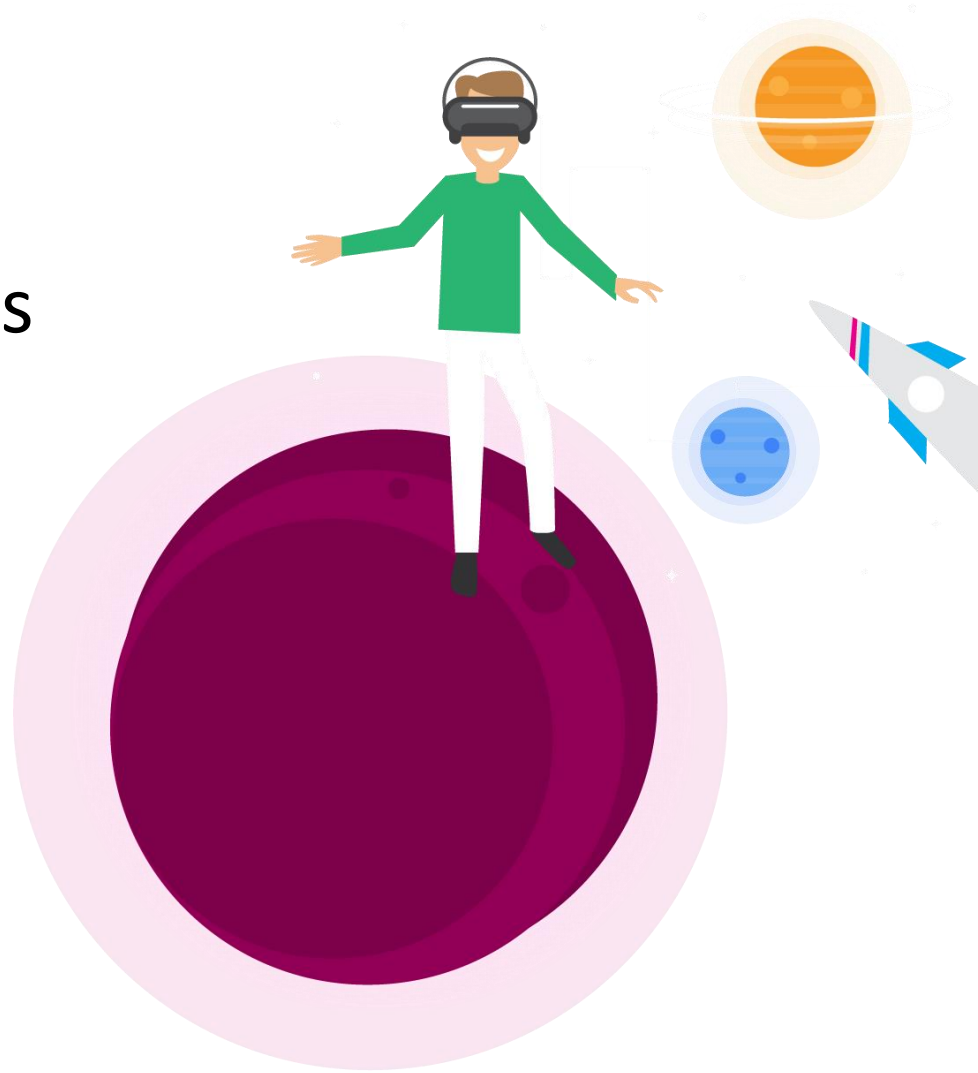
Helping researchers utilize virtual reality for data visualization

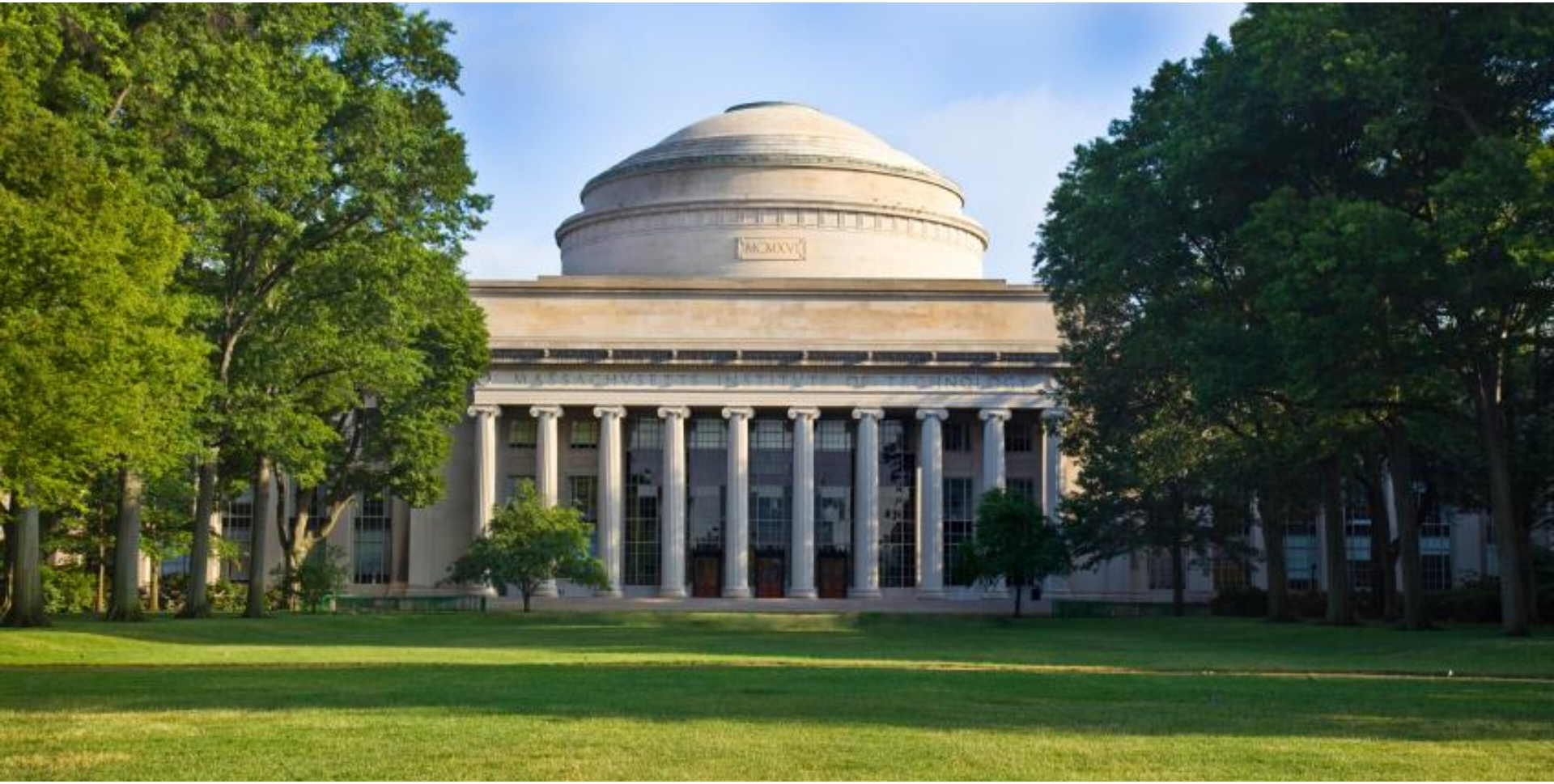
Madeline Wrable
GIS Specialist
IASSIST'18

