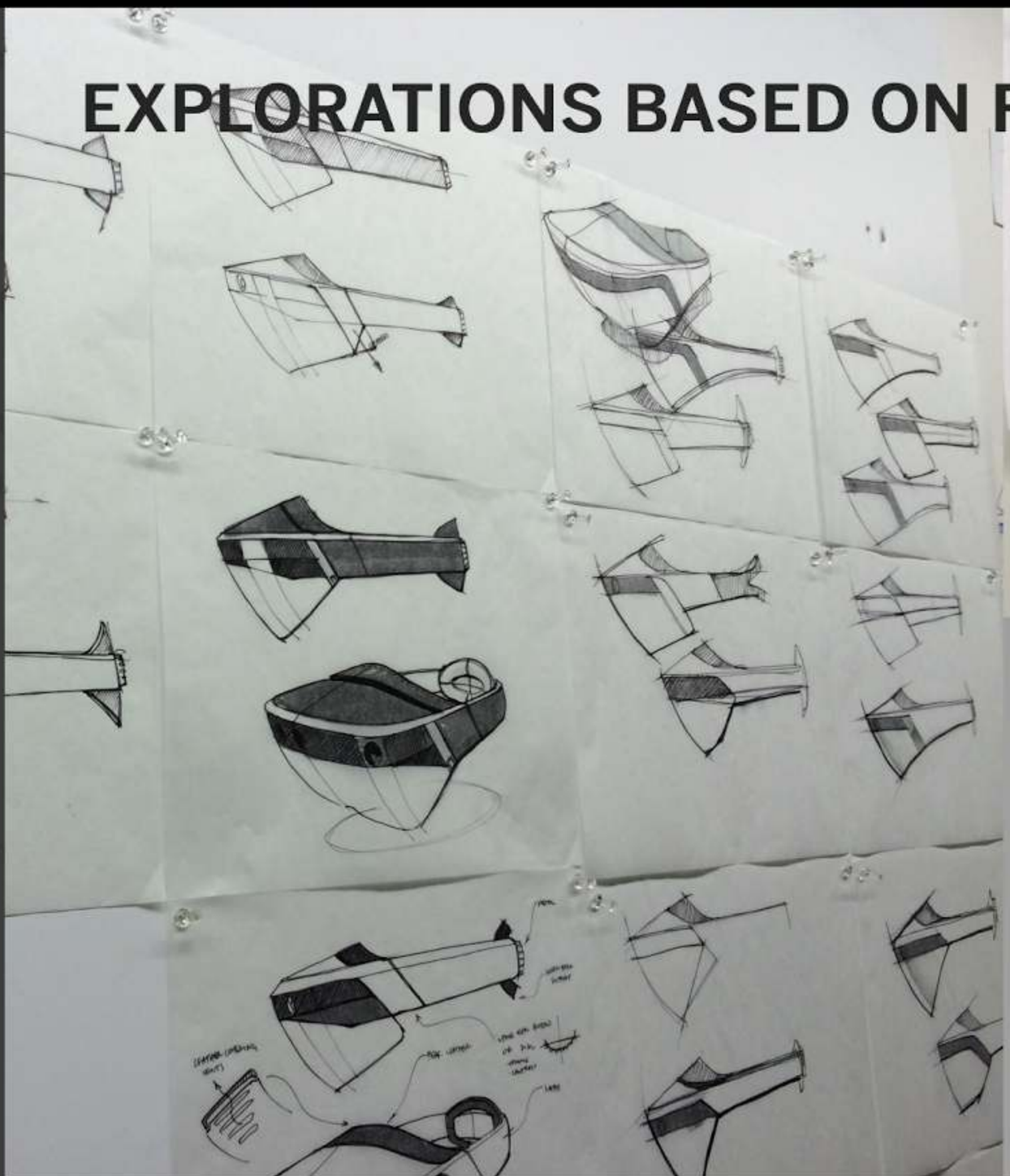


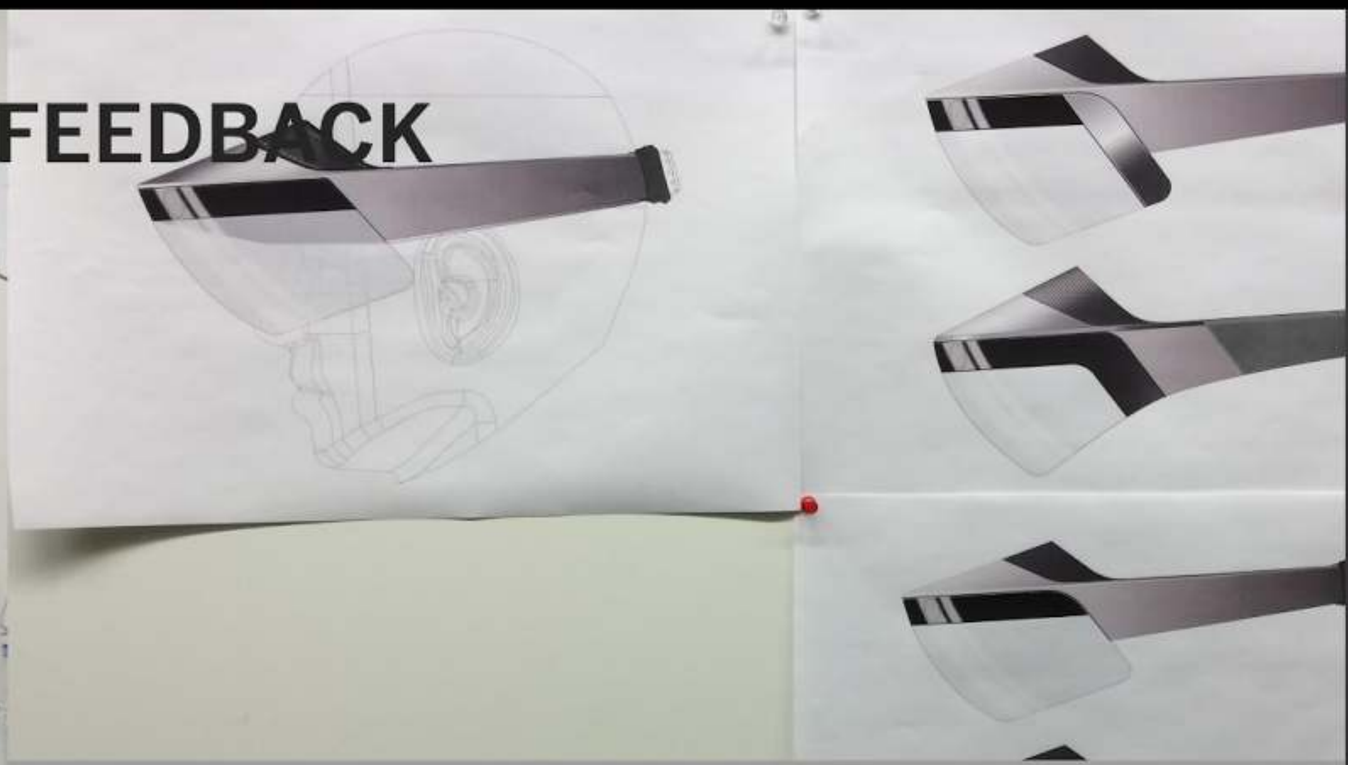
Ear Study

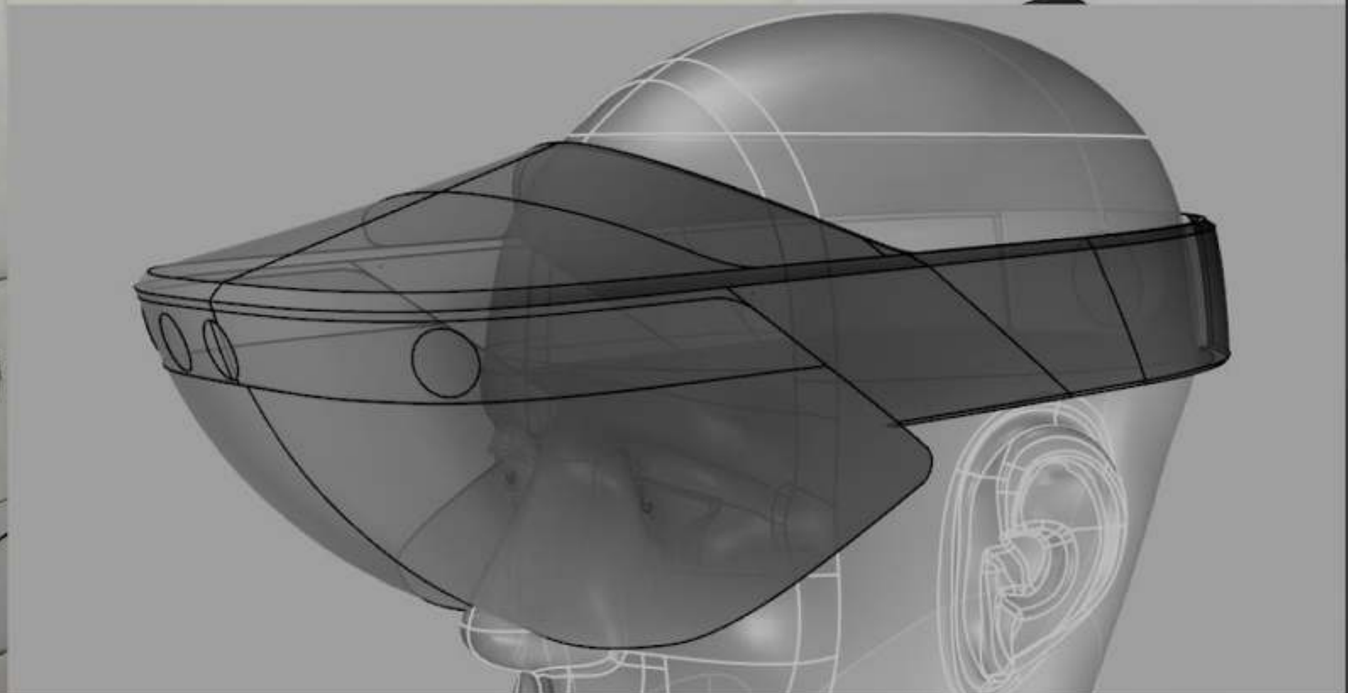
Ear locations in CAD translated to the foam head models



