

Réalité augmentée

Christophe Vestri

28 février 2022

<https://github.com/vestri/CoursAR>

Objectifs du cours

- Découvrir/connaitre/approfondir la RA
- Avoir quelques bases théoriques
- Expérimenter quelques méthodes et outils
- Réaliser un projet en RA

<https://github.com/vestri/CoursAR>

- Evaluation:
 - Participation et travail en classe (25% + 25%)
 - Projet (50%)

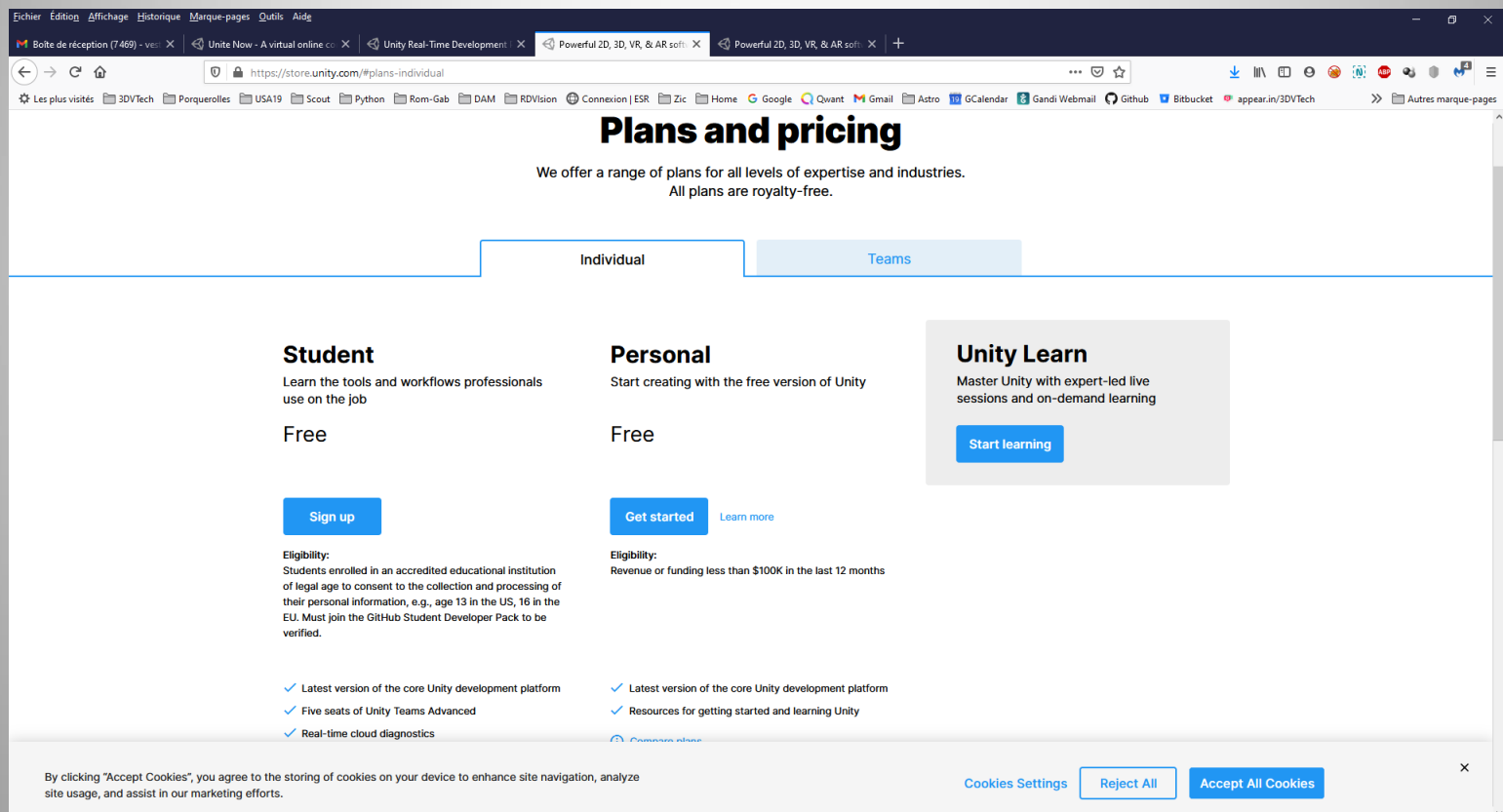
Plan du cours

- 28 février : Réalité augmentée intro, Unity/ARFoundation
- 1 mars: Construction application RA Vuforia
- 8 mars: Projet Unity/Vuforia StarWars
- 15 mars: Vision par ordinateur et début projet
- 22 mars : Présentation des Projets

Installation unity3D

<https://unity.com/>

Version 2021.2.13f1



The screenshot shows the 'Plans and pricing' page on the Unity website, specifically for individual users. The page is titled 'Plans and pricing' and includes a sub-header: 'We offer a range of plans for all levels of expertise and industries. All plans are royalty-free.' Below this, there are two tabs: 'Individual' (selected) and 'Teams'. The 'Individual' tab displays three main plan categories: 'Student', 'Personal', and 'Unity Learn'. Each category has a description, a 'Free' status, a 'Sign up' or 'Get started' button, and a list of features. The 'Unity Learn' section is highlighted with a blue 'Start learning' button. At the bottom, there is a cookie consent banner with 'Cookies Settings', 'Reject All', and 'Accept All Cookies' options.

Plans and pricing

We offer a range of plans for all levels of expertise and industries.
All plans are royalty-free.

Individual **Teams**

Student
Learn the tools and workflows professionals use on the job

Free

Sign up

Eligibility:
Students enrolled in an accredited educational institution of legal age to consent to the collection and processing of their personal information, e.g., age 13 in the US, 16 in the EU. Must join the GitHub Student Developer Pack to be verified.