Content

- Background Story
- VR at the MIT Libraries
- VR hard/software
- Getting started



Massachusetts Institute of Technology



Getty Images

MIT GIS Services

- GIS Lab
- Additional software
- GIS data repository, GeoWeb
- One-on-one help
- Workshops

Credit: Lisa Sweeney

Background Story

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The MIT Libraries
Experimental Collections Fund
Supports projects using library datasets in new ways.

I used it for a drone-pilot-project.
Do you have any ideas?

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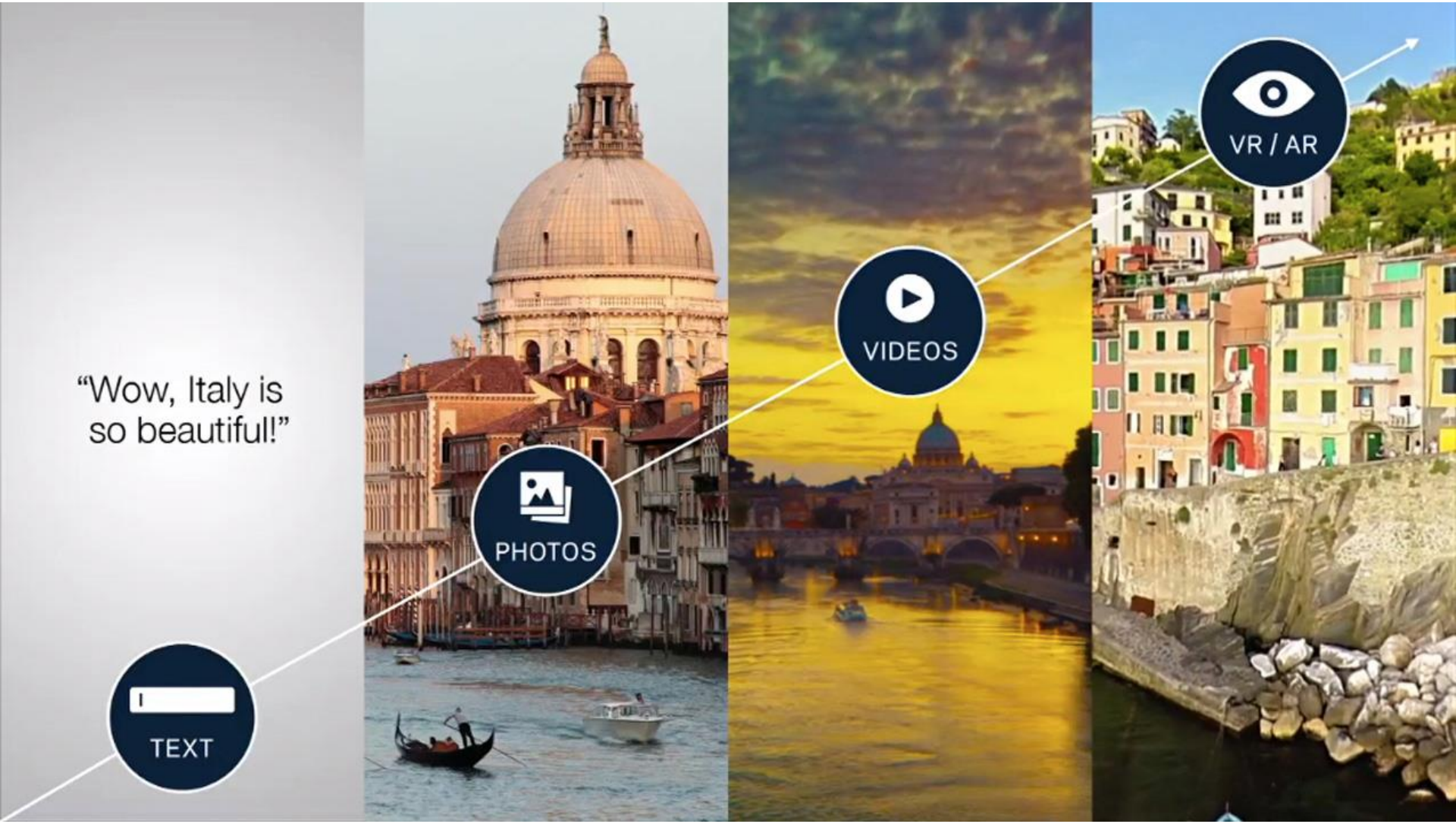
I wonder if virtual reality (VR) would be a good fit…


