Virtual and Augmented Reality

Development frameworks for VR/AR

Jordi Linares Pellicer

Juan Jesús Izquierdo Doménech

Jorge Orta López

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Technology or content?

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Stereo vision
Interaction
Localization and Tracking
New interaction devices
Rendering & Physics

Technology

Content

2D, 3D, animations
360º videos
Spatial sound
New GUI requirements
Real-time techniques

Content tools

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Content creation

Development tools

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Visualization and interaction

- We will focus on real 'development' tools, not authoring tools (e.g. Layar)

Development tools

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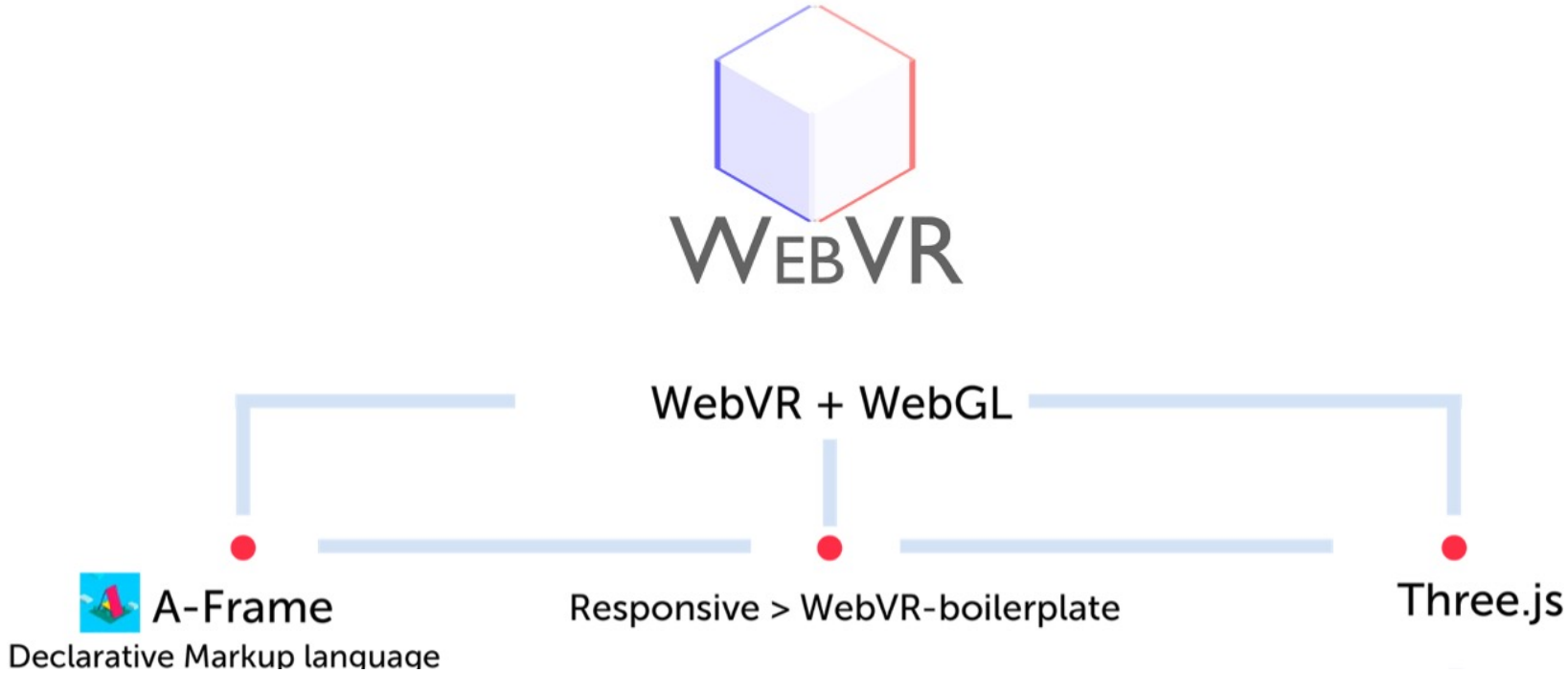
Web standards



Development tools

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Web standards

8TH WALL

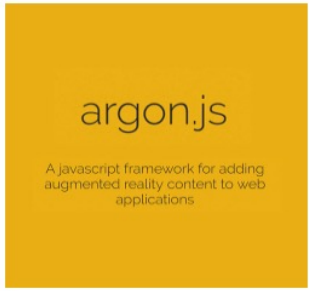
https://www.8thwall.com/

WebAR Frameworks

These are just some of the available frameworks.