- ✓ Latest version of the core Unity development platform
- ✓ Five seats of Unity Teams Advanced
- ✓ Real-time cloud diagnostics

Personal
Start creating with the free version of Unity

Free

Get started [Learn more](#)

Eligibility:
Revenue or funding less than \$100K in the last 12 months

- ✓ Latest version of the core Unity development platform
- ✓ Resources for getting started and learning Unity

Unity Learn
Master Unity with expert-led live sessions and on-demand learning

Start learning

By clicking "Accept Cookies", you agree to the storing of cookies on your device to enhance site navigation, analyze site usage, and assist in our marketing efforts.

[Cookies Settings](#) [Reject All](#) [Accept All Cookies](#)

Réalité augmentée

Introduction

Christophe Vestri

Plan Cours1

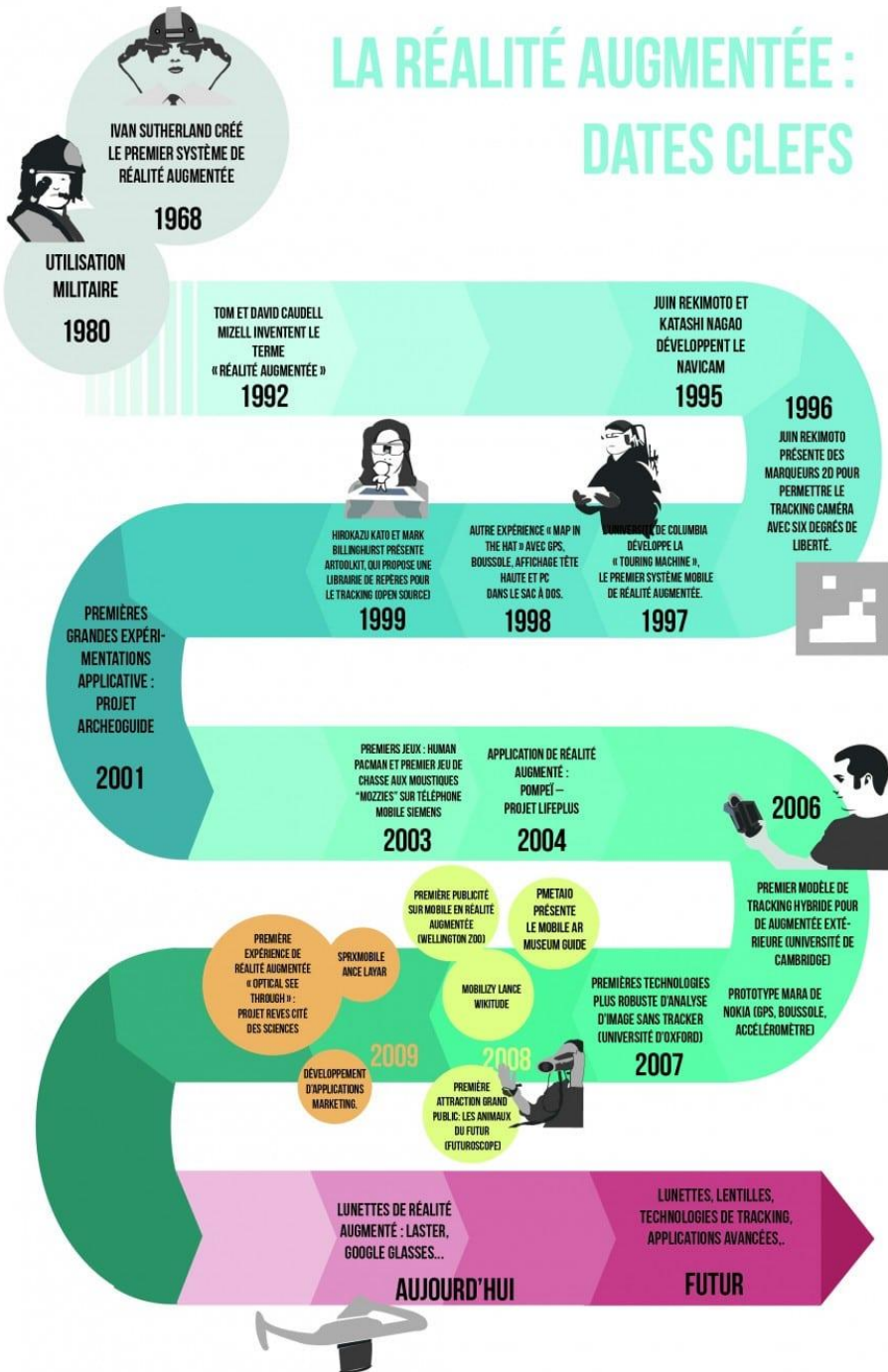
- Définitions Réalité augmentée
- Applications
- Outils
- Démo
- Projet DAM
- Unity3D

Pokemon GO & Genesis



- 5 juillet 2016: lancement
- 2 aout 2016: 100 millions de téléchargements
- 1.6 Millions USD/j au débuts
- Env 1 Milliard USD en 2016 -> 3 milliards
- 2 Milliards en 2020 (malgrès Covid)

LA RÉALITÉ AUGMENTÉE : DATES CLEFS



Rapide historique

Qu'est-ce que la Réalité augmentée?

Qu'est-ce que la Réalité augmentée?