"Wow, Italy is so beautiful!"
TEXT
PHOTOS
VIDEOS
VR / AR

VR Pipeline

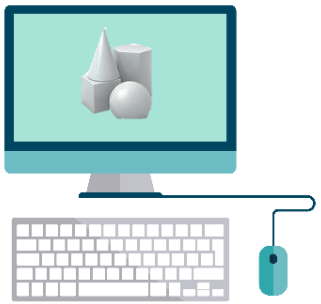
Content Creation
2D → 3D

+

Software
Interface
3D/VR

→

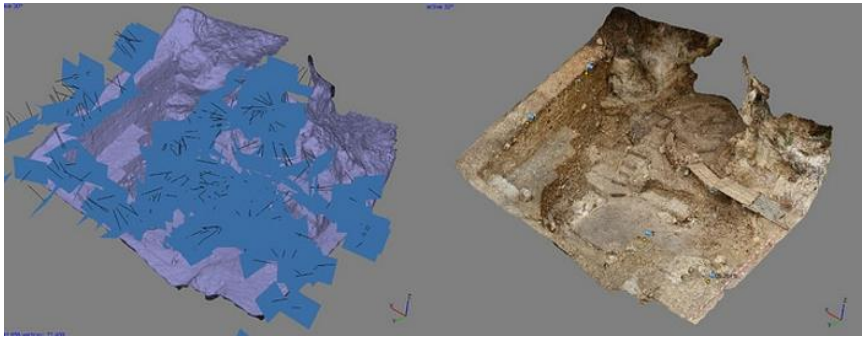
Content Viewer
headsets

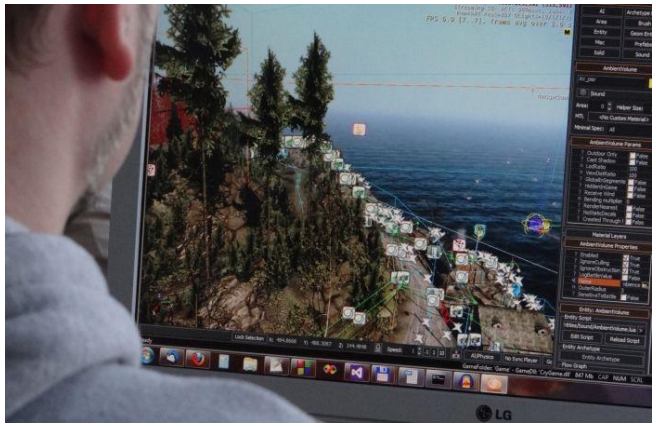


Credit: HiSunnysky, Pixabay.com, & slon.pics

Content Creation Platforms

- Photo Spheres
- Photogrammetry
- 3D Scanning
- 3D Modeling
- Game Engines
- …





Content Viewing Platforms

Mobile Devices	• Google Cardboard • Google Daydream • Samsung Gear VR
Laptop/Desktops	• Oculus Rift • HTC Vive (Pro)
Game Consoles	• Sony PlayStation VR
Standalone HMDs & Eye Tracking	• FOVE VR • Google Hololens

Google, Samsung, Oculus, HTC , Sony, & Fove product websites

MIT GIS Services

- GIS Lab
- Additional software
- GIS data repository, GeoWeb
- One-on-one help
- Workshops

Credit: Lisa Sweeney

MIT GIS Services

- GIS Lab » powerful computers & graphics cards (content viewer)
- Additional software » 3D modeling software (content creation)
- GIS data repository, GeoWeb » available datasets (content)
- One-on-one help » exposure to the community
- Workshops » teaching experience
- **Perfect for a VR-pilot-project**

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MIT GIS Services

+ headset

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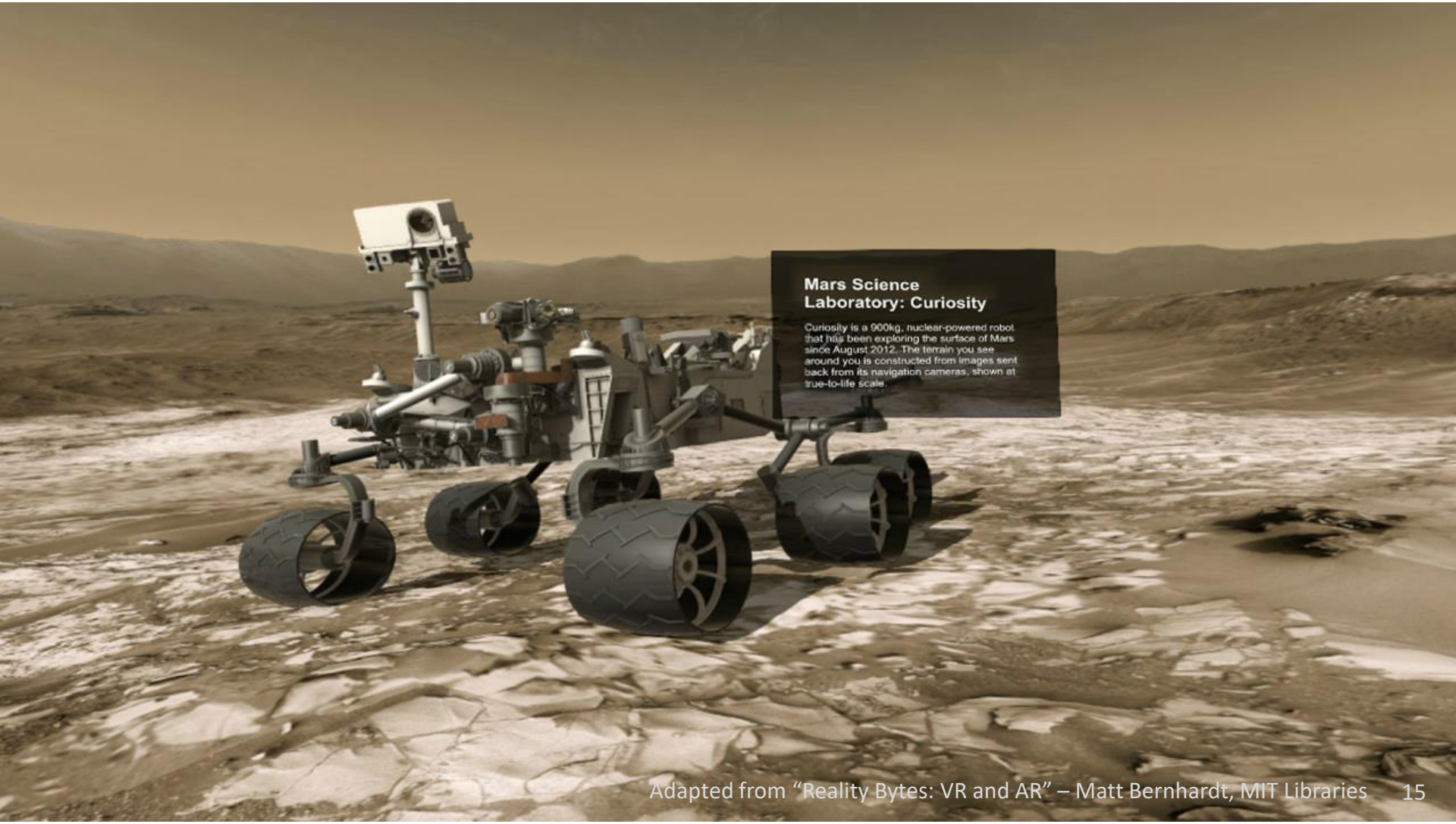
VR Applications

