## ✓ unity TP RÉALITÉ AUGMENTÉE 02 : ✓ vuforia<sup>™</sup> UNITY + VUFORIA - IHM 3D EN AR<sup>1</sup>

| 1. Introduction                                   | 2  |
|---|----|
| 2. Mode 3D AR                                     | 2  |
| 2.1 Configurations                                | 2  |
| 2.1.1 Players setting                             | 2  |
| a) Choisir dans XR setting :                      | 2  |
| b) Configurer dans 'other setting' :              | 2  |
| 2.1.2 ARcamera.                                   | 3  |
| 2.2 Test pour agrandir les deux images            | 5  |
| 3. Création d'une app 3DAR                        | 6  |
| 4. Création d'un menu UI en mode 3D               | 11 |
| 4.1 Configuration du canvas                       | 11 |
| 4.2 Configuration d'un joystick                   | 12 |
| 4.2.1 Ajout joystick :                            | 12 |
| 4.2.2 Association :                               | 13 |
| 4.3 Autre Solution :                              | 14 |
| 4.3.1 Pointage avec mouvement de la tête et timer | 14 |
| 4.3.2 Pointage avec boutons virtuels              | 14 |
| 5. Conclusion                                     | 15 |
| 6. Références :                                   | 17 |

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## 1. Introduction

On souhaite créer un IHM en 3D en AR (augmented reality). On utilisera un QR code comme image cible (image target). On ajoutera aussi des boutons virtuels à notre interface.

## 2. Mode 3D AR

Vuforia fournit un exemple afin de tester le mode 3D AR.

### 2.1 Configurations

Les configurations sont :

#### 2.1.1 Players setting

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| lethod Default •  | <ul> <li>SamplesResources</li> <li>Scenes</li> <li>SampleScene</li> <li>StreamingAssets</li> </ul>   | Virtual Reality Supported 🖌<br>Virtual Reality SDKs<br>= Vuforia  |  |
| 11 Game Center Add  | <ul> <li>Wuforia</li> <li>Packages</li> </ul>  | Stereo Rendering Mode* Multi Pass   | +, -   |
| Build Build And Run   |  | Uvforia Augmented Reality is required when using the Virtual Reality SDK.   | e Vuforia  |
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a) Choisir dans XR setting :

Virtual reality supporter (mode 3D) avec Vuforia comme viewer ( + et choisir Vuforia)

et

Vuforia augmented reality

b) Configurer dans 'other setting' : ARMv7



#### 2.1.2 ARcamera

La caméra vuforia est configurée comme suit :

| ImageTarget     Collab       ImageTarget     Construction  | b • Acco<br>nspector<br>Tag ARCamera<br>Tag Untagged<br>Transform<br>sition<br>tation<br>ale<br>Camera<br>ar Elans | unt ▼ Layers ▼  | Layout •                        | Iple3DAR - Android <dx11 on<br="">I Iterarchy a =<br/>Ireate =   @rAll<br/>Q 2 Eyewear ==<br/>C R6 Genera</dx11> | Collab  Collab  Collab  Collab  Collab  Collab  Collapping Planes | Near 0.01                    | Layout •           |
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En mode run on obtient ceci :



#### en ayant ajouté une 'image target' :

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|                                     |                                    |   | ▶ 🚔 ∨uforia   | Cast Shadows                                    | On +   |
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## 2.2 Test pour agrandir les deux images

Changement : 'field view' de 51 à 40 : effet aucun la valeur chage et passe à 72 en mode Run.

## 3. Création d'une app 3DAR.

Créer un nouveau projet 3D

#### Effacer la caméra installée par défaut :



Mettre une camera Vuforia :

importer les package nécessaire (cela se fait tout seul)



