VR… Coming to a Jobsite Near You… Soon!

Ben Bringardner & Matt Deeken

VDC Manager
Black & Veatch

Design & Virtual Construction Manager
Black & Veatch

Class summary

- Join us for a guided tour of how Black & Veatch is exploring the potential impact of "VR jobsites" on the future of design and construction. What's a "VR jobsite, you ask? It is a virtual version of the actual jobsite, including cranes and temporary works. This virtual version can take many forms ranging from 3D meshes to spherical photography. The idea is to create and use VR jobsites for planning, safety & historical purposes because it eliminates assumptions and risk by capturing and portraying the actual jobsite conditions, not just modeled conditions. Additionally... and most fun of all... you can immerse yourself in a VR jobsite or future design using 1st person virtual reality (VR). Together we will explore real examples, proofs of concepts and ideas from infrastructure projects including power plants & water projects. It won't be a total space odyssey, some of the ideas we will explore together are being implemented today...with ease!

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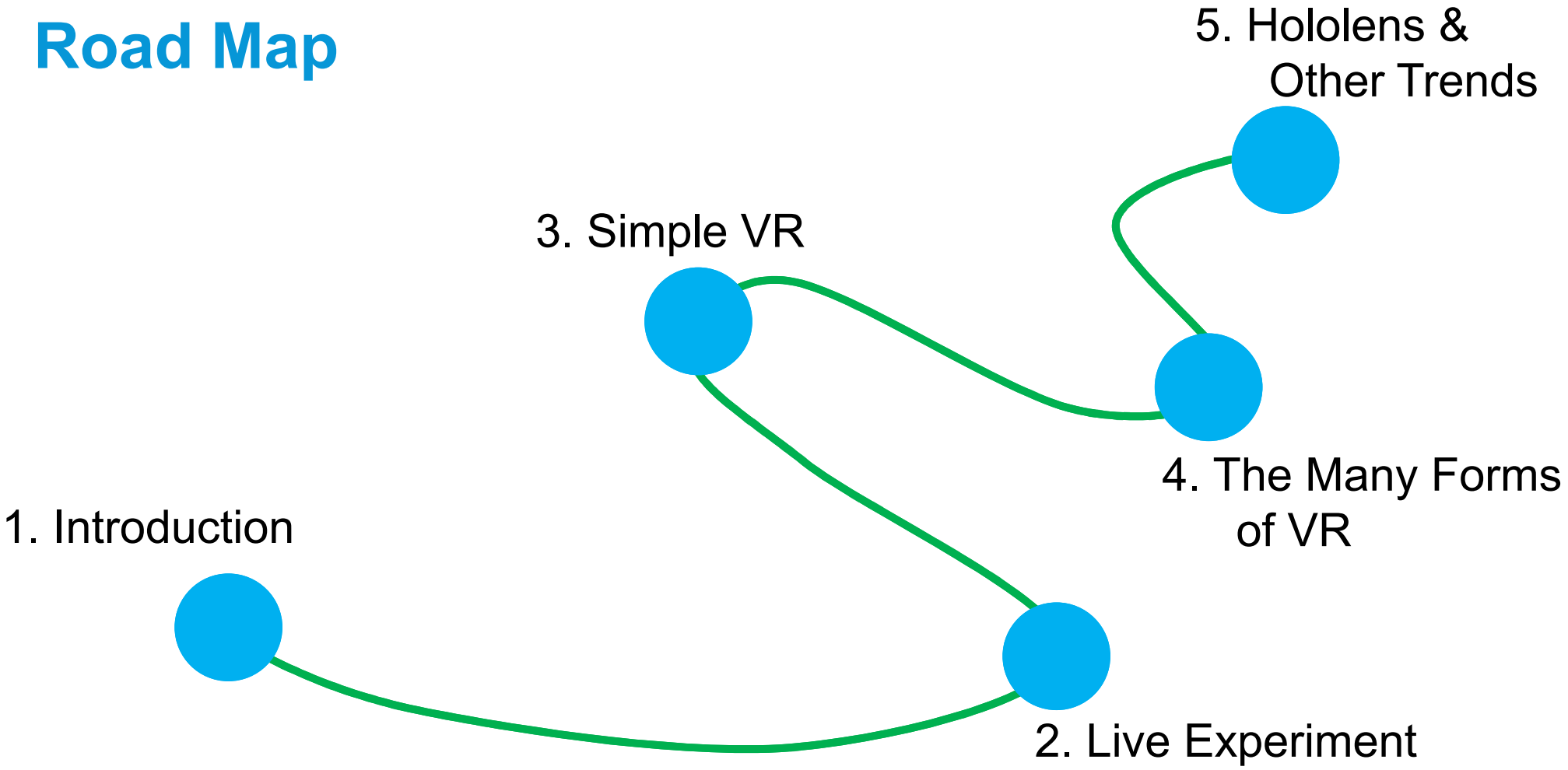
Explore VR for Construction Together

