

# Simulated Space for Real World Places

University of Wisconsin Madison



Kevin Ponto

May 17, 2016

Internet2 Collaboration SIG

History

NORC (1954)



**BIG**

**EXPENSIVE**

**EXCLUSIVE**

# History

# Transition to Personal Computers



Today

Transition to Personal VR



My Group

The Living Environment Laboratory



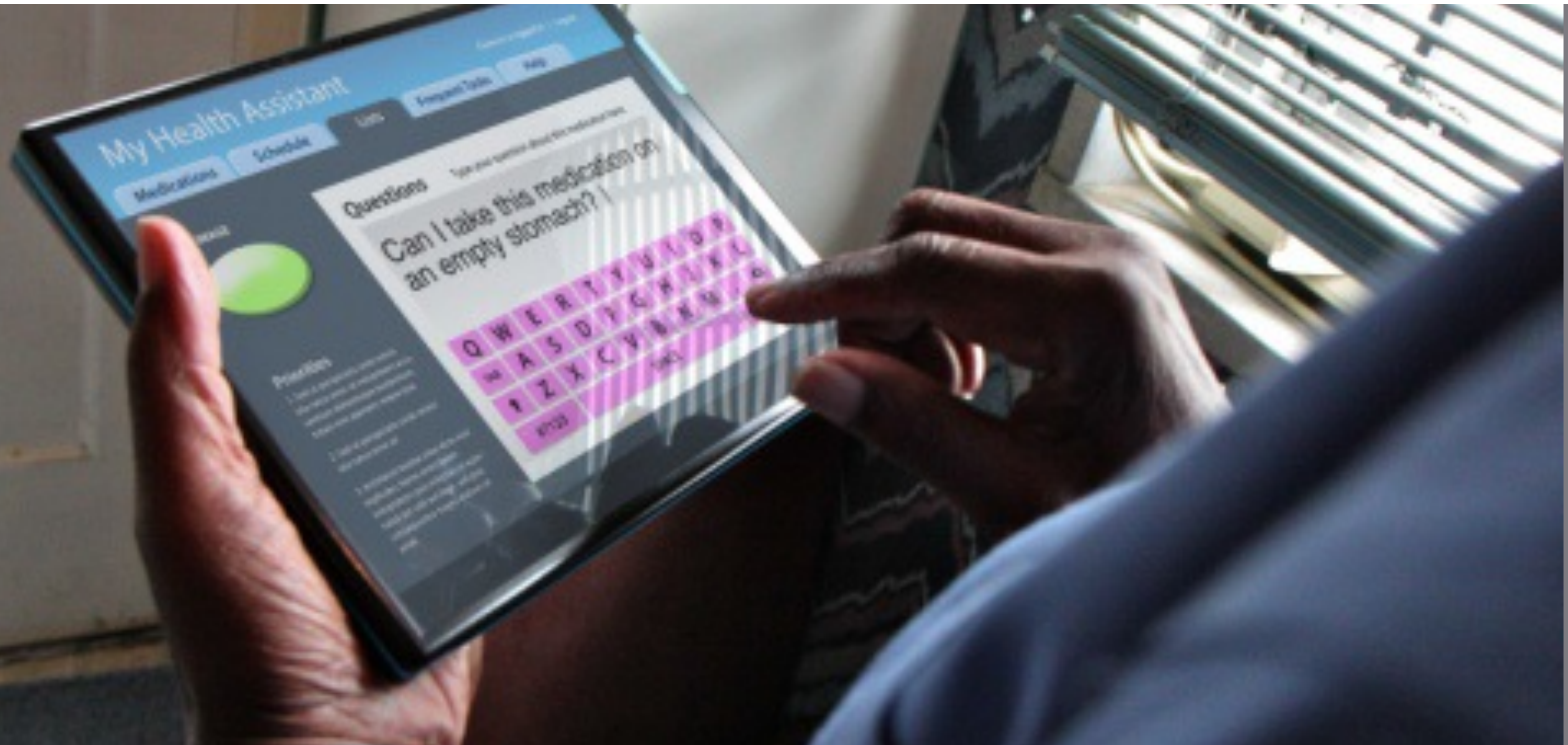
History of the LEL

Part of University of Wisconsin-Madison



# History

# Project Health Design



History

Context of the Home Environment





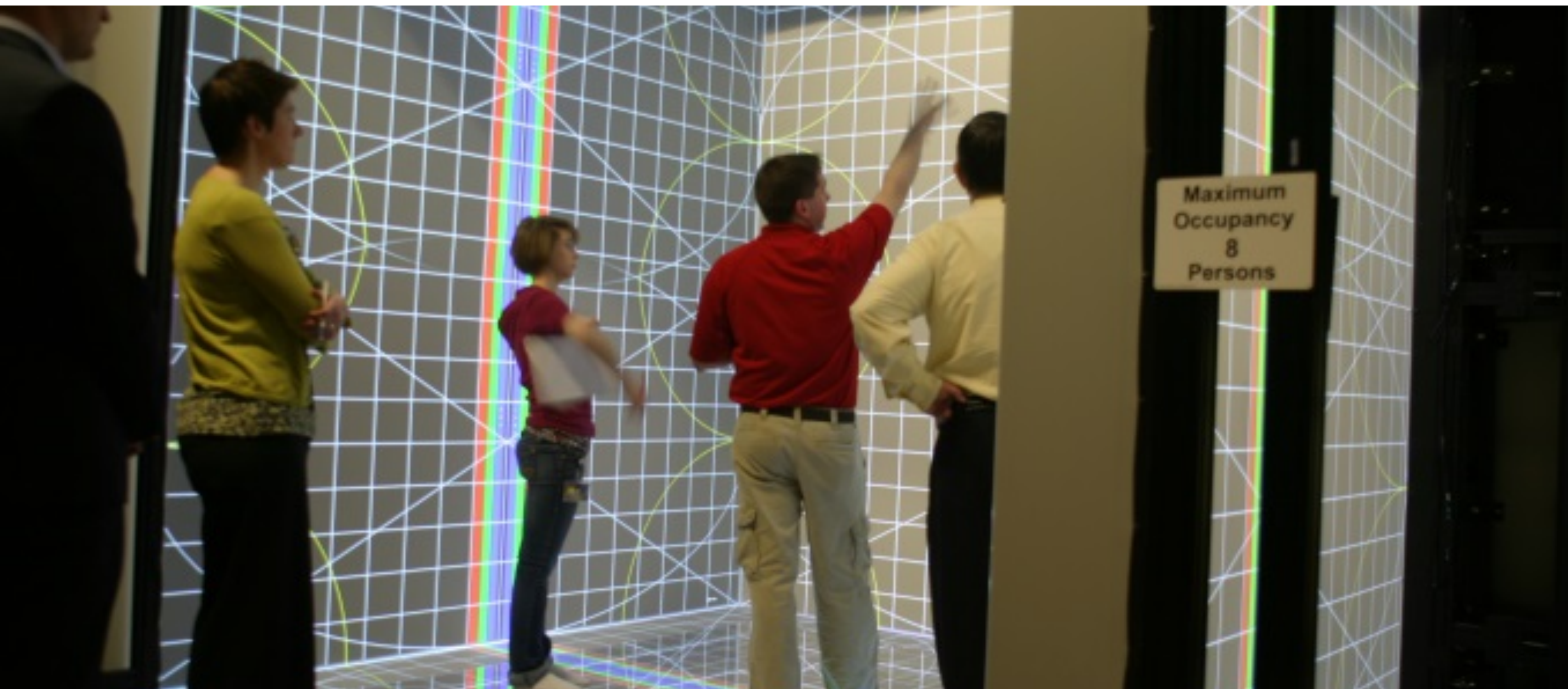
History of the LEL

Wisconsin Institute for Discovery



# History of the LEL

# CAVE (2011)



History

Motivation



# Challenge:

How do we set expectations for this technology?

