A comparison between different applications of Immersive Analytics: Survey

Koosha Mirassadollahi

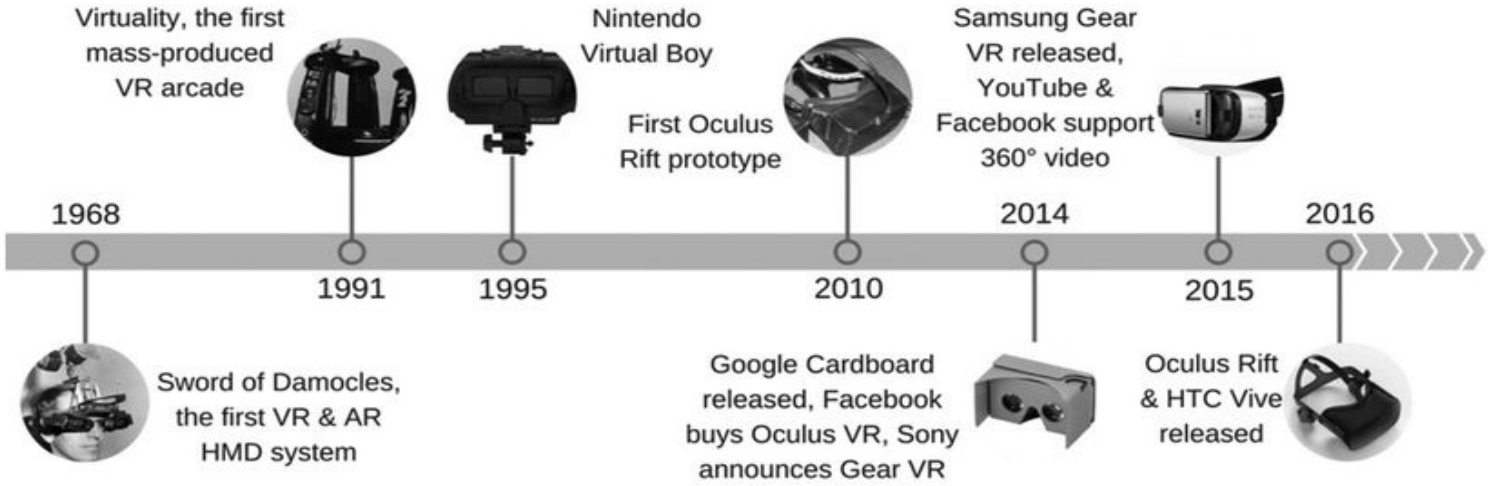
CPSC 547

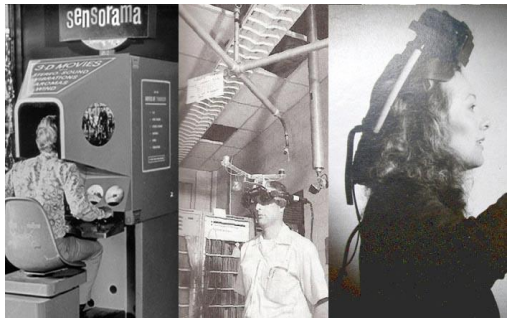
THE UNIVERSITY
OF BRITISH COLUMBIA

Outline

- Introduction
  - Language
- Comparison/Analysis
  - Evaluation
  - Conclusion
- References