Key learning objectives

At the end of this class, you will be able to:

- Be excited about the future of VR versions of jobsites
- Realize that we are closer that we think to making this reality
- Implement workflows for simple VR at their project
- Tell their friends about some way cool stuff!

Road Map


5. Hololens &
Other Trends
3. Simple VR
4. The Many Forms
of VR
1. Introduction
2. Live Experiment

Technology in Construction

GEICO.COM's
SO EASY A CAVEMAN CAN DO IT : OFFENSIVE ?

2004…

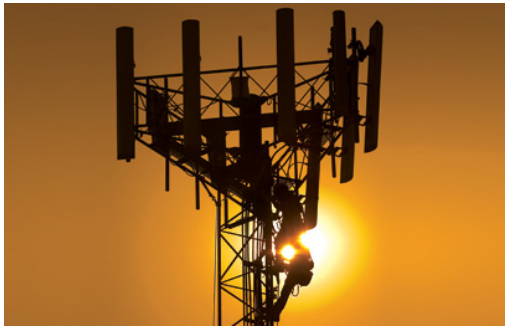
learned abou
information. n
facts provide
details abou
wledge

Black & Veatch

- Infrastructure EPC
- Turnkey Delivery
- Complex Projects
- Direct Hire Execution

Power, Oil & Gas

Special Projects



Telecomm

Water

Direct Hire Execution

- 500,000 craft manhours
  - Pipefitting
  - Steel Erection
  - Electrical
- Big Incentive
  - 2% faster = $1,000,000
- Advanced Work Packaging
- Leverage Technology

Live Experiment … 2 Volunteers Please!!!

Traditional

&

Hololens

360 Site Photos to VR

Theta S – 360 Camera

- Cheap, Fast & Easy
  - $350
  - Point & Shoot
  - Captures 360 instantly
  - Photos & Video

360 to VR Options

- Holobuilder (www.holobuilder.com)
  - Virtual Job Walks
  - Floor Plan
  - iPhone App
- Autodesk Play

- $10 Google Cardboard

Hacks & Ideas

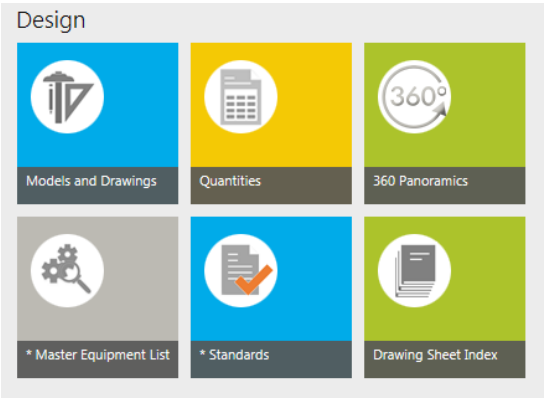
- Project ‘Streetview’
- Progress Photos
- Project Time Lapses
- Safety
  - Site familiarization
  - Blind Spot Training
  - Hazard Recognition
- Link to VR Dashboard & Blind Spot Training

https://www.holobuilder.com/explore?page=details&id=4882397946445824

The many forms of VR

Multiple Avenues to VR

- 360-Degree Photos
- Rendered Panoramic Images
- 3D Video/Animation
- Full Virtual Environment
  - Photogrammetry
  - BIM