# Expectations | Holodeck



# Expectations

# Simulations



Nicolalde, D.F., Freese, V., Ponto, K., Tredinnick, R., Kinneberg, M. , **“Applying Kanban to Health- care via Immersive 3D Virtual Reality”** 3D User Interfaces (3DUI), 2014 IEEE Symposium on, Min- neapolis, MN. March 29-30, 2014.

Results

Kitchen Scenario



# Research

# Virtual Exertions



Ponto, K., Kimmel, R., Kohlmann, J., Bartholomew, A., and Radwin, R., **“Virtual Exertions: a user interface combining visual information, kinesthetics and biofeedback for virtual object manipulation”** 3D User Interfaces (3DUI), 2012 IEEE Symposium on, (2012) pp. 85-88.



Expectations

Not a New Problem



# Challenge:

How do we build VR  
simulations?

# Star Trek | Holodeck



Challenge

Build a Simulation



# Research

# Building Environments

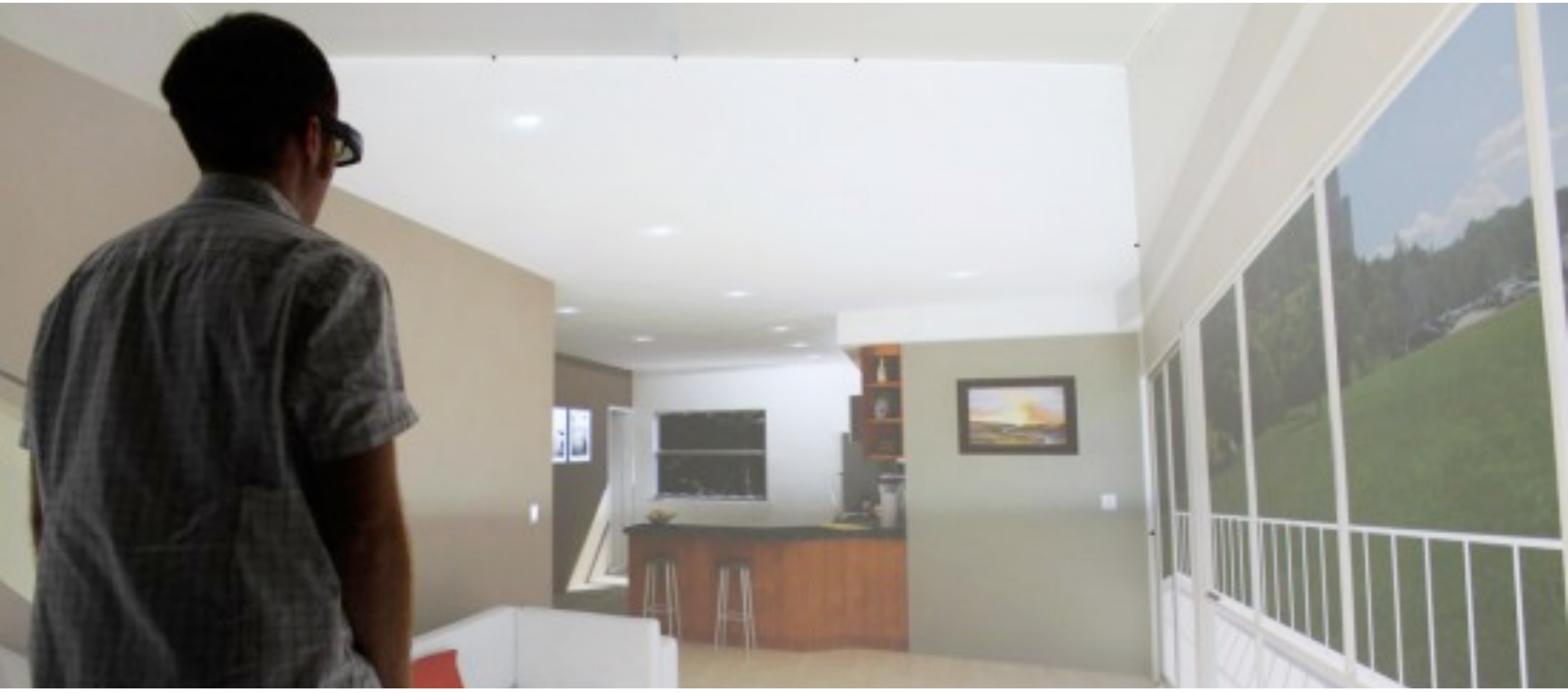


Ponto, K., Tredinnick, R., Bartholomew, A., Roy, C., Szafir, D., Greenheck, D., and Kohlmann, J., **“SculptUp: A Rapid, Immersive 3D Modeling Environment”** 3D User Interfaces (3DUI) Contest, Orlando, FL. March 16-17, 2013.

Tredinnick, R. and Ponto, K., **“Say It To See It: A Speech Based Immersive Model Retrieval System”** 3D User Interfaces (3DUI), 2013 IEEE Symposium on, Orlando, Florida. March 16-17, 2013.