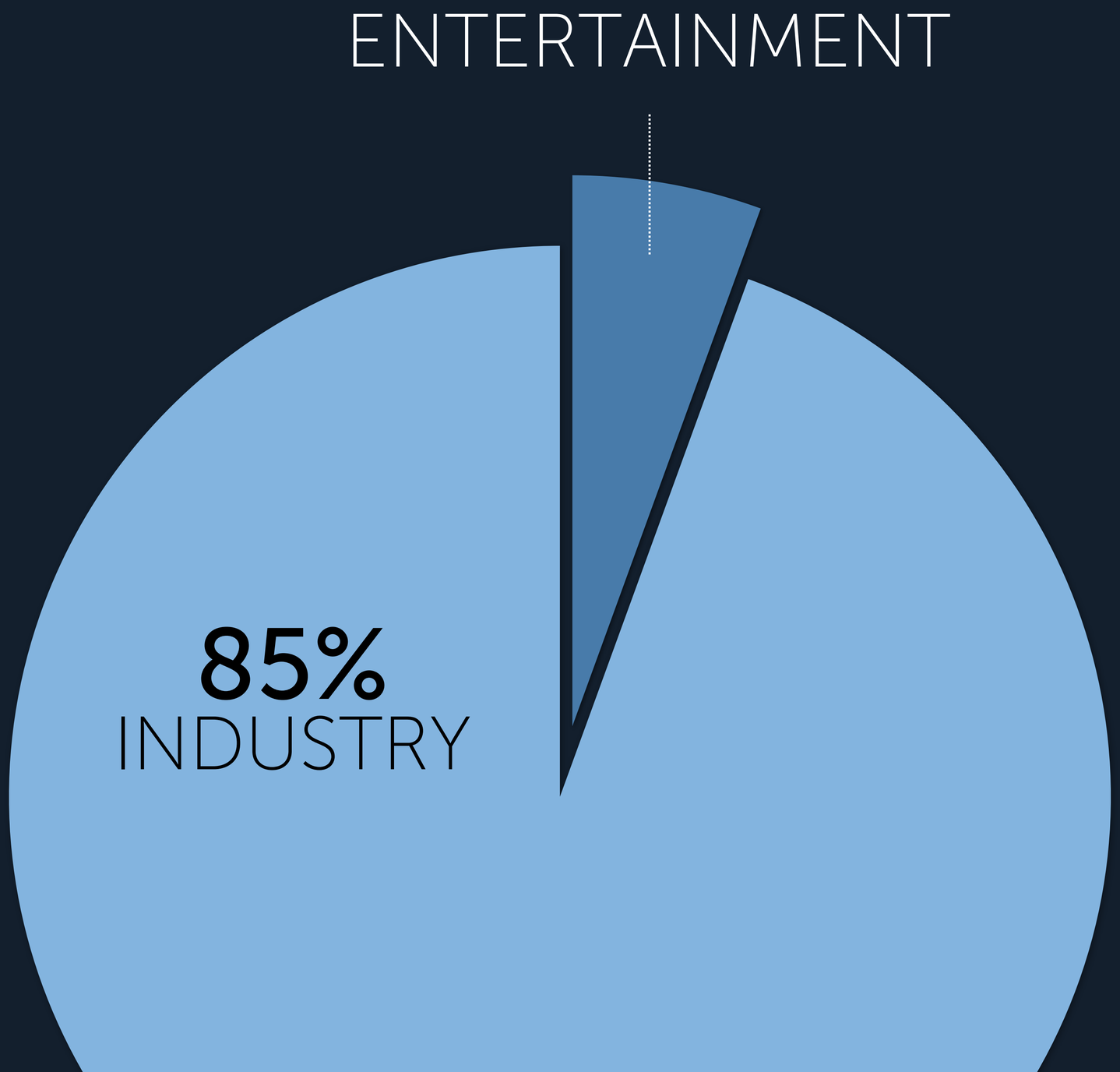
EXPLORATIONS BASED ON FEEDBACK







Tools, not toys



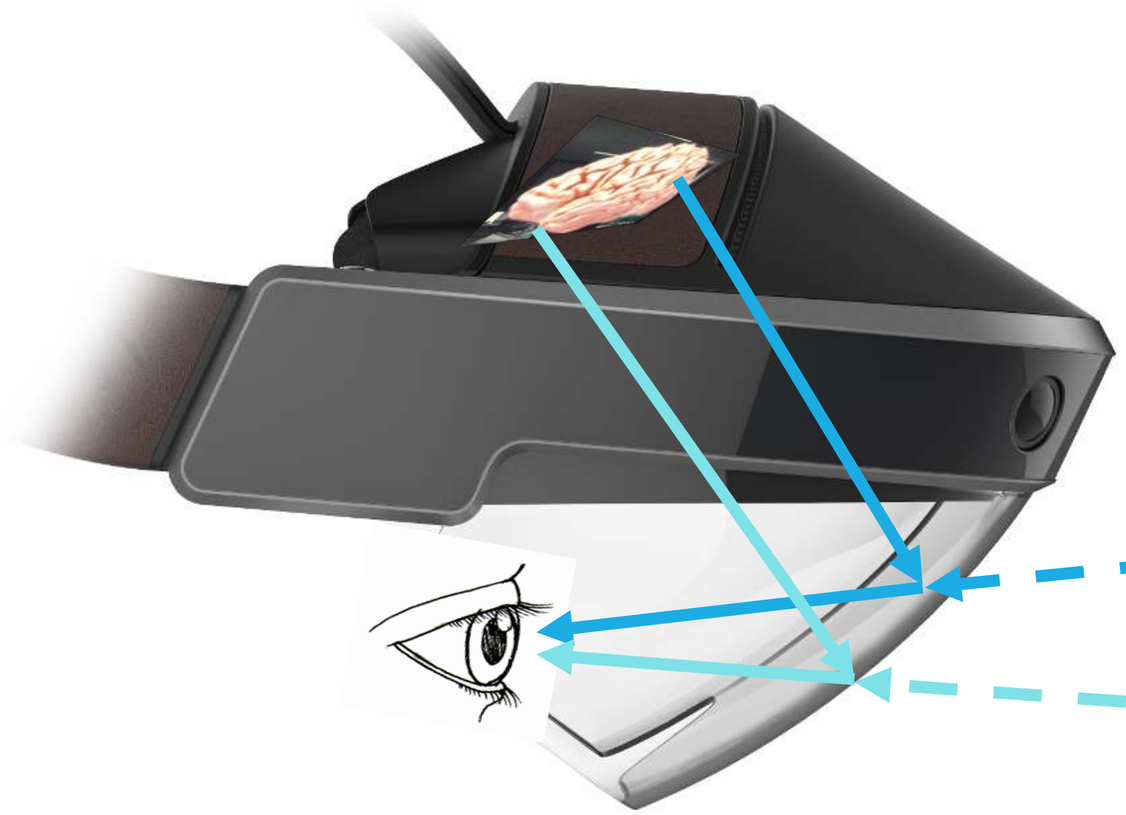
Office Without Screens

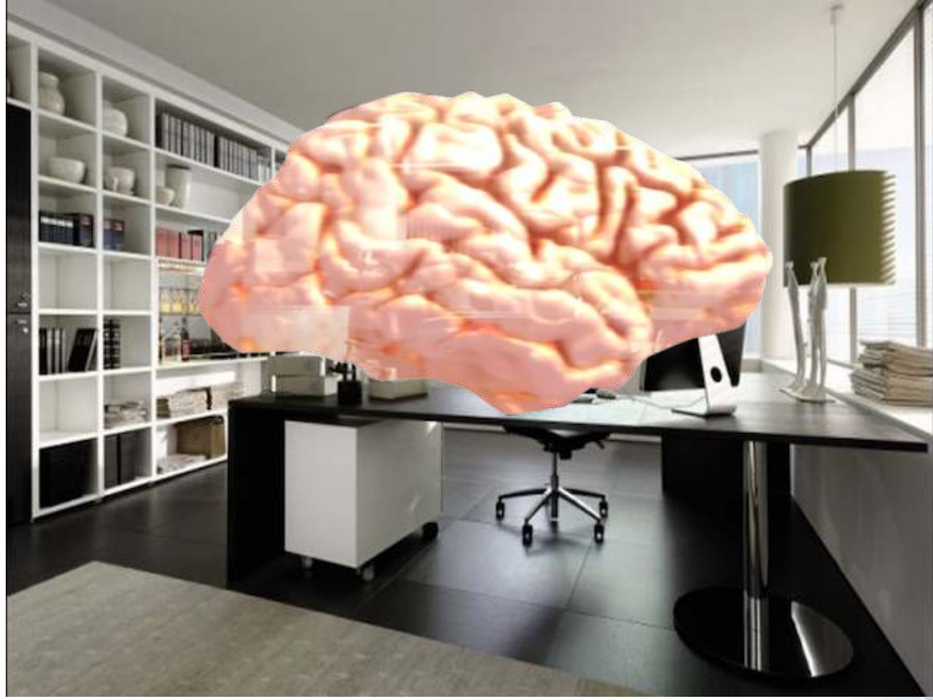
Gmail
Facebook
GlassBrain
Monitor
Biodigital
Spheriano
City Highway
Data Visualizer
Noda
Bloomberg
Technology

