

# LECTURE 6: EXAMPLE VR APPLICATIONS

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COMP 4026 – Advanced HCI

Semester 5 - 2017

Bruce Thomas, Mark Billinghurst  
University of South Australia

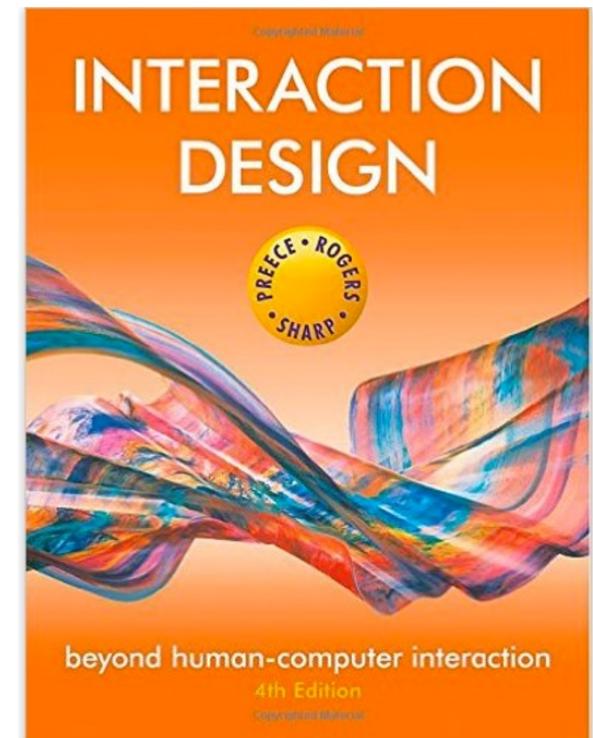
August 31<sup>st</sup> 2017



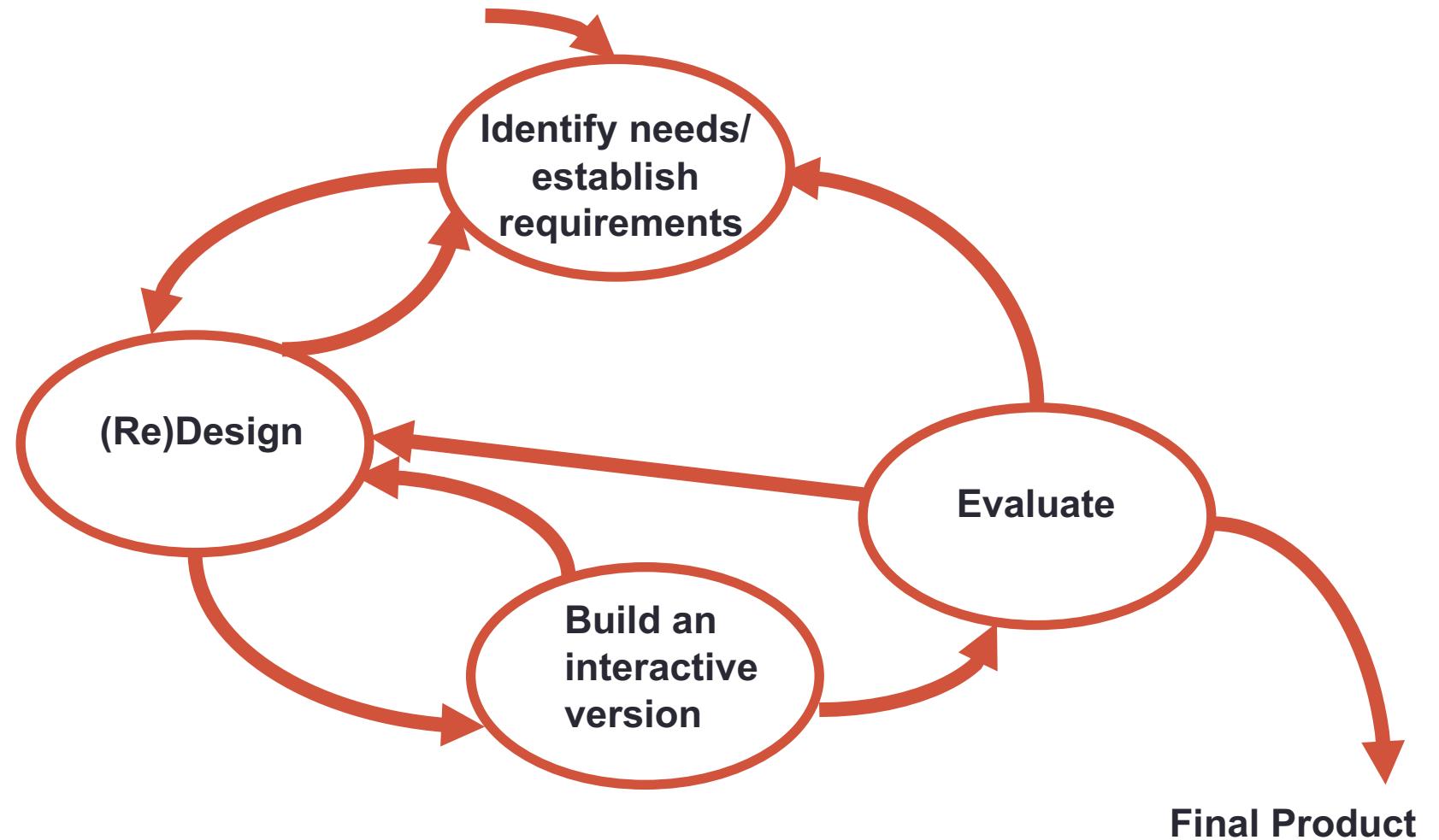
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# Lecture 5: Recap

- **Interaction Design for VR**
  - Iterative method for designing VR experiences
  - Applying well known ID techniques to VR
- **Interaction Design Process**
  - Needs analysis
  - Experience Design
  - System Prototyping
  - Evaluation



# The Interaction Design Process



Develop alternative prototypes/concepts and compare them  
And iterate, iterate, iterate....