Challenge

Home Environments



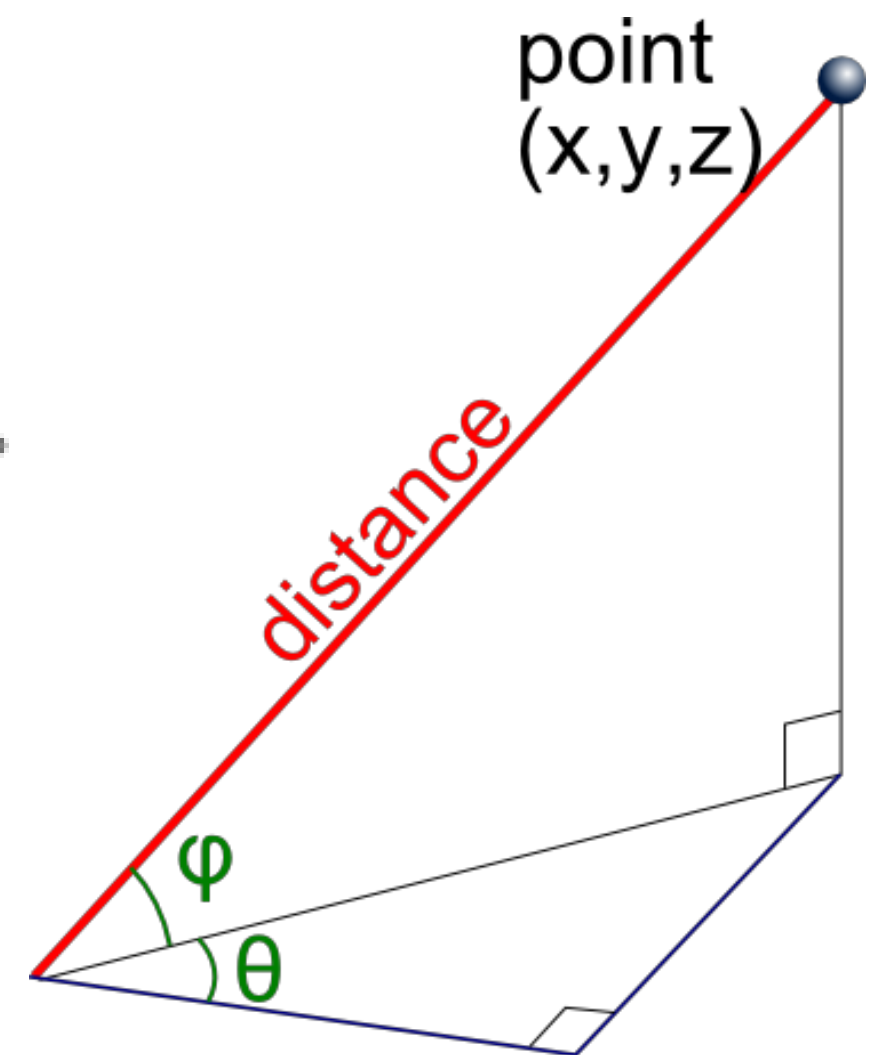
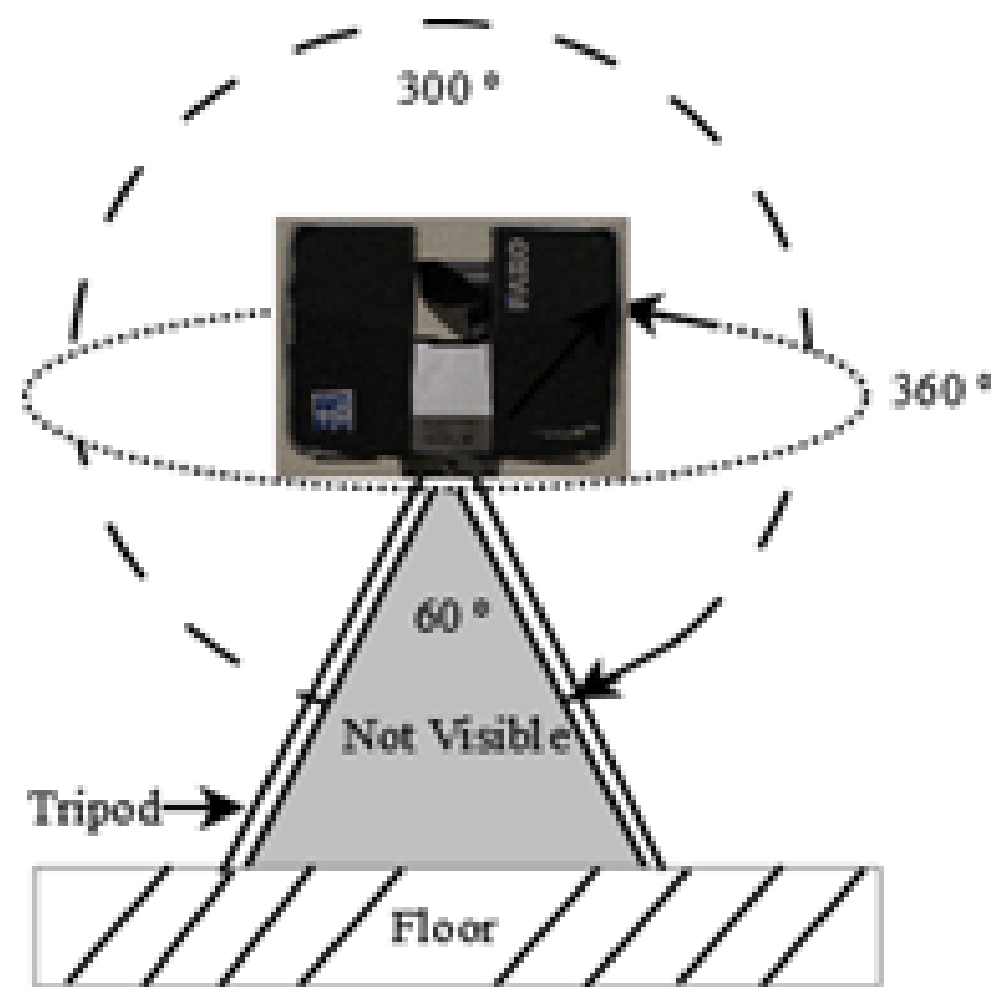
Challenge

Home Environment



Solution

LiDAR





Results

Realistic Home Environments

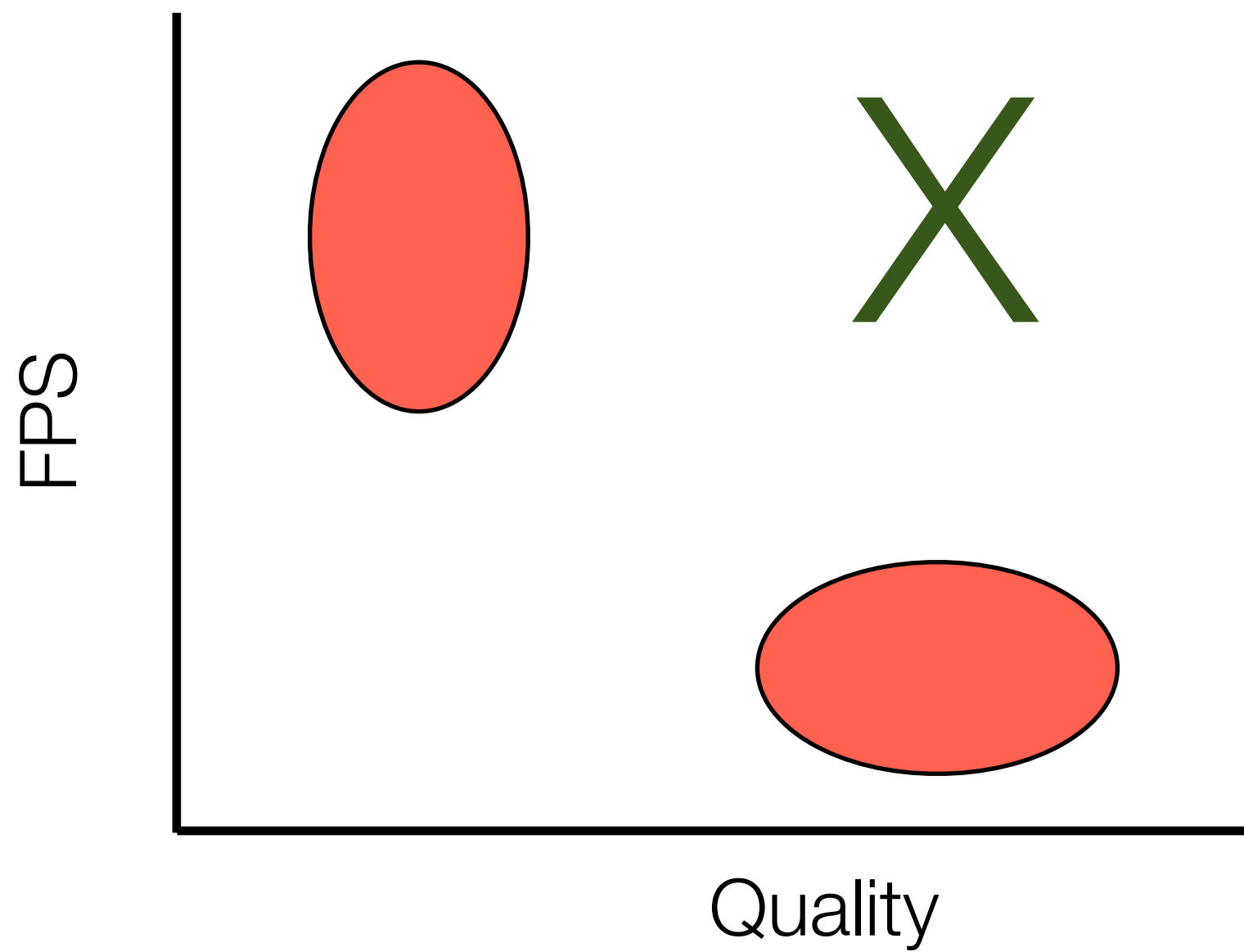


# Challenge:

How do we support VR  
visualizations of big data?