New Ways of Learning

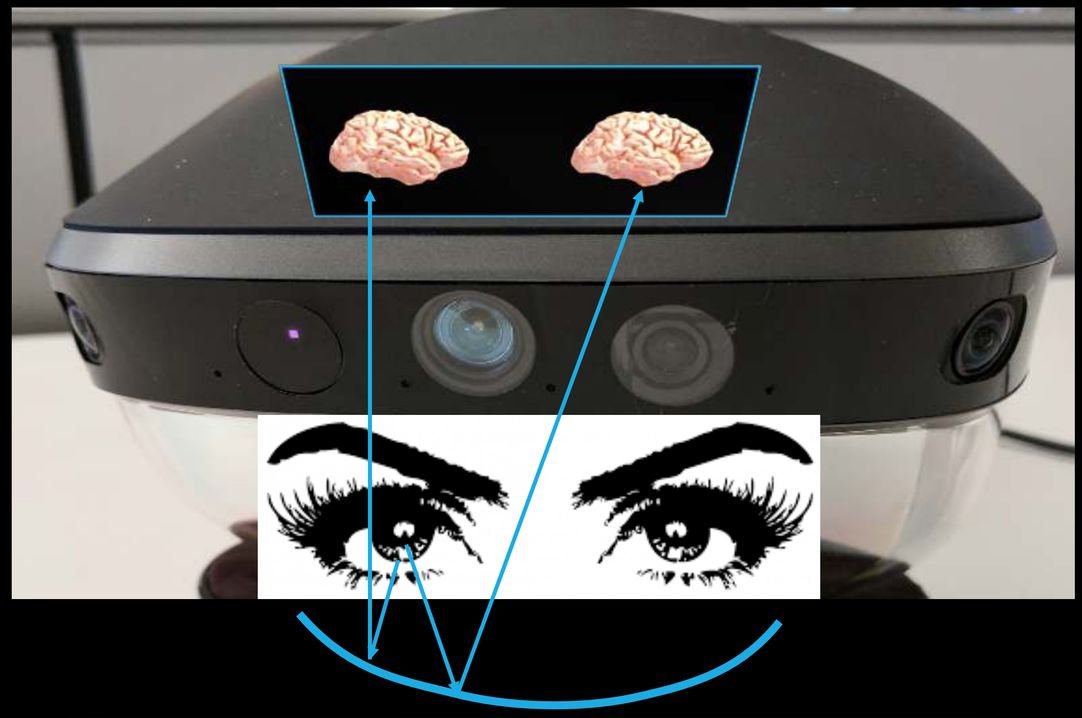
EXIT

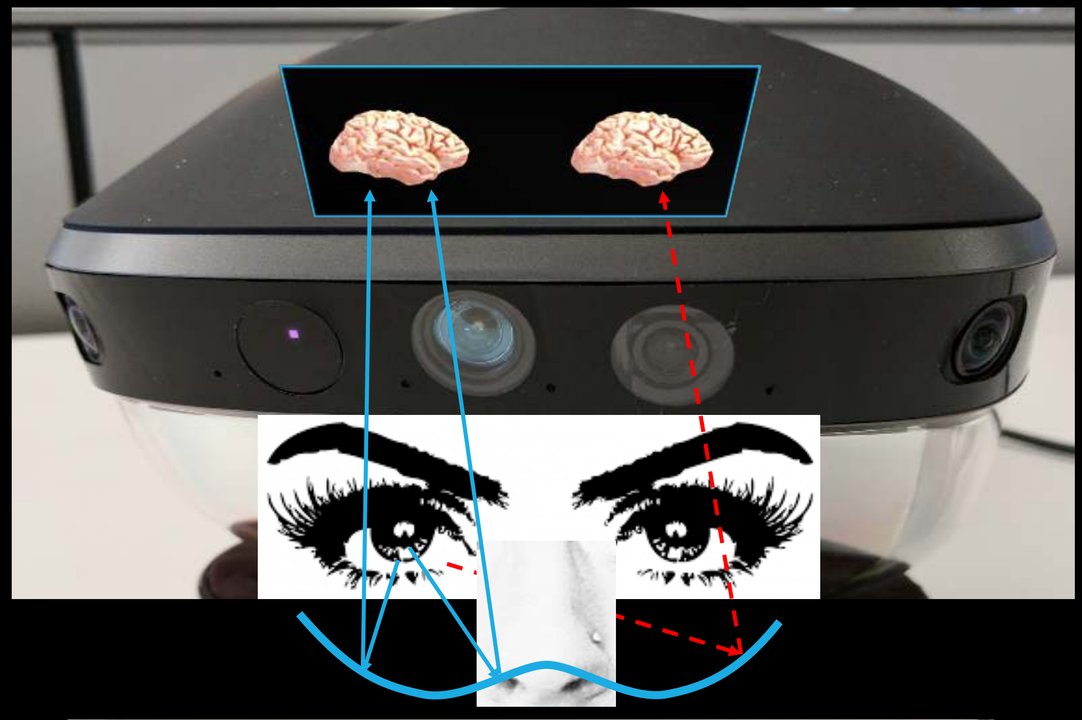
Collaboration

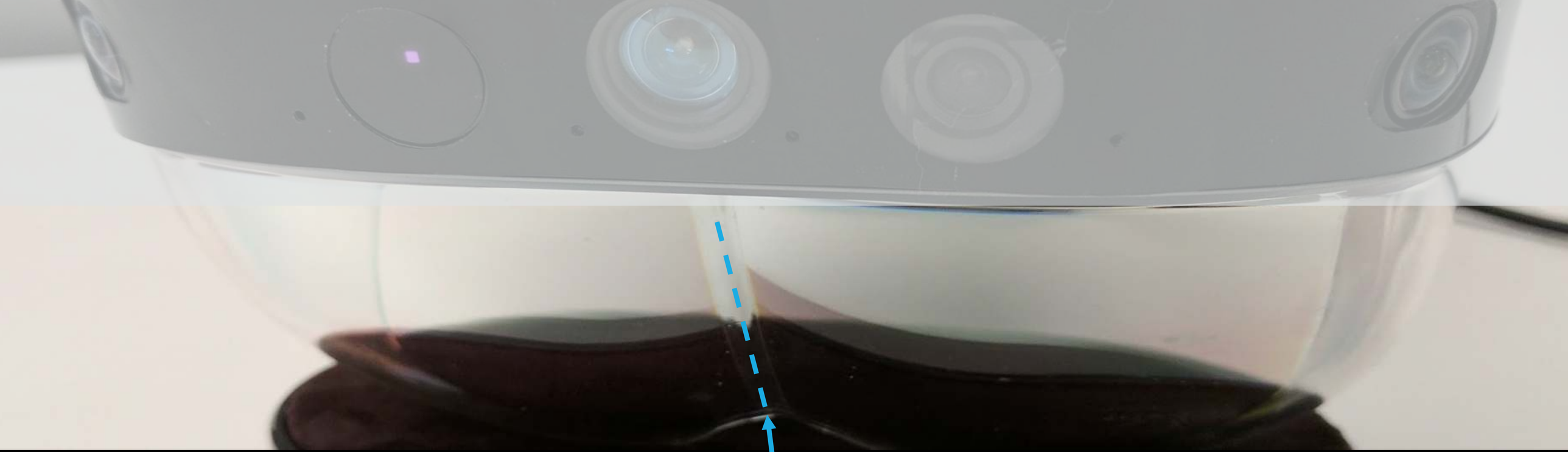




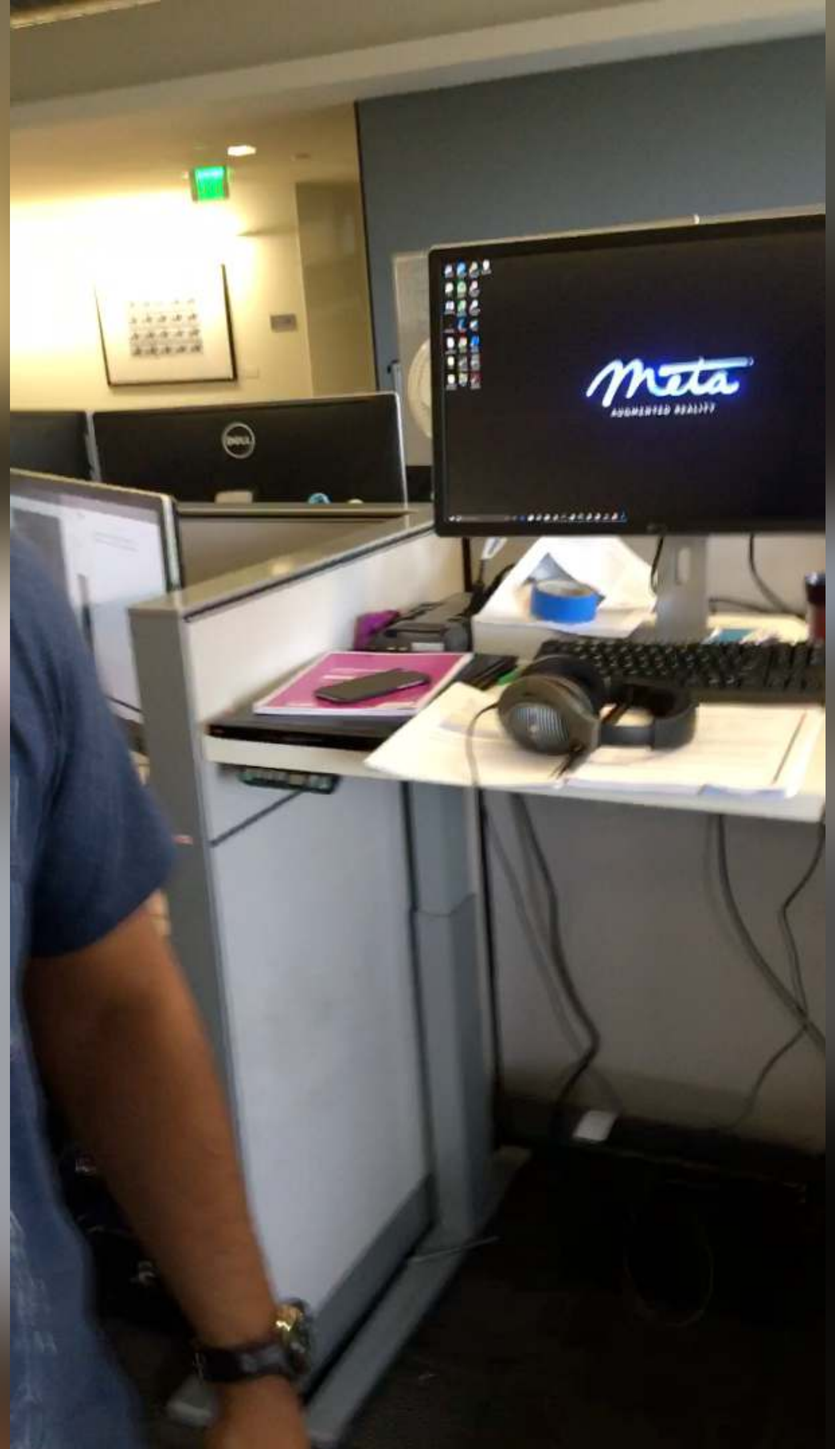
Meta
AUGMENTED REALITY