The AR.js project allows for open-source AR, free of charge, cross-platform and without installation on any modern device.

Based on the open source ARToolKit tracking library, JSARToolKit uses WebGL & Three.js to render 3D models over real world objects.



Whether used to create a new AR application, or add an AR view to an existing web application, the argon.js framework provides a set of abstractions and utilities for adding an AR view to your web application in a platform- and technology-independent way.

Awe.js provides a few other types of AR experiences such as augmented reality markers, location-based, and leap motion sensor AR. It uses WebRTC, WebGL, and getUserMedia device API to produce an AR experience in the browser.

Three.ar.js is a helper three.js library for building AR web experiences that run in WebARonARKit and WebARonARCore. WebARonARKit and WebARonARCore are experimental apps for iOS and Android that let developers create Augmented Reality (AR) experiences using web technologies.

X3DOM is an open-source framework and runtime for 3D graphics on the Web. It aims to fulfill the current HTML5 specification for declarative 3D content and allows including X3D elements as part of any HTML5 DOM tree.

Unity

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Why Unity?

- The most popular tool when creating games, serious games, interactive apps and VR/AR/MR etc.
- Support to all the main available hardware and with many additional complements: SDKs, plugins etc.
- A huge AssetStore with thousands of complements
- Multiplatform support for VR and AR (AR Foundation, MARS)
- According to them, 95% of VR/AR/MR content is developed with Unity

Unity + ARKit

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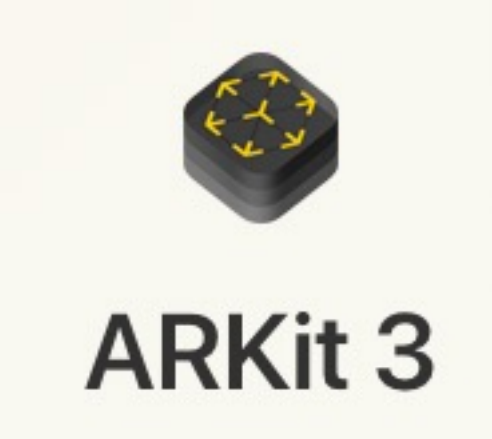
Why Unity?

- Unity supports the two most important SLAM solutions from Apple and Google



https://www.youtube.com/watch?v=vkS-VqAss4s

People Occlusion

Now AR content realistically passes behind and in front of people in the real world, making AR experiences more immersive while also enabling green screen-style effects in almost any environment.

Motion Capture

Capture the motion of a person in real time with a single camera. By understanding body position and movement as a series of joints and bones, you can use motion and poses as an input to the AR experience — placing people at the center of AR.

Simultaneous Front and Back Camera

Now you can simultaneously use face and world tracking on the front and back cameras, opening up new possibilities. For example, users can interact with AR content in the back camera view using just their face.

Multiple Face Tracking

Now ARKit Face Tracking tracks up to three faces at once, using the TrueDepth camera on iPhone X, iPhone XS, iPhone XS Max, iPhone XR, and iPad Pro to power front-facing camera experiences like Memoji and Snapchat.

Collaborative Sessions

With live collaborative sessions between multiple people, you can build a collaborative world map, making it faster for you to develop AR experiences and for users to get into shared AR experiences like multiplayer games.

Additional Improvements

Detect up to 100 images at a time, and get an automatic estimate of the physical size of the image. 3D-object detection is more robust, as objects are better recognized in complex environments. And now, machine learning is used to detect planes in the environment even faster.