Introduction





Niantic is working with Qualcomm on augmented reality glasses

Greg Kumparak @gregk / 5 days

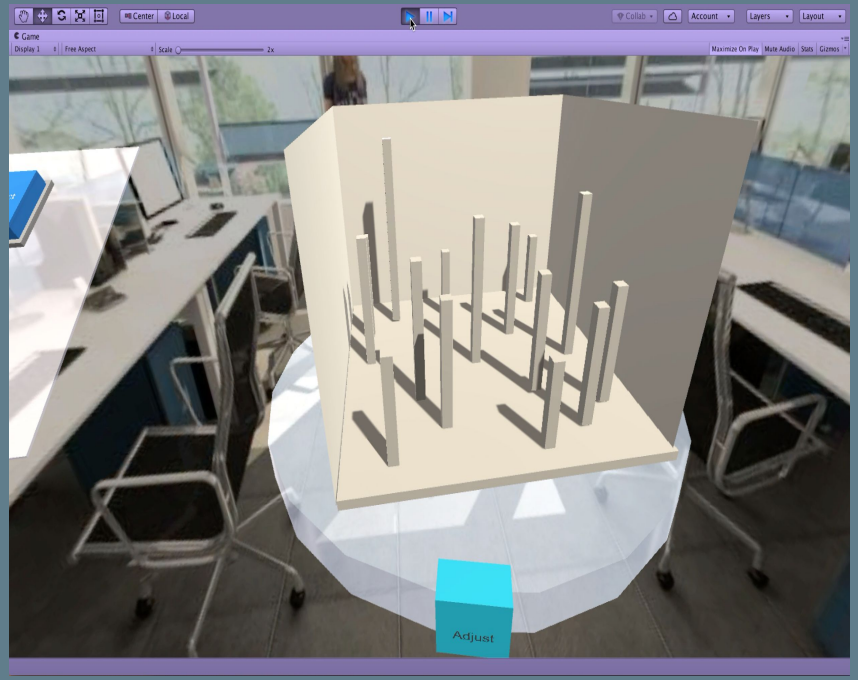
We've known for a while that Pokémon GO creator **Niantic** is feels a bit limited in what it can do with augmented reality today.

Language

Definitions

Immersive Analytics is the new tool that brings data visualization, mixed reality mediums, and visual analytics together and provides us with a more collaborative experience in a new field of human-computer interaction.

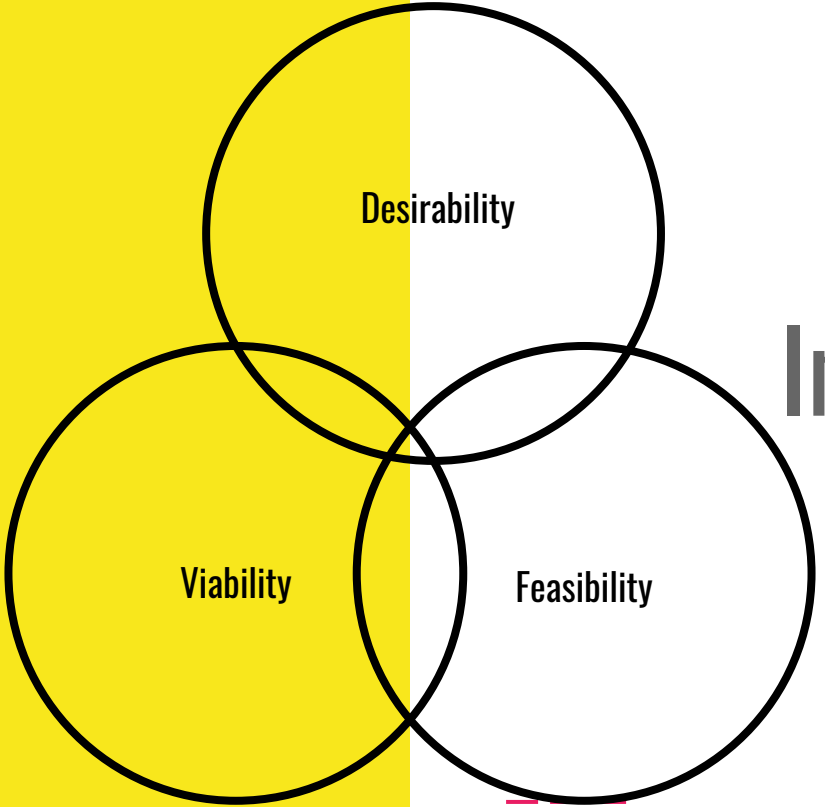
Multi-dimensional(Mixed-reality medium)
Collaborative
Interactive
Multi-sensory



Do we need this?