# Methods for Identifying User Needs

Learn from people



Learn from Experts

Learn from analogous settings

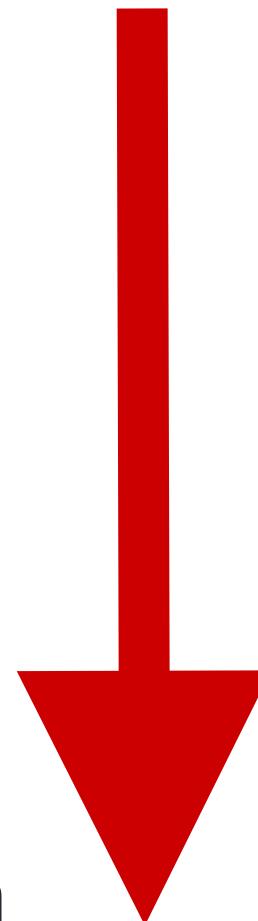
Immersive yourself in context

# VR Design Considerations

- Use UI Best Practices
  - Adapt known UI guidelines to VR
- Use of Interface Metaphors/Affordances
  - Decide best metaphor for VR application
- Design for Humans
  - Use Human Information Processing model
- Design for Different User Groups
  - Different users may have unique needs
- Design for the Whole User
  - Social, cultural, emotional, physical cognitive

# Typical Development Steps

- Sketching
- Storyboards
- UI Mockups
- Interaction Flows
- Video Prototypes
- Interactive Prototypes
- Final Native Application



*Increased  
Fidelity &  
Interactivity*

# VR Prototyping Tools

- **Low Fidelity**
  - Sketched Paper Interfaces – pen/paper, non-interactive
  - Onride Photoshop tool – digital, non-interactive
  - InstaVR - 360 web based tool, simple interactivity
  - SketchBox – create VR interface inside VR
- **High Fidelity**
  - Entiti – template based VR with visual programming
  - A-Frame – web based VR tool using HTML
  - EditorVR – Unity wrapper inside VR
  - Unity/Unreal Game Engine – programming needed

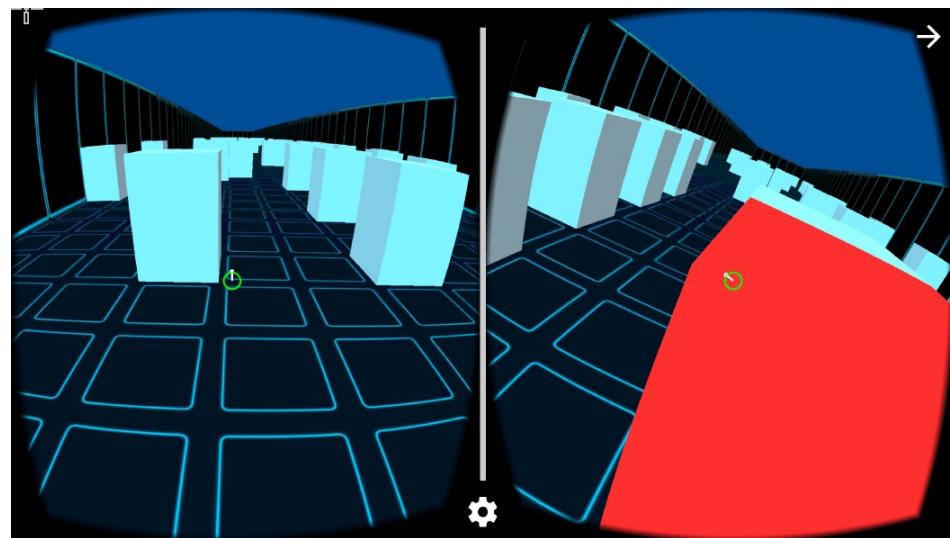
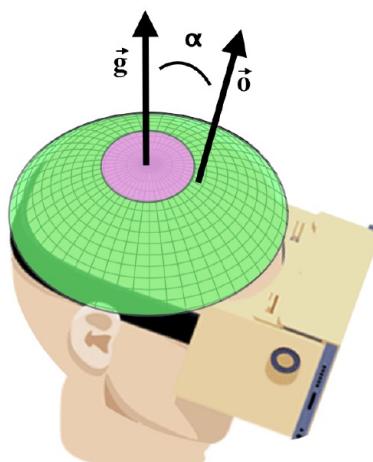
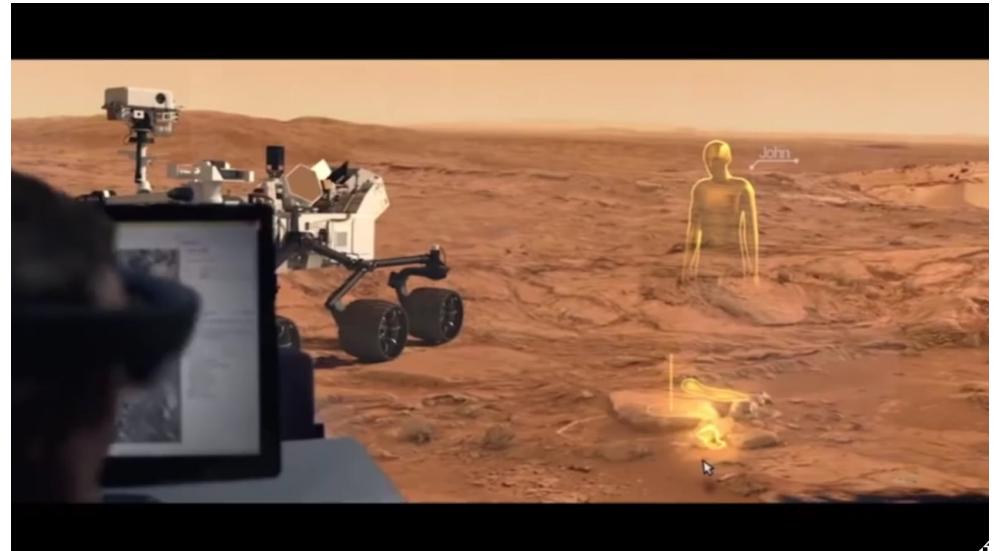
# Four Evaluation Paradigms