- Augmentée:
 - Amplifier
 - Rehausser
 - Améliorer
- [Wikipédia](#): La **réalité augmentée** désigne les systèmes informatiques qui rendent possible la superposition d'un modèle virtuel 2D ou 3D à la perception que nous avons naturellement de la réalité et ceci en temps réel.
- [RAPro](#) : Combiner le monde réel et des données virtuelles en temps réel

Continuum réalité-virtualité



Environnement
réel



Réalité
augmentée



Réalité
virtuelle



Environnement
virtuel



Réalité mixte

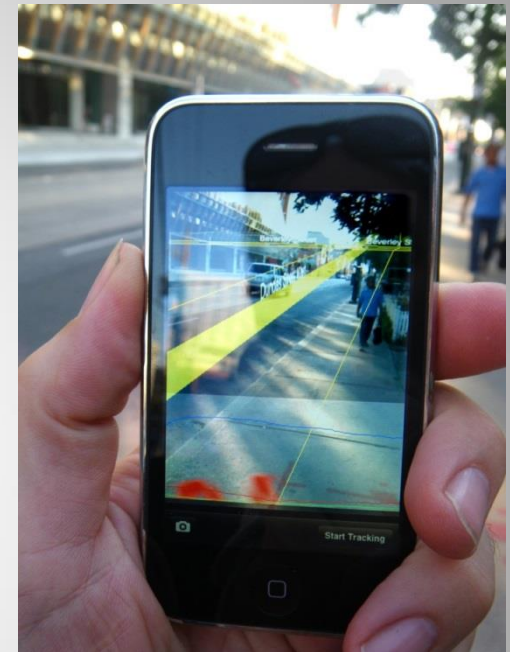
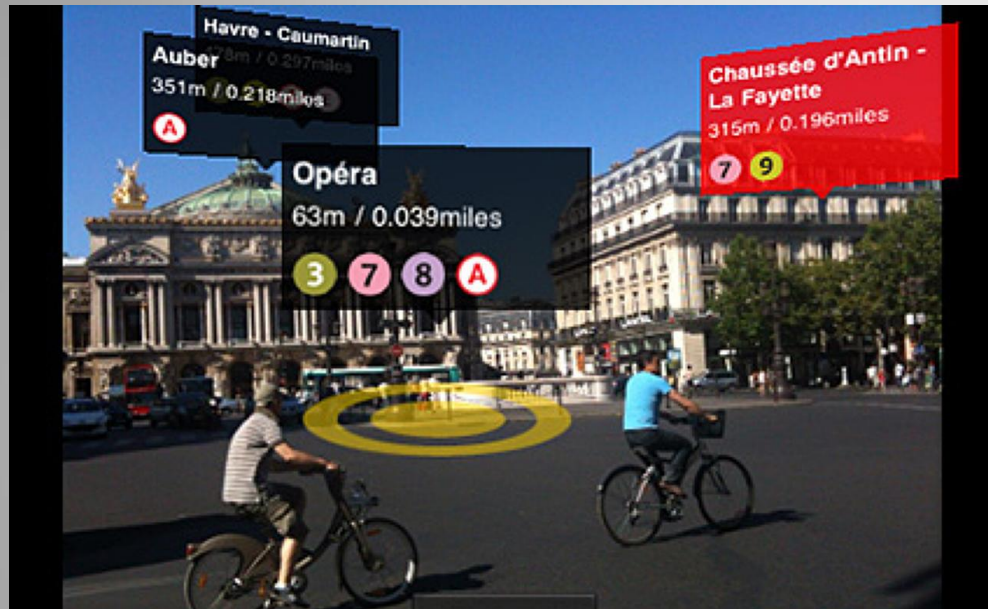
Qqs Demos et vidéos

- <https://ar-js-org.github.io/AR.js-Docs/>
- GoogleTraduction/Wordlens:
www.youtube.com/watch?v=06olHmcJjS0
- Autres videos.... [HyperReality](#)
- Review 2021: [augmented Reality](#)
- CES 2018/2019/2020...

Autre définition de la RA

- [RAPro](#) : Combiner le monde réel et des données virtuelles en temps réel
- 5 sens:
 - Visuel: smartphone, lunettes...
 - Sonore: déficients visuels
 - Tactile/haptique: systèmes retour de force
 - Odorat: Cinema 4D
 - Goût:

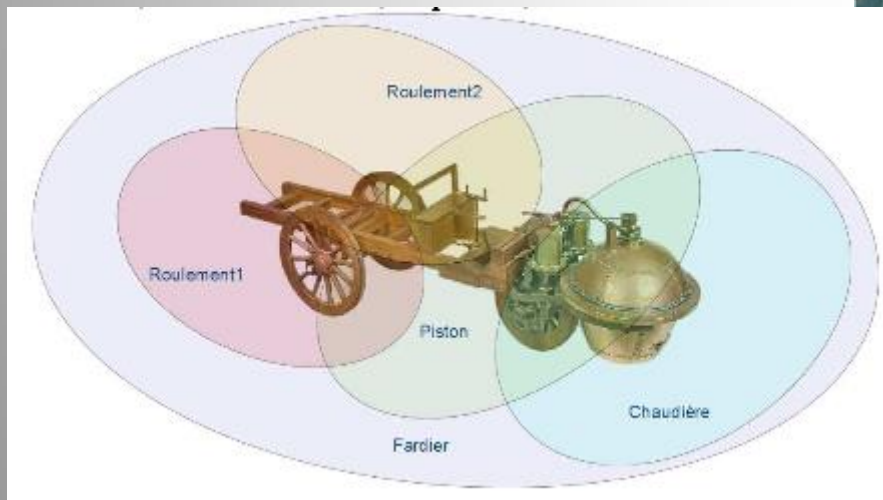
Exemples RA visuel



Exemples RA Sonore



Topophonie



CNAM

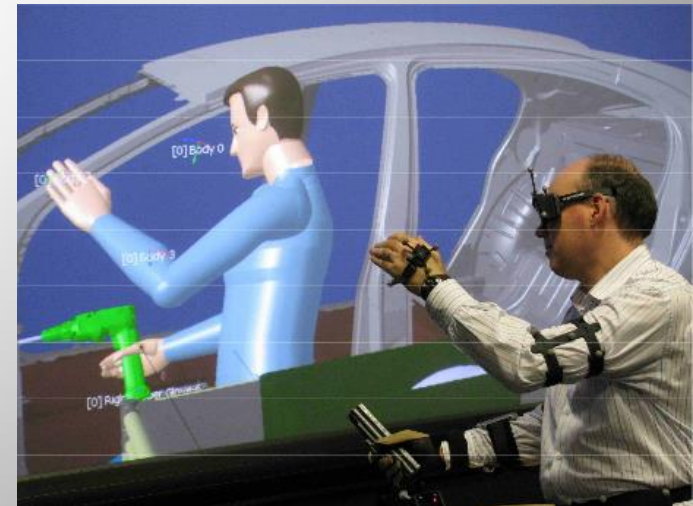
Exemples RA Haptique



Sense-Roid



Peau artificielle



Examples RA Olfactive



AMBISCENT



Meta cookies



Vaqso VR

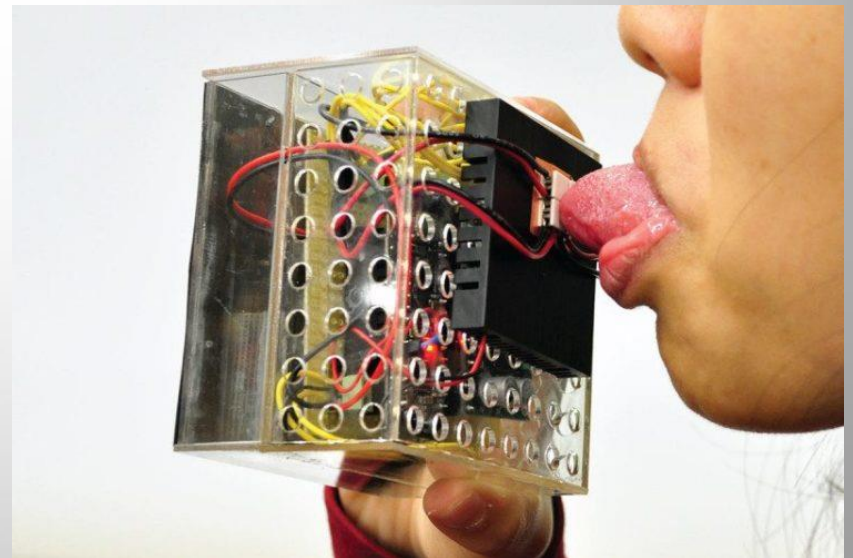
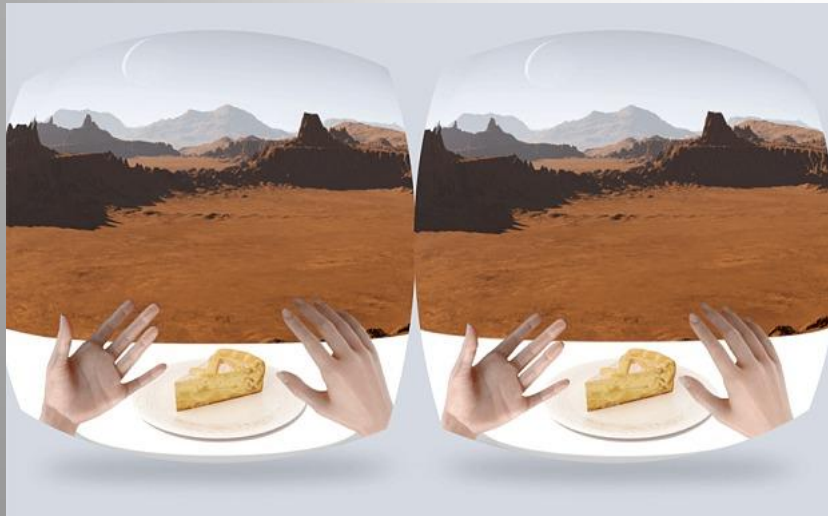