"Yes"
"No"

2D vs 3D



Immersive

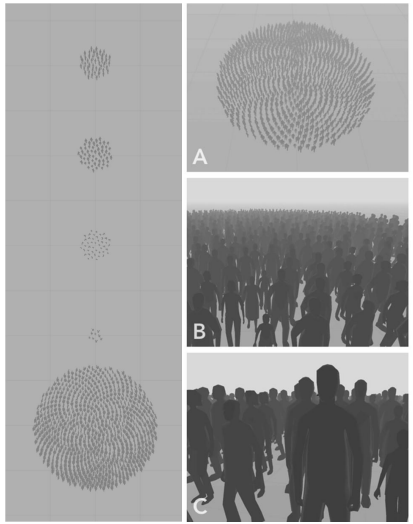
Applications

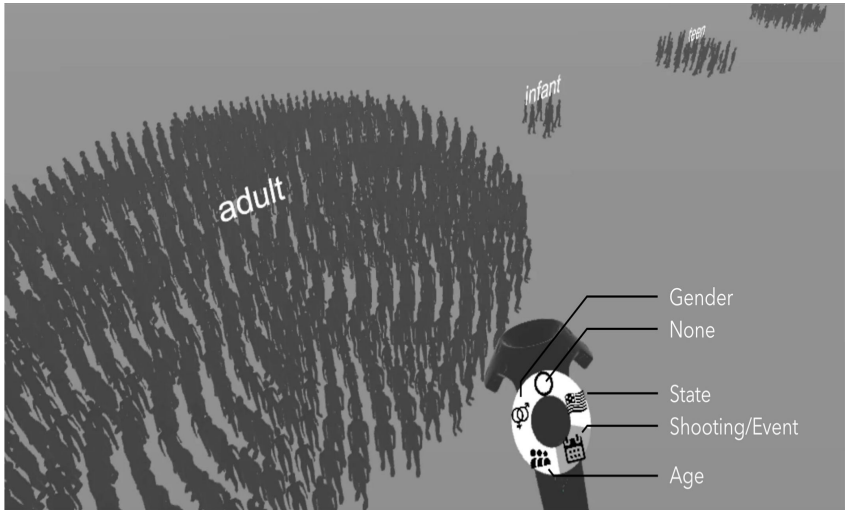
Immersive Analytics as storytelling
Immersive Analytics as collaboration
Immersive Analytics as health sciences
Immersive Analytics as built environment

Related Work | Comparison

Immersive Analytics as storytelling

Data-driven storytelling





Immersive Analytics as storytelling

Data-driven storytelling

Ref[21] from Hans Rolling's BBC Performance

Comparison

On-screen display:

Simplicity(in technique and execution)
Accuracy for data abstraction
Comprehensive and effective
Less cost and time

Immersive:

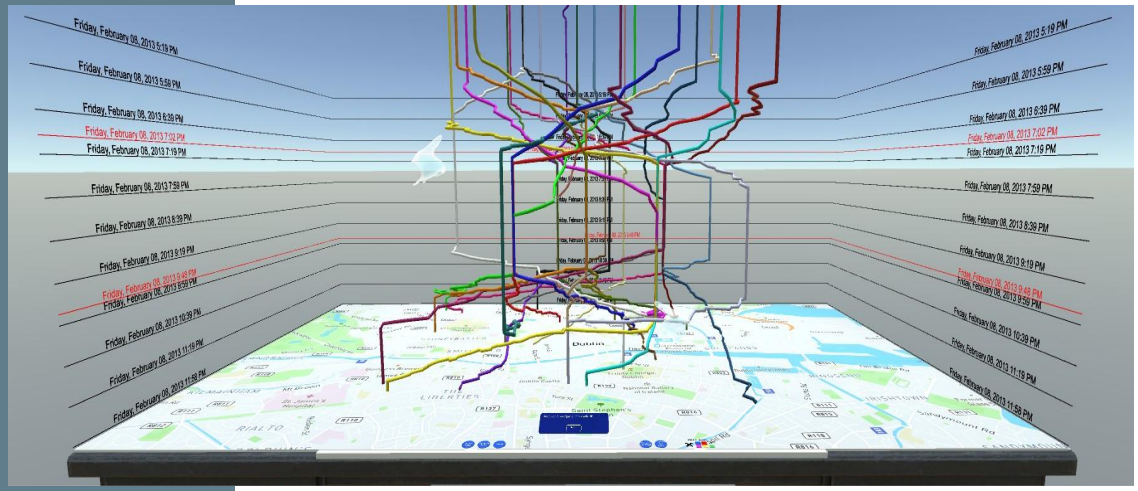
Sense of presence, more awareness of scale and space
Emotional and empathetic responses
Two handed interaction
Customizable: Change the viewpoint
Interactive, engaging, absorbing, attractive