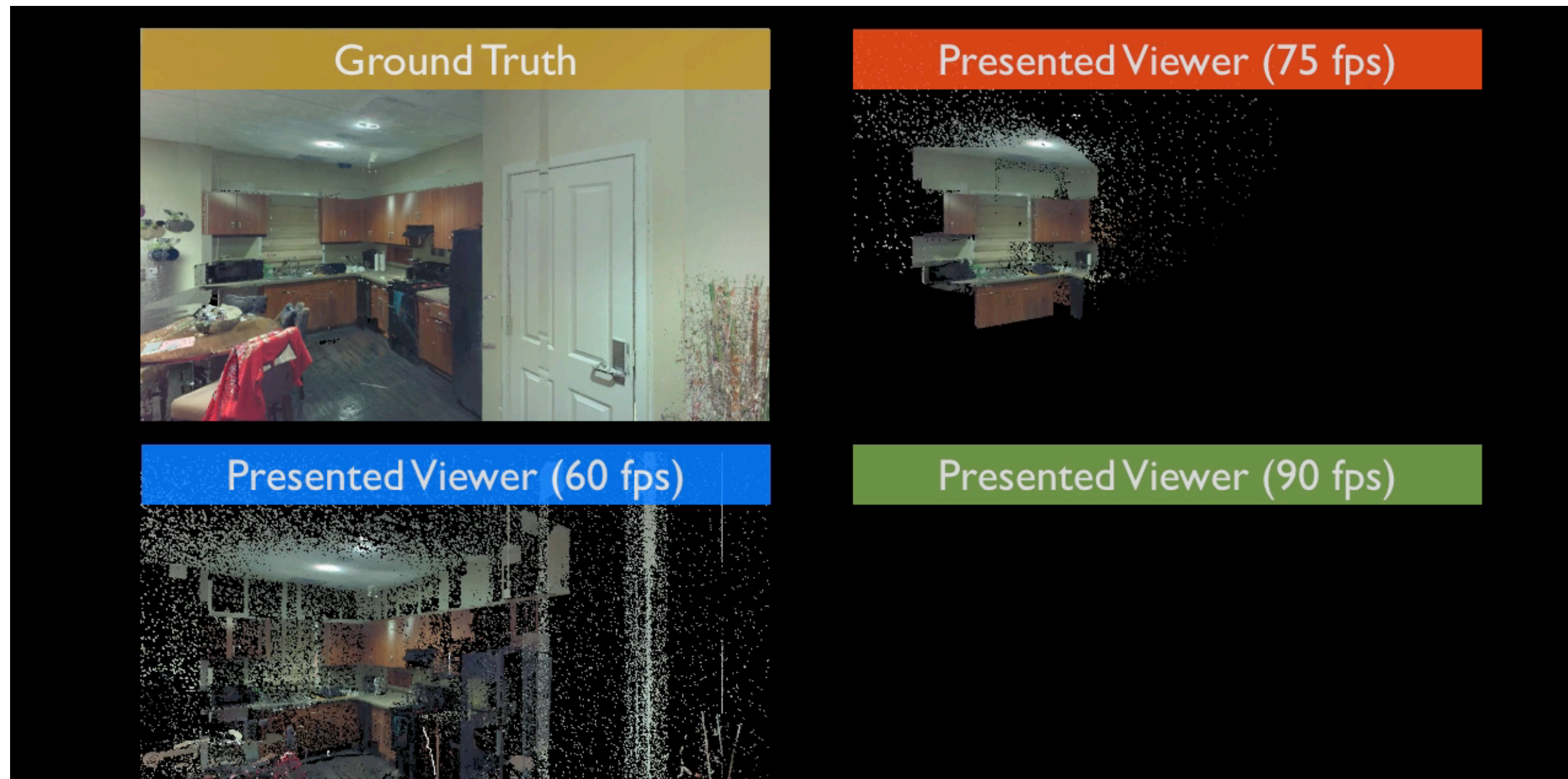
Challenge

Visualization Bandwidth



# Challenge

# Visualization Bandwidth



# Challenge

# Visualization Bandwidth



Broecker, M., Ponto, K., "Transient Motion Groups for Interactive Visualization of Time-Varying Point Clouds" IEEE Aerospace 2016.

Challenge

Visualization Bandwidth



Broecker, M., Ponto, K., "Transient Motion Groups for Interactive Visualization of Time-Varying Point Clouds" IEEE Aerospace 2016.

# Challenge

# Visualization Bandwidth



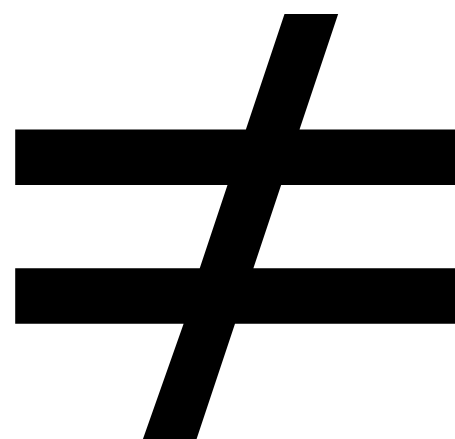
Broecker, M., Ponto, K., "Transient Motion Groups for Interactive Visualization of Time-Varying Point Clouds" IEEE Aerospace 2016.

# Challenges

# Perceptions in Virtual Reality



Virtual



Physical



Research

Perceptually Calibrating Virtual  
Environments



# **Challenge:**

How do we support research?

# Personnel

# Faculty and Staff

## Faculty & Staff



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Support

Government Agencies



Agency for Healthcare Research and Quality  
*Advancing Excellence in Health Care*