[CamSoda](#) *OhRoma*

Examples RA gustative



TagCandy



UIST Tokyo

Applications

- Augmentation de print



IKEA 2014



Idée3com : Application Brisach Vision



Applications

- Manuels augmentés



Applications

- Urbanisme



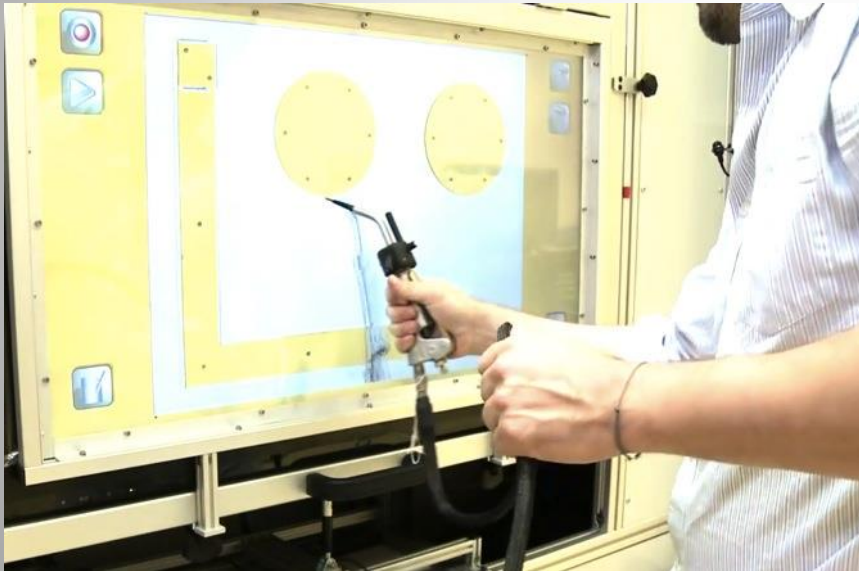
KRAKEN REALTIME



Métropole de Rennes

Applications

- Formation augmentée



CEA list & Renault : gestes techniques collage



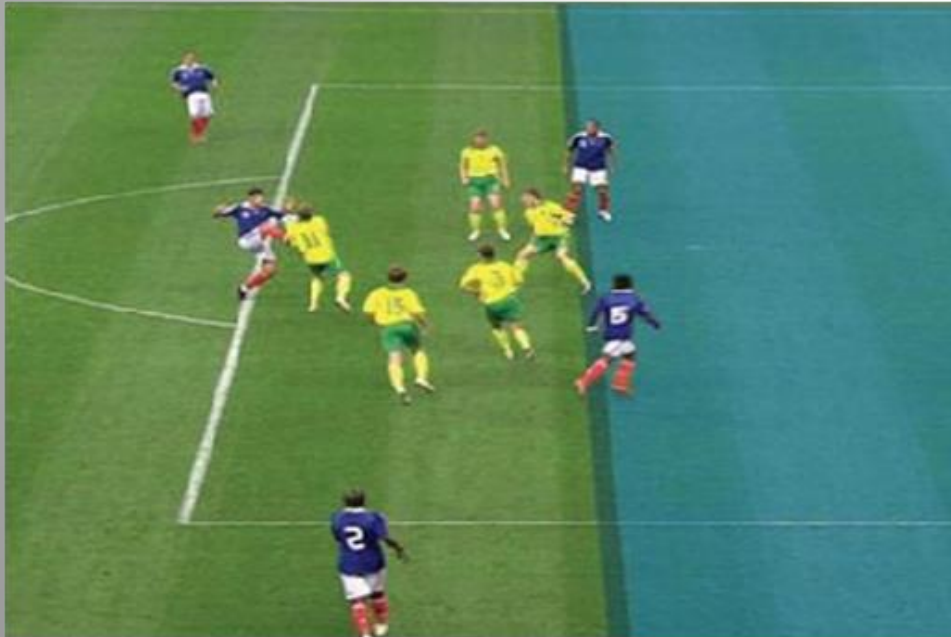
Institut de Soudure



Lincoln Electric

Applications

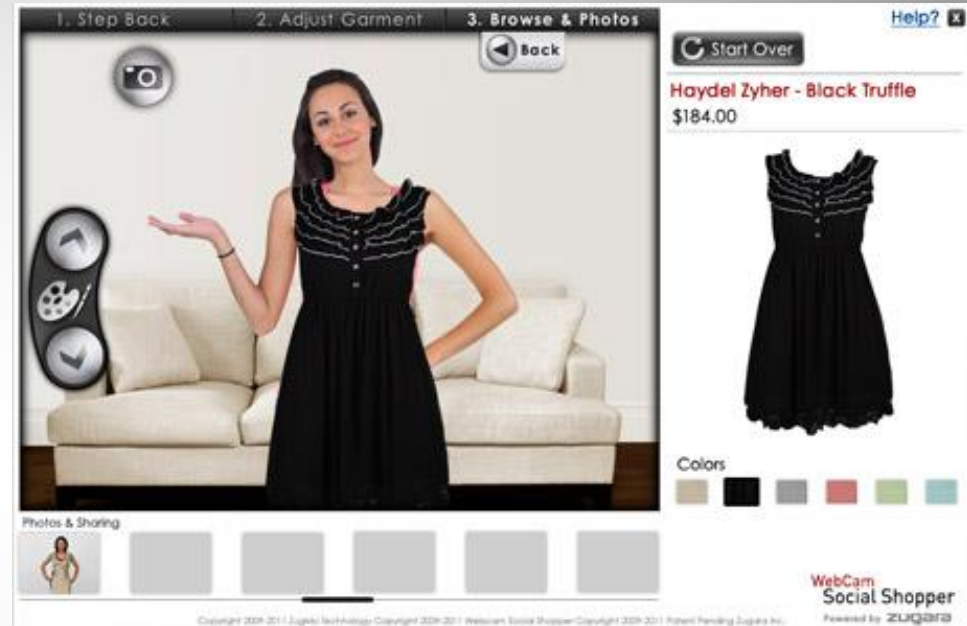
- TV



Throttle		
Car	24	3
Speed	189.2	190.1

Applications

- Essayage sur internet



Applications

- Musées, art, tourisme



Museum d'histoires naturelles de Washington



MOMO urban art on the Williamsburg Art & Design Building in Brooklyn.