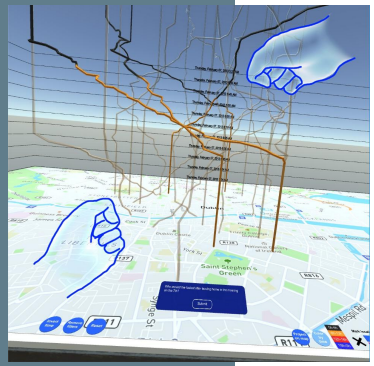
What-Why-How Analysis

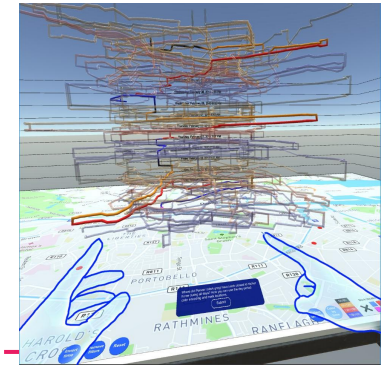
Example	Mass shootings IA	Hans Rolling's IA
What	Data: number, age, gender of people	Data:budget, countries,years
Why	Compare, filter,...	Compare,Navigate, super impose
How	Immersive Visualization Unit	Immersive Scatterplot

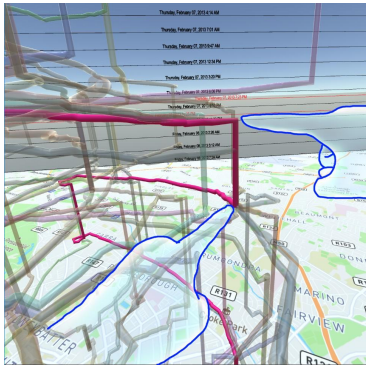
Immersive Analytics as Collaboration

Data-driven collaboration





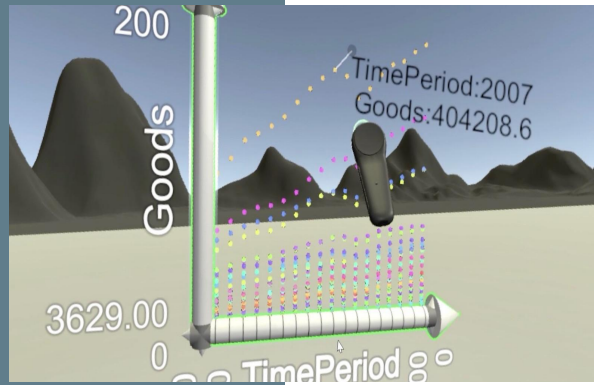


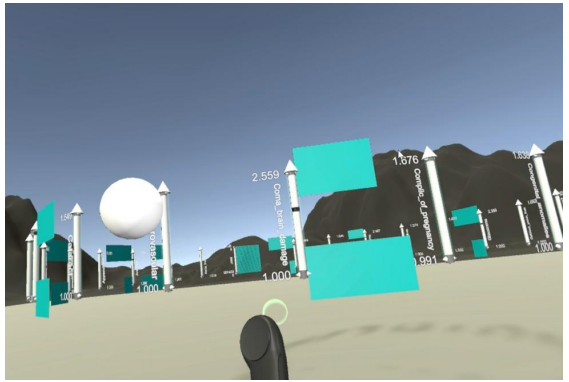


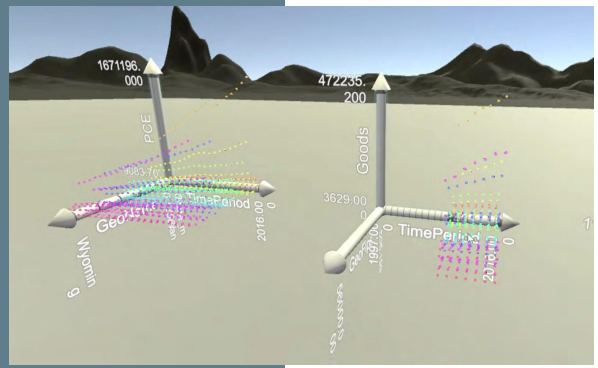
Immersive Analytics as Collaboration

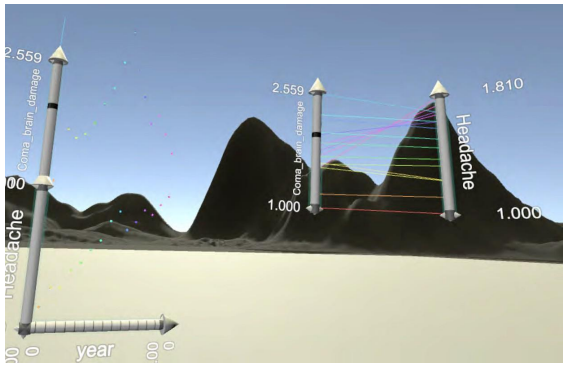