- ‘quick and dirty’
- usability testing (lab studies)
- field studies
- predictive evaluation

# Characteristics of Approaches

	<b>Usability testing</b>	<b>Field studies</b>	<b>Predictive</b>
<b>Users</b>	do task	natural	not involved
<b>Location</b>	controlled	natural	anywhere
<b>When</b>	prototype	early	prototype
<b>Data</b>	quantitative	qualitative	problems
<b>Feed back</b>	measures & errors	descriptions	problems
<b>Type</b>	applied	naturalistic	expert

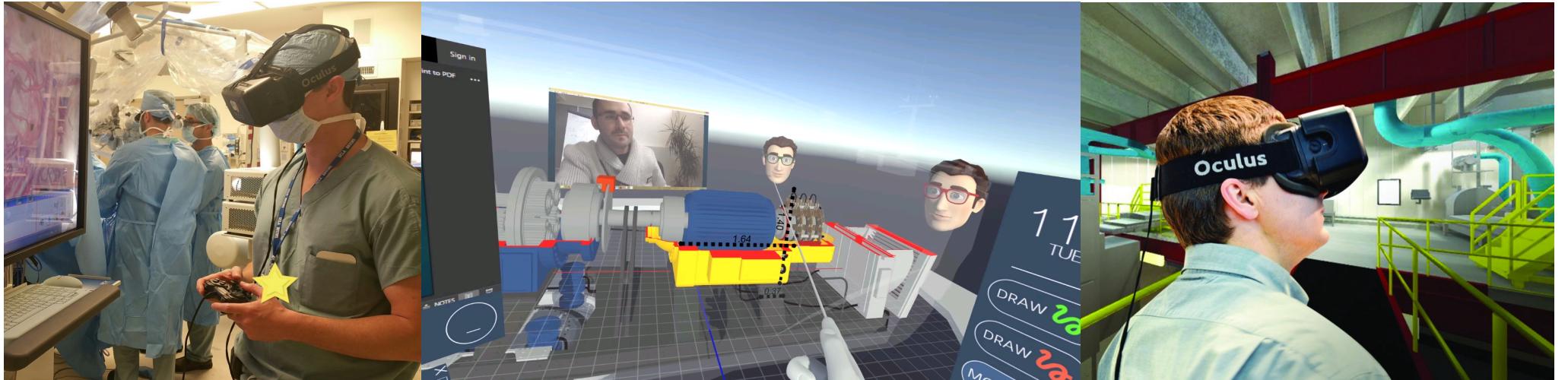
# Examples Mentioned



# EXAMPLE VR APPLICATIONS

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# Virtual Reality Applications



- Ideal applications for VR should:
  - Be strongly visual, have 3D spatial elements
  - Benefit from first person immersion
  - Benefit from 3D manipulation/navigation
  - Support Autonomy, Interaction and Presence (AIP Cube)
  - Etc..

# Many Possible Types of VR Applications

## Healthcare

Surgeons operate in VR to practice difficult procedures ahead of time



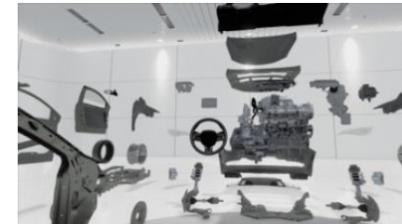
## Entertainment

Fully immersive cinematic experiences (Virtual stadiums, Concerts, Theatre)



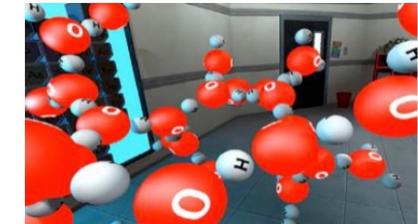
## Manufacturing

VR Headsets used to experience, build and inspect prototyping designs



## Education

Virtual classes to observe historic, natural and architectural sites to drive deeper subject engagement



## Charity

Charities are allowing people to experience first hand hardships such as war, poverty and natural disaster for a deeper impact



## Sporting

Coaches using player point of view simulations to train teams, devise plays and revisit past games



## Military

Virtual combat simulations are used to train soldiers before they are deployed in real life