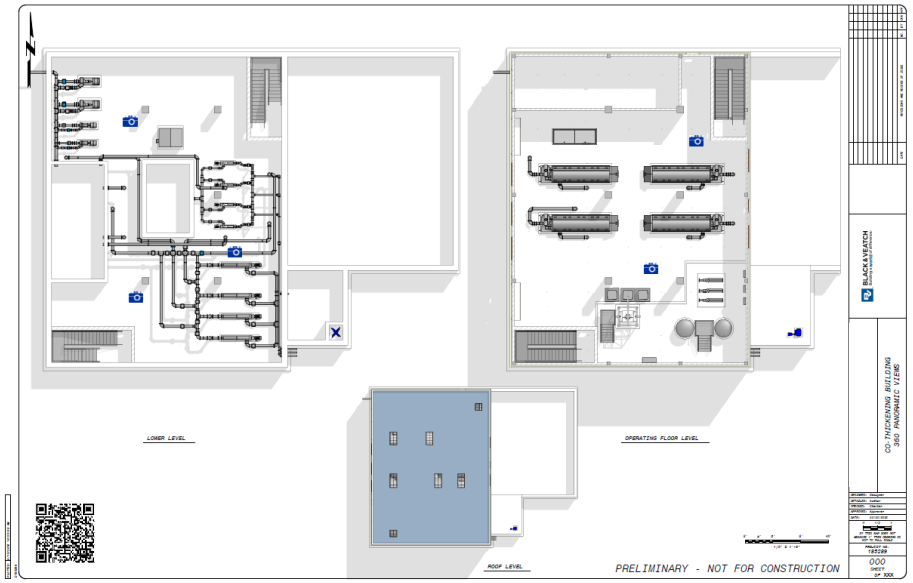
Full Project Life-Cycle Support

Project Pursuit	Design Phase	Construction	Operation
Interview Content	Design Review	Progress Tracking	Maintenance Pre-planning
Public Outreach	Client Engagement	Volume Calculations	AR X-Ray Vision
Conceptual Planning	Safety/Operations	4D Review	Access O&M Info
			Emergency Response/Disaster Training

3D Print and VR Connection

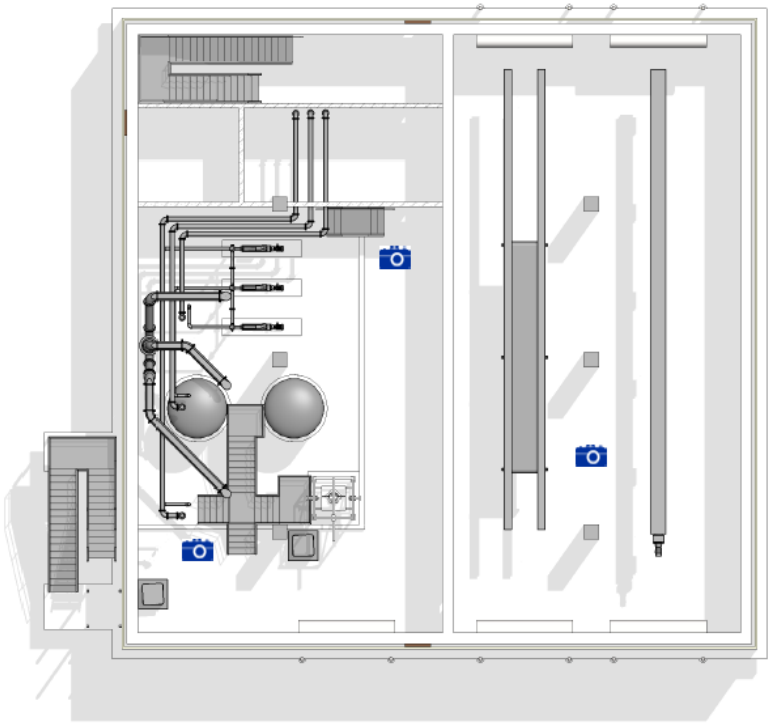
- Concept
  - 3D Print of Proposed Facility
  - Site Plan Underlay
  - QR Codes to Access Stereo Panos