#### Configurer le player :

#### switcher sur Android

| \$   | Unity 2018.3.14f1 P  | ersonal - SampleScene.unit                              | y - AR3D_ex01 - Android* <   | DX11 on E | OX9 GPU>   |   |   | _ 🗇 🗡  |
|--|--|---|--|-----------|--|---|---|--|
|  | Build Settings   | ×   |  |           |  |   |   |  |
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| Platform Platform PC, Mac & Linux Standalone  Android IIII iOS | Android<br>Texture Compression<br>ETC2 fallback<br>Build System<br>Export Project  | Compling scripts  | l on   |           | Viewport Rect<br>Depth<br>Rendering Path<br>Target Texture<br>Occlusion Culling<br>Allow HDR<br>Allow MSAA   | Far 2000<br>X 0<br>W 1<br>Use Graphics<br>None (Reno                                      | Y 0<br>H 1<br>Settings<br>der Texture)                  |  |
|  | Build App Bundle (Google Pla<br>Run Device<br>Development Build<br>Autoconnect Profiler<br>Script Debugging<br>Scripts Only Build<br>Compression Method<br>SDKs for App Stores | Default device + Refresh                                | <ul> <li>Scenes</li> <li>Vuforia</li> <li>Packages</li> </ul>                          |           | Allow Dynamic Resc<br>Target Display   | Ilut Display 1<br>er<br>aviour (Script<br>abled. Enable Vufo<br>ject.<br>ria Engline vers | )<br>ria in the Player                                  | s)<br>The second s |
| Facebook   | Xiaomi Mi Game Center  | Add Learn about Unity Cloud Build Hatform Build And Run |  |           | World Center Mode<br>Open<br>Open<br>Script  | DEVICE<br>Vuforia Engine<br>alization Error<br>DefaultIn<br>Add Compor                    | e configuratio<br>Handler (S<br>ItializationErr<br>nent | crij 🔯 🕻 🌣<br>rorHandler o   |
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Choisir le mode : XRsetting = Virtual reality SDK (Vuforia) + Vuforia augmented reality (s'installe tout seul)

| €)                         | Unity 2018.3.14f1 Personal - SampleScene       | unity - AR3D_ex01 - Android* <dx1< th=""><th>11 on DX9 GPU&gt;</th><th>_ 🗇 🗡</th></dx1<>   | 11 on DX9 GPU>  | _ 🗇 🗡                  |
|----------------------------|--|--|---|------------------------|
|                            | Build Settings                                 | ×  |   |                        |
| Scenes In Build            |  |  | Collab • 🛆 Account • Laye                                     | ers 🔹 Layout 🔹         |
|                            |  | T Hierarchy     Create      Oreate      Oreate | Inspector     Default Icon                                    | (Texture 2D)           |
|                            |  | ARCalifera   | Default Cursor  | Select<br>(Texture 2D) |
| Platform                   | Add Open Scen                                  | <u>es</u> )  | Cursor Hotspot X 0  | Y 0                    |
| PC, Mac & Linux Standalone | Android  |  | Settings for Android  | +                      |
| 🔮 Android                  | Texture Compression Don't override             | •  | Icon  |                        |
| iOS                        | Build System Gradle                            | Project     Create      Q  | Resolution and Presentation                                   |                        |
| Éty tvos                   | Build App Bundle (Google Play                  | h Assets   | Other Settings  |                        |
| Xbox One                   | Development Build                              | ► Scenes ► Vuforia   | Publishing Settings   |                        |
| ₽.54 PS4                   | Script Debugging                               | Packages   | Virtual Reality Supported 🖌                                   |                        |
| Universal Windows Platform | Compression Method Default SDKs for App Stores | •  | Virtual Reality SDKs<br>= Vuforia                             |                        |
| WebGL                      | Xiaomi Mi Game Center Add                      |  | Stereo Rendering Mode* Multi Pass                             | +, -                   |
| Facebook                   | Learn about Unity Cloud Bu                     | uld  | ARCore Supported  |                        |
| Player Settings            | Build Build And Rur                            |  | Vuforia Augmented Reality is required<br>Virtual Reality SDK. | when using the Vuforia |
| :                          |  | _  |   | ■ <b>* *</b> 18:00     |