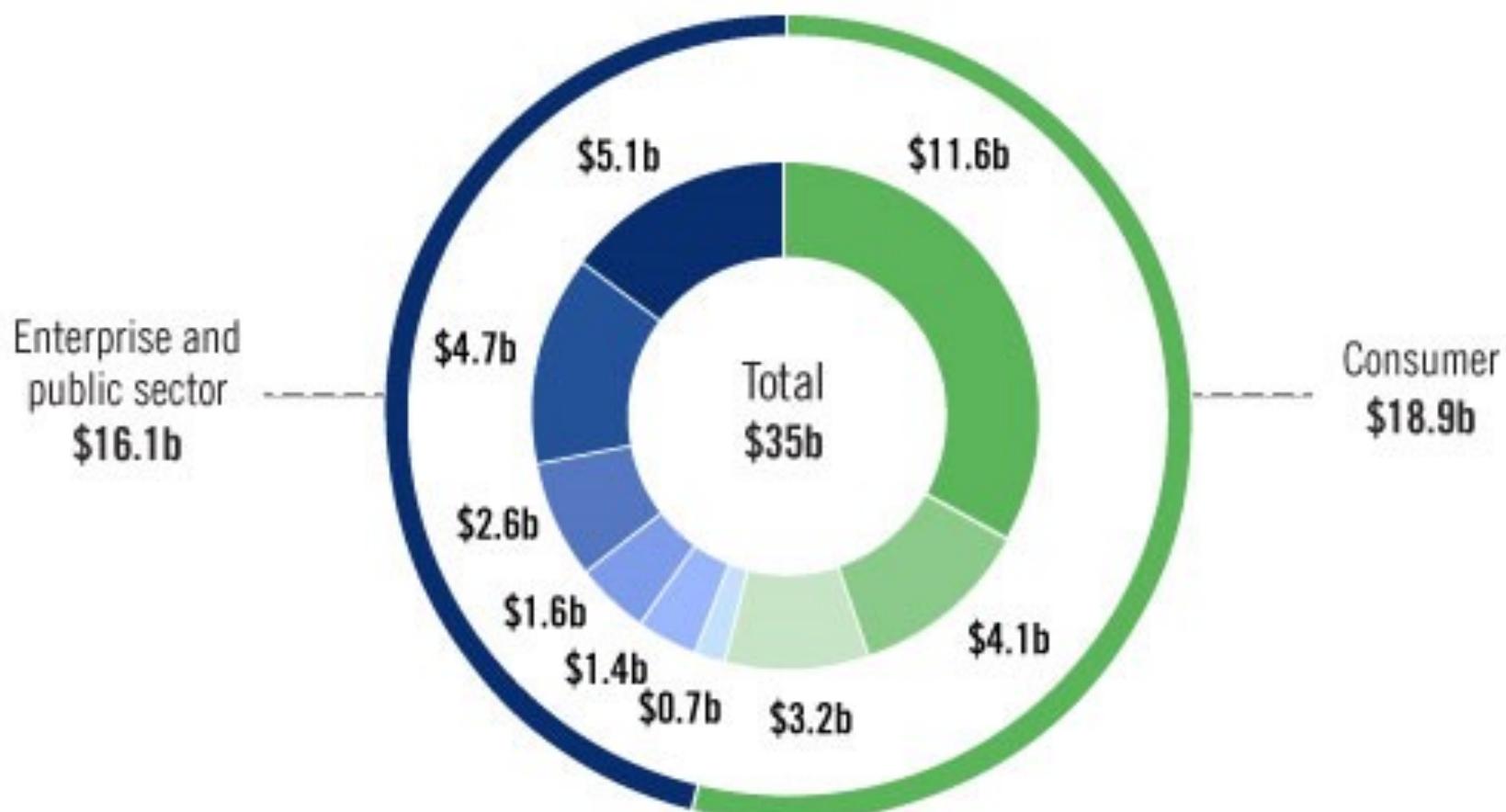
## Travel

Travel agencies let customers experience destinations in VR before they book, from views such as helicopter or submarine



## Expected VR and AR Market Sizes in 2025

■ Healthcare ■ Engineering ■ Real Estate ■ Retail ■ Military ■ Education  
■ Video Games ■ Live Events ■ Video Entertainment



Source: Goldman Sachs Global Investment Research

[www.investmentu.com](http://www.investmentu.com)

# Potential Disruption for Existing Domains

## SOCIAL

*"[VR] has the potential to be the most social platform ever. Immersive, virtual and augmented reality will be part of people's daily lives."*

**Mark Zuckerberg**  
CEO of Facebook

## GAMES

*"Working on game development, we always try to create a new kind of experience, and having VR technology is almost unfair."*

**Shuhei Yoshida**  
President of Sony PS Studios

## FILM

*"We're right on the cusp of a major upheaval of the entertainment world once [VR] technology really kicks in."*

**Peter Jackson**  
Director of Lord of the Rings Trilogy

## MUSIC

*"I can only do so many concerts. So to be able to have more people experience them through VR... that would be epic."*

**Miley Cyrus**  
Singer / Songwriter

## ADVERTISING

*"[VR] is a perception changer for any advertiser that wants to associate with a new frontier in media."*

**Mitch Gelman**  
VP of Product for Gannet Digital

## EDUCATION

*"[VR] is going to be really important for education. Because kids don't learn best from reading a book or looking at a chalk board."*

**Palmer Luckey**  
Creator of the Oculus Rift

# Example VR Applications

- Education
  - Google Expeditions
- Medicine
  - Virtual Characters
- Entertainment
  - The Void, Zero Latency
- Art + Design
  - Tilt Brush
- Collaboration
  - Facebook Spaces



# EDUCATION

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# Google Expeditions

Google Expeditions

About

How it works

Explore

Get Started

EXPEDITIONS AR

GET THE APP



## Bring Your Lessons To Life

Imagine exploring coral reefs or the surface of Mars in an afternoon. With Expeditions, teachers can take students on immersive, virtual journeys.



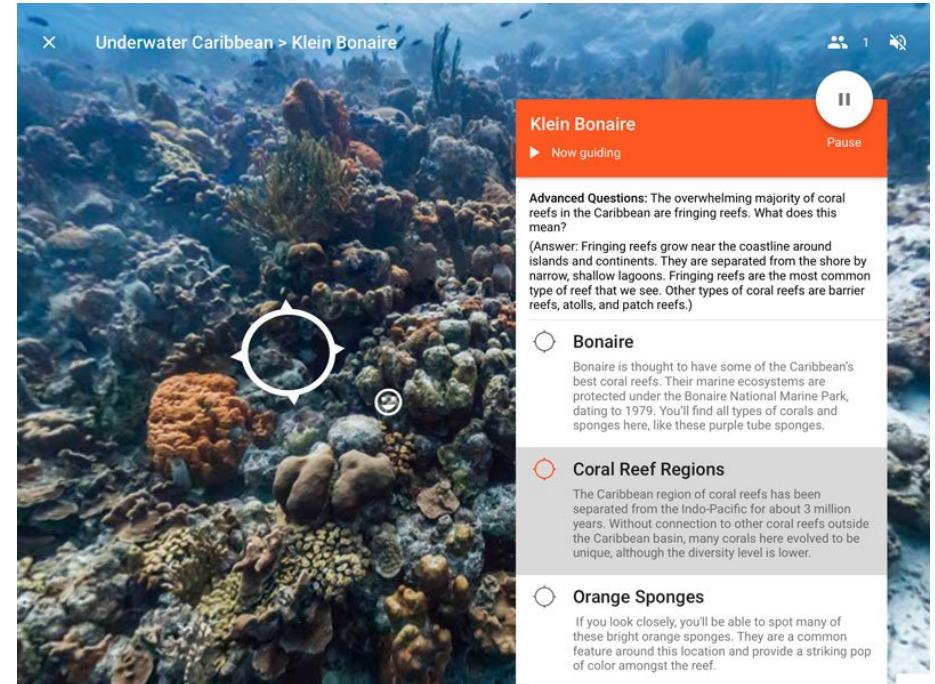
- <https://edu.google.com/expeditions/>
- Mobile VR Educational application (Android, iOS)
- Designed for classroom experiences

# Google Expeditions



- **Goal:** Provide low cost educational VR experience
  - Based on Google Cardboard VR platform
- **Different roles:**
  - **Guide**— person leading an expedition on a tablet
  - **Explorer**— person following an expedition on a phone.
- **Usage**
  - Used by over 1 million students
  - Over 500 educational experiences developed
    - Royal Collection Trust, American Museum of Natural History, etc.