Enhanced Digital Documents



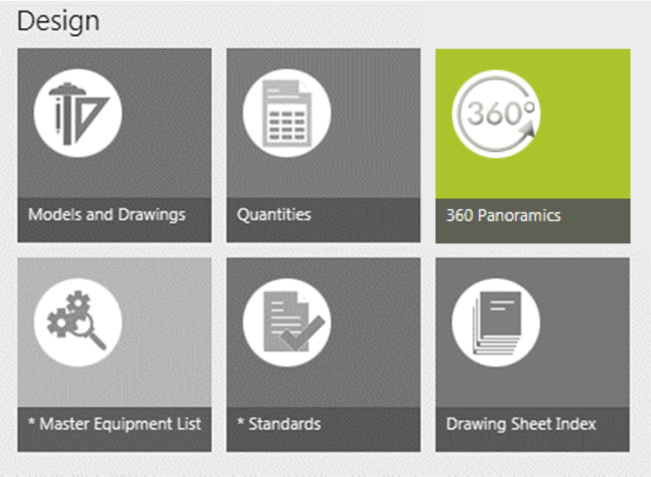
- Traditional design drawings enhanced with hyperlinks and QR codes.
  - Hyperlinks hosted in PDF copy of document.
  - Access to panoramic renderings and online BIM viewer.
  - Connection from physical print to electronic data.

Enhanced Digital Documents



- Hyperlinks to interactive 360-degree panoramic renderings
- Help orient the viewer in the context of the project
- Allow navigation between viewpoints

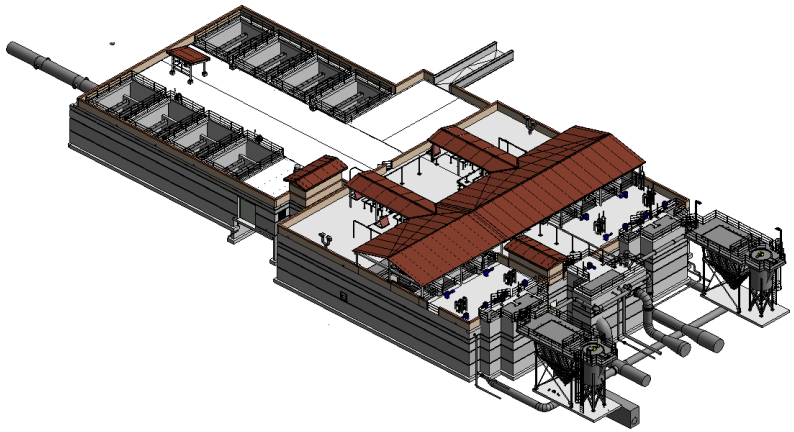
Enhanced Digital Documents



Example Pano

- Incorporated into standard milestone review process
- Accessed through client facing web interface
- Emphasized in early project phases to capture meaningful client feedback