Unity + ARCore

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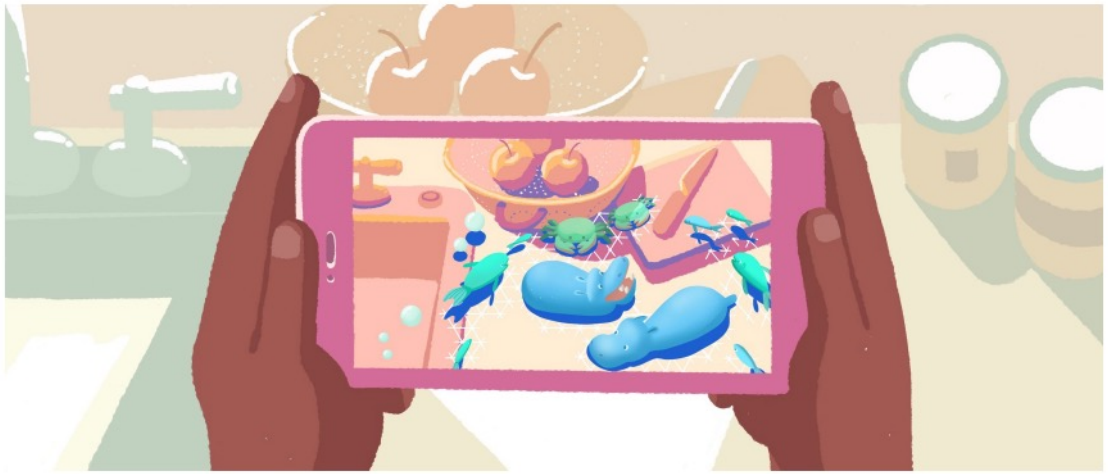
ARCore

https://www.youtube.com/watch?v=ttdPqly4OF8

ARCore overview



ARCore is Google's platform for building augmented reality experiences. Using different APIs, ARCore enables your phone to sense its environment, understand the world and interact with information. Some of the APIs are available across Android and iOS to enable shared AR experiences.

ARCore uses three key capabilities to integrate virtual content with the real world as seen through your phone's camera:

- **Motion tracking** allows the phone to understand and track its position relative to the world.
- **Environmental understanding** allows the phone to detect the size and location of all type of surfaces: horizontal, vertical and angled surfaces like the ground, a coffee table or walls.
- **Light estimation** allows the phone to estimate the environment's current lighting conditions.

Unity + Vuforia

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VUFORIA

- The tool we will use in our practices for its easy integration in Unity

Unity

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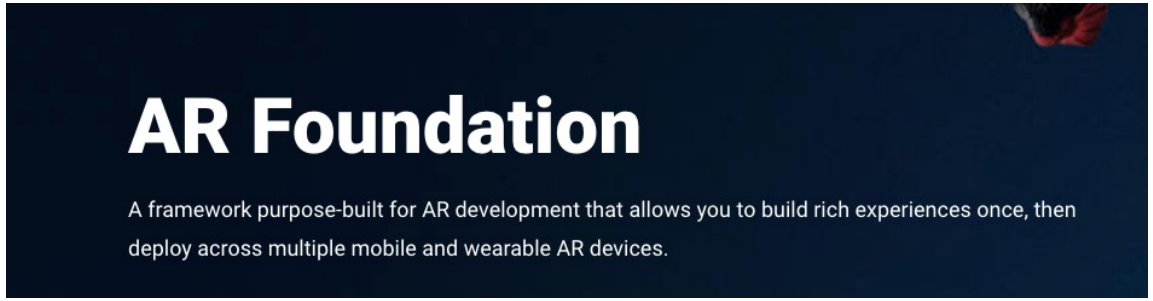
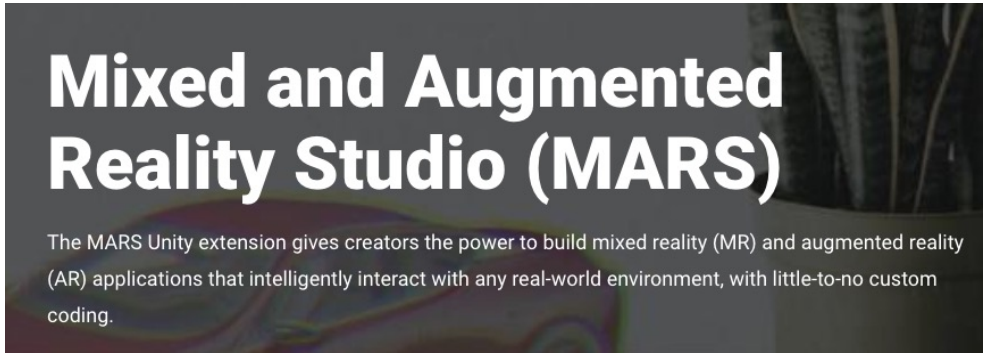
Why Unity?