# Teacher Led VR Experiences



*Guide Interface*

- Teacher/Guide uses tablet to control the experience
  - Selects the virtual tour experience
  - Guide sees tour script, can select immersive scenes to view
  - Guide sees focus point and where individual students are looking
  - Students connect as followers, look at what guides highlight

# System



- **Hardware**

- Google Cardboard mobile viewer
- Smart phones + tablet (class set)
- Wireless router

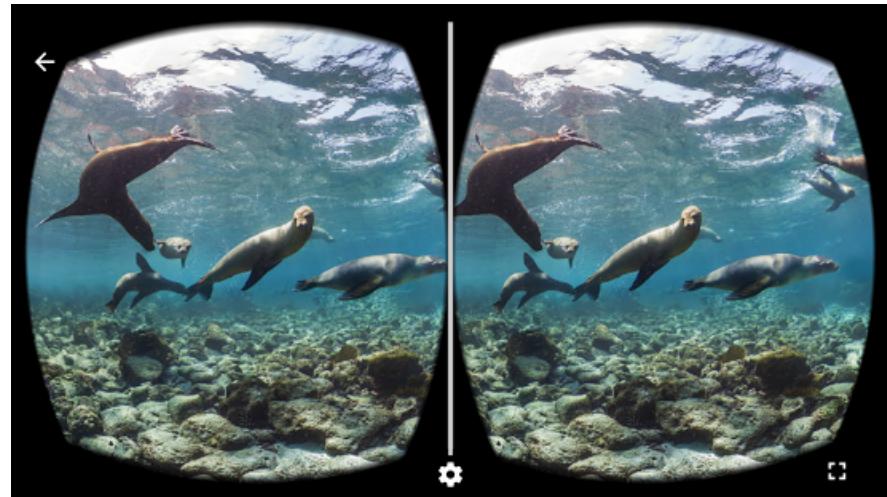
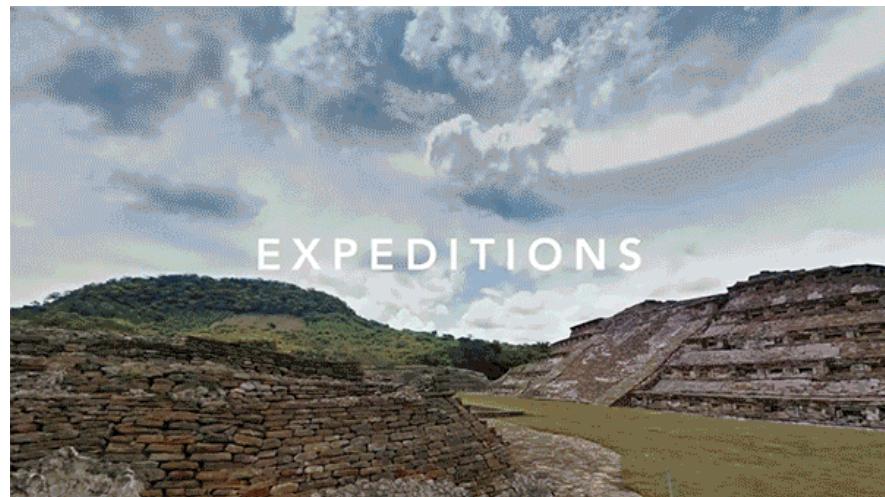
- **Software**

- Viewer and Guide applications (iOS/Android)
- 360 image/video VR experiences



*Class set for 30 students*

# Example Experiences



- Over 500 locations/experiences
  - Great barrier reef, Great Wall of China, Grand Canyon, etc.

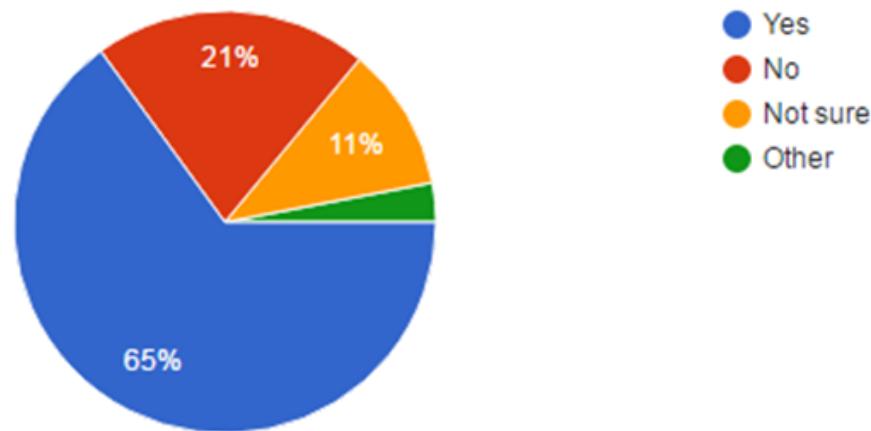
# Demonstration



- [https://www.youtube.com/watch?v=3MQ9yG\\_QfDA](https://www.youtube.com/watch?v=3MQ9yG_QfDA)