Enhanced Digital Documents



REVIT + A360 + Bluebeam + SharePoint

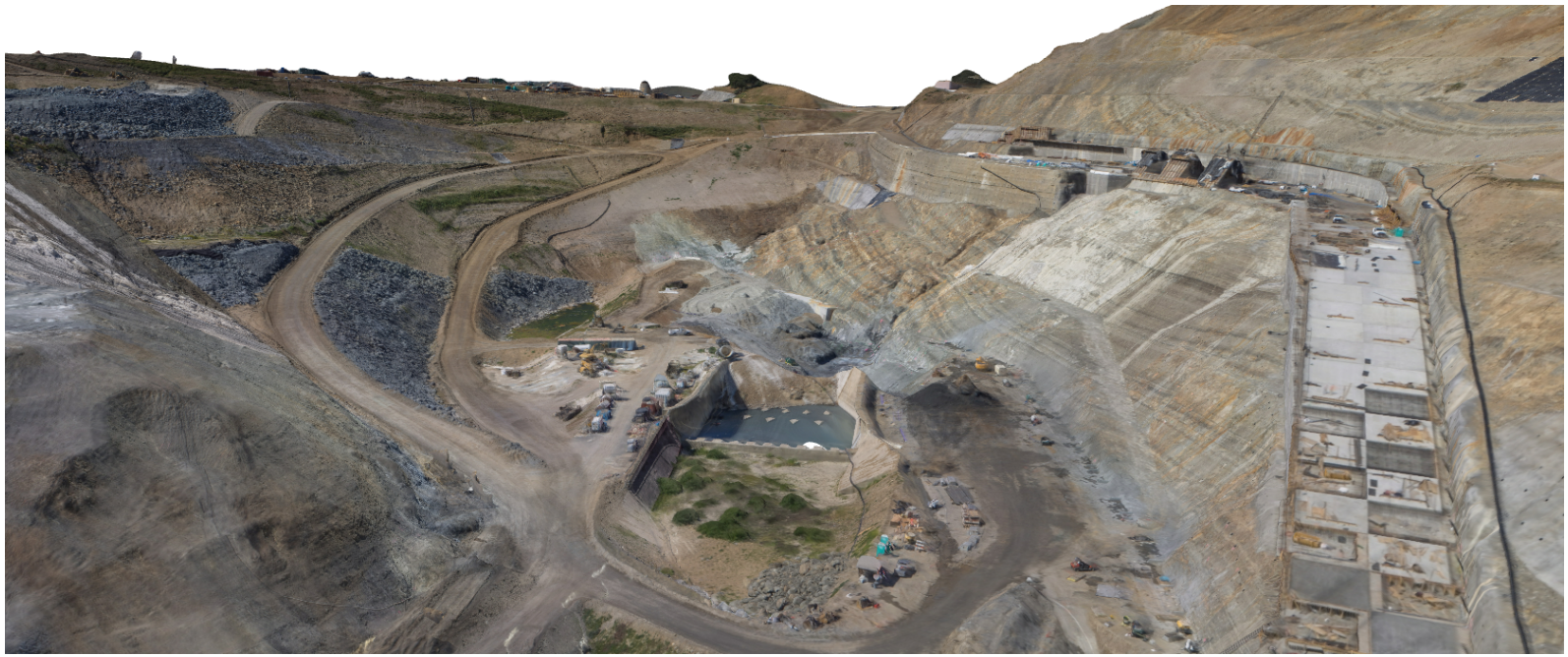
OR

AUTODESK NAVISWORKS

- Authoring designs in Revit
- A360 Cloud Rendering
- Autodesk LMV
- Bluebeam Revu
- SharePoint Web Portal