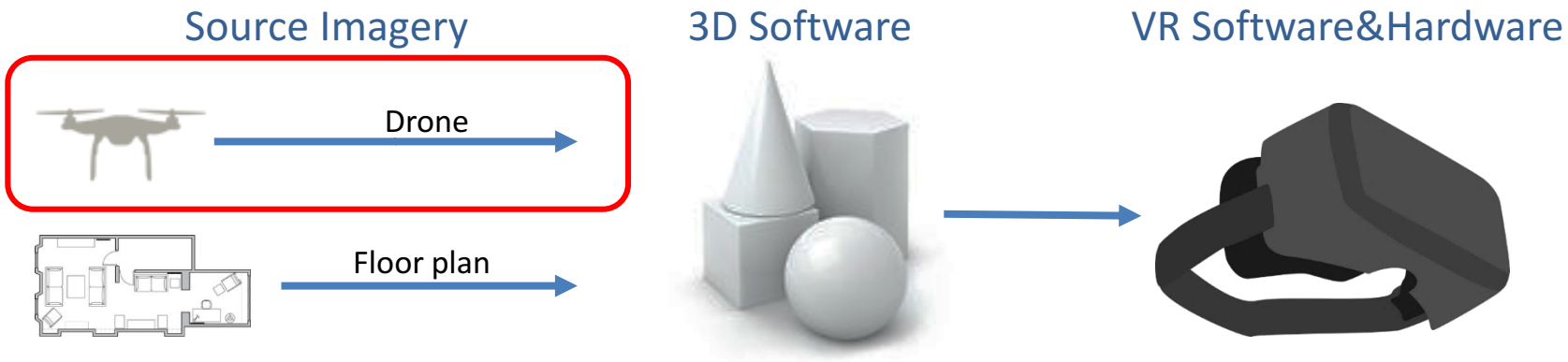


VR Applications: good candidates are…

- Rare (e.g. spacewalk)
- Impossible (e.g. time travel)
- Dangerous (e.g. climb Everest)
- Expensive (e.g. travel to the moon)

MIT GIS Lab: 3D & VR Applications

Applications Overview



The GIS Lab's drone collected
imagery of geological formations
near Death Valley National Park, CA.

DJI_0852.JPG

DJI_0853.JPG

DJI_0853.JPG

DJI_0853.JPG

DJI_0854.JPG

DJI_0856.JPG

DJI_0856.JPG

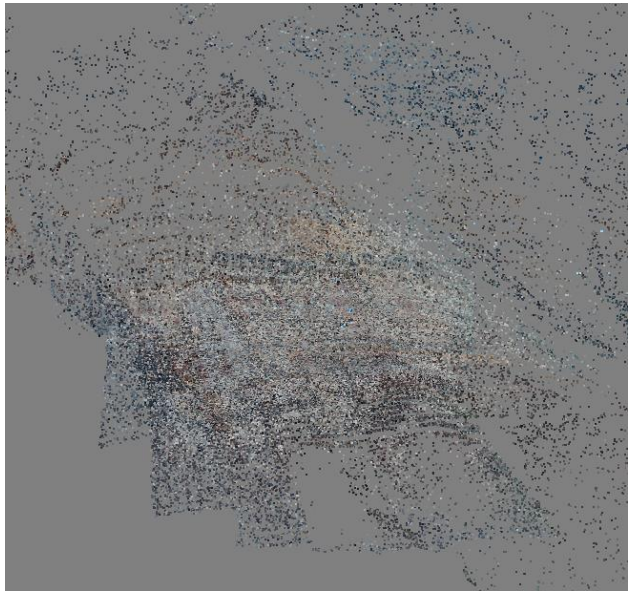
DJI_0856.JPG

DJI_0857.JPG

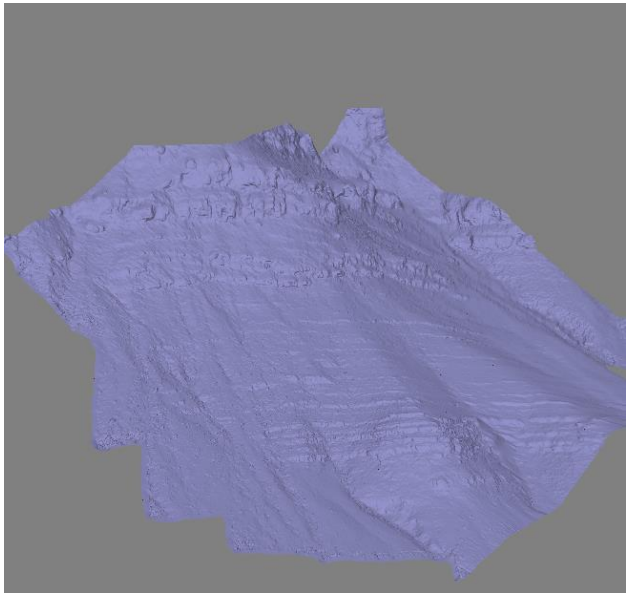
DJI_0857.JPG

Processed imagery using Agisoft Photoscan software:

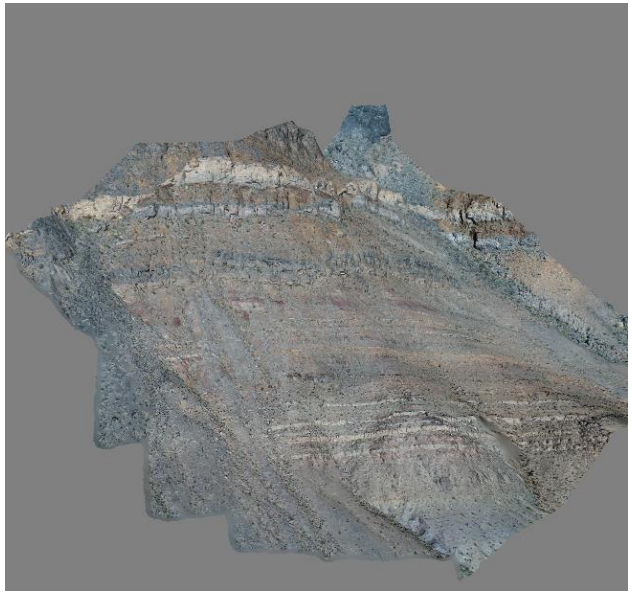
Point Cloud

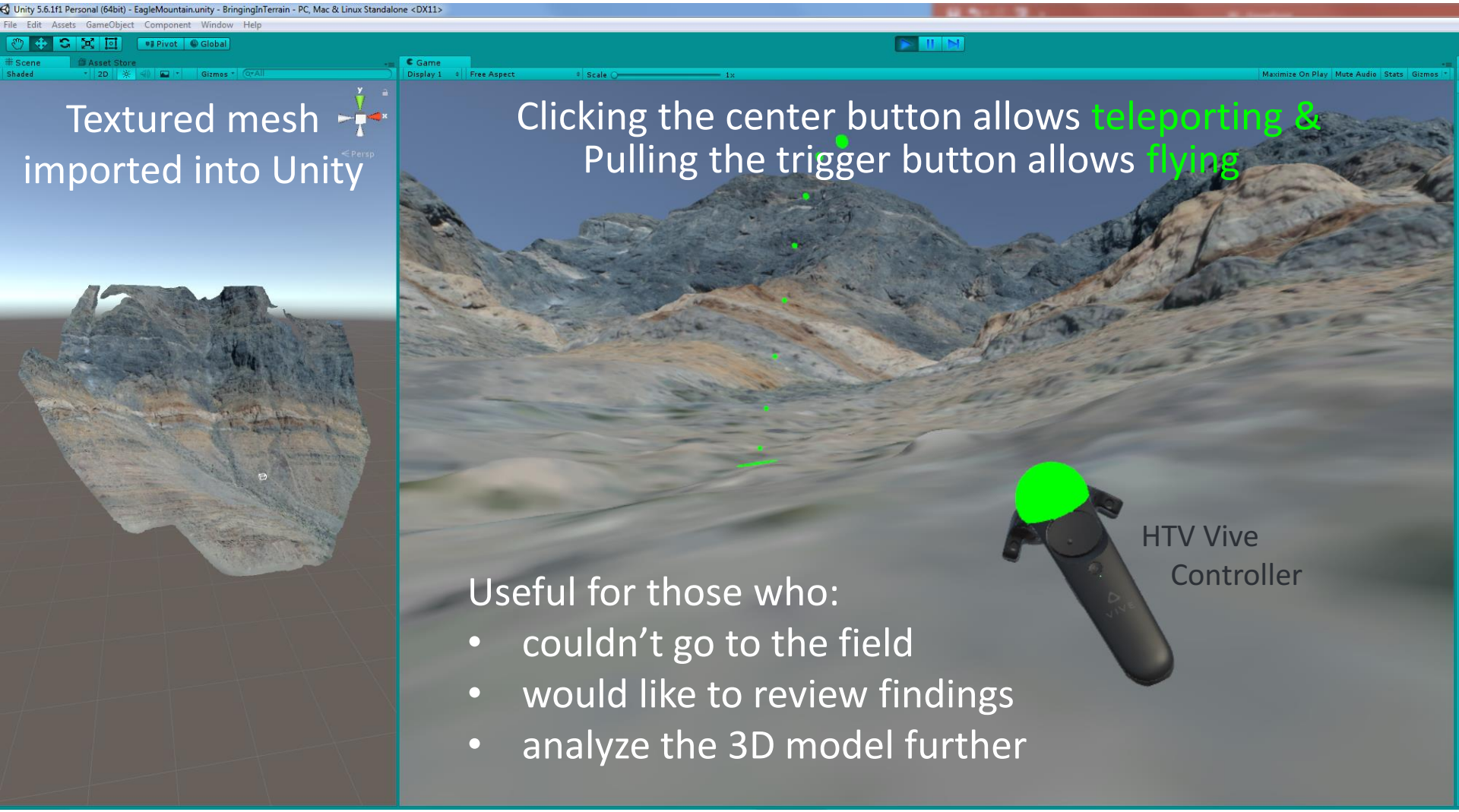


Solid Mesh

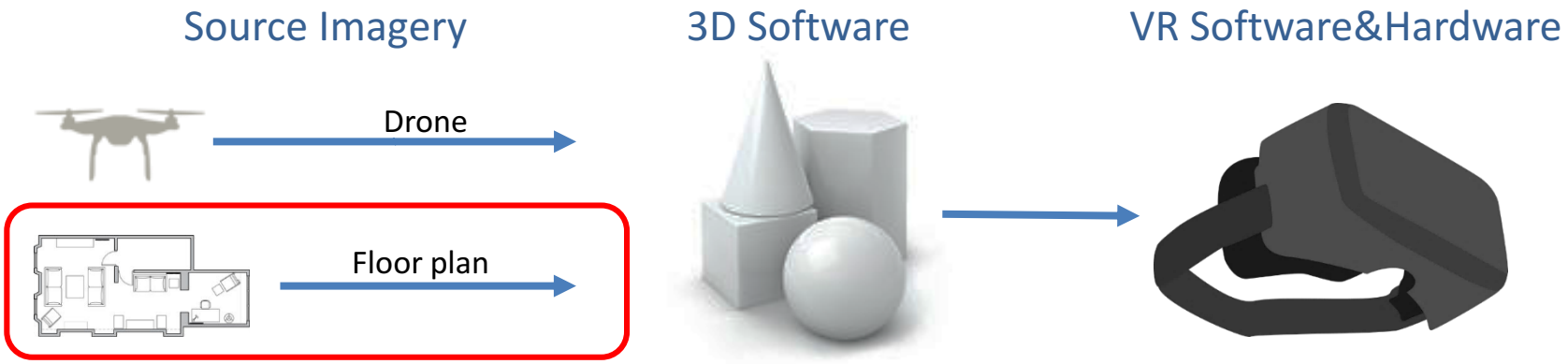


Textured Mesh

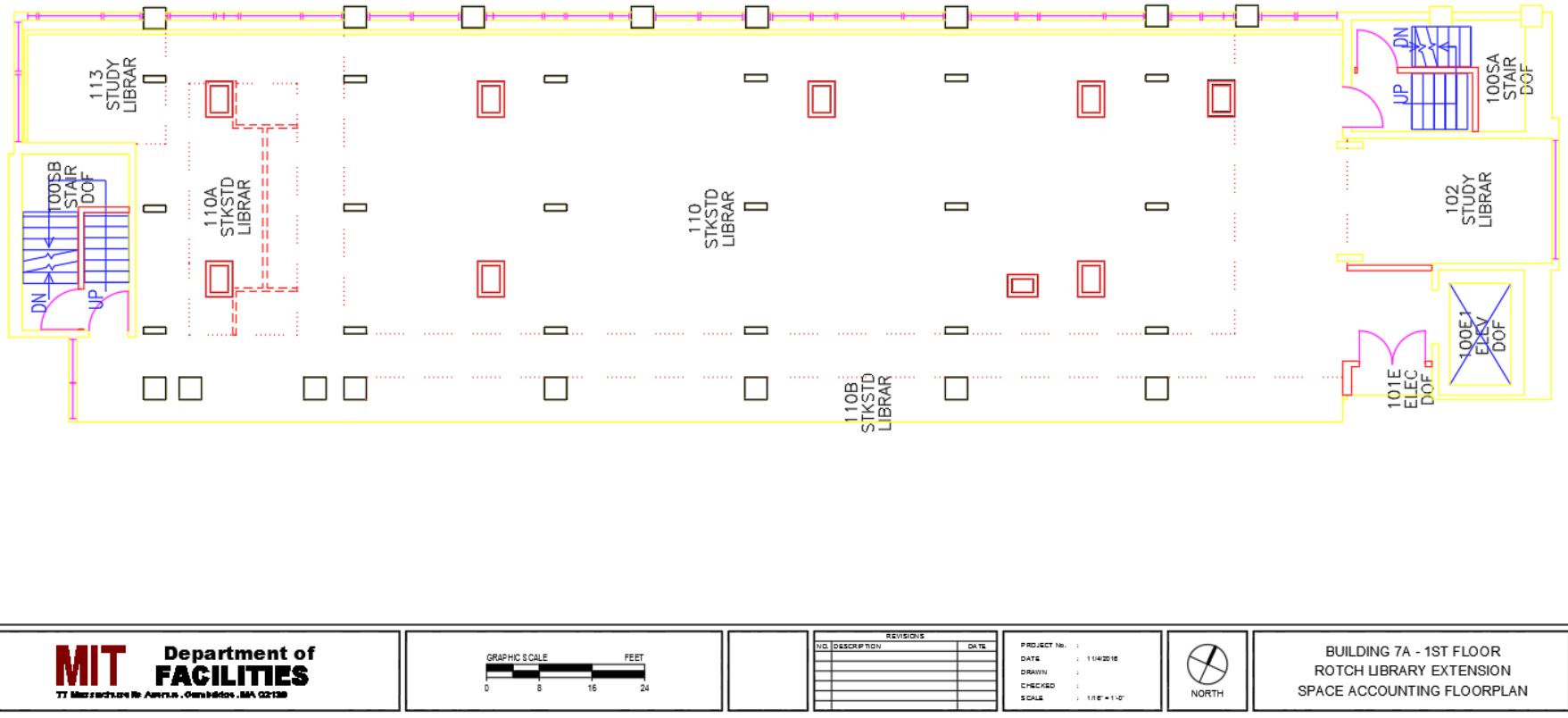


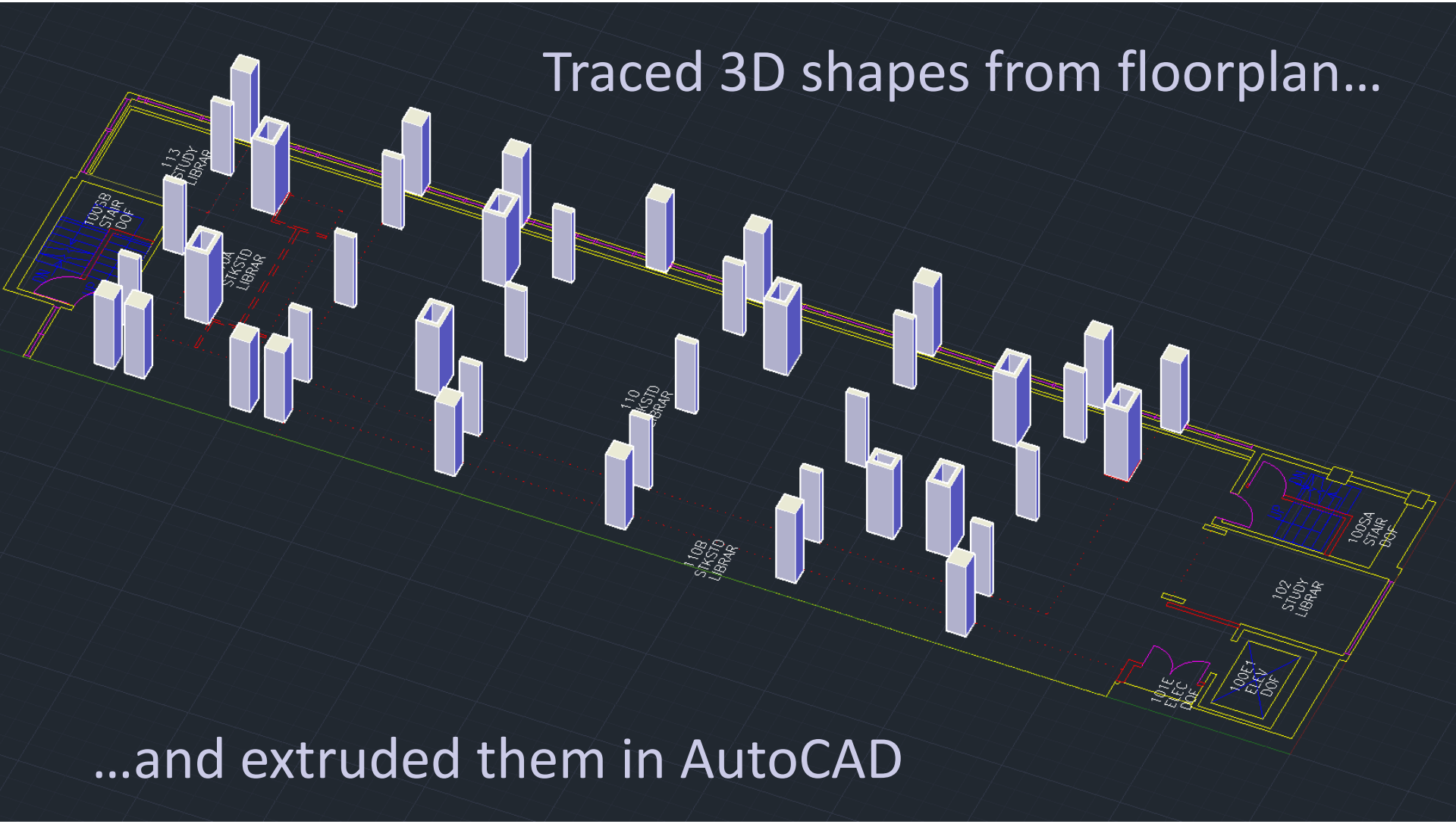

Unity 5.6.1f1 Personal (64bit) - EagleMountain.unity - BringingInTerrain - PC, Mac & Linux Standalone <DX11>
File Edit Assets GameObject Component Window Help
Pivot Global
Scene
Asset Store
Shaded 2D Gizmos
Persp