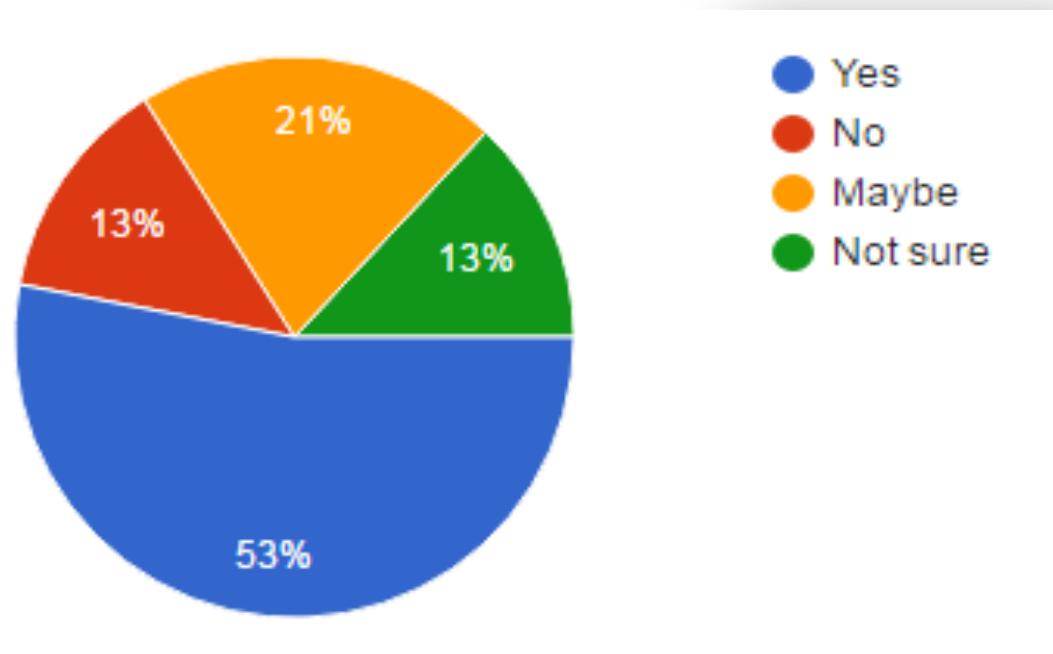
# Feedback

Did you experience a "wow" moment during your experience with Google Expeditions?  
(100 responses)



- Teacher/student survey (100 people)
  - 65% experienced a “Wow” moment during Google expedition
  - Noted the variety of educator styles and approaches possible
  - People enjoyed “The feeling of ‘being’ there”

# Limitations



- 53% of participants identified some problems, including:
  - Difficult for some people who wore glasses
  - Some complained of eye strain, headaches or nausea
  - Some staff were reluctant/resistant to use the leader tablet
  - Issues of disabilities and inclusion

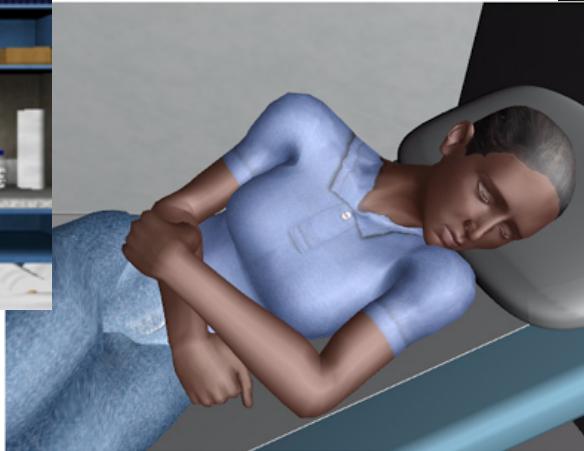
# Challenges/Solutions

- Making VR accessible
  - Designing for phones, tablets, low cost viewers
- Synchronizing content with all viewers
  - Teacher controlled viewing
  - Teacher can guide experiences
- Engaging interaction on simple viewers
  - Head pointing based interaction, button input
- Supporting Educational goals
  - Providing compelling educational content

# MEDICINE

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# Virtual Patients



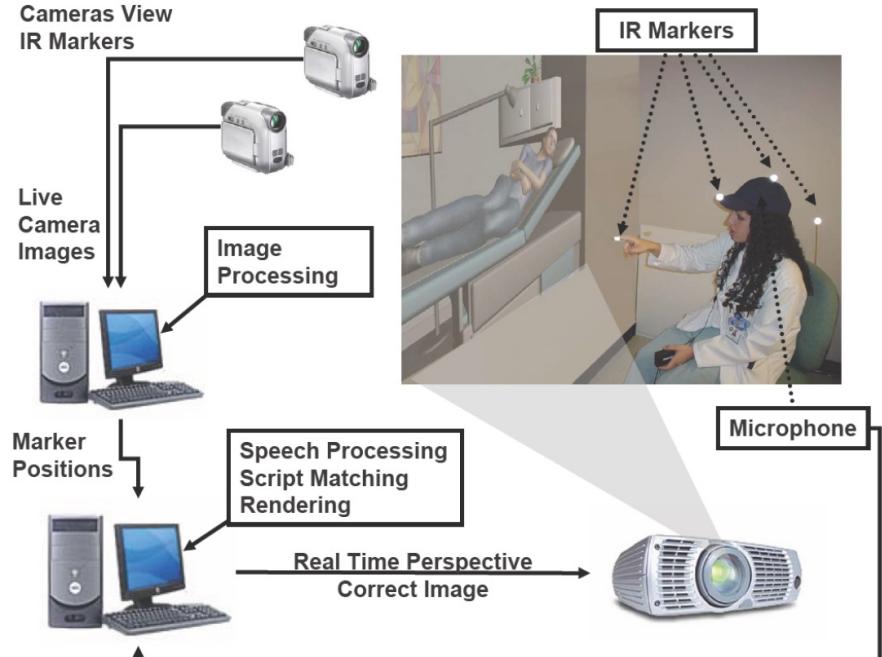
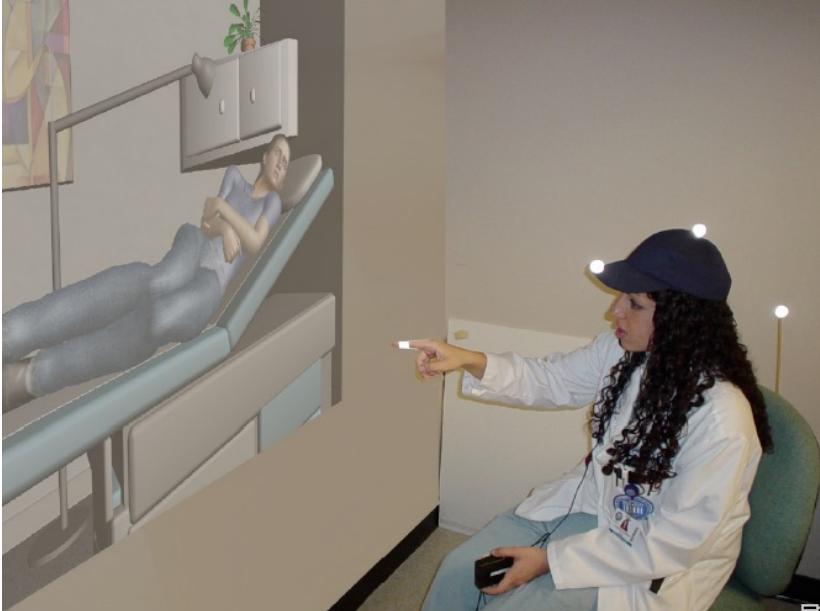
- **Problem**

