Virtual Reality (VR) and Augmented Reality (AR) with ArcGIS

Mark Baird
Simon Haegler
Rex Hansen
Agenda

• Concepts and terminology
• Products
  • AuGeo
  • CityEngine
  • ArcGIS Runtime
• Many organizations seek to use their live and local authoritative GIS content and analytics across the mixed reality spectrum

• Critical needs for usability
  - Virtual reality needs high fidelity and responsive performance
  - Augmented reality needs positional accuracy
  - Must be cost effective
AR - Augmented Reality

Interacting with outside world

*Mobile Devices*
Global Positional Tracking

Accuracy:
- GPS: ~10m, outside-only
- Wi-Fi: ~2m
- Beacon: ~1m
- RFID: ~1m
Standard AR
MR – Mixed Reality

Mixed presence

Microsoft HoloLens & Magic Leap
Global Positional Tracking

Challenge for phones and AR/MR headsets:
• Inside-out motion tracking, but needs initial position
VR
VR - Virtual Reality

Being there

HMD
→ motion sickness is major problem for adoption of VR
Mobile VR versus Premium VR

- Low price
- Broad reach
- Graphics limited
- Bandwidth limited
- Only 3 DoF still

- High cost
- Complex setup
- Great graphics
- Free movement
- Advanced controllers
Targeting XR experiences with ArcGIS

• Apps
  - AuGeo [mobile AR]
  - ArcGIS 360 VR [mobile VR]

• Developer options
  - CityEngine
    - VR Experience [premium VR]
    - Export to game engines [MR]
  - ArcGIS Runtime [mobile AR/VR]
AuGeo

- A mobile app to display your GIS features in an Augmented Reality environment

- Completely out of the box, easy to setup

- Available for iOS and Android

- By Esri Labs

- Source code available with AppStudio for ArcGIS, tutorial available on YouTube
VR and AR with CityEngine
Use Cases – Urban Planning

- Experience 3D in first person
- Compare scenarios interactively
- Share VR experiences via the web
360 VR Experience on ArcGIS Online/Portal

Consumption
Download into mobile device/HMD

ArcGIS 360 VR x-platform viewer app

Authoring
Upload as 3VR file

CityEngine

360 VR Experience on ArcGIS Online/Portal
Esri Labs is proud to present ArcGIS 360 VR. The ArcGIS 360 VR app allows you to quickly immerse yourself into 3D city models by teleporting to static viewpoints and comparing different urban design scenarios. These VR experiences can be easily created with the 3D modeling software, CityEngine, and are hosted on ArcGIS Online, the cloud platform of the global smart mapping leader, Esri. Rather than relying on high-performance graphics computers and cumbersome wired VR accessories, a simple smartphone paired with an affordable wireless headset are all that is required to be immersed in a ArcGIS 360 VR experience.

*By using ArcGIS 360 VR, our planning board and jurors can now study the impact of new architectural developments and urban planning scenarios from the perspective of pedestrians and drivers.*
ArcGIS 360 VR Summary

- CityEngine: built-in 3VR exporter with Layer and Scenario support
- Share/Consume 360 VR Experiences via ArcGIS Online
- Get it at labs.esri.com
Interlude: CityEngine Export to Game Engines
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Officially supported game engines
- Unity
- Unreal Engine

Dedicated Session:

High-end 3D Visualization with CityEngine, Unity and Unreal

Presenter: Benjamin Neukom
Time: Wed, 3pm and Thu, 10am
Room: B7/8
CityEngine XR with Unity
SteamVR Plugin

Scripting
Valve Corporation

Free

Import

ATTN: When upgrading from an older version, it is best to first delete the SteamVR folder in your project, and then import the package. You may also want to delete any "openvr_api" files in your Plugins folder and its subfolders before importing the new package.

Support Website  Visit Publisher's Website
Originally released: 80 April 2019
Package has been submitted using Unity 4.7.1, 5.0.1, and 5.4.0 to improve compatibility within the range of these versions of Unity.
CityEngine VR Experience with Unreal Engine
Material Setup

- Control materials with the "material.shader" attribute in CGA

```python
set(material.shader, "/Game/Materials/CityEngineMaterials/M_CE_MaskedOpacity")
```

- Template has 3 built-in materials (opaque, semi-transparent, masked)
- Also, create custom materials in Unreal and reference them from CGA
1. Export models from CityEngine using Unreal Engine exporter
2. Create CityEngine VR Experience project in Unreal Studio
3. Import models (Datasmith files)
4. Set up points of interest
Summary: CityEngine Premium VR

- CityEngine & Unity
  - Solution for medium-complexity XR experiences
  - Recommended for Mobile, Desktop, Room-Scale VR
  - Using standard FBX
  - blog.arcgis.com -> “CityEngine Unity”

- CityEngine & Unreal Engine
  - Solution for high-end Arch Viz VR experiences
  - Recommended for Desktop, Room-Scale VR
  - Using Epic Games Datasmith
  - community.esri.com -> “CityEngine VR Experience”
ArcGIS Runtime
Supporting **AR** and **VR** with ArcGIS Runtime today

- Build native apps with AR/VR experiences
- Integrated with the ArcGIS Platform
- 3D already supported on all platforms/devices
- **Private beta program!**
  - SDKs for .NET, iOS, Android
  - Targeting mobile devices

Request access to the beta program, email: [ArcGISRuntimeARVRBeta@esri.com](mailto:ArcGISRuntimeARVRBeta@esri.com)
ArcGIS Runtime AR demo
Supporting **Mixed Reality** with ArcGIS Runtime in the future

- Integrate with game engines
  - New light-weight Runtime API – no rendering engine
  - Good for MR but also any “gaming type” application that needs GIS
  - Easy cross hardware development
  - Good MR UI design experience
  - Integration with the existing MR community
  - Physics and other 3D effects