ImAxes

axis control
scatterplot matrix
physical navigation







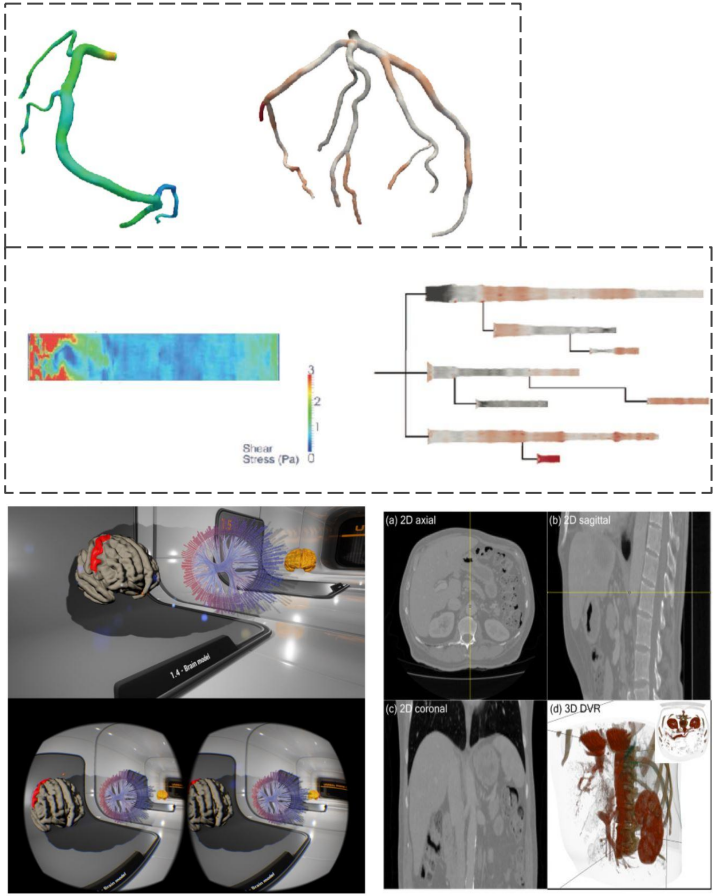


What-Why-How Analysis

Example	Trajectories	ImAxes
What	Data: trajectories	scatterplot,points
Why	Select,Scale, rotate, zoom, inspect through time	Select, Interact, scale,compare,...
How	Interactive spatio-temporal	Immersive Scatterplot Matrix

Immersive Analytics as Health Sciences

Artery Visualizations for Heart Disease Diagnosis
Brain structure



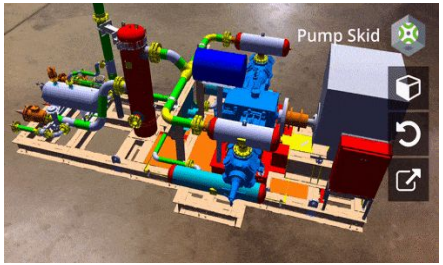
Ref from **Visualization Analysis and Design**[Fig 1. Borkin et al. Artery Visualizations for Heart Disease Diagnosis. Proc InfoVis 2011.]]