- Unity allows a wide collection of complementary SDKs and plugins in order to develop VR/AR/MR apps with different devices and functionalities (ARKIT and ARCORE)
- They are also integrating them all into their own multiplatform design (AR Foundation, MARS)



The objective is to make our live easier as developers with a first layer (AR Foundation) and a complete extra environment (MARS)



Vuforia

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- Vuforia is an SDK for mobile devices that enables the creation of Augmented Reality applications
- It uses CV technology mainly to recognize and track images and 3D objects
- This capability enables developers to position and orient virtual object, such us 3D models and other media, in relation to real world imagen when these are viewed through the camera of a mobile device
- The virtual object then tracks the position and orientation of the image in real-time so that the viewer's perspective on the object corresponds with their perspective on the target, so that it appears that the virtual object is a part of the real world scene

Vuforia

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- Vuforia SDK is available as a package in Unity
- Vuforia SDK is available on iOS, Android and UWP
- Vuforia was a Qualcomm product but now belongs to PTC, inc.

Vuforia

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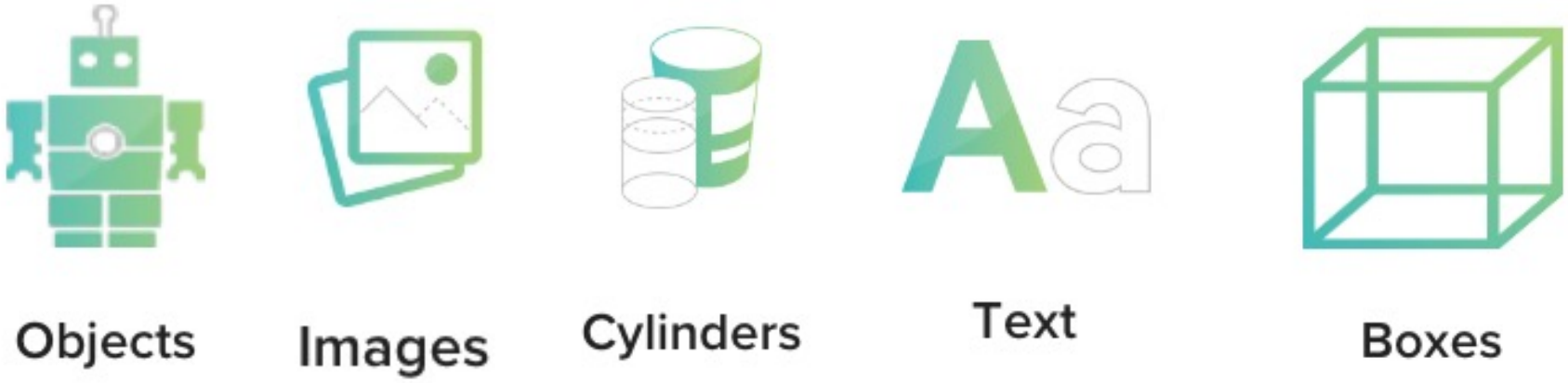
- Vuforia can use several elements as targets



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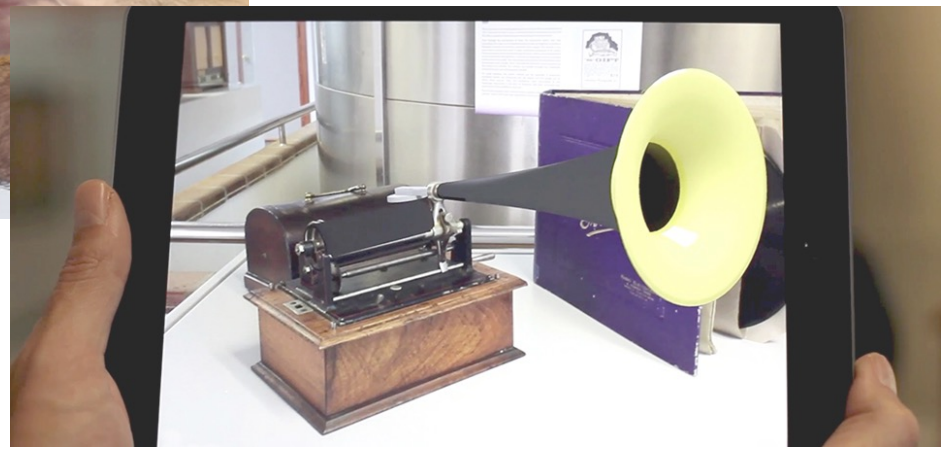
- Our experiences with objects as targets