- Many doctors have poor doctor/patient skills
- Have limited opportunity during training to learn skills

- **Solution**

- Virtual patients that doctors can communicate with naturally
- Artificial agents with speech understanding

# Typical System Setup



- Trainee in front of projection screen
- Speech and gesture recognition
- Intelligent agent on screen

Johnsen, K., Raij, A., Stevens, A., Lind, D. S., & Lok, B. (2007, April). The validity of a virtual human experience for interpersonal skills education. In *Proceedings of the SIGCHI conference on Human factors in computing systems* (pp. 1049-1058). ACM.

# Demo:



- [https://www.youtube.com/watch?v=xC70\\_tRGOOk](https://www.youtube.com/watch?v=xC70_tRGOOk)

# Key Findings

- Virtual Humans can replace actors in training
  - interaction skills used with a virtual human translate to the interaction skills used with a real human
- Students feel a strong sense of co-presence
  - Having character respond to speech and gesture increases immersion
- VR is capable of creating realistic characters
  - Life size, intelligent backend, speech recognition
- Skills learnt transfer to real world

# Challenges/Solutions

- Training in medical environment
  - Design for training in medical exam room
  - Use projected VR not HMDs
- Natural interaction
  - Support speech and gesture interaction
- Tactile/haptic feedback
  - Use prosthetics to add support for palpation and other tactile interaction between doctor and virtual patient
- Supporting Educational goals
  - Give virtual character domain knowledge

# ENTERTAINMENT

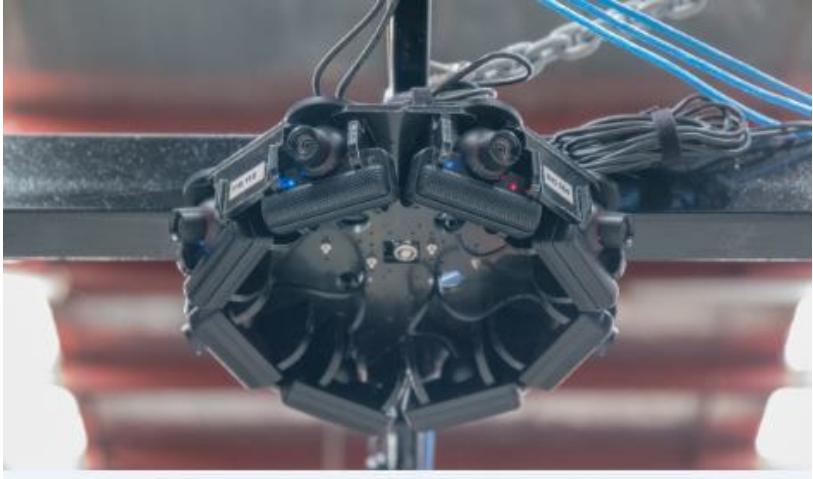
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# Large Scale VR Gaming



- Provide multi-player VR gaming in warehouse space
- Examples
  - The Void - <https://www.thevoid.com/>
  - Zero Latency - <https://zerolatencyvr.com/>

# Typical System



*Tracking cameras*

- **Wide Area Tracking**
  - Computer vision, lights/reflective balls
    - > 120 cameras for 300 m<sup>2</sup> space
- **Backpack VR system**
  - Haptic feedback vest, wireless HMD
- **Real Props**
  - Tracked objects, walls



*Backpack system*

# The Void Demo



- <https://www.youtube.com/watch?v=XgetffuOgBA>

# Challenges/Solutions

- Wide area tracking
  - Computer vision tracking of
  - Over 100 cameras + multiple servers
- Freedom of movement
  - Custom wireless VR backpacks
  - Ruggedized HMDs, weapon props
- Natural interaction
  - Redirected walking, tangible props
- Compelling content
  - Multi-sensory feedback, custom game platform