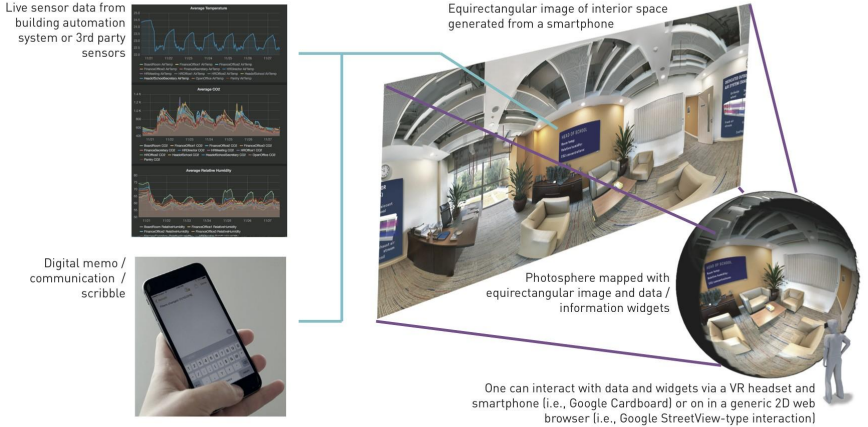
What-Why-How Analysis

Example	Arteries	Brain Vessels
What	Data: Congestions, Vessels,...	Data: Shape, Structure,vessels,...
Why	Select,Scale, rotate, zoom,...	Select,Scale, rotate, zoom,filter, compare
How	Immersive Spatial	Immersive Spatial

Immersive Analytics as built environment

BIM(Unity reflect)
Disaster management
Grading
Parametric design
Generative design





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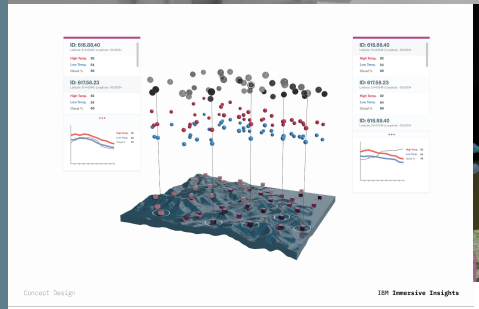

