Shapes in Action Course

AR using Unity/Vuforia

IMPORTANT: We were probably short in time while doing this tutorial and I was not able to around all the projects and verifying all the steps to make it done. Please check out this tutorial again, including some remarks for MacBook version.

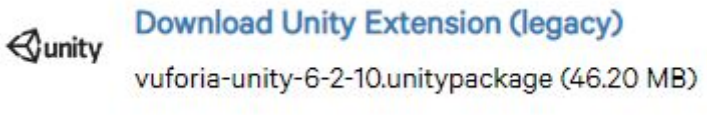
Recent versions of Unity may be not compatible (yet!) with Vuforia. So please, download the Unity source files available on the course before doing this tutorial. So at least making a test from these files you are sure that your version is compatible and it could works. Of course, you could try to download older versions of Unity and see if it works.

A Windows version of this tutorial is available through this link:
https://drive.google.com/open?id=1CxageO_ORWhRiSEJV3JSSqxMvifgLCzI (~12MB)

Mac people may find useful the following tutorial:
https://www.youtube.com/watch?v=HnjbTytHH6U

1st Step:
Downloading Unity, Vuforia Asset and Registering to Vuforia page.

1. Download Unity: Google “download Unity” or just go to the following address https://unity3d.com/get-unity/download
   After click on *Choose your unity + download link.*
2. Register to Vuforia: Go to the Vuforia Developer webpage. Click in Register and fill the form.
3. Download Vuforia Asset: After completing the registration procedure you need to go to the download page and click on *Download Unity Extension (legacy).*



2nd Step:

Uploading a picture to Vuforia Developer portal

1. First you need to upload a picture to Vuforia Developer website. This is the picture the Vuforia system recognize and enable the AR effect to happen.

2. Let is choose the 3D Menger Sponge (since we have it printed at the lecture room) . You can download it by accessing my webpage: http://users.jyu.fi/~joaugero/ and going to my Teaching section. Alternatively you can also export a jpg/png on the Lorenz system simulation in processing you have done in the previous exercise.

Digression - Mathematical aspects behind Menger Sponge

Please check out the wikipedia article about Menger Sponge.
https://en.wikipedia.org/wiki/Menger_sponge

Just out of curiosity this picture of the 3D Sponge was also creating using Processing and you can follow a tutorial by Daniel Shiffman on youtube *"Coding Challenge #2: Menger Sponge Fractal" (The Code Train youtube channel)*.

All these techniques that we are learning are not restricted to Augmented and Virtual Reality. We can use these to create 3D printings and Virtual models.
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2. On Vuforia Developer Portal click on *"License Manager"* and after *"Get Development Key"*. Choose a name for your Key (e.g., 3DFractal), check the box and click on confirm. You will need to return at that point later to get the generated license key.

3. Now go to the tab *"Target Manager"*. Click on *"Add a Database"* and choose a name for your database (e.g., MengerSponge). You will see that a row with the name MengerSponge (or the name you chosen) will appear. Click on it.

Finally, it is now the time to upload our Menger picture. Feel free also to upload also a picture generated by the Lorenz simulation in processing just to make a try and to compare these!

4. Adding the picture: Click on *"Add Target"* and choose the following options
Type: Single Picture
File: Find the place where you saved the 3DManger picture
Width: 50 (let is see if 50 is enough...)
Name: Choose your favorite name ("3DMenger" sounds good).

5. Click on *"Download Database"* to download this Package. We need to import it later on Unity.

Notice that Vuforia gives a rating on the quality of the picture. Better is the picture rating easier your app will recognize it. **Please, call me when you reach this step so we can discuss a bit about what we have been done.**

3rd Step:
Making Vuforia "communicate" with Unity!

Importing Vuforia Package

1. Open Unity and create a new project. Choose your favorite name (e.g., ARProject). You may need to register an account on Unity, if you can not work offline.
2. Now we need to import the Vuforia Asset - the file we download before on the link *Download Unity Extension (legacy).*
3. *Go to Asset -> Import Package -> Custom package*
   Wait some time until the package is imported.
4. Once a window appear listing the Vuforia files, click on *"Import".*

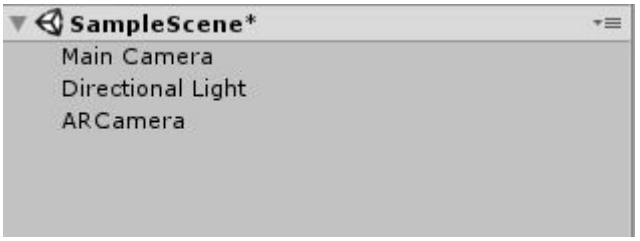
Creating our AR App

1. *Add a AR Camera: go on Game Object -> Vuforia -> AR Camera*
   Sometimes a window can appear if your version of Unity are not compatible with Vuforia. Read what is written in that window and click on import/upload. Probably you need to update Vuforia or Unity (or import other assets)

   .

