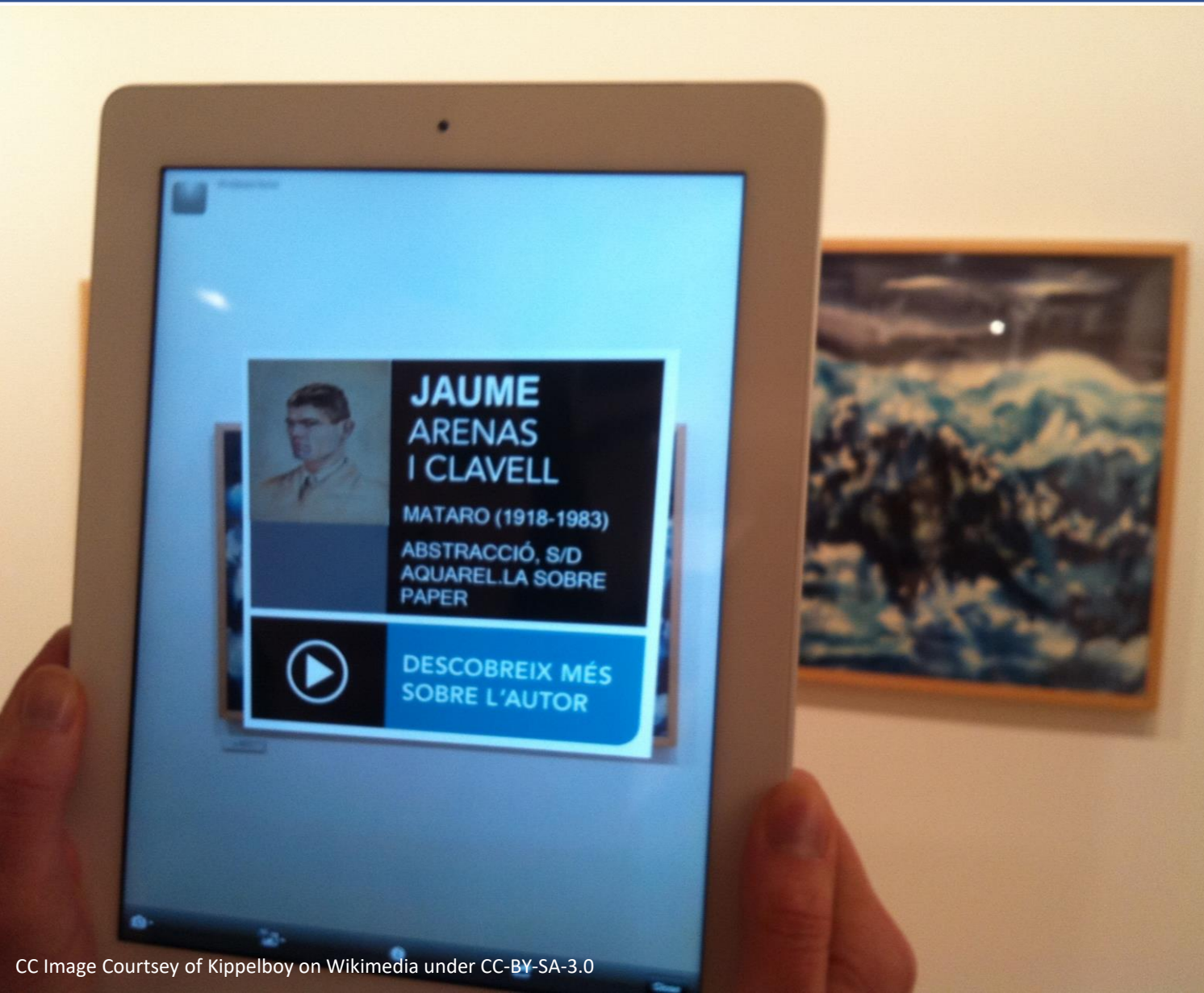# Professional Certificate in AR/VR Development and 3D Graphics

Summary

Week 9: AR Development: Image Tracking

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Overview

1. Create an Augmented Reality experience
2. Look into different types of AR and Mixed Reality features
3. Review different AR frameworks
4. Employ AR frameworks
5. Use Vuforia's Image Targets for image tracking in AR

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Augmented Reality

An interactive experience of a real-world environment where the objects residing in the real world are enhanced by computer-generated perceptual information across multiple sensory modalities.