Calaveras Dam Replacement

+ AUTODESK® REMAKE + AUTODESK® STINGRAY =



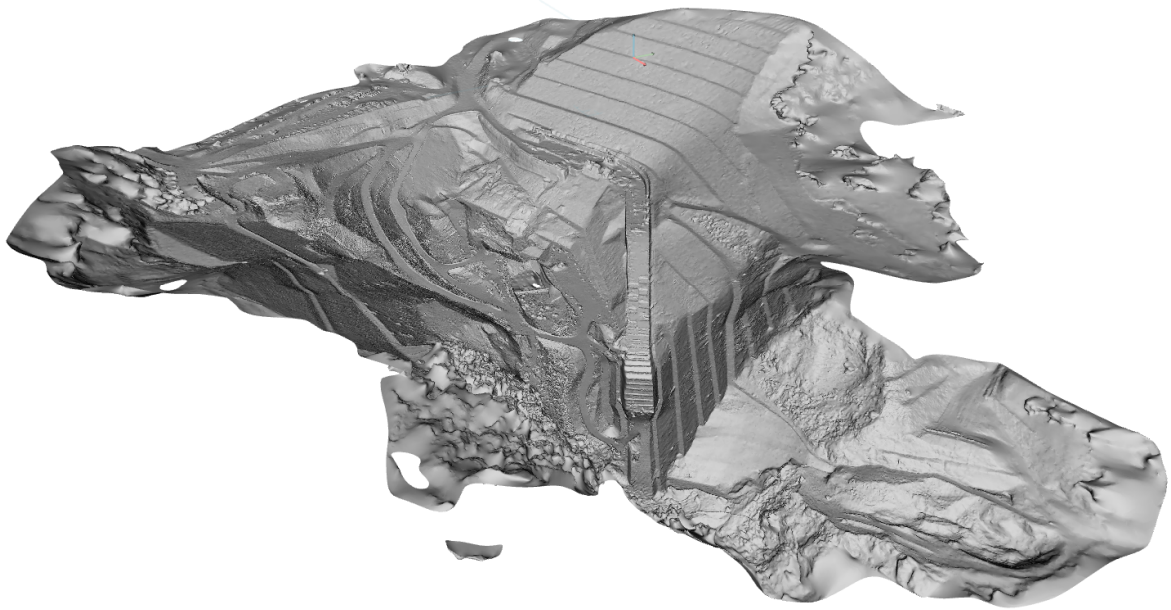
Calaveras Dam Replacement

- Deliverables
  - HD Video
  - Still Photography
  - Orthomosaic
  - 3D Mesh Surface
  - VR Environment

Calaveras Dam Replacement

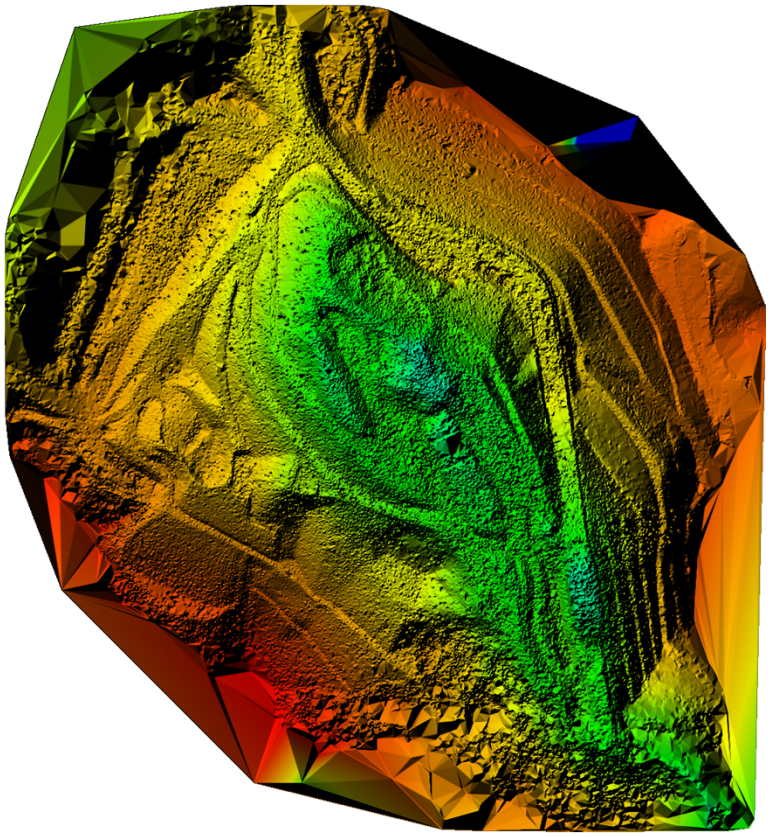
Calaveras Dam Replacement

- Digital Environment
  - 93 Images
  - 24 Million Faces
  - Area = 4.6 Million SF
  - Perimeter = 1.7 Miles



