Focal Point

A VR interaction framework for manipulating objects / environments

Last Updated Mar 31, 2016
v1.0

Website
http://www.albert-hwang.com/focal-point-vr

Focal Point VR Unity Asset
http://u3d.as/qT7

Questions
http://answers.unity3d.com and add @phedhex in the message

Github Repo (contributions welcome)
https://github.com/Albert/FocalPointVR

Contents

# Demos

First, a Quick Note about Buttons

Please note the difference between **Triggers** and **Grips** in the diagram below. These demos use **Grips** for gripping game objects. It is not the most affordable choice (as the trigger is the most obvious interaction), but through testing we found that it felt the best and reserved the **Triggers** for more sophisticated interactions. If you wish, you may remap this functionality in the corresponding `SteamVRControllerAdapter` script (make sure you have the right one, as some demos have their own).
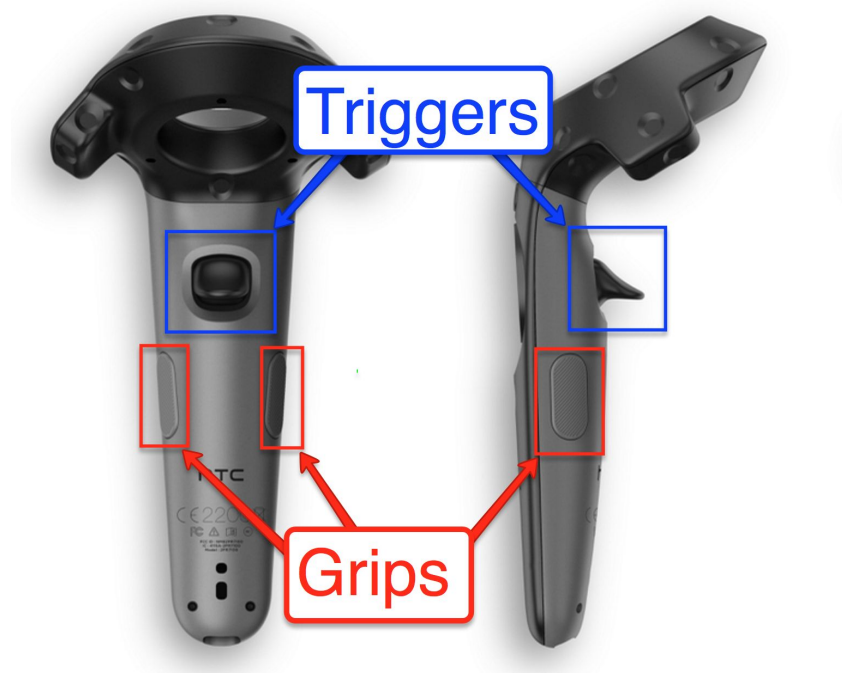
How to Load Demos

Focal Point depends on the SteamVR Unity asset, and therefore requires additional setup.
After importing both the Focal Point and SteamVR assets into a Unity project:

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1) Open any one of the Focal Point demos
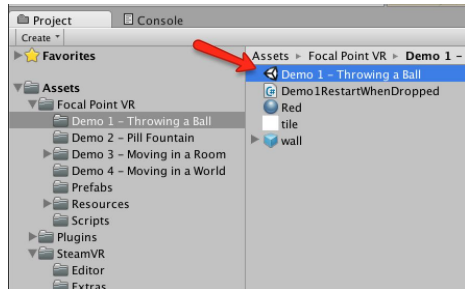
2) Add the `SteamVR/Prefabs/[CameraRig]` prefab to the demo scene object hierarchy
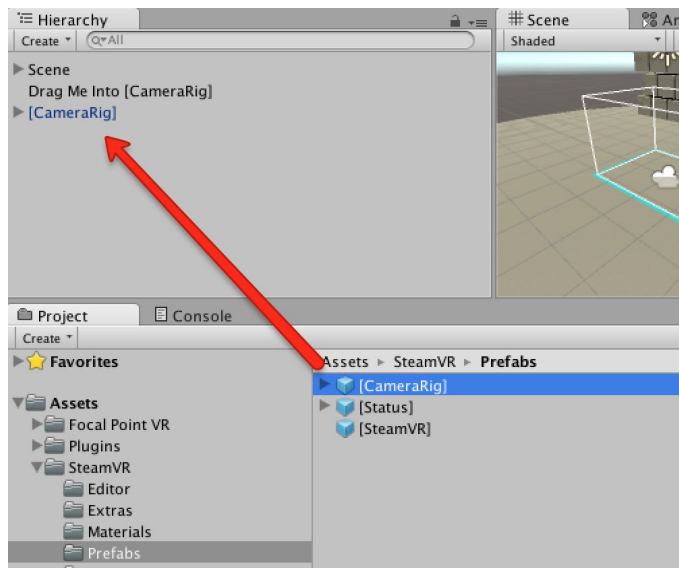
3) Drag the `Drag Me Into [CameraRig]` object so that it is inside the `[CameraRig]` object
you just added.

4) Press the play button and gear up!