Characteristics of Augmented Reality

Combination of real and virtual world

Real-time, for potential real-time interaction

3D registration of real and virtual space

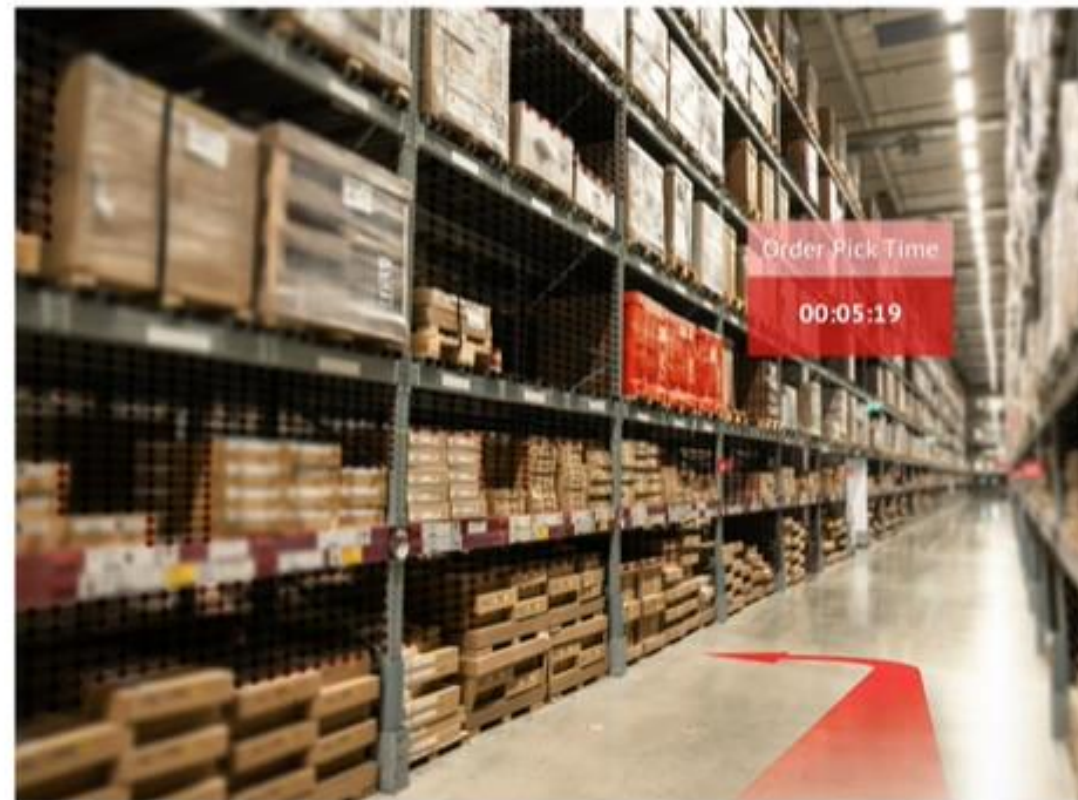Augmentables like animation, sound, vibration, or mix of some/all

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Types of Anchors

Marker based system

The system recognizes a marker, such as a poster, printout, soda can, or other 2D or 3D objects. It uses the marker to position and orient virtual objects in real-time.

Markerless system

Uses Simultaneous Localization and Mapping technology (SLAM) to capture and interpret the surroundings, while simultaneously aligning virtual objects in real space with anchors.

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Types of Marker Based Systems

Fiducials

- Simple markers based on binary black and white images

- Read by an imaging system as a point of reference or a measure

Images

- The engine detects and tracks by comparing features from the camera against a database

Objects

- Object Scanning: camera scans 3D object to generate a point cloud for future detection

- CAD based: digital 3D model information is used to detect and track physical copies of the 3D model in the real world
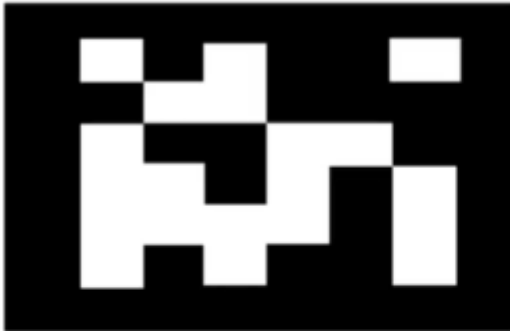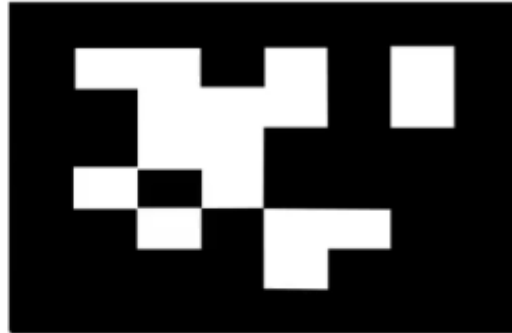
Fiducials

ArUco

AprilTag

ARToolkit

ARTag

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Markerless AR Systems

Leverage the real-world and real-time information to extract basic geometrics for establishing features.