Applications

- Médical



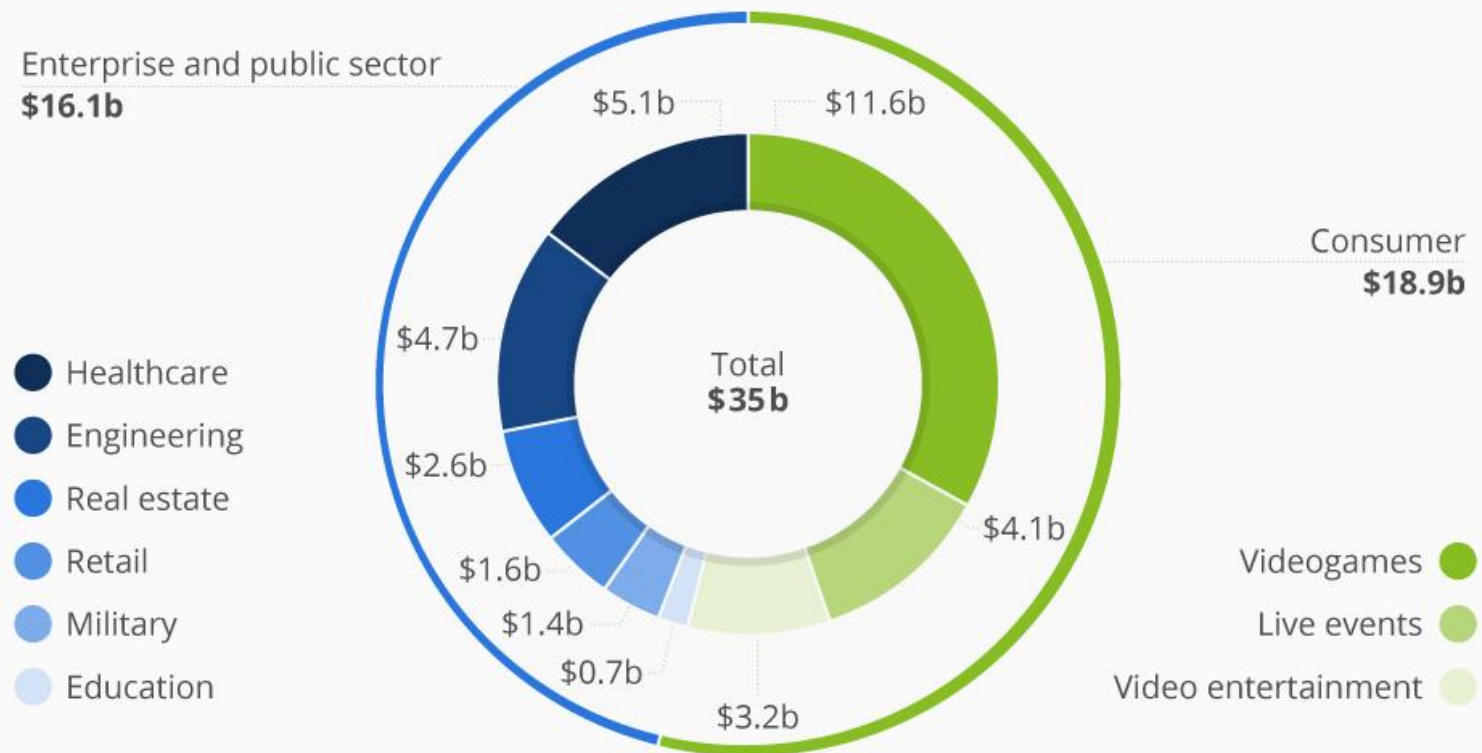
VeinViewer



Future Market

The Diverse Potential of VR & AR Applications

Predicted market size of VR/AR software for different use cases in 2025*



@StatistaCharts

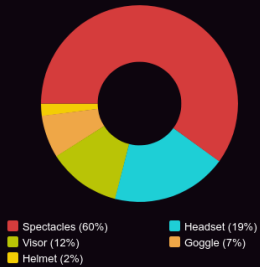
* Base case scenario

Source: Goldman Sachs Global Investment Research

statista

Economie – AR Smart glasses

FORM FACTORS



42

AR smart glasses in market or in advanced stages of development



\$1,000

median cost of AR smart glasses on the market

ANDROID DOMINANT OPERATING SYSTEM



60%

of AR smart glasses are powered by Android



Android (60%)
Microsoft (16%)
Other (24%)

PRIMARY MARKET IS THE ENTERPRISE



60%

of AR smart glasses are intended for commercial or industrial purposes



DHL drove a 25% increase in efficiency using Vuzix M100 smart glasses as part of a picking solution

Boeing cut production time by 25% and reduced error effectively to zero using Google Glass in its wiring harness assembly

Thyssenkrupp Elevator has reduced the average length of service calls by 4X by provisioning HoloLens to 24,000 technicians



THE HOLY GRAIL OF AR: FIELD OF VIEW (FOV)

33°

average AR smart glasses FOV



FOV (degrees)

COMMON USER INTERFACES

GESTURE



48%

VOICE



71%

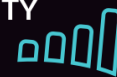
BUTTON



79%

FEATURES TO WATCH

CONNECTIVITY



Only 14% of AR smart glasses support LTE. As 5G networks emerge expect to see more AR smart glasses support cellular connectivity.

DEPTH SENSOR



26% of AR smart glasses are equipped with Depth Sensors. As the market moves towards more immersive experiences expect this sensor to be a common feature on go-forward AR devices.

The Definitive Guide to Augmented Reality Smart Glasses is a living resource that contains up-to-date information on AR smart glasses that are on the market or in late stage development. This interactive infobase aims to help consumers and organizations in selecting the right device for their needs. Visit <http://arglassesguide.com/>

Sources

The Definitive Guide to AR Smart Glasses: <http://arglassesguide.com/>

APR: <https://www.apr.com/landing/landing/>

Vision: <http://www.vision.com/news-releases/vision-smart-glasses-will-be-arguably-the-most-important-of-the-global-augmented-reality-program-2018-07-11.html>

Windows: <https://blogs.windows.com/devices/2018/09/13/microsoft-business-enables-the-possibility-to-transform-the-global-elevator-industry-with-holo-lens-2018-09-13.html>

Author: Ron Padzensky

Published in partnership with:

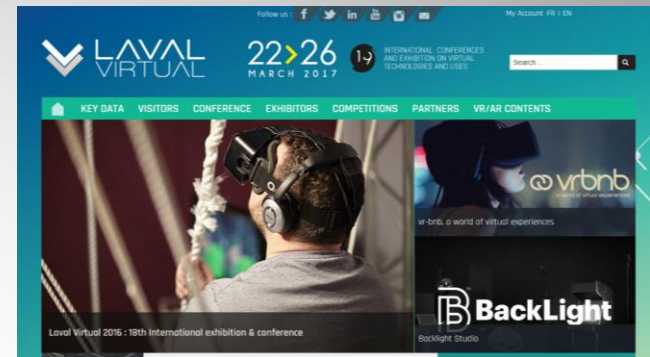
AugmentedReality.org & Super Ventures

Quelques entreprises 06

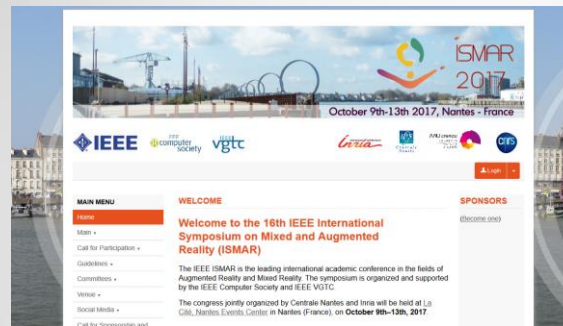
- **Robocortex:** SDK
- **Optis:** Image de synthèse et RV
- **Lm3labs:** interfaces interactives
- **Touchline Interactive:** Dev applis mobiles
- **Tokidev:** Dev applis mobiles
- **Wacan:** Dev applis mobiles
- **Interactive 4D:** Serious Games
- **Avisto:** SSII

Conférences et liens RA

- Laval Virtual



- ISMAR



- RAPro:

- <http://www.augmented-reality.fr/>



- AVFR:

- <http://www.af-rv.fr/>



Autres cours/infos

- Cours <http://web4.ensiie.fr/~bouyer/rvsi.html>
- Cours [Atelier IHM](#) de Nice
- Cours [Master IVI lille](#)
- Coursera: [Getting start with AR](#)
- ARFoundation
<https://www.youtube.com/watch?v=FGh7f-PaGQc>
- Plein d'autres Youtube et tutos technos
- Udemy ([payants](#))

Outils de RA

- Metaio (-> Apple)
- [Unity](#) et [Vuforia](#) (features)
- [Wikitude](#) ([features](#))
- Été 2017: [ARCore](#) et [ArKit](#)
- Autres: [ARToolkit](#), [Sumerian](#), [AR.js](#), [Argon.js](#)
- Liste SDK liste: [Social Compare-AR-Sdk](#)
- Lunettes RA: [Social Compare-AR-lunettes](#)

Projet final cours AR

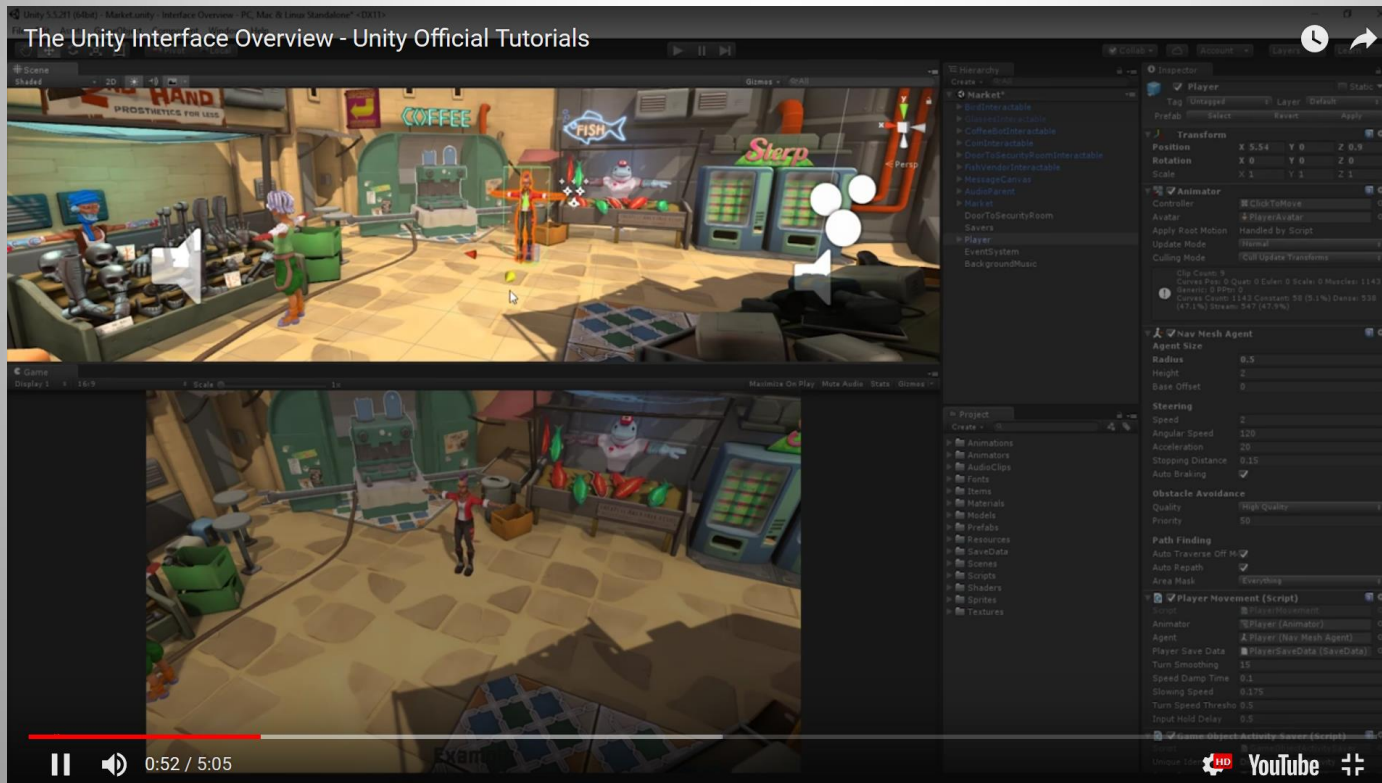
- Objectifs:
 - 1 projet chacun avec AR (ou VR) inside
 - Outil que vous voulez avec Unity: Vuforia, ARFoundation, Arcore, Arkit...
 - Présentation le dernier cours
- Planning
 - Cours1: Installation Unity et ARFoundation
 - Cours2: ARFoundation + Vuforia ImageTarget
 - Cours3: Développement d'une démo Monster/Star wars
 - Cours4: Avoir un sujet/idée en RA pour commencer
 - Cours5: demo de votre projet

Tutoriaux et Idées projets

- Les sites Unity3D, Vuforia et autres sdk
- Chaines Youtubes AR
 - [MatthewHallberg](#)
 - [Edgaras Art](#) et <https://www.ourtechart.com/>
 - Et plein d'autres
- Chaines Unity3D
 - [N3K](#)

Intro Unity3D

- Unity 3D
- AssetStore et Tutoriaux





- Create Unity ID

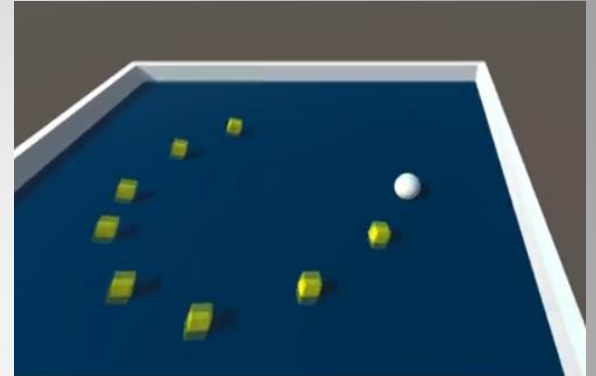
A screenshot of the Unity ID creation form. The form is titled "Create a Unity ID" and includes a subtext: "A Unity ID allows you to buy and/or subscribe to Unity products and services, shop in the Asset Store and participate in the Unity community." The form fields are: Email, Password (with a toggle for visibility), Username, Full Name, and Country (a dropdown menu labeled "Select country"). At the bottom, there is a section titled "Click or touch the Cloud" with five icons: a game controller, a smartphone, a fingerprint scanner, a pair of scissors, and a cloud icon.