National Institutes of Health  
*Turning Discovery Into Health*



Support

External Sponsors



Support

Internal Competitions





Funding

Challenge

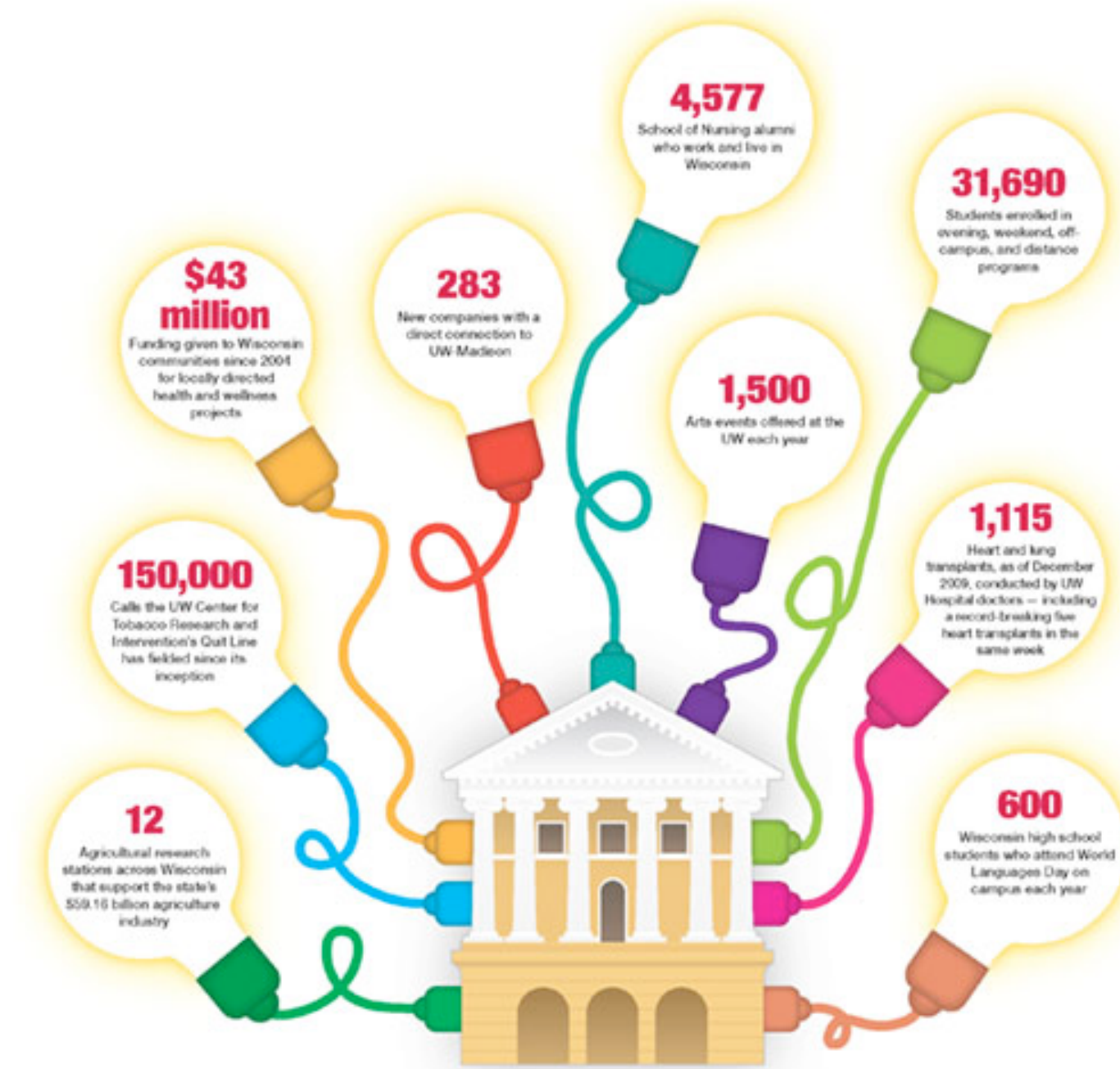


# **Challenge:**

How do we support outreach events?