Surface features
ARKit and ARCore

Room-scale features
HoloLens and Magic Leap 1

Cloud anchors or cloud AR facilitates users to scan the real-world, point cloud collections, store them in the cloud and accessible everywhere to be matched in the real-world.

Google ARCore Cloud Anchors

Microsoft Azure: Spatial Anchors

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Types of Targets and Their Support Across Devices

	Vuforia	Wikitude	ARKit	ARCore	HoloLens (Windows Mixed Reality)	Magic Leap (Lumin SDK)
Fiducial markers	Y (has its own marker type: VuMark)	Y	Y	Y	N	Y
Image	Y	Y	Y	Y	N	Y
Image adv	Y (Cylinder, cone, box, or cube)	Y (Cylinder)	N	N	N	N
Cloud Image Database	Y	Y	N	N	N	N
Object Scan	Y	N	Y	N	N	N
Object CAD	Y	Y	N	N	N	N
Surface	N	Y	Y	Y	Y	Y
Room	N	N	N	N	Y	Y

Vuforia Image Targets

Determine the tracking potential of an image by looking at its features such as sharp, spiked, or chiseled details.

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Image Targets: Features

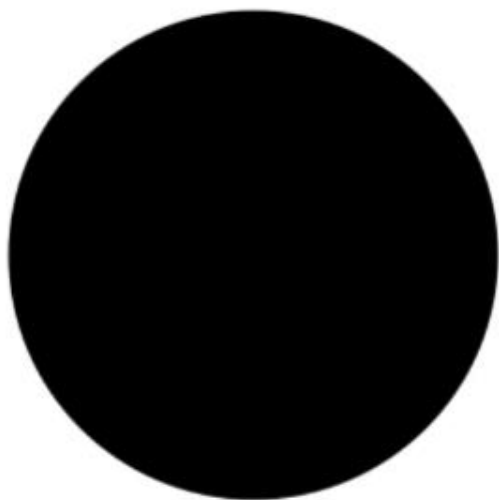A square contains four features for each one of its corners

A circle contains no features – no sharp or chiseled details

A hybrid object has only two features: one at each of its sharp corners

Image Targets: Features

Has round organic geometries – difficult to track

Has chiseled corners and extractable features – easy to track

Features of a Good Image Target

Rich in detail and contain a variety of visual elements for better feature extraction

Asymmetric for correct orientation

Widely distributed features throughout the canvas

Good contrast between:

- Visual elements and the background
- Bright and dark regions, well-lit areas
- Grey scale values regardless of color

Image Target: Common Mistakes and Errors

When choosing an image target, avoid:

- Repetitive patterns
- Organic shapes
- Single color and smooth gradient background
- Dense and small typeface text

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Advantages of Older AR Frameworks

- Compliant with older phones and provide a wider audience reach, moreso than with ARCore and ARKit

- Provide high-accuracy image tracking

- Provide additional features for image tracking like image geometries

Vuforia Download and Install

- License Manager allows users to manage their licenses

- Target Manager assists in creating and managing targets

- While creating a license, users must read the License Key with the features of license

- Create a Database under Target Manager

- Add your targets in Database

- Add features to the image

- Download the Database

- Install the image into Unity and set up a project

- Create a new scene

- Download Vuforia and import the package through it

Testing Vuforia

Learn how to test out Vuforia with sample image in this video

Create a New Target

Create a cylinder and an associated database and explore the features for target tracking in this video.

Configure the Database for Use in Unity

In this video, learn how to set up the cylinder database for use in Unity with image targets to create two augmentable objects.

Coding for Tracker Customization

API StateManager Class

In this video, learn how to access Vuforia capabilities through scripting and then add the API StateManager class reference.

Add Logic for Interaction

This video explains the procedure to add logic to your script to establish an interaction between your objects.

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Key Takeaways

- Augmented Reality-features, landscape, and frameworks
- Vuforia's Image Targets and how to optimize tracking
- Develop environment and create Augmented Reality experience using Image Targets
- Current affordances, constraints, and use cases in the industry