   MacBook Users: If you are using Unity on MacBook there is no Vuforia option inside the menu Game Object. Alternative you can get the AR camera by looking on the project window (on the bottom of Unity workspace) choosing Vuforia -> Prefabs -> ARCamera. Please click and drag the ARCamera component inside the left area (where the directional light is).

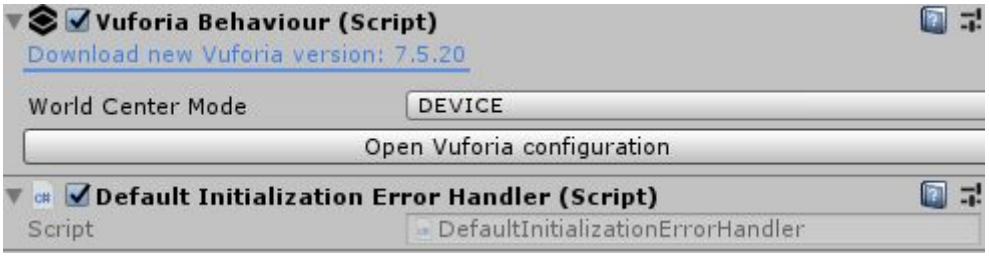
2. Now you will see on the left size that the AR camera was added in your scene



3. We must now delete the Main Camera. Right click on Main Camera and choose the option Delete. You can leave the direction light even our scope is not to discuss how to create a scene on Unity. It will be not make any difference in the final result.

4. Now click on AR Camera. We need to add the application licence key done in the Vuforia Developer portal website.

5. On the inspector panel (see below) click on **Open Vuforia configuration** on the **Vuforia Behavoir Script (Tab)**



6. On the first line *"App License key"* copy and paste the License key generated at Vuforia website (see again the instructions on 2nd step item 2. above)

Problem: If you can not click on "Open Vuforia configuration". You must verify if your Unity allows you to use VR/AR components. The solution for this problem could be on *File -> Building Setting*. In the Building settings window click on *Player Settings*. On the right panel, by the end you will see the option *"Vuforia Augmented Reality Support"*. Check this mark and close everything.

Making our scene

1. Let include the picture we want our webcam to recognize (3D Menger Sponge) on the scene. Import the Asset containing your image (you downloaded it on 2nd step item 5.)

2. Go to *GameObject -> Vuforia -> Image*

   MacBook users: You should instead go to the project window and choose Vuforia -> Prefabs -> ImageTarget. Then Drag the ImageTraget component in the left panel.

3. You will see that on the left panel a ImageTarget was included. Click on it and you will see in the inspector (right side) the Tab *"Image Target Behavoir (Script)"*.

4. Choose Database the name of your database and after Image target the image you want Vuforia/Unity to recognize.

5. Notice that you can change the size of the image by clicking on ImageTarget and choosing on Inspector tab (right side) on Transform item the scale on x,y,z.

Last Step:
Choosing what we want to do while the image is recognized

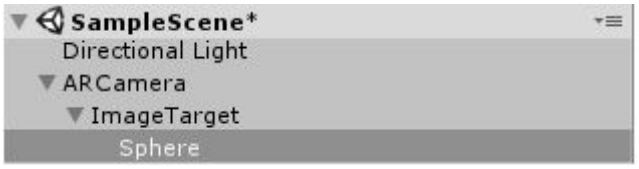
6. Very stressing remark: We could do at this point something super fancier. For example, to write a simulation making some movement on the image or play a video. Our goal here is just to understand how the principle works and make a test. Of course, you can be curious and learn more Unity/programing and make the Augmented Reality even more interesting.

7. To do a test, let is just include a sphere in our scene. So, go to *GameObject -> 3D Object -> Sphere*. (This should work also on MacBook :) !)

8. Click on the sphere on the left panel and choose the dimensions of the sphere by changing the option scale on the Inspector Tab (right side). Notice that you can also click on the second bottom as show in this picture

And use the mouse to move your sphere on this 3D space. Place the sphere on the top of our image.

9. We are almost done. We just need to create some hierarchy so Unity will understand what we want to do. More precisely, what is the image target and what Unity must show when the webcam recognizes the Image target.
Move the ImageTarget, AR Camera and Sphere in the following order. As it shown in the picture.



10. You must click on ImageTarget and drop it on AR Camera. The same for the sphere: click on Sphere and drop it on ImageTarget.

    Click on Play and Cross your fingers!!!!! Your Augmented Reality tab can be tested by using the webcam integrated in your computer.

For testing it at home you need to print the greyfractalcorrect.jpg file available through this link http://users.jyu.fi/~joaugero/greyfractalcorrect.jpg or use this image on your mobile phone. If you want to see how it looks like check the first seconds of this video: https://www.youtube.com/watch?v=MtiUx_szKbI&t=506s

The above video is a 20 min tutorial explaining how to integrate Vuforia and Unity. You can also follow this one to check if you did all the steps correctly (notice that the Vuforia/Unity version is the video are older than the one you have installed in your pc). Moreover, you can also get some idea on how play a video when the image is recognized using a similar technique than we used in the app we demonstrated on the Tuesday lecture.