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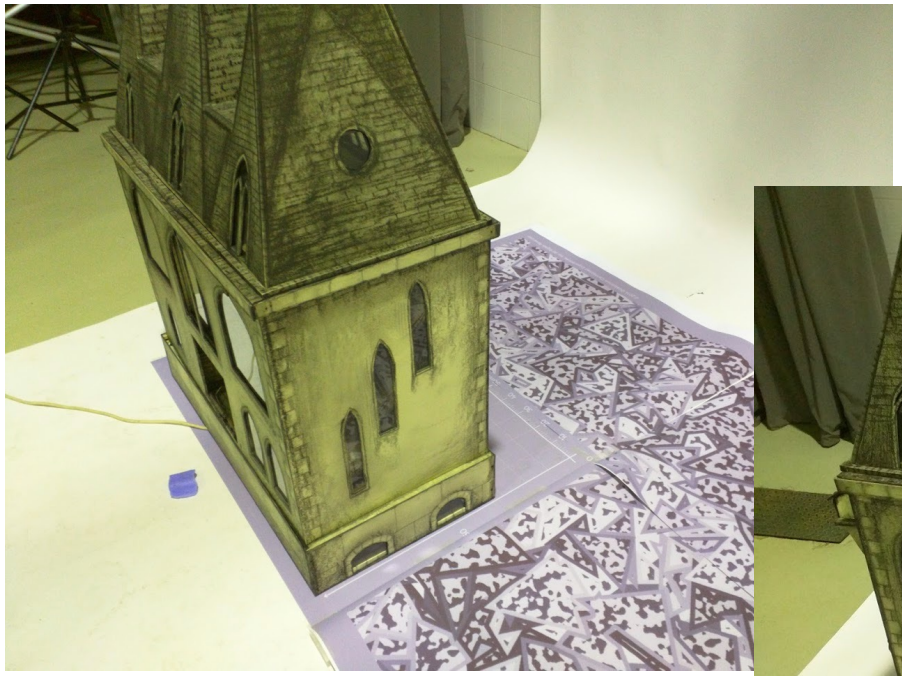