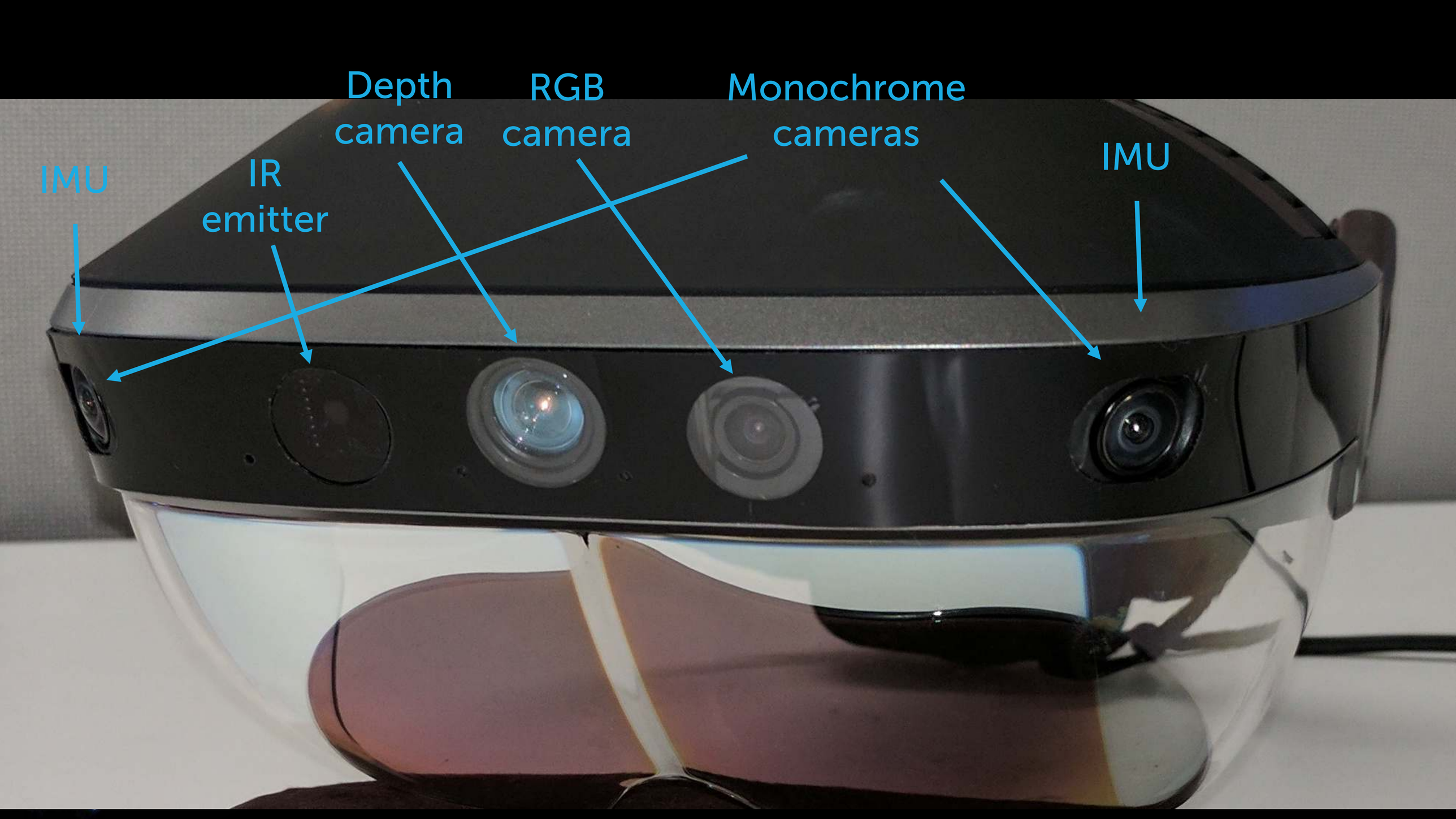


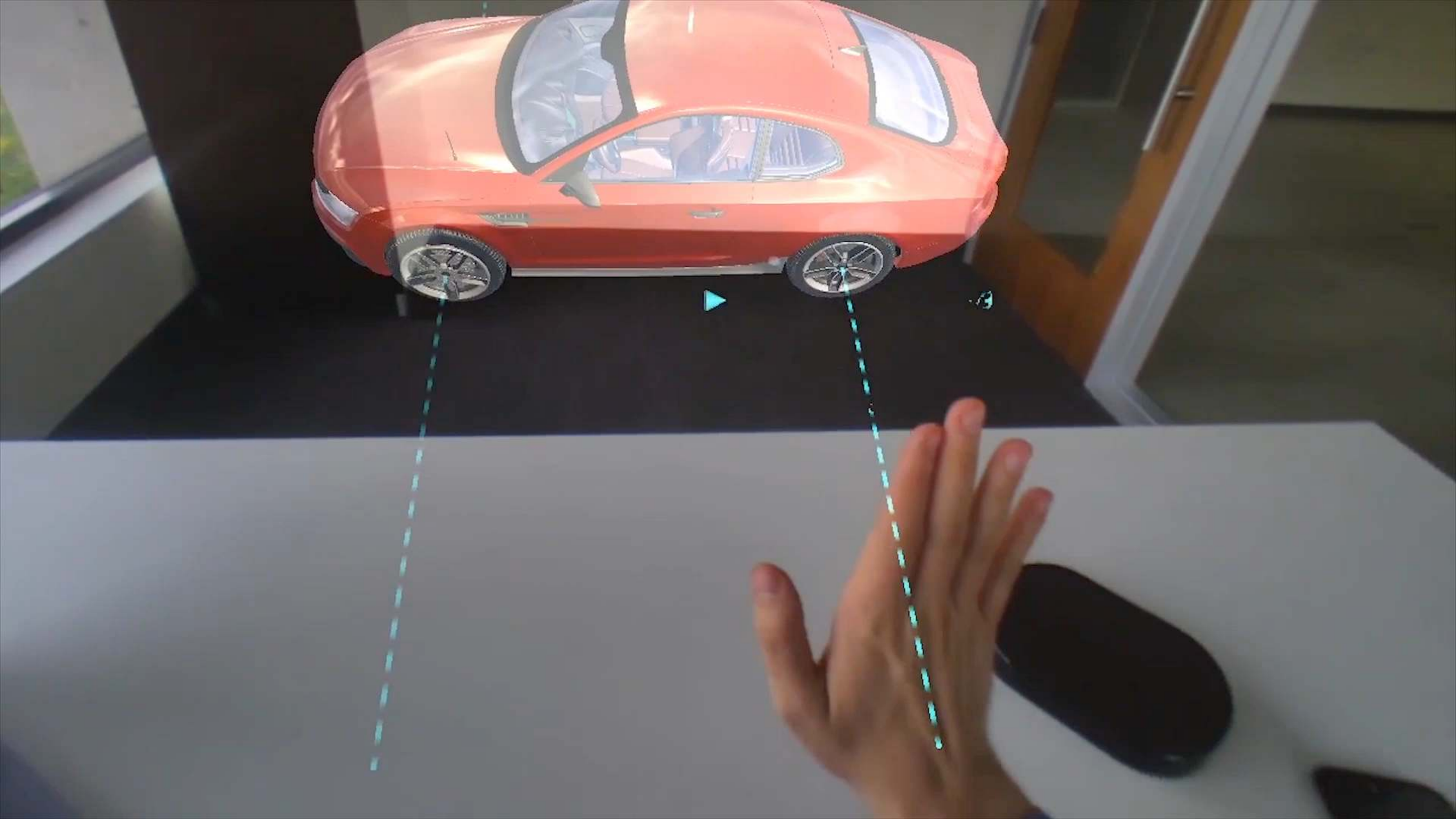


The groove
that separates
the displays


Meta
AUGMENTED REALITY

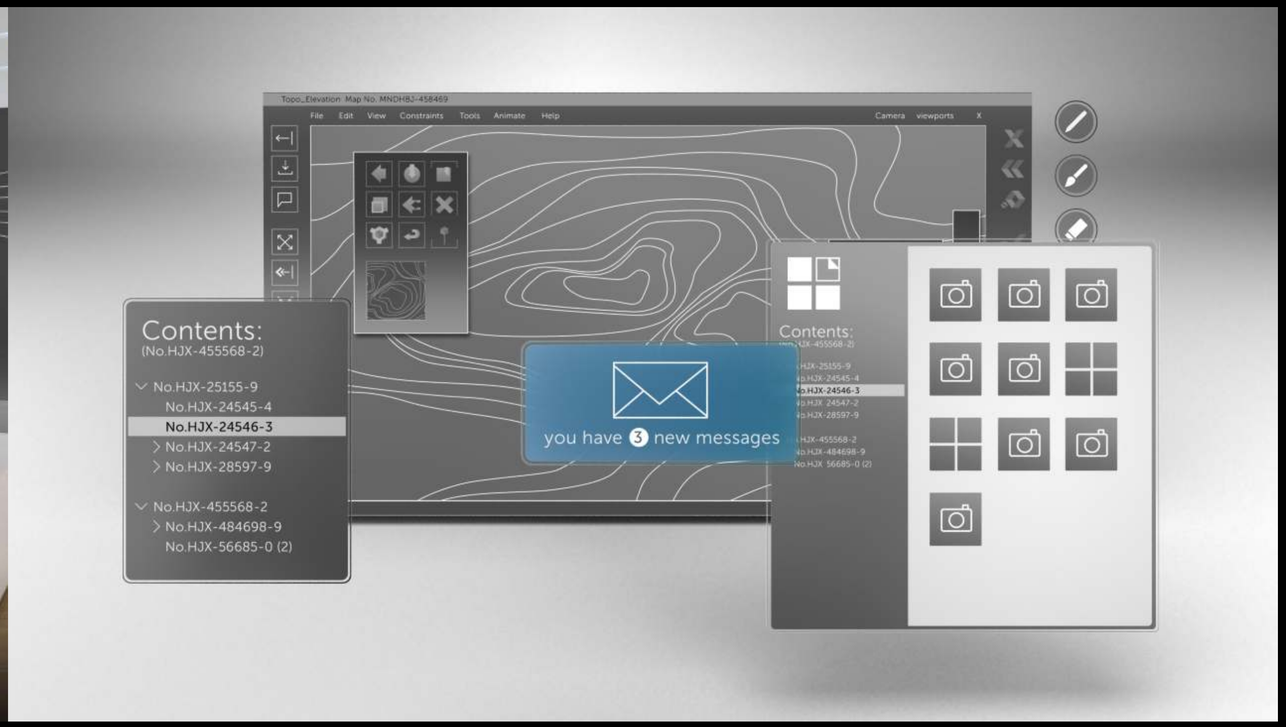
Sensors

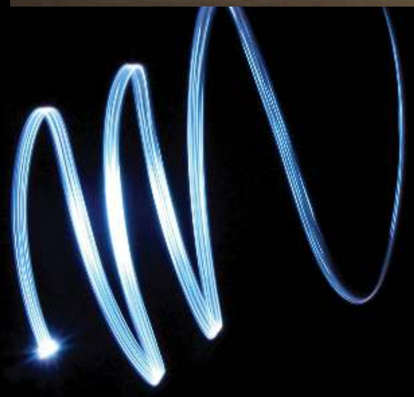

Depth camera
RGB camera