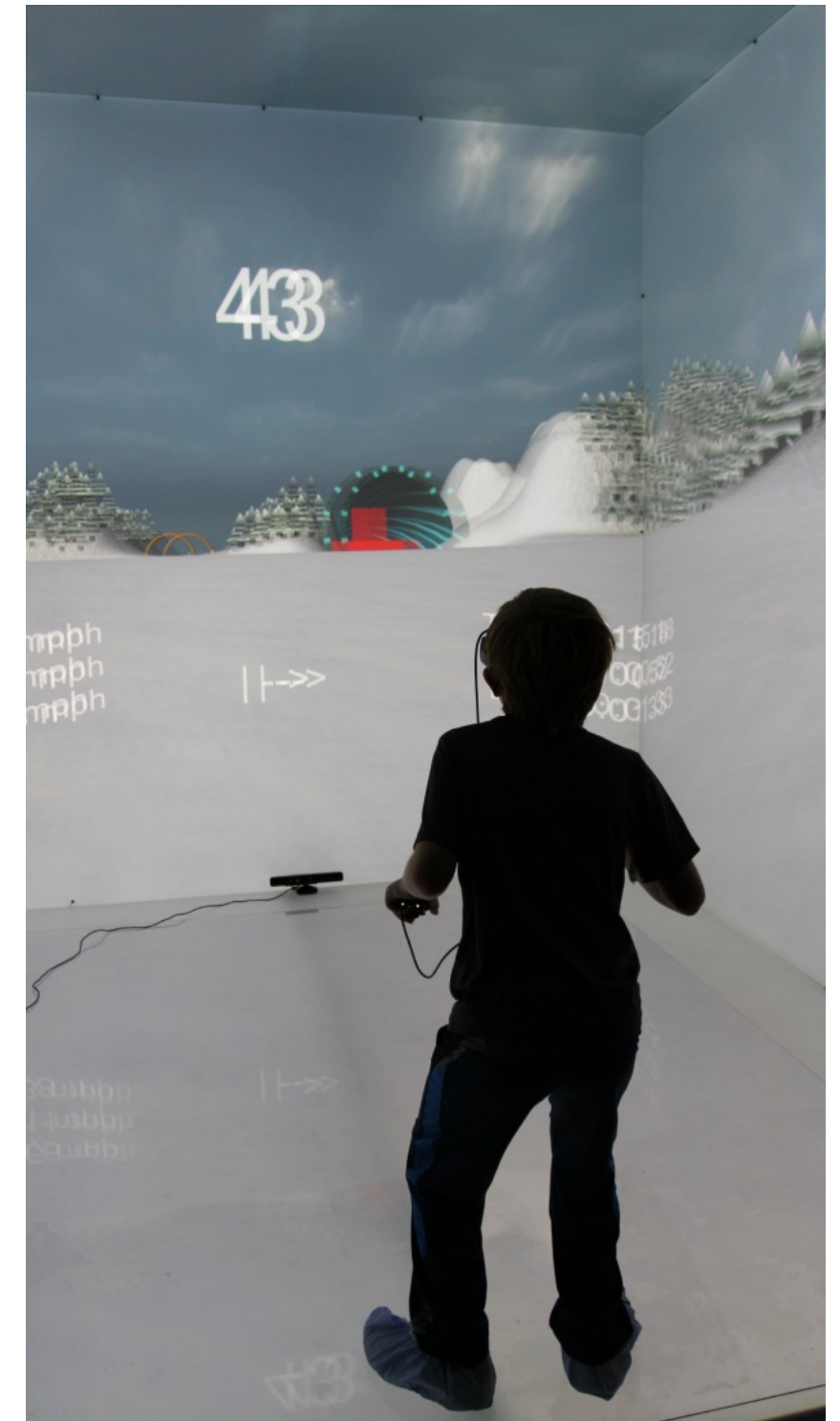
# Outreach

# Wisconsin Idea



Outreach

Educational Science Events



Outreach

Exhibitions



Outreach

Public Learning Events



Outreach

Positive Experience



Outreach

Large and Diverse Audience





Outreach

Challenges



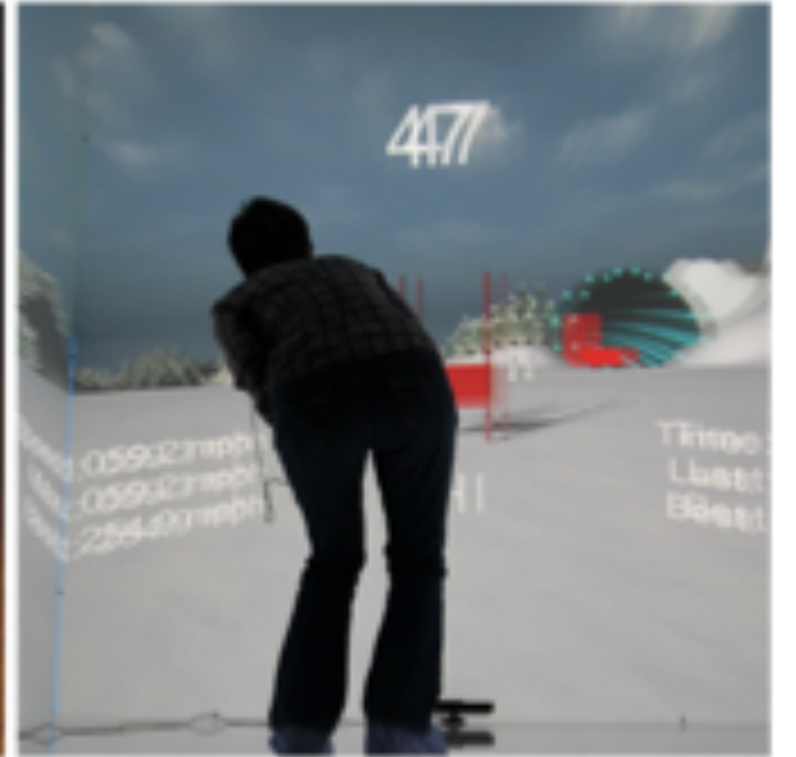
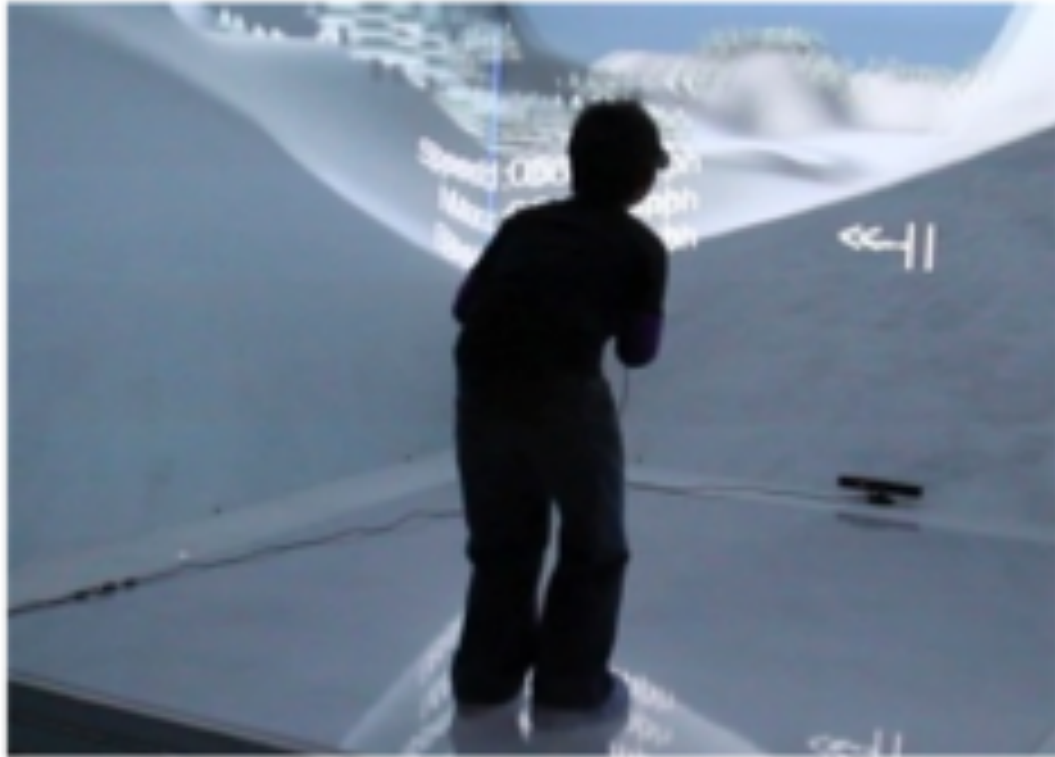
Outreach

Funding



# Outreach

# Publications



Outreach

Not So Nice People

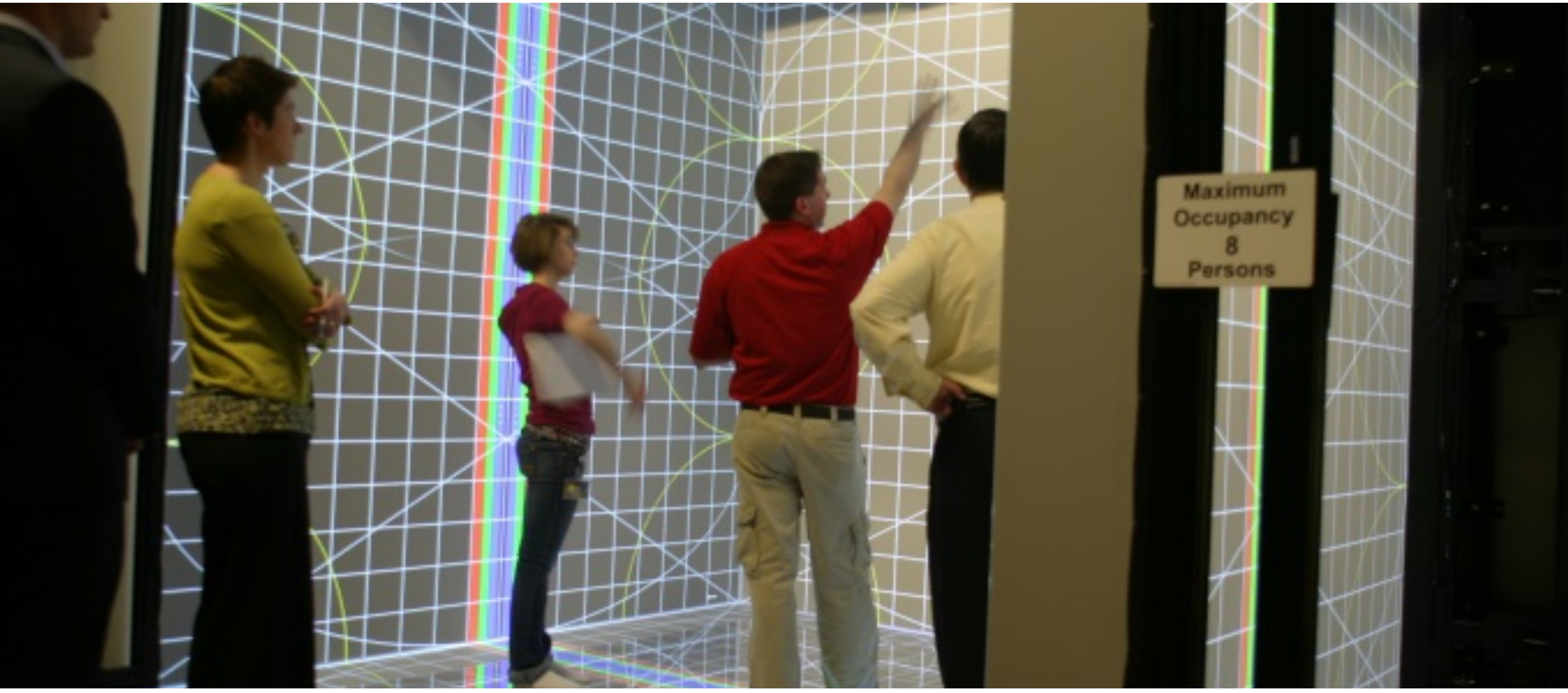


# Challenge:

How do we support a variety of environments?