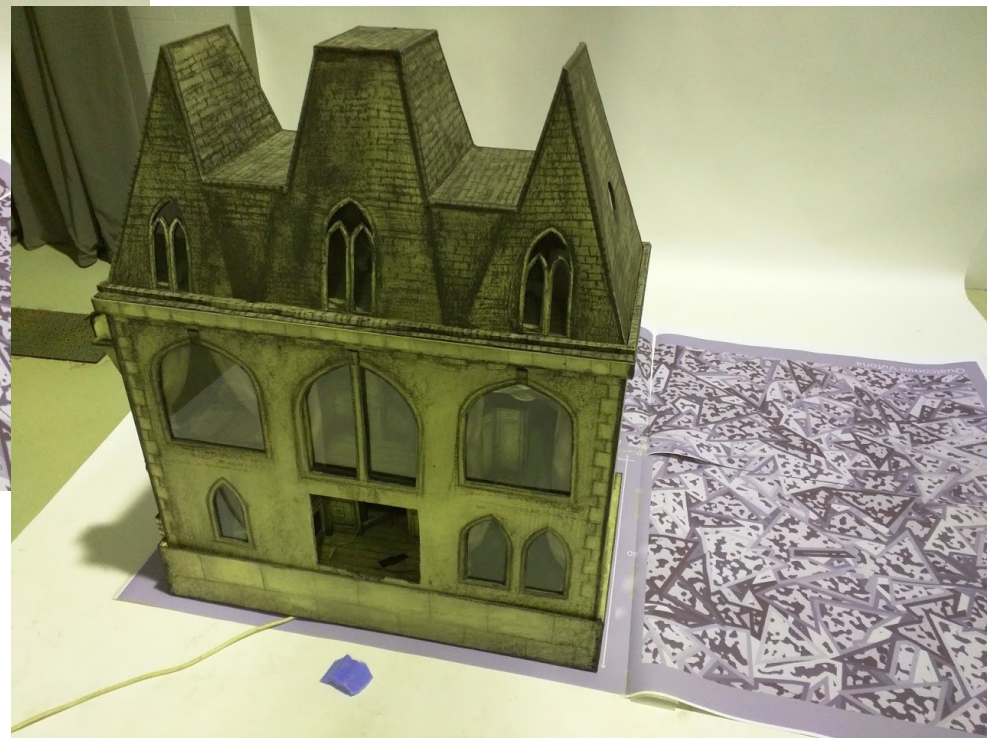

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- Besides Vuforia, ARCore and ARKit there are many additional possibilities, such as:

ARTOOLKIT 6 EasyAR

wikitude See more. XZIMG Images, Intelligence

kudan COMPUTER VISION MAXST

https://www.8i.com/ https://immersal.com/

Real holograms Now belongs to Hexagon

More options

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- Some other possibilities:
  - GO Map - 3D Map for AR Gaming (Unity AssetStore)
  - Mapbox for Unity (https://www.mapbox.com/unity)
  - Motive.io (for developing VR for the industry)

Motive.io

More options

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- https://niantic.dev/products/ardk/
- Niantic Lightship. A full SDK (Unity supported) with a lot of complements to develop any indoor/outdoor AR experience

- https://www.ar.dev/
- Niantic iniciative towards AR Cloud

More options

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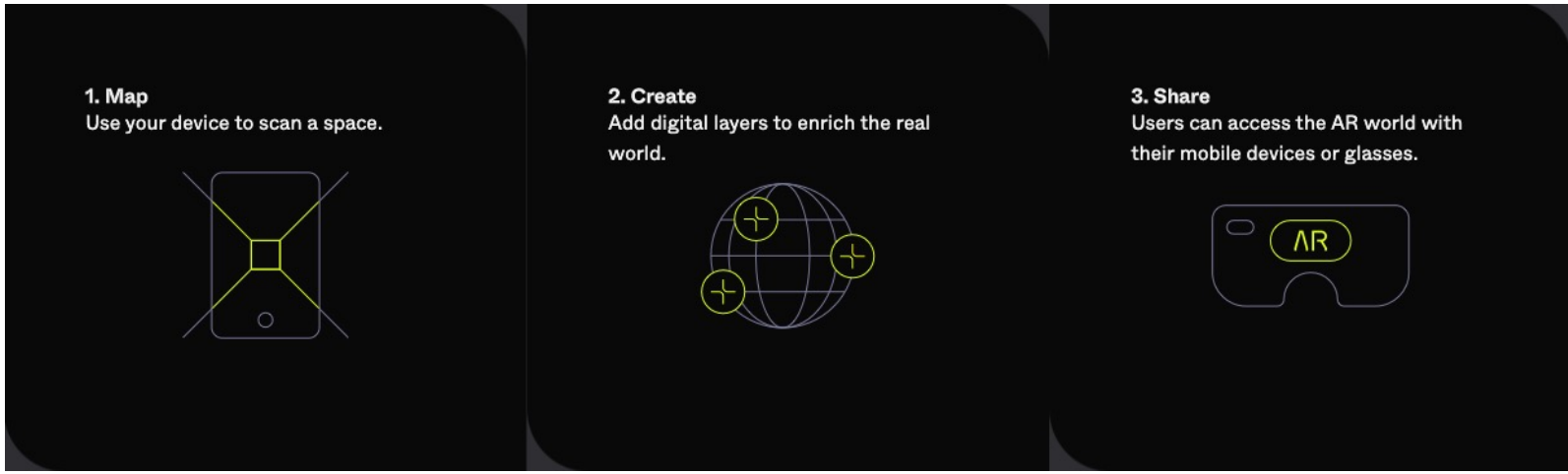
IMMERSAL



https://www.youtube.com/watch?v=cpQEMvvARI8

ARWAY

https://www.arway.app/

https://www.youtube.com/watch?v=EhhbHdbnfZ8

https://www.youtube.com/watch?v=w_Y5HXEyhj4