Monochrome cameras
IMU
IR emitter
IMU



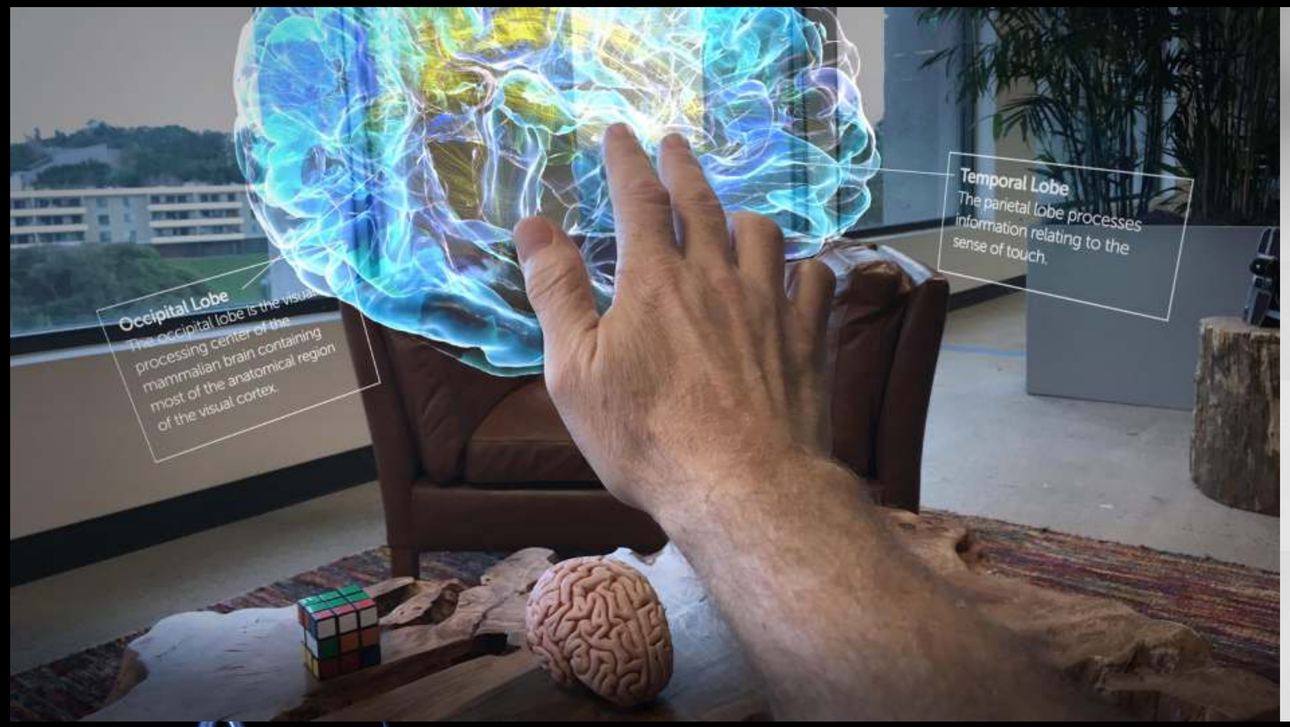
SPATIAL INTERFACE DESIGN:
Vol. I

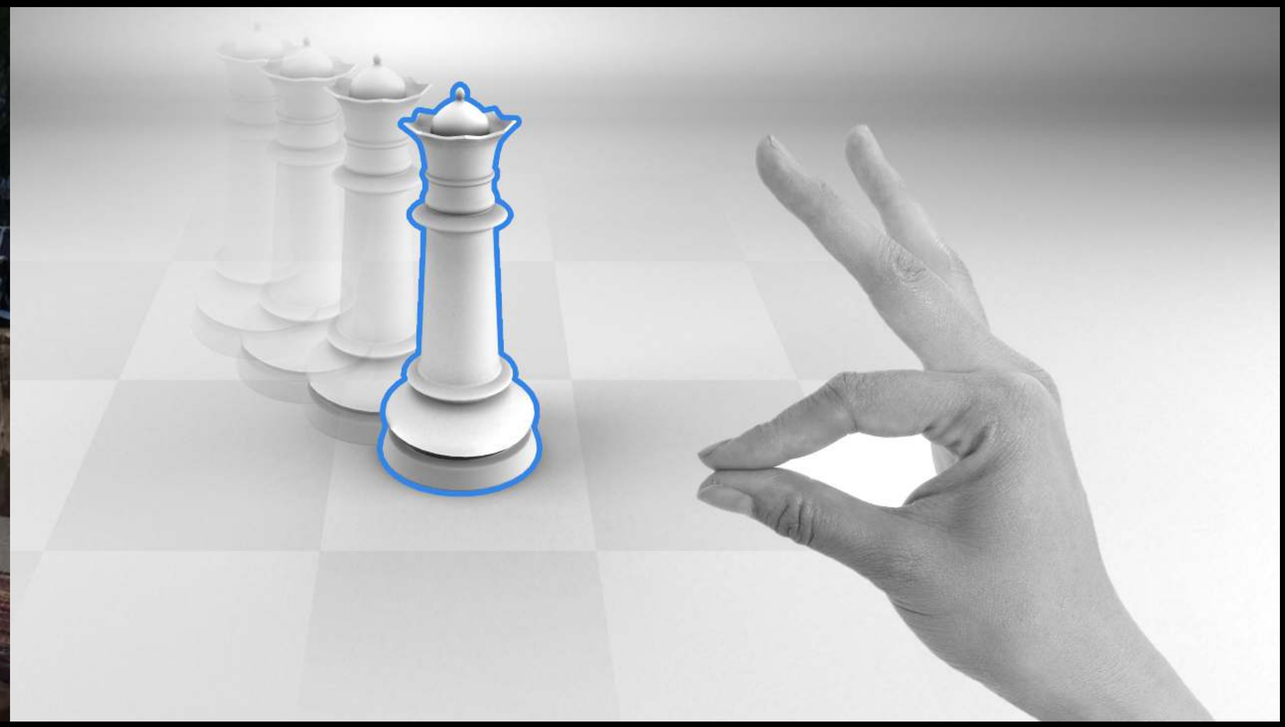
Think Spatial

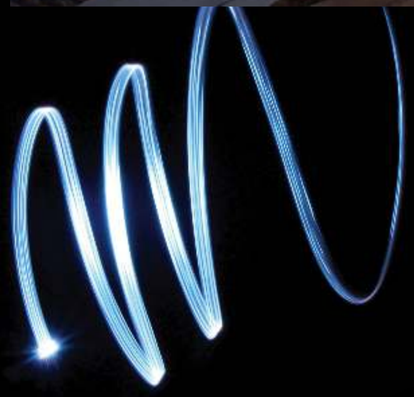




Touch to See

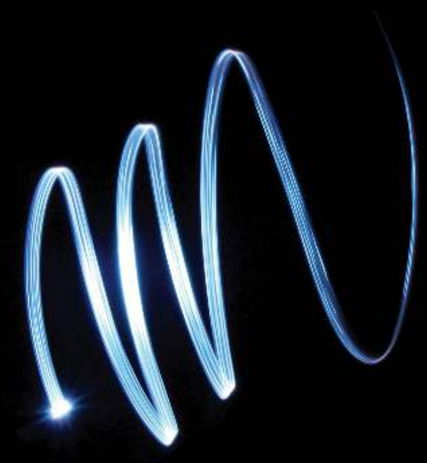

Occipital Lobe
The occipital lobe is the visual processing center of the mammalian brain containing most of the anatomical region of the visual cortex.
Temporal Lobe
The parietal lobe processes information relating to the sense of touch.