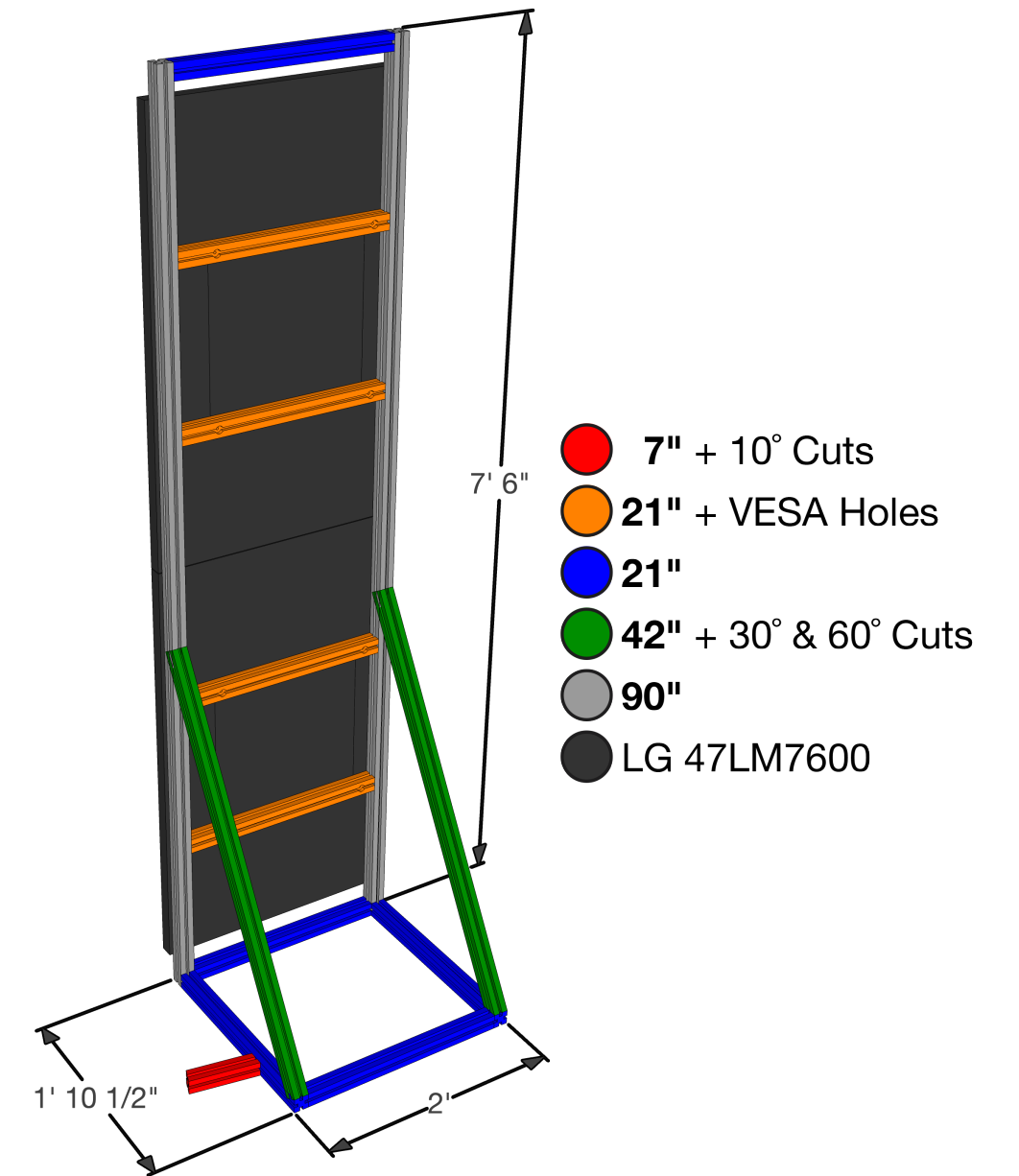
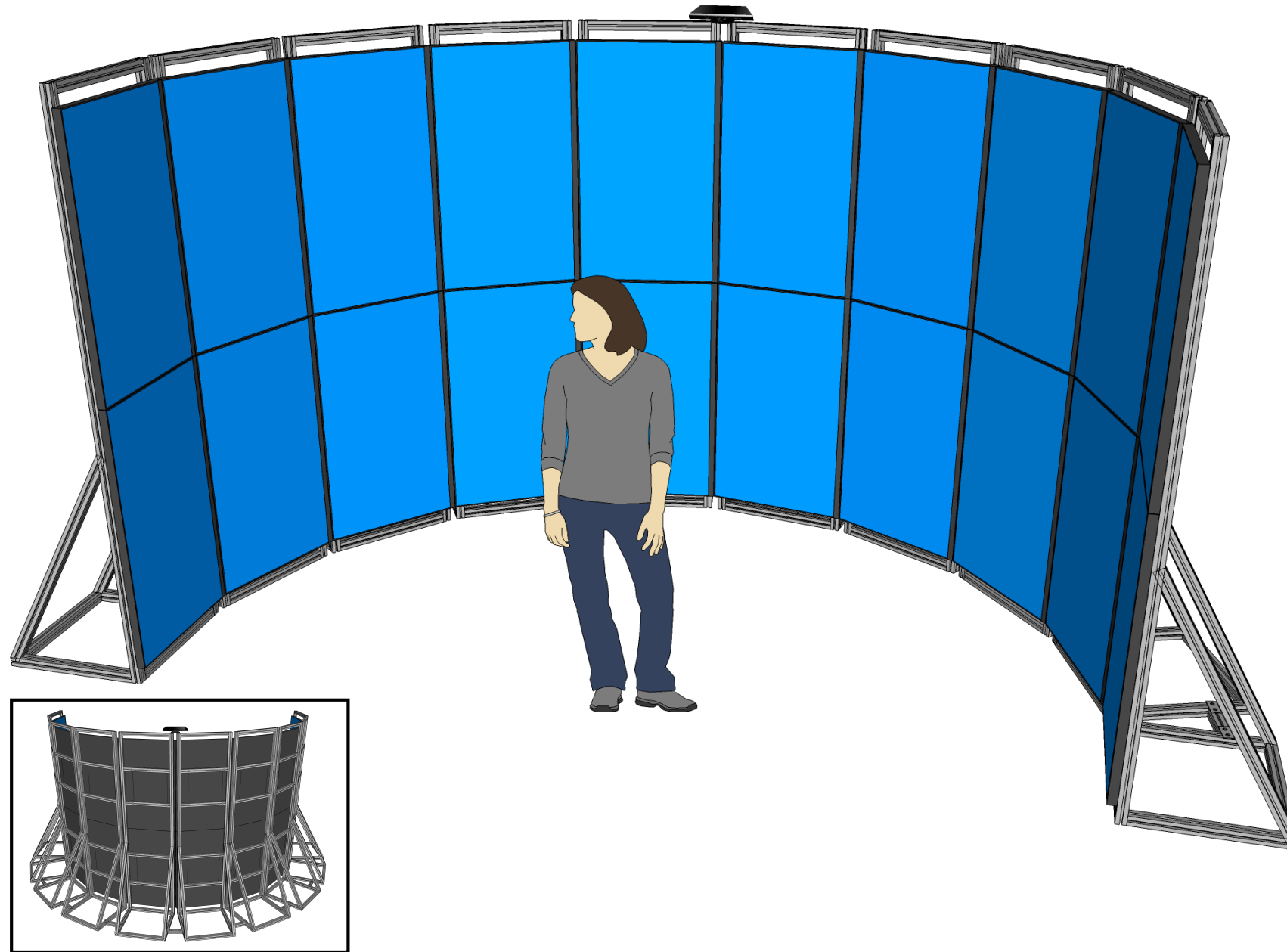
Facilities

