



Training Program:

Augmented and Virtual Reality in the classroom

# Augmented Reality in the classroom



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# Introduction to Augmented Reality

“Augmented Reality (AR) is an enhanced version of reality created by the use of technology to overlay digital information on an image of something being viewed through a device (such a smartphone camera).” [Merriam-Webster]

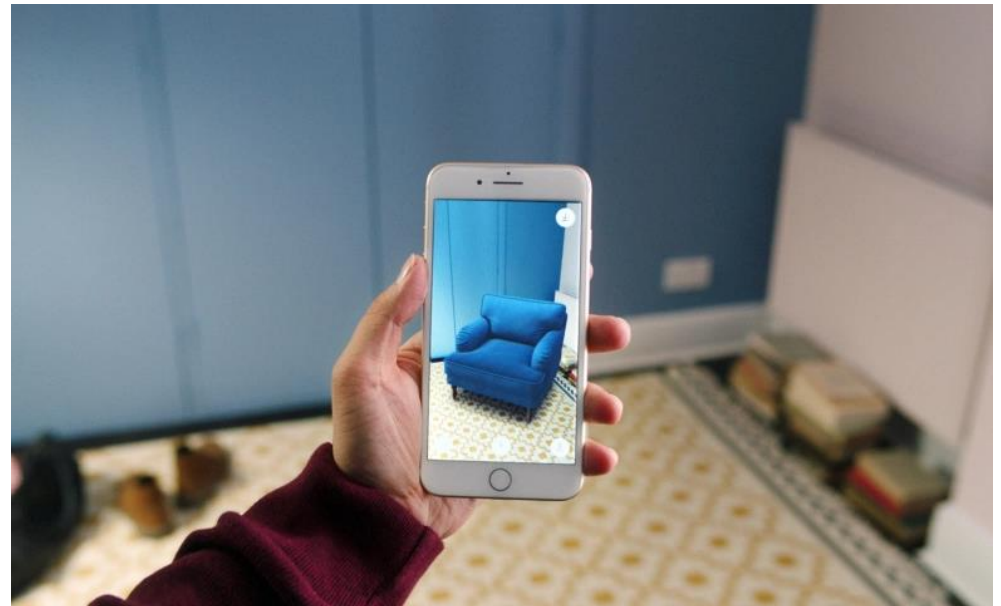


# Introduction to Augmented Reality

“AR is used to enhance natural environments or situations and offer perceptually enriched experience.” [Wikipedia]

AR characteristics are [Azuma, 1997]:

- It combines virtual and reality
- It takes place in real time
- It is registered in 3D



# Introduction to Augmented Reality

Digital content such as images, videos, 3D models, animations, sounds (meta-information) can be used to enhance reality.



## VR vs AR

### VR – “Replaces reality”

- Generation of virtual scene requires realistic images
- Displaying devices should be total immersive, with high FOV
- Tracking accuracy can be low to medium

### AR – “Enhances reality”

- Scene generation can be made with a smaller rendering quality
- Displays are non-immersive, small FOV
- Tracking accuracy should be high

FOV when wearing a VR headset determines how much of the landscape ahead of you is visible when you’re wearing the headset.

Broadly AR is the middleman between Reality and a completely virtual environment (VR).

## AR technology

For AR applications required:

- **Image capture devices**, such as smartphone camera, laptop camera, PC camera
- **Positioning / tracking**, for superposing the virtual content on the real world, the device for image capture must be positioned relative to the image.
- **Software**, for allowing positioning information to be combined with other information and data (such as 3D models), and to be augmented onto the visual data recorded by the digital camera.
- **Image display devices (imaging devices)**, such as a smartphone. PC. tablet., laptop, AR glasses, HMDs.

## AR technology

AR can be:

- Marker recognition based
- Geo-location based



Marker recognition based



Geo-location based

## AR Markers

AR markers (or targets) are images used to determine the position and orientation of a camera with respect to the real world scene.

Before selecting an image as your target you should make sure that the image's format, aspect ratio and color space are supported by the application you intend to use.

In general, AR markers should allow an easy and fast detection by camera. For that those images should adhere to some rules that you are going to find out later through this course.

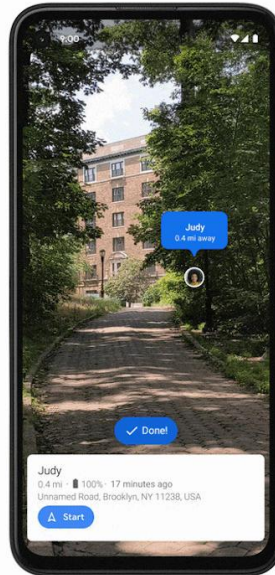


## An AR Chemistry example



## AR location based

AR location – based is using GPS (Global Positioning System), smartphone location and orientation sensors and geospatial data to superimpose meta-information about the point of interest.



Google Maps can offer directions using Augmented Reality since 2019

## AR software

AR software can be broadly categorized into:

- **End-to-end solutions**, such as HPRveal (former Aurasma), Augment, Layar, etc.
- **Software developments kits (SDK)**, such as Vuforia for Unity 3D, Wikitude, ARToolKit, FLARToolKit, ARLab, etc.

One can create AR applications using SDK or end-to-end solutions or one can already developed AR apps (check, for instance, Play Store on your smartphone).

## Using AR apps

AR applications can be found and downloaded from a variety of application stores, depending on the Operating System installed on the device.

Depending on the type of AR used by the application, a marker or GPS signal may be required to augment an image.

Try this out for yourself:

1. Access Play Store on your Android smartphone
2. Search “Augmented Reality”
3. Select an app, *Stack it AR*, for instance (or directly search this app by name)
4. Install the app
5. Press Open (Google Play Games app should also be installed)
6. Start the Game by pressing the play button
7. Follow games indications for placing the bricks.
8. Bricks are positioned by tapping the screen.

# AR in Education

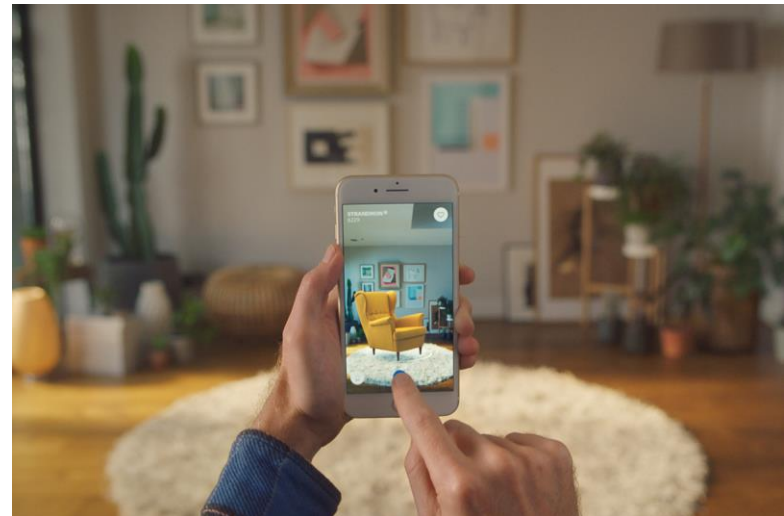
We need:

- A good application area where AR can help
- Good pedagogic principles
- Consider the target audience
- Create interaction/interest

## Requirements to exploit AR

We need:

- 3D, virtual models
- Learn how to build 3D models
- Assign models to markers





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**Thank you for your attention!!!**



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