#### Retourner sur la camera Vuforia

#### Ouvrir la configuration Vuforia :



#### Configurer 'Digital eyewear'



#### Ajouter un objet à voir : ici un cube blanc.

| <₽                              | Unity 2018.3.14f1 Persona   | al - SampleScene.unity - AR3D_ex01 - Android <dx11< th=""><th>on DX9 GPU&gt; 🗕 🗖 🗙</th></dx11<> | on DX9 GPU> 🗕 🗖 🗙   |
|---------------------------------|---|---|---|
| File Edit Assets GameObject Con | mponent Window Help   |   |   |
|                                 | 💵 Pivot 🕼 Global  |   | Collab • 🛆 Account • Layers • Layout •  |
| # Scene                         |   | -= Hierarchy  |   |
| Shaded * 2D 🔆 📣                 | Gizmos * Q*All  |   | 💭 🜍 🗹 Cube 🗌 Static 🔻 🍐   |
|                                 |   | y a Directional Light   | Tag Untagged + Layer Default +  |
|                                 |   | C AR Camera   | Transform   |
|                                 |   | x Z Cube  | Position X 0 Y 0 Z 1.96   |
|                                 |   |   | Scale X 1 Y 1 Z 1   |
|                                 |   | < Persp   | Cube (Mesh Filter)  |
| EFF                             |   |   | Mesh ©  |
| 121212                          |   |   | 🔻 🛃 🗹 Mesh Renderer 🛛 🔯 🖈   |
|                                 |   |   | Materials   |
|                                 |   |   | Bend Probes   |
|                                 |   |   | Anchor Override None (Transform) ©  |
| E Cancala Cama                  |   | Project   | Cast Shadows On +   |
| Free Aspect + Scale (           | 1x Both Eyes + Maximize On Play   | Mute Audio Stats Gizmos + Create + Q  | Receive Shadows   |
|                                 |   | V 🚔 Assets  | Motion Vectors Per Object Motion +  |
|                                 |   | VuforiaConfiguration  | Lightmap Static   |
|                                 |   | ► Scenes<br>► Vuforia   | To enable generation of lightmaps for this Mesh Renderer, please enable the 'Lightmap Static' property. |
|                                 | The second se | ▶ 🚞 Packages  | Dynamic Ocduded 🗹   |
|                                 |   |   | ▼ 🤪 🗹 Box Collider 📃 🗐 🛱 🌣  |
|                                 |   |   | 🔥 Edit Collider   |
|                                 |   |   | Is Trigger  |
|                                 |   |   | Material None (Physic Material)   |
|                                 |   |   | Center X 0 Y 0 2 0  |
|                                 |   |   |   |
|                                 |   |   | Default-Material  |
|                                 |   |   | StidQer Standard  |
|                                 |   |   |   |
| 📲 🔮 🕨 😭                         | 📚 🛛 📦 🖄 📑 🍕   |   | · · · · · · · · · · · · · · · · · · ·   |
|                                 |   |   |   |

Construire l'apk :

Eliminer les erreurs : souvent il faut déactiver Android TV dans 'other setting'.

Ok ça marche on a bien un double écran.



## 4. Création d'un menu UI en mode 3D

### 4.1 Configuration du canvas

Le création d'un menu en 3D (visible sur les deux yeux) nécessite le mode Word space pour le canvas contenant les UI.

Exemple :