CAVE

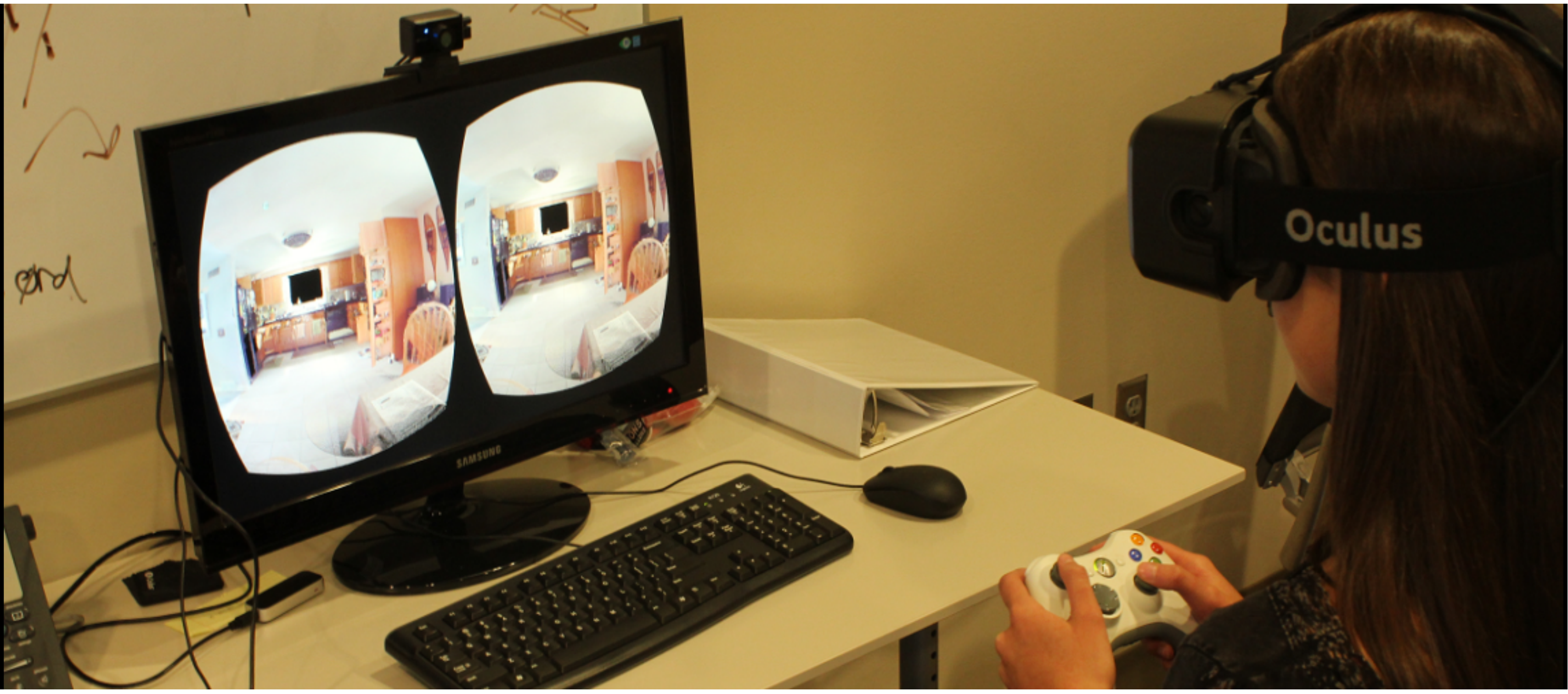


# Facilities

# DSCVR System



# Facilities | HMDs





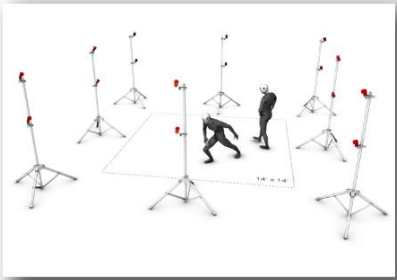
# Facilities

# AVS

## Tech



Consumer Head-mounted displays



Motion capture/ Tracking System

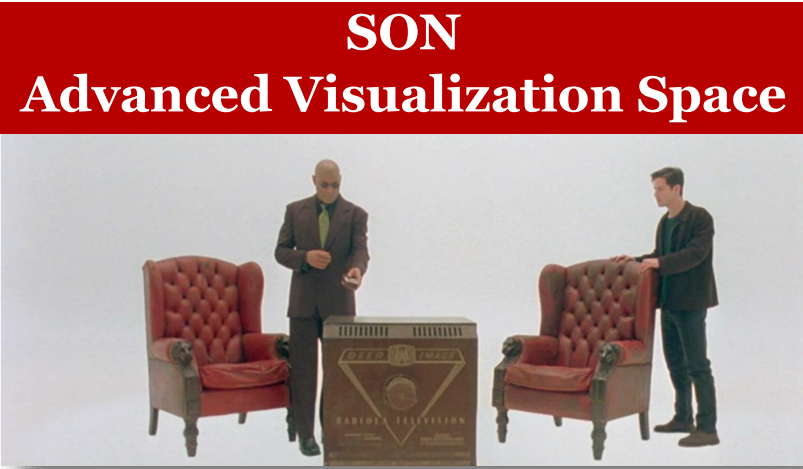
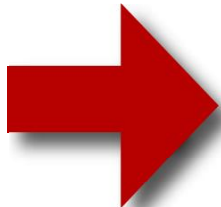
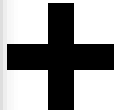
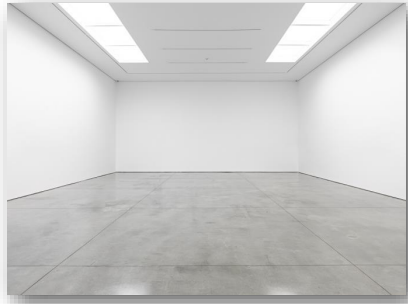


Interactive Authoring and Editing



Full 3D Reconstruction

SON Whitespace



Multiple avatars!  
Natural interaction  
**Props** (chairs, table, boxes, etc)  
Interactive/Reactive scenarios

Software

Game Engines



**unity**

Software

WebGL



# Concluding Thoughts

Conclusion

1950s Computers



Conclusion

1990s CAVEs



Conclusion

Benefits to Exclusivity





**VALVE**<sup>®</sup>





Conclusion

Impact

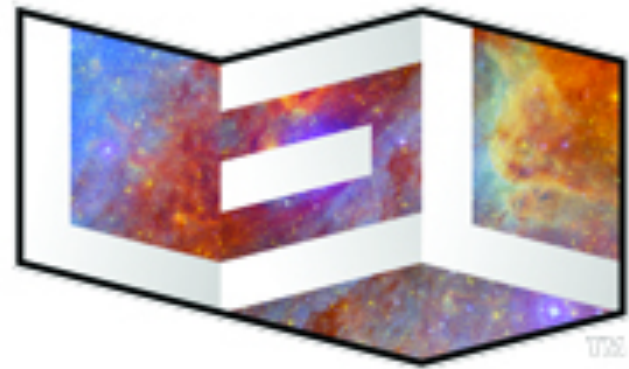


Conclusion

These are Exciting Times



# Stay connected with us:



Living Environments  
Laboratory



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Website: <http://wid.wisc.edu/research/lel/>