Udon Tether Grapple

Version 1.0.1 (2020-12-8)

by Waai!

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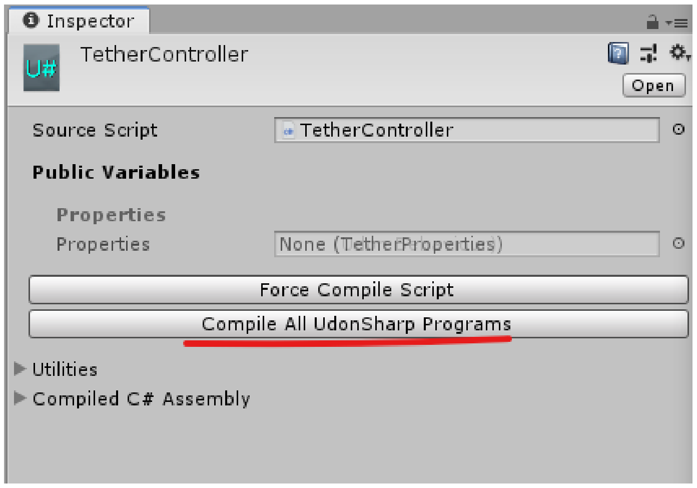
Basic Setup

1. Import *VRChat SDK3* to project (don't forget to let the SDK set up your layers and collision matrix)
2. Import *UdonSharp* to project (https://github.com/Merlin-san/UdonSharp/releases)
3. Import Tether Grapple package to project
4. Compile all UdonSharp programs by using the button in the inspector of any Udon C# Program Asset:



Inspector

TetherController

Source Script: TetherController

Public Variables

Properties