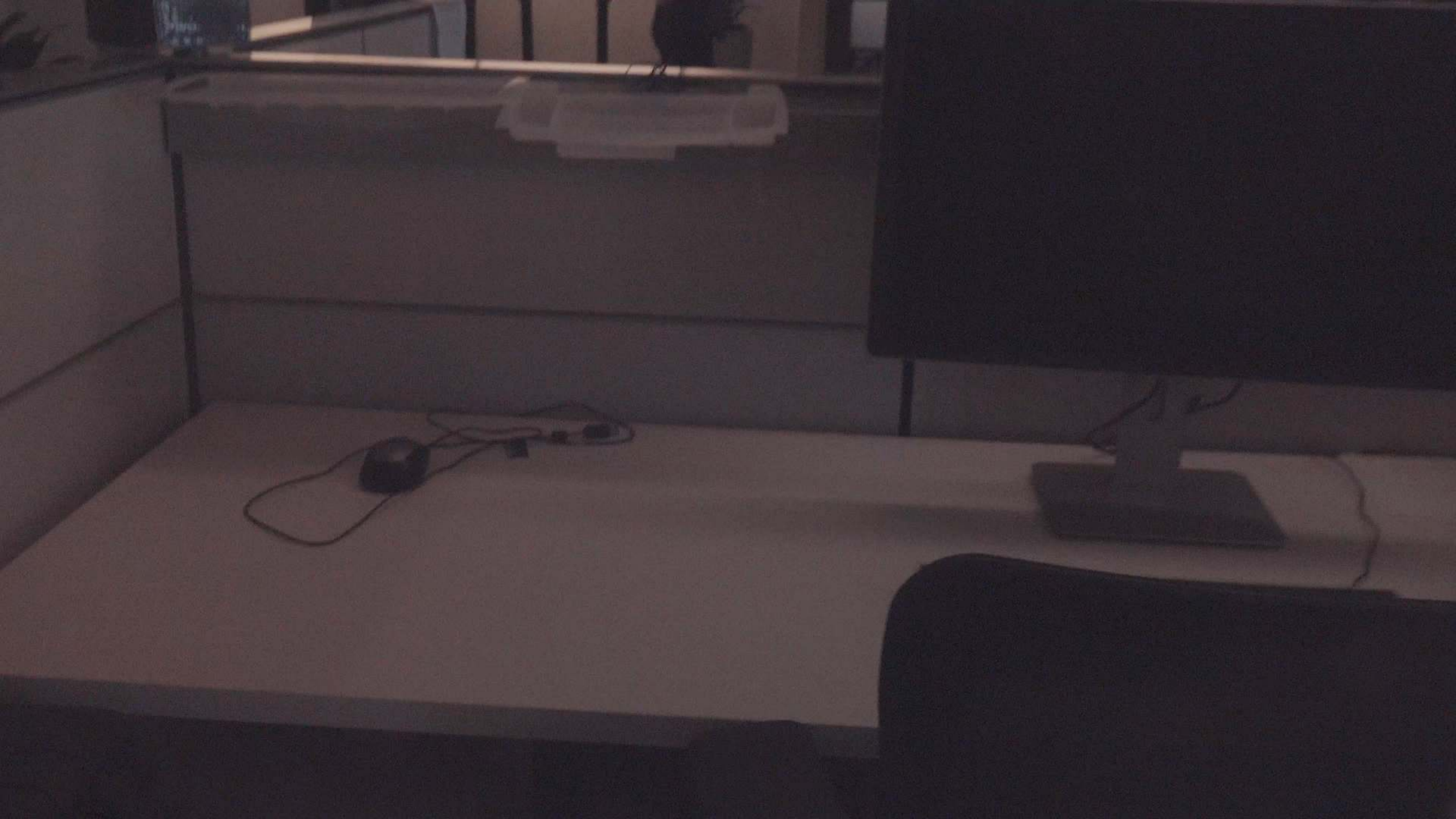


Computer Graphics / Rendering

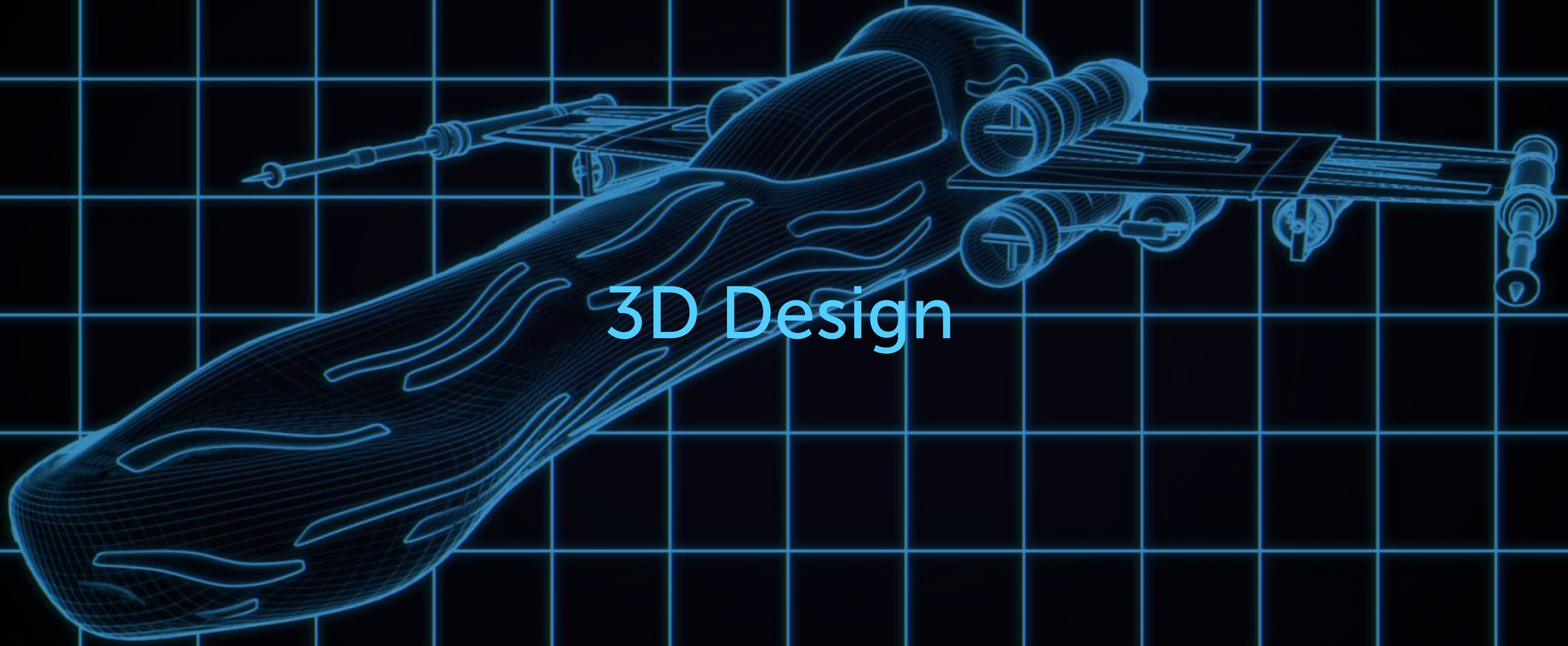
Tether is a ***feature***,
not a bug



PELICAN
FRAGILE



Use Cases

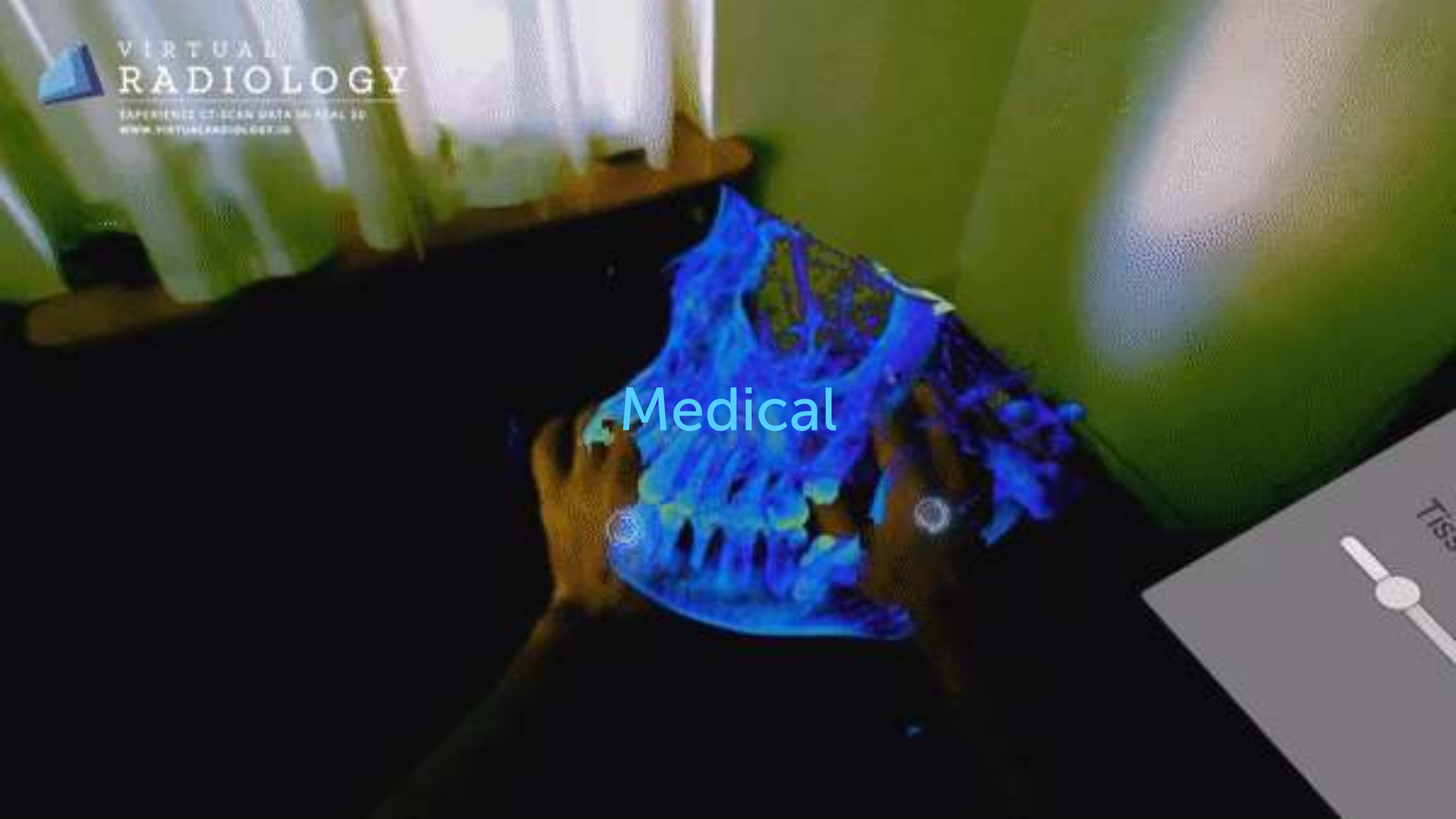


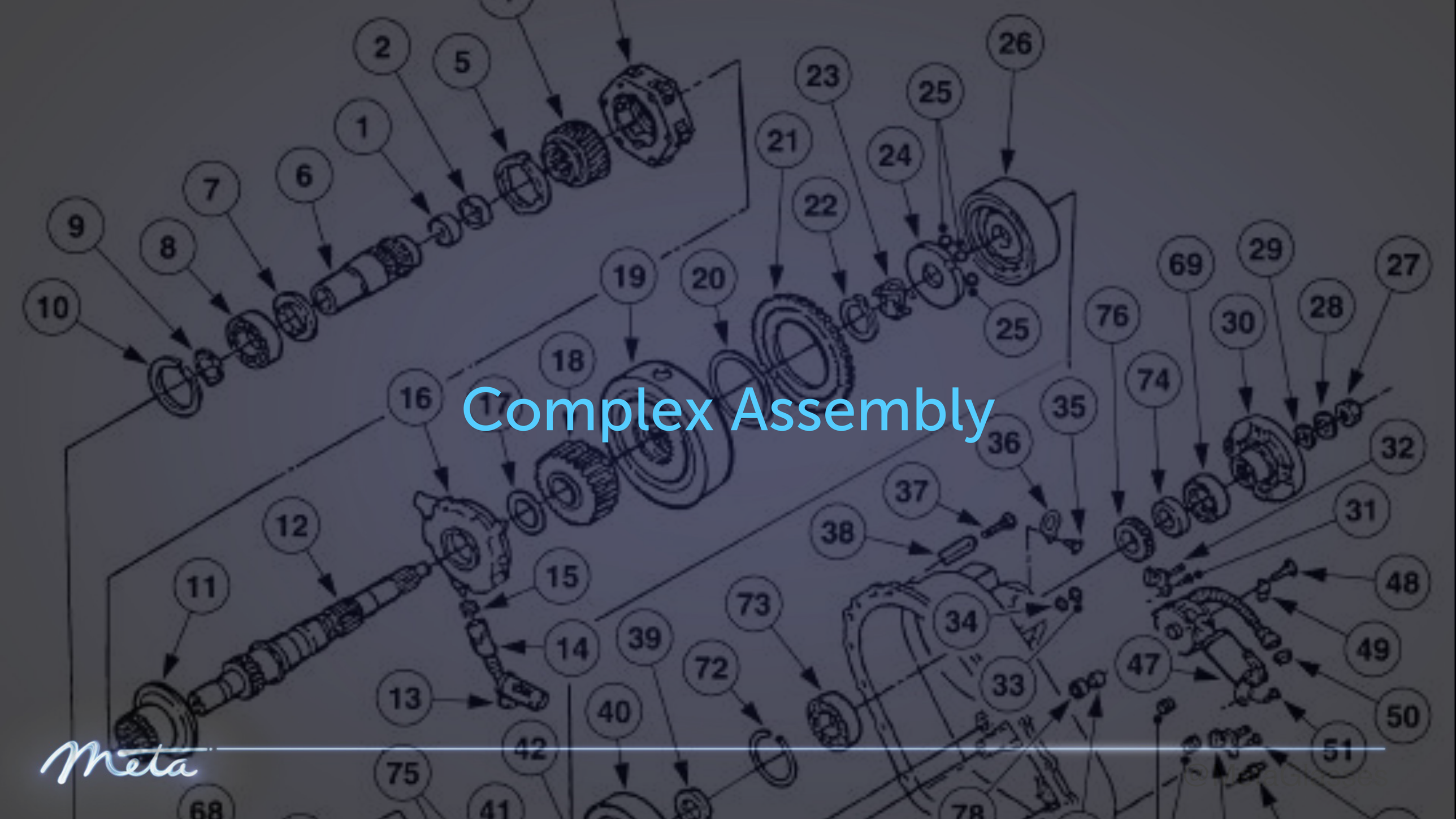
3D Design

Meta

the crystal was deployed
CHAT
N
W
50
200
300
S
Gaming
Meta

SteamVR Compatible


VIRTUAL
RADIOLOGY
EXPERIENCE CT SCAN DATA IN REAL 3D
WWW.VIRTUALRADIOLOGY.IN
Medical


Complex Assembly

MOON
73 missions
SUN
6 missions
MERCURY
2 missions
MARS
40 missions
VENUS
42 missions
ASTEROIDS
& COMETS
17 missions
JUPITER
9 missions
SATURN
8 missions
Training

Retail & eCommerce
Meta
ZeroLight

WebVR w/ Firefox

Monitor Replacement

Endless Possibilities

Kiss your phone, laptop, & TV goodbye

Thank you, ICIP 2017!
Xie xie!