Demo 1: Throwing a Ball

Control the red ball's position and scale, and use it to interact with the cube wall

Moving and Throwing

- With one controller **Grip + drag** to translate the ball the same distance you translate your hand.
- If you **Grip + drag + release** at the right time, you can throw the ball (please use controller wrist straps!) Tip: don't think of it as using a controller to handle something -- think of it as picking up and throwing a ball
- This behavior is the same regardless of how far away you are from the ball. This means you can "throw" it to yourself remotely
- Try throwing the ball through the cube wall

Scaling

- Bring the ball close to your hand. Now, with both controllers **Grip + drag** your hands closer to and further apart from each other. The ball will scale accordingly, similar to pinch and zoom on a touch screen
- Scaling in this manner is relative to the "Pivot Point" -- the point halfway between your two hands. Scaling objects that are far away will also push them further away (to such an extent that from your perspective it may look the same size)
- Scaling can be disabled by finding the `Sphere` game object and checking `Lock Scale` in the `Focal Point VR_Manipulation Handler` component

Rotating

- If you **Grip + drag** using two controllers, the ball will rotate around the "Pivot Point" (again, the middle point between your two hands). In this manner, you can quickly pivot the ball around you gripping with your hands.

Note -- to reset the level, simply toss the ball off the edge and wait a moment (while not pressing either of the **Grips**)

Demo 2: Pill Fountain

Select and Manipulate one of many pills

Selection

- With one of your controllers, point to a pill and pull a `Trigger` all the way down and release
- A halo will appear around that object if you have selected it
- You may only select one object at a time, as both controllers always share the same selected object

Manipulation

- Using the same patterns in **Demo 1: Throwing a ball**, manipulate the pill as you see fit.
- Try catching new pills mid-air by `Triggering` to select and `Gripping` them in quick succession. You can then toss these objects toward your head and catch them.
- See how far you can throw a pill. Remember to use your wrist straps!

Manipulation -- Pinned Mode

- On the `Drag Me Into [CameraRig]` game object, find the `Focal Point VR_Steam VR Adapter Demo2` component, and check the box labeled `Enable Pinned Mode`
- Now, when you `Grip` with one controller, the object is pinned to your controller's rotation. This makes interacting with distant objects feel very different, as they will react to your controller's rotation

Demo 3: Moving in a Room

Navigate a room by making it move around you

Small Scale Movement

- With one controller `Grip + drag` with to translate the environment the same distance you translate your hand.

Large Scale Movement

- Point one of your controllers to the ground in front of you, pull the `Trigger` completely and hold. This will raycast a laser, and the hit of the laser will be your "Focal Point," or point of interaction.
- Move the "Focal Point" by dragging while holding down on `Trigger` to move the world around you under your feet.
- By default, the laser has a max distance of 7 meters. You can modify this, but your mileage will vary as your accuracy goes down when you raycast into the horizon

Customizing

- In the `Scene` game object, inside the `Focal Point VR_Manipulation Handler` component, uncheck `Lock Rotation` and `Lock Scale` to enable rotation and scaling… or just proceed to Demo 4.

Note: This room will only rotate in one dimension so as to not make you sick. Rotations that wobble the horizon line will make you sick.

Demo 4: Moving in a World

Quickly navigate in a world through manipulation

Small Scale Movement

- Just like in Demo 3, one controller `Grip + drag` will translate the environment the same distance you translate your hand.
- `Grip + drag` with two controllers will rotate and scale.

Large Scale Movement

- Read the notes for Demo 3 on how to translate.
- Use two controllers to place two "focal points" on the ground. Now, you can rotate, scale, and translate the world as if you were standing on a giant touch screen (think pinch-to-zoom, two finger rotation, etc…)
- Try making the entire world only 1 foot wide. Tip: Scaling the world down to be tiny and then scaling up in a new location is a great way to move very quickly across large distances

Rolling your own Interactivity

So you've done the demos and you want to know how you can implement this into your own scenes. This should be pretty simple:

Out of the Box Approach

1) Drag the `SteamVR/Prefabs/[CameraRig]` prefab into your scene
2) Drag the `Focal Point VR/Prefabs/Standard SteamVR Adapter` object into the `[CameraRig]` that you just dragged in
3) On the `Standard SteamVR Adapter`, there is a `Focal Point VR_Interaction Manager` component. Add the element you want to manipulate in the `Subject` field
4) This subject will exhibit default behavior unless a `Focal Point VR_Manipulation Handler` component is added to it. For more information on this component, see attached documentation on the next page.

Advanced Approach

1) Do the above **Out of the Box Approach**
2) Play the scene
3) Right click and copy the `[CameraRig]` in your object hierarchy
4) Stop the scene
5) Paste from clipboard into your object hierarchy, creating `[CameraRig] (1)`
6) Remove the `Focal Point VR_Steam VR Adapter` Component from the `Standard SteamVR Adapter` game object inside `[CameraRig] (1)`
7) Delete the old `[CameraRig]`
8) Modify corresponding scripts as you see fit

`Manipulation Handler` Options

Lock Translation / Rotation / Scale
toggles whether or not object can be translated / rotated / scaled

Translation / Rotation Inertia on Release
When released, does the game object keep inertia? When enabled:
- … if the game object is physics-based (has a rigidbody and is not kinematic), a velocity and / or torque will be applied to the rigidbody
- … if the game object is not physics-based (no rigidbody or is kinematic), the object will animate in the direction and rotation it was heading

Translation / Rotation Inertia Threshold
Only applicable to non-physics-based inertia. How much (in meters / degrees per second) an object needs to be moving / rotating for it to persist inertia upon release.

Flick Animation Length
Only applicable to non-physics-based inertia. How long in seconds does this animation occur?

Is Selectable
A hook intended to help devs who want to make certain items selectable and other items not selectable. An example of this implementation can be found in
`FocalPointVR_SteamVRControllerAdapterDemo2.cs`