| €                                       | Unity 2018.3.14f1 Personal - ma               | intenance.unit | y - ARLux_e - Android <dx11 or<="" th=""><th>DX9 G</th><th>PU&gt;</th><th></th><th>_ 🗇 🗙</th></dx11> | DX9 G      | PU>                           |   | _ 🗇 🗙                         |
|---|---|----------------|--|------------|-------------------------------|---|-------------------------------|
| File Edit Assets GameObject Comp        | onent Window Help                             |                |  |            |                               |   |                               |
| 🖑 🕂 S 😤 🖾 🛞                             | 🗝 Center 🛛 🚭 Global                           | ► II           |  | Col        | lab 🔹 🙆 Accou                 | nt 🔹 Layers   | • Layout •                    |
| # Scene                                 |   | -=             | '≡ Hierarchy   | â -= [     | Inspector                     |   | iii -=                        |
| Shaded * 2D ※ ④ 6                       | Gizmos * Q*All                                |                | Create * Q*All   |            | Canvas                        |   | 🗌 Static 🔻 🎽                  |
|   |   | ¥ =            | G Directional Light  | *=         | Tag Untagged                  | : Layer ui  | :                             |
|   | <b>A</b>                                      |                | ARCamera   |            | Rect Transfor                 | rm  | 🔯 7. 🔅                        |
|   | T.  |                | Canvas     MosScriptsCameObject  |            |                               | Pos X Pos Y   | Pos Z                         |
|   |   | •              | EventSystem  |            |                               | Width Height  | 1200                          |
|   |   | ≪Back          | ImageCode  |            |                               | 1280 720  | (;) R                         |
|   |   |                | Mane_schema<br>ImageDocTech  |            | Anchors     Rivot             | x 0.5 x 0.5   | _                             |
|   |   |                | <b>~</b>   |            |                               |   |                               |
|   |   |                |  |            | Scale                         | X 0 Y 0<br>X 1 Y 1                                      | Z 0                           |
|   |   |                |  | -          |                               |   |                               |
| /////////////////////////////////////// |   |                |  |            | Render Mode                   | World Space   | 1                             |
| Console                                 |   | -=             |  |            | Event Camera                  | None (Camera)   | 0                             |
| sbA3 (1280x720) * Scale 🔾               | 0,512 Both Eyes   Maximize On Play Mute Audio | Stats Gizmos * |  |            | A World Spac<br>may not regis | e Canvas with no specified<br>ster UI events correctly. | Event Camera                  |
|   |   |                | Project  | <u> -=</u> | Sorting Laver                 | Default   |                               |
|   |   |                | Create * (Q. )   | 4 %        | Order in Layer                | 0   | ·                             |
|   |   |                | Assets     Editor  | â          | Additional Shader Ch          | Nothing   | •                             |
|   |   |                | ▶ 🔤 images   |            | 🔻 🔝 🗹 Canvas Scale            | r (Script)  | 💽 🕸 🌣                         |
|   |   |                | ► 🚔 Resources  |            | UI Scale Mode                 | World   |                               |
|   |   |                | d accuell  |            | Dynamic Pixels Per U          | 1   |                               |
| Afficher                                | schéma 🖌 Afficher doc. tach                   |                | demonstration  |            | Reference Pixels Per          | 100   | <b></b>                       |
| Allele                                  | Schema V Anicher code V Anicher doc. tech     |                | C maintenance  |            | Graphic Rayc<br>Script        | aster (Script)  |                               |
|   |   |                | 🔻 🚞 scripts  |            | Ignore Reversed Gra           |   |                               |
|   |   |                | arret  |            | Blocking Objects              | None  | •                             |
|   |   |                | changerSceneVersAccueil  |            | Blocking Mask                 | Everything  | •                             |
|   |   |                | scenePrecedente  | •          | - A                           | Add Component   |                               |
| Could not deinitialize the tracker.     |   |                |  |            |                               |   |                               |
| 📲 📲 📽 🗋 🧝                               | 💐 🗕 📦 🞽 🚭 🗈                                   |                |  |            |                               | 1111  | <ul> <li>↑ 1 01:40</li> </ul> |

Le menu doit être positionné autour de la ARcamera avec une profondeur permettant de le voir (ici z = 1200)

Test : visualisation ok mais disparaît au bout d'un certain temps !!

essai de cliquer à l'aide d'une souris bluetooth : ne marche pas ni sur œil droit ni sur gauche... à approfondir.

### 4.2 Configuration d'un joystick

Des joysticks de base sont déjà présents mais votre le joystick doit être ajouté. On doit associer les AxeX, Y, les boutons aux actions du script de base (dans Event system)

#### 4.2.1 Ajout joystick :

Dans 'Project setting' :



Choisir : input + Dupliquer un horizontal existant (CD + duplicate) Choisir un axe correspondant à son joystick.

Exemple :

Windo



Les axes 4, 5, 6 et 7 correspondent à des joysticks utlisables pour déplacer en X ou en Y.

#### 4.2.2 Association :

Dans Eventsystem de la scène on peut voir les noms associés à chaque axe :



On peut choisir pas un glisser déposer le premier élément sélectionné dans la scène : Button\_mode\_demo dans notre cas.

| 🔻 🗲 🗹 Event System (Script) 🛛 👔 井 |                  |  |   |  |  |
|-----------------------------------|------------------|--|---|--|--|
| Script                            | EventSystem      |  | o |  |  |
| First Selected                    | Button_mode_demo |  | ø |  |  |
| Send Navigation                   | vent:            |  |   |  |  |
| Drag Threshold                    | 10               |  |   |  |  |

Cet élément sera actif lors du lancement de l ascène. Afin de le rendre visible il suffit de prévoir une couleur pour 'highlightedcolor'



#### Remarque :

il y a plusieurs vertical, horizontal dans les inputs car plusieurs déclencheurs (les triggers peuvent coexister : une souris, un joustick un gamepad coexistent).

### 4.3 Autre Solution :

#### 4.3.1 Pointage avec mouvement de la tête et timer.

A tester...