- Create a Project for the demo

Exercice Unity

Roll a Ball

- Déplacer et Animer un objet
- Déplacer caméra avec objet
- Détecter collision d'objets
- Contrôle par smartphone ([Gyroscope.attitude](https://gyroscope.attitude))
- Score et construction du jeu



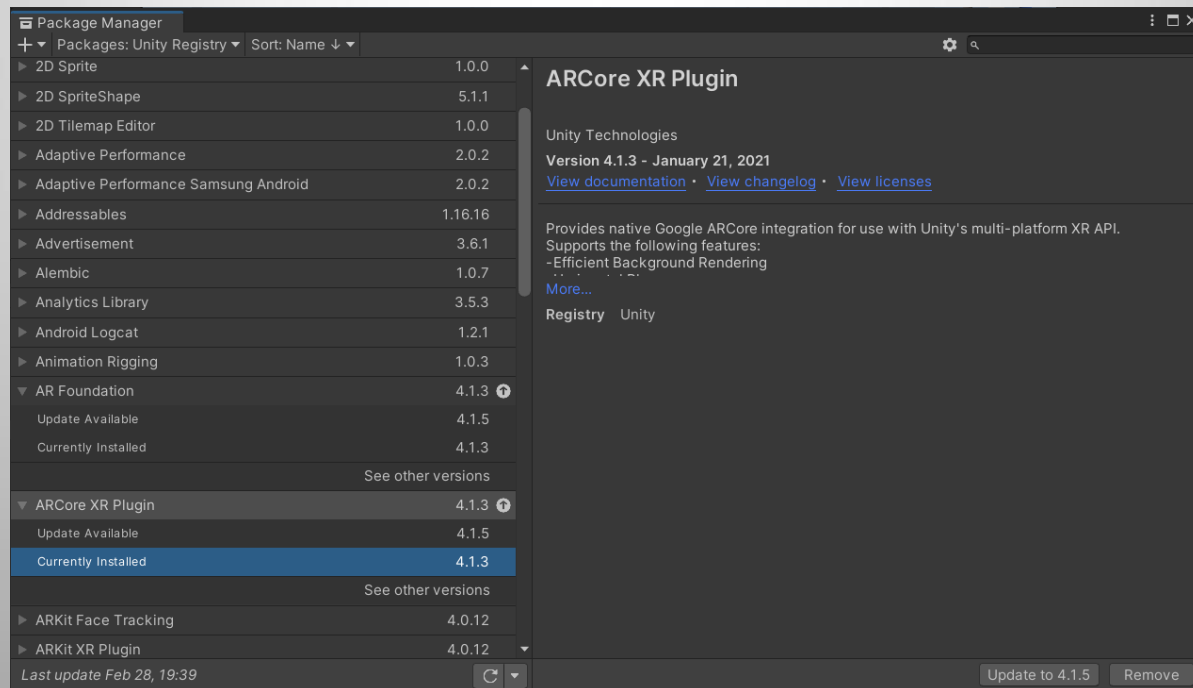
<https://learn.unity.com/project/roll-a-ball-tutorial>

Exercice ARFoundation

- Build&settings
- Switch to android
- Player settings
 - Remove vulkan
 - Multithreading rendering on
 - Android version 24 ou 26 mini
- XR plugin -> ARCore
- Smartphone en mode debug

Exercice ARFoundation

- Package manager/ unity registry
 - Ajouter ARFoundation
 - Ajouter ARCore XR plugin ou ARKit XR plugin



Exercice ARFoundation 1

- Création d'une scene AR simple (cube sur surface plane)
 - Supprimer caméra
 - Ajouter AR session et AR Session Origin
 - Ajouter un cube (0.1m de côté) dans AR Session Origin
- Build settings
- Ajouter la scene
- Brancher votre smartphone
- Build and Run

Exercice ARFoundation 2

- Utilisation ARPlane
 - <https://learn.unity.com/tutorial/configuring-plane-detection-for-ar-foundation>
 - Supprimer caméra
 - Ajouter AR session et AR Session Origin
 - Ajouter un AR default plane, ajouter une Sphere et créer un Prefab
 - Dans AR Session Origin:
 - ajouter AR plane Manager component
 - Drag&Drop le prefab dans PlanePrefab
 - Build & run

Exercice ARFoundation 3

- Utilisation Image Tracking
 - <https://www.youtube.com/watch?v=MdeuA0FITS0>
 - Supprimer caméra
 - Ajouter AR session et AR Session Origin
 - dans AR Session Origin: Add component/AR Tracked Image Manager
 - Dans prefabs: create/XR/ReferencelImageLibrary
 - Dans ReferencelImageLibrary: Ajouter une image .jpg
 - Dans AR Tracked Image Manager:
 - D&D ReferencelImageLibrary et un prefab
 - Ajouter nb detect=2

Exercice ARFoundation Samples

- Dans UnityHub on va charger le projet : Add arfoundation-samples directory
- Build & launch
- Si erreurs de compilation
 - Dans Package Manager: Ajout input systems
 - Dans Build settings/player: allows unsafe mode

Pour la prochaine fois

- **Commencez à réfléchir idée de projet**
- **Continuez Unity, ARFoundation & Vuforia**
- **Séance prochaine:**
 - **ARFoundation et Vuforia**
 - **Unity script + Star Wars exo**