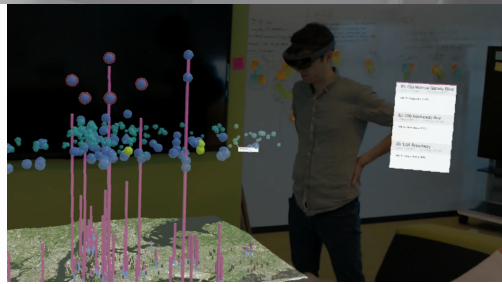

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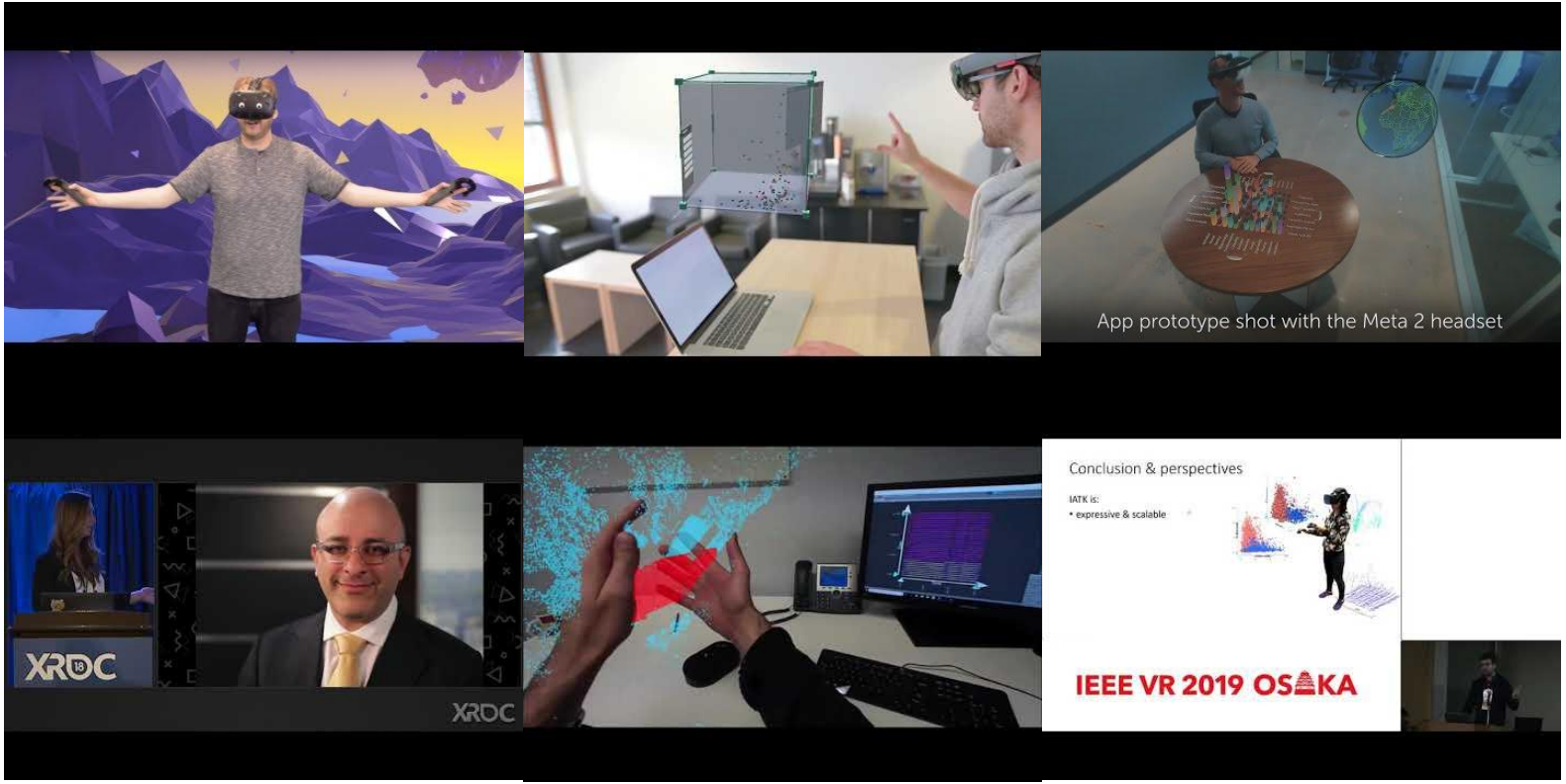
Two handed interaction
Change the viewpoint
Interactive, engaging, absorbing, attractive

Usability and comfort?
Measuring user performance
Learn how to interact with it

What-Why-How Analysis

Example	Sensory data Visualization	BIM data
What	Data: Sensory data, temperature,...	Data: Building information data
Why	Select,Inspect, compare, ...	Select, compare,...
How	Interactive Immersive Visualization	Interactive Immersive Visualization

Evaluation


App prototype shot with the Meta 2 headset
XRDC
XRDC
Conclusion & perspectives
IATK is:
• expressive & scalable
IEEE VR 2019 OSAKA

Conclusion

2D-3D

Strengths

- Accuracy for several tasks
- Good for analyzing, exploring,filtering,...
- Usually less cost and time
- More comprehensive in data use cases

Weaknesses

- Boring!(barcharts)
- Not good/hard for showing temporal data
- Not having enough attraction, involvement

Immersive

Strengths

- Collaboration
- Emotional engagement
- Multi-sensory interaction
- Decision-making
- Accessible and portable
- Usability and comfort

Weaknesses

- Danger of depth, distortion,...
- Problem with data accuracy, text,...
- Should learn how to interact with it
- Technology is not developed yet(Resolution, FOV)

Conclusion

	2D	3D	Immersive
Storytelling	☐	☐	✔
Collaboration	☐	☐	✔
Interaction	☐	☐	✔
Health Sciences	✔	✔	☐
Built environment	✔	✔	✔

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Q&A