



TP 3D Interaction

Documentation:

<https://docs.unity3d.com/Packages/com.unity.xr.interaction.toolkit@3.1/manual/index.html>

[https://docs.unity3d.com/Packages/com.unity.xr.interaction.toolkit@3.1/api/](https://docs.unity3d.com/Packages/com.unity.xr.interaction.toolkit@3.1/api/UnityEngine.XR.Interaction.Toolkit.html)

[UnityEngine.XR.Interaction.Toolkit.html](https://docs.unity3d.com/Packages/com.unity.xr.interaction.toolkit@3.1/api/UnityEngine.XR.Interaction.Toolkit.html)



The goal of this TP is to design different interaction techniques to allow you to efficiently perform 3D manipulation. These techniques will be tested on a specific simple task, which consists in stacking cubes as fast as possible to create a two-colored tower. A yellow target object on the right enables you to generate yellow cubes and a blue one on the left enables you to generate blue cubes. Cubes will have to be moved to the middle area to build the tower. Each level of the tower needs to be composed of two cubes of the same color placed perpendicular to those of the previous level. Each level must alternate between blue and yellow cubes. You will have 2 minutes to stack cubes and you will count the number of level as a measure of the performance. The current record is 19 levels after two attempts.

1. Basic interaction techniques

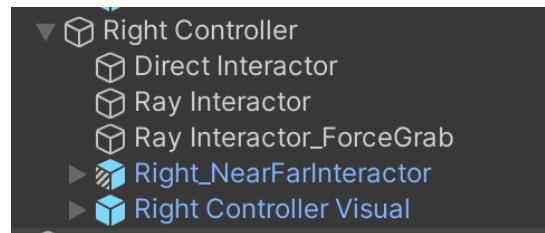
To help you, the test task is already implemented. So you have to run the Unity project in the VR headset and try to achieve the task with the provided basic interaction and navigation techniques.

- Download **Interaction3D.zip** on the Moodle of UE, unzip it and open it with Unity.
- Check that the « Build Settings » are properly configure for **Android**.
- You should now be able to « Build and Run » the Unity project in the VR headset. If it does not work, you have to check the configuration of the Unity project by following the steps you achieved during the first TP of the UE RVRA.

- Once it is running, try to achieve the task with the provided interaction techniques. You can use the joystick of the left controller to navigate in the 3D space or press the X button to switch to the teleportation navigation technique. You can touch objects with right controller and press its « trigger » button (i.e. the button under the index finder) to grab cubes or activate specific objects (target objects for generating cubes or reset button).
- Please fill out the related question in the TP report.

2. Managing several interaction techniques on each controller

To manage several interaction techniques and allow you to test them without having to deploy each time the application on the VR headset, we provide you a script to switch among several interactors.



- Check the `LeftHand/RightHand Controller`: They have a script called « `Controller Manager` » which allow you to switch among interactors by pressing the B or Y buttons, respectively on right and left controllers.
- The interactors need to be listed as children of the `LeftHand/RightHand Controller` and tag with « `ControllerMode` ». Check the tag of the provided `Direct Interactor` as an example.
- Once B or Y buttons are pressed, the next interactors in the list is activated and the other ones are deactivated (right now, you only have one interactor on each controller, so nothing happens when you press the B or Y buttons).
- At the end of the TP, you should have something similar the image. You have an interactor for each interaction techniques and the `Controller Manager` will allow you to select at runtime the one you want to use for each controller.

3. Customize the cube manipulation point

As you probably noticed, the current interaction allow you to grab the cubes by the middle. However, this is not always convenient. In this part, we will tune the `XR Grab Interactable` to allow you to grab cubes by the contact point of the controller.

- Create two new cube generators by duplicating the provided one (one for Yellow cubes and one for Blue cubes). You may want to slightly change their color to be able to differentiate them for the original ones.
- Duplicate the two prefabs that correspond to the Blue and Yellow cubes (`Assets > Prefabs`).
- Modify the two new prefabs to activate the `Use Dynamic Attach` option and try to understand its parameters. You may also want to slightly change their color to be able to differentiate them for the original cubes.
- Attached these new prefabs to the new cube generators.
- Run the application in the VR headset and try to achieve the test task.
- How did you find the interaction technique now? Please fill out the related question in the TP report.

4. Virtual ray interaction technique

The goal of this part is to allow interaction at a distance. You will have to implement a virtual ray interaction technique.

- Add a new interactor as a child of the `RightHand Controller` (right click in the hierarchy > `XR` > `Ray Interactor`).
- Configure it to be active on all interaction layers except the `Teleport Layer` and set the `Select` inputs in `Input Configuration` to be able to grab cubes by pressing on the « trigger » of the controller.
- To avoid issue, you also need to uncheck the `UI Interaction`.
- Run the application in the VR headset. You should be able to interact with objects at a distance.
- You can also explore the parameters of the `Ray Interactor`, especially the `Force Grab` and the `Manipulate Attach Transform` options. You can create copies on the `Ray Interactor` with or without these options as children of the `RightHand Controller`. It will allow you to test these options directly in the virtual environment and to switch among the different versions at runtime in the application.
- Try to achieve the test task with the different variations of the virtual ray techniques and find which one is the most appropriate for the test task. Please fill out the part about these different versions in the TP report.

5. Test the Near Far interaction technique

We will now test a new interaction technique called `Near Far interaction`.

- Add a new `Righth_NearFarInteractor` a child of the `RightHand Controller` (you can use the prefab that you will find in `Samples > XR Interaction Toolkit > 3.1.2 > Starter Assets > Prefabs > Interactors`).
- Configure it as you did for the `Ray Interactor`.
- Test the difference with and without the `Force Grab` option.
- Try to understand how the technique works and to achieve the task with this new technique. Please fill out the part about these different versions in the TP report.

6. Use both hands

To efficiently achieve the test task, it could be interesting to use both hands to manipulate the cubes. You can thus add some manipulation techniques also on the left hand and try to find a good combination of different techniques to achieve faster the task.

- Please fill out the question about two-hand manipulation in the TP report.

7. Contact

Cédric Fleury - cedric.fleury@imt-atlantique.fr