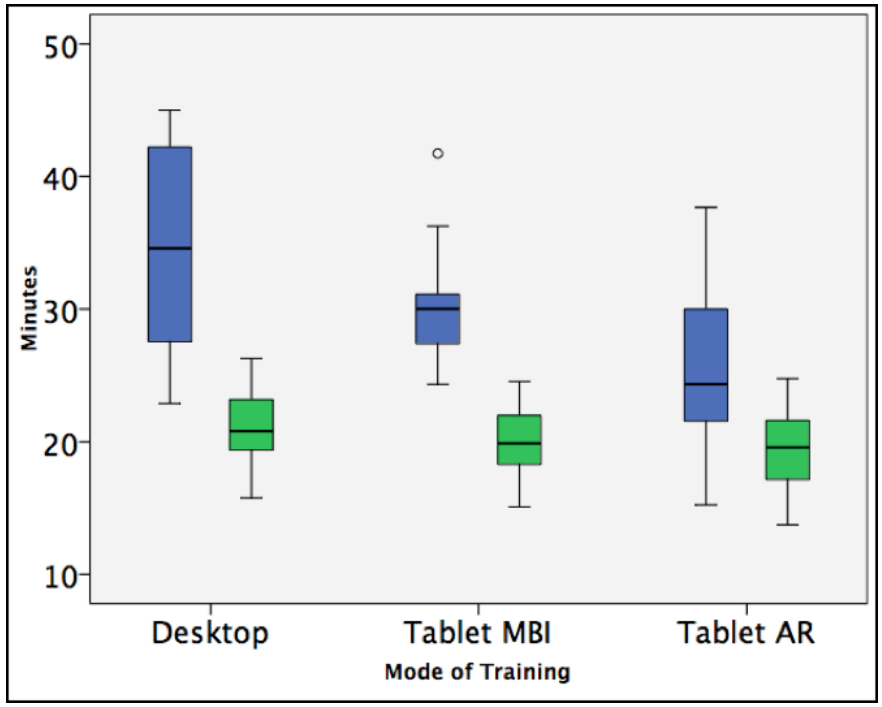
Calaveras Dam Replacement

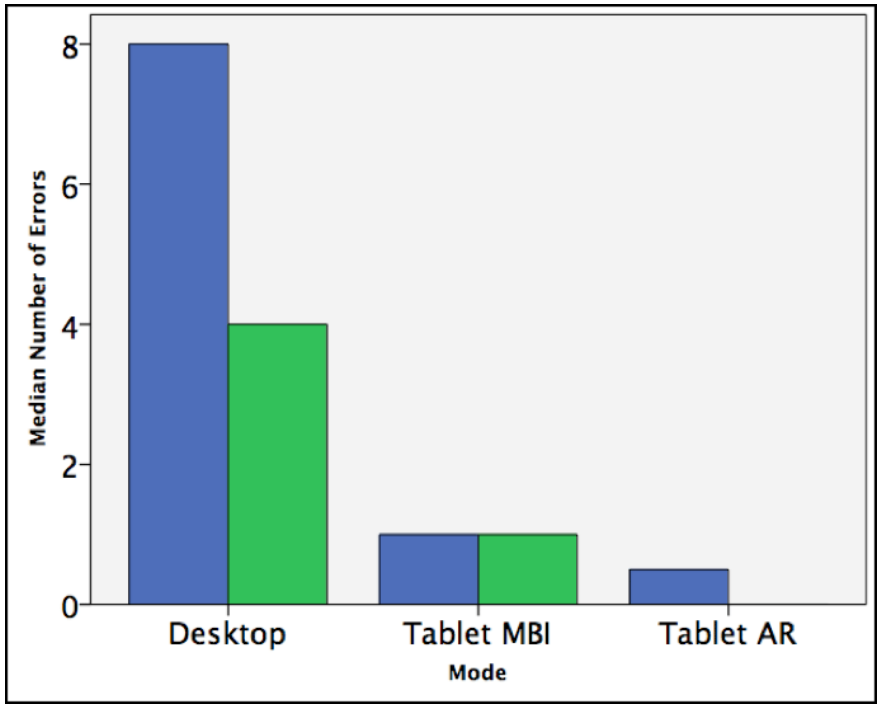
- Next Steps
  - Additional Flights
  - Progress Tracking
  - Volume Calculations
  - Schedule Look-ahead (Integrations with 4D Model)



Hololens & Other Trends

Boing Wing Academic Study





Experiment Round Up

Basic Process

Limitations

- Cost
- Not PPE Compatible
- Sensitive to Light Levels
- Outside / Big Room
- Preparing Models
- Too Many Polygons
- Looks Ridiculous

Additional Autodesk VR Options

- Forge WebVR
- Autodesk Live
  - One button push from Revit
- Autodesk Play
  - 3D Presentation Tool
- Stingray/Unreal

Around the Industry

http://www.constructiondive.com/news/virtual-reality-used-to-test-worker-reactions-to-job-site-accidents/427996/

https://www.cnet.com/news/i-operated-a-giant-excavator-from-2500km-away-and-it-was-trippy/

What Does this All Mean…

How did we do?

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