#### 4.3.2 Pointage avec boutons virtuels

Utiliser des boutons virtuels sur une image target.

Problème : nécessite une image target.

### 5. Conclusion

Ceci est une seconde approche en 3D sur la création d'ihm en réalité augmentée à utliser avec un casque VR (percé) associé à un téléphone.

ATTENTION le téléphone doit avoir un écran d'excellente qualité (2880x1440) pour l'affichage en double écran (œil droit et gauche) et une caméra de bonne résolution pour la reconnaissance optique.

IMPORTANT : il peut etre nécessaire de configurer la camera Arcamera en mode autofocus continu graçe à un script placé dans la Arcamera :

Le script pour l'autofocus continu :

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using Vuforia;
public class ARcamFocus : MonoBehaviour
{
   void Start()
    {
       var vuforia = VuforiaARController.Instance;
         vuforia.RegisterVuforiaStartedCallback(OnVuforiaStarted);
         vuforia.RegisterOnPauseCallback(OnPaused);
    }
    private void OnVuforiaStarted()
    {
         CameraDevice.Instance.SetFocusMode(
             CameraDevice.FocusMode.FOCUS_MODE_CONTINUOUSAUTO);
    }
   private void OnPaused(bool paused)
    {
       if (!paused) // resumed
         {
           // Set again autofocus mode when app is resumed
```



#### La configuration :

|       | Create T (07A)       | - orear riago       | 30110 20101               |
|-------|----------------------|---------------------|---------------------------|
|       |                      | Background          |                           |
|       |                      | Culling Mask        | Everything                |
| _     |                      | L. L.               |                           |
| ×     | ARCamera Z           | Projection          | Perspective               |
|       | Canvas               | Field of ∨iew       | 60                        |
|       | EventSystem          | Physical Camera     |                           |
|       | MesScriptsGameObject | · ·                 |                           |
| SK _  | 🕨 🕨 🧊 ImageTarget    | Clipping Planes     | Near 0.05                 |
|       |                      |                     | Far 2000                  |
|       |                      | Viewport Rect       |                           |
|       |                      | X O                 | Y O                       |
| Ī     |                      | W 1                 | H 1                       |
|       |                      |                     |                           |
|       |                      | Depth               | 1                         |
|       |                      | Rendering Path      | Use Graphics Settings     |
| W     |                      | Target Texture      | None (Render Texture      |
|       |                      | Occlusion Culling   |                           |
|       |                      | Allow HDR           |                           |
|       |                      | Allow MSAA          | Ŭ.                        |
|       | Project              |                     |                           |
|       | Create T Q 4 🔖       |                     | л                         |
| -=    | Resources            | 📃 🥥 🗹 Audio Listen  | er 🔟 :                    |
| mos 🔻 | Scenes               | 🔍 👁 💽 Vuforia Beh   | aviour (Script 🛛 🔯 :      |
|       |                      | Download new Vufo   | oria Engine version: 8.1. |
|       | demonstration        |                     |                           |
|       | a installation       | World Center Mode   | DEVICE                    |
|       |                      | Open Vuforia        | Engine configuration      |
|       | ▼ Scripts            | 🔻 🖳 🔽 Dofoult Initi | alization Error 🛛 🕅 '     |
|       | AR camFocus          |                     |                           |
|       | arret o              | Campe               |                           |
|       | changerScene 3       | 🔻 🍺 🗹 A Rcam Foci   | us (Script) 🛛 🔯 🕻         |
|       |                      | Script              | AR camFocus               |
|       | scenePrecedente      |                     |                           |
|       | a sceneSuivante      | Add C               | Component                 |
|       |                      |                     |                           |

Essais réalisés avec différents matériels :

- Tablette ARCHOS pour 2D : ok pour AR mais pas de gyroscope donc pas d'objets en lévitation (les doc.)
- smartphone Alcatel Idol 4S (2880x1440) :

- OK pour objets en léviation
- mais pas de reconnaissance optique avec vuforia (caméra mauvaise!) mais après utilisation du script autofocus continu : OK
- affichage OK car 2x1440x1440
- smartphone Samsung A3 2017 : ok pour tout avec une résolution écran pour affichage mauvaise (1280x720 donc une image de 640x720 par œil!!!)

A vous de jouer...

# 6. Références :

https://library.vuforia.com/articles/Solution/Working-with-the-Camera