Game
Display 1 Free Aspect Scale 1x
Maximize On Play Mute Audio Stats Gizmos
Textured mesh imported into Unity
Clicking the center button allows teleporting &
Pulling the trigger button allows flying
HTV Vive Controller
Useful for those who:
• couldn’t go to the field
• would like to review findings
• analyze the 3D model further

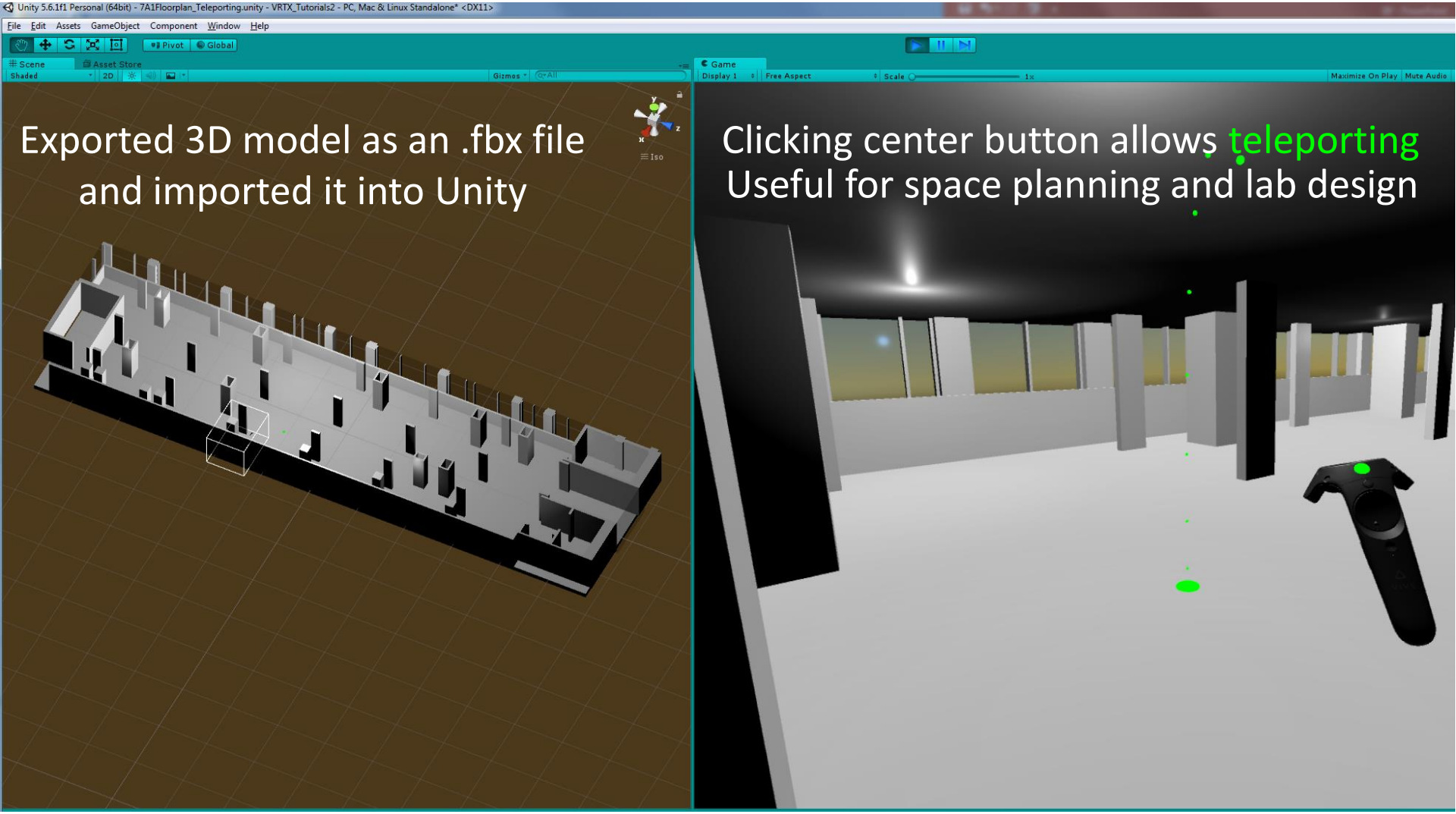
Applications Overview



Started with a floor plan in AutoCAD




Traced 3D shapes from floorplan…
…and extruded them in AutoCAD


Unity 5.6.1f1 Personal (64bit) - 7A1Floorplan_Teleporting.unity - VRTX_Tutorials2 - PC, Mac & Linux Standalone* <DX11>
File Edit Assets GameObject Component Window Help
Pivot Global
Scene Asset Store
Shaded 2D Gizmos
Game
Display 1 Free Aspect Scale 1x Maximize On Play Mute Audio
Exported 3D model as an .fbx file and imported it into Unity
Iso
Clicking center button allows teleporting
Useful for space planning and lab design