# **ART + DESIGN**

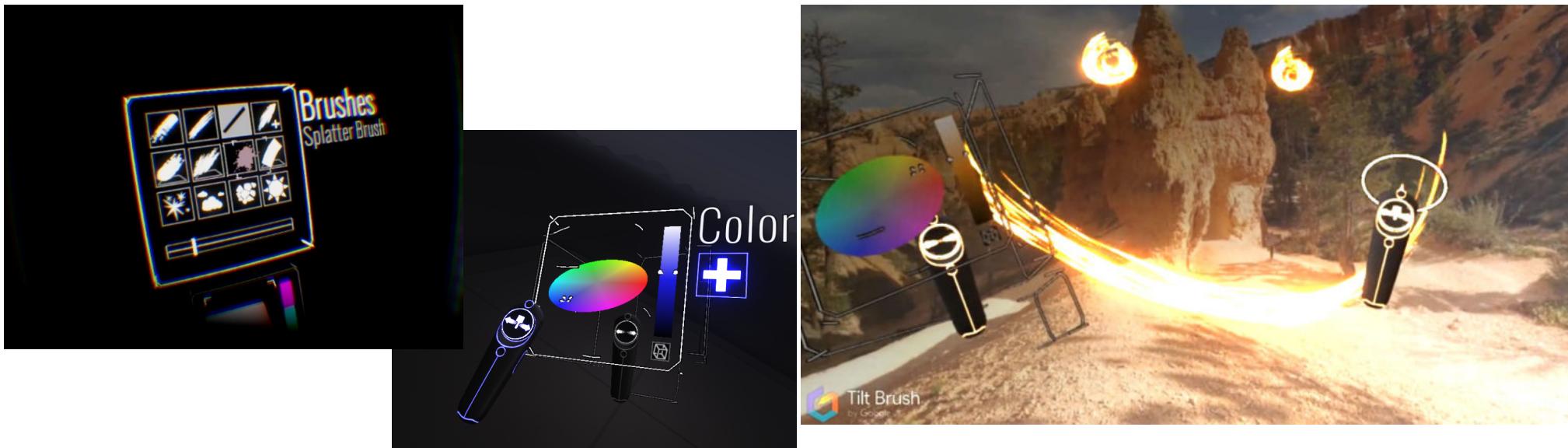
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# Tilt Brush



- Intuitive 3D immersive drawing/sculpting program
- Developed by Patrick Hackett and Drew Skillman 2014
- Acquired by Google in 2015
- <https://www.tiltbrush.com/>

# Functionality



- **Goal:** Extremely natural 3D painting/sculpting
- **User Interface**
  - Two handed interface designed for two controllers (Vive, Rift)
  - Brush in dominant hand, tool palette in non-dominant
  - Typical drawing functionality – color, brush width, undo/redo, etc..
- **Content sharing**
  - Created content can be exported/shared in 2D/3D formats

# Demo



- <https://www.youtube.com/watch?v=TckqNdrdbgk>

# Artist Feedback



- <https://www.youtube.com/watch?v=91J8pLHdDB0>

# Example Tilt Brush Sketches



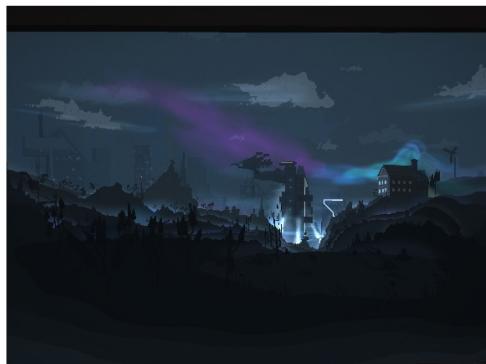
Overwatch - Mei  
Elizabeth Edwards  
2w ago



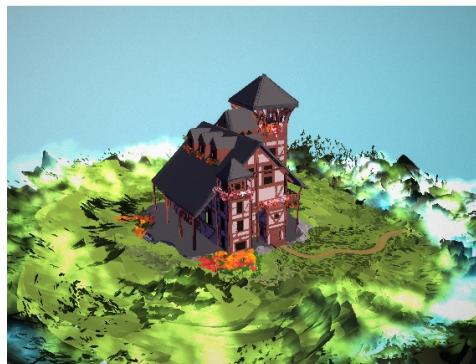
Blue Steel  
Will Huse  
3w ago



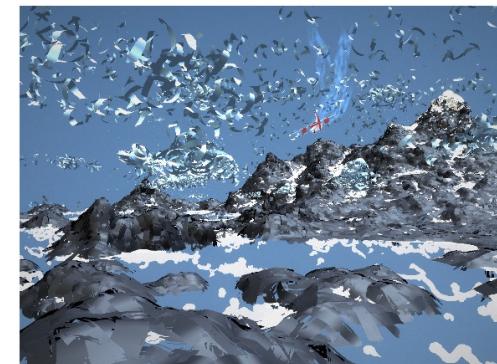
VR Community Garden  
Ali Bahremand  
2w ago



Backyard View  
Danny Bittman  
3w ago



Black Forest House  
Janine  
3w ago



Antarctica  
S. Paul Michael  
3w ago

- <https://vr.google.com/sketches/>
- Explore in desktop VR

# Challenges/Solutions

- **Intuitive Interface**

- Very natural metaphor – painting in space
- Two handed interface – map to VR controllers
- Familiar menu objects from paint programs

- **Need for limited training**

- Provide in app training, tool tips

- **Content sharing**

- Enable content to be exported in variety of formats
  - Video, animated GIFs, 2D images, 3D files

- **Engaging Experience**

- Provides novel immersive artistic experience

# COLLABORATION

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# Facebook Spaces



- Collaborative VR environment
  - VR meeting and interaction space (up to 4 people)
- Focus on communication
  - Speech and gesture based
- <https://www.facebook.com/spaces>

# System Interaction



- Designed for Oculus Rift/HTC Vive
  - Upper body tracking, touch controllers
- Simple interaction
  - Loading scenes, direct object manipulation
- Content creation
  - Selfie pictures, simple sketching

# Demo



- <https://www.youtube.com/watch?v=PVf3m7e7OKU>

# Challenges/Solutions

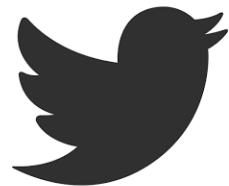
- Create shared sense of Presence
  - Use common background, shared objects
- Natural communication
  - Support non-verbal behaviour, speech/gesture input
- Intuitive interaction
  - Map real body motion onto Avatars
  - Limited ability to navigate/move through environment
- Engaging Experience
  - Shared content creation, experience capture



[www.empathiccomputing.org](http://www.empathiccomputing.org)



[mark.billinghurst@unisa.edu.au](mailto:mark.billinghurst@unisa.edu.au)



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