Workflow Resources

Drone

- Drone model: Phantom 4
- Flight planning: DroneDeploy
- Photo stitching: PhotoScan

Floorplan

- Floorplans : MIT Facilities
- 3D software: AutoCAD

- Exported as FBX files, and imported into **Unity**
- Used **SteamVR & Virtual Reality Toolkit (VRTK)**

Future applications

- Launch VR room
- AR/MR applications
- Create 360° library tour
- Invite community experts
- More learning materials

VR Pipeline

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+

Software
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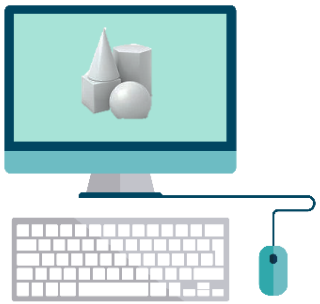
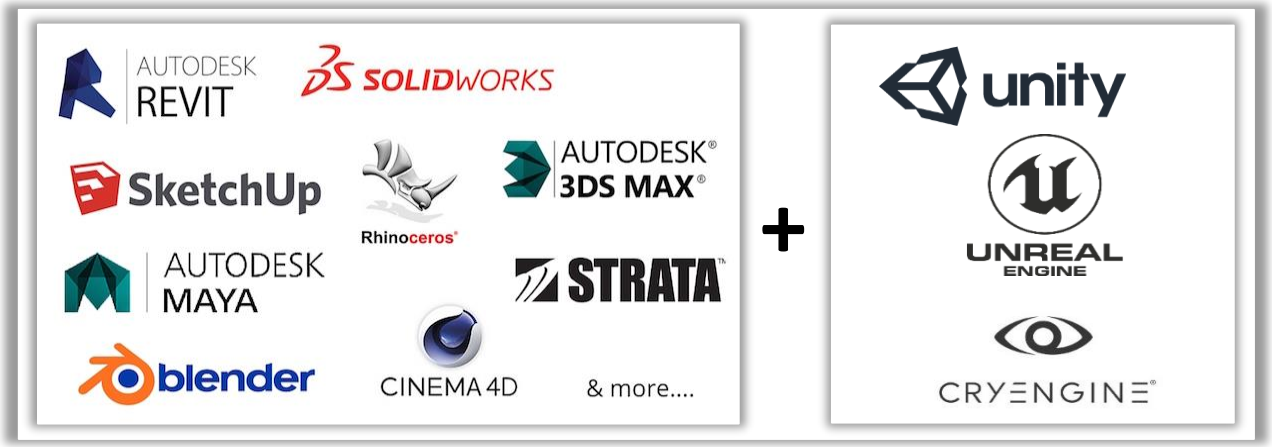


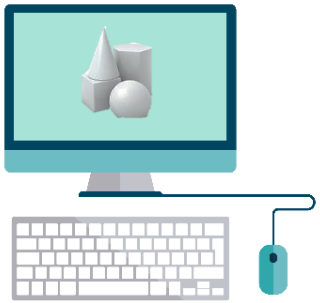
Credit: HiSunnysky, Pixabay.com, & slon.pics

VR Pipeline

Content Creation Software



Content Viewer



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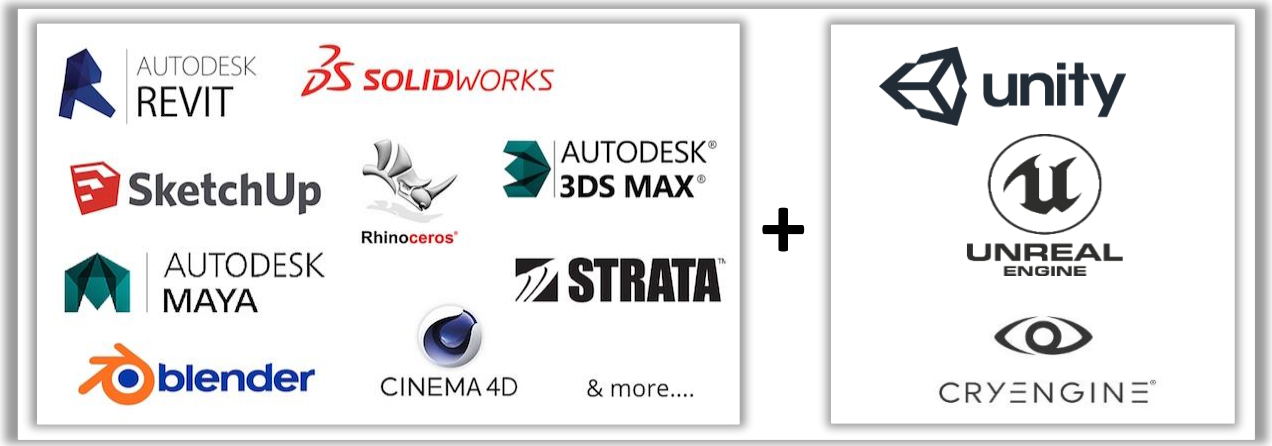


Content Viewer

Download software, most are free for educational purposes

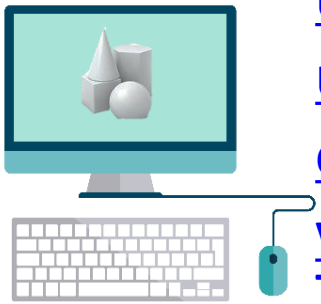
[Rhino]

[Blender]

[SketchUp]

[Autodesk]

& follow the tutorials available for VR



[Unity]

[Unreal]

[CryEngine]

[VirtualReality Toolkit (VRTK)]

for display in headset

Credit: HiSunnysky, Pixabay.com, & slon.pics

Tips & Tricks

- Find where you already have some equipment (e.g. computer, graphics card, software)
- Make sure whatever plug comes off the headset plugs directly into your device (phone/computer)
- Explore other's apps. & watch VRTK tutorials
- Think of a simple application to get started with
- Set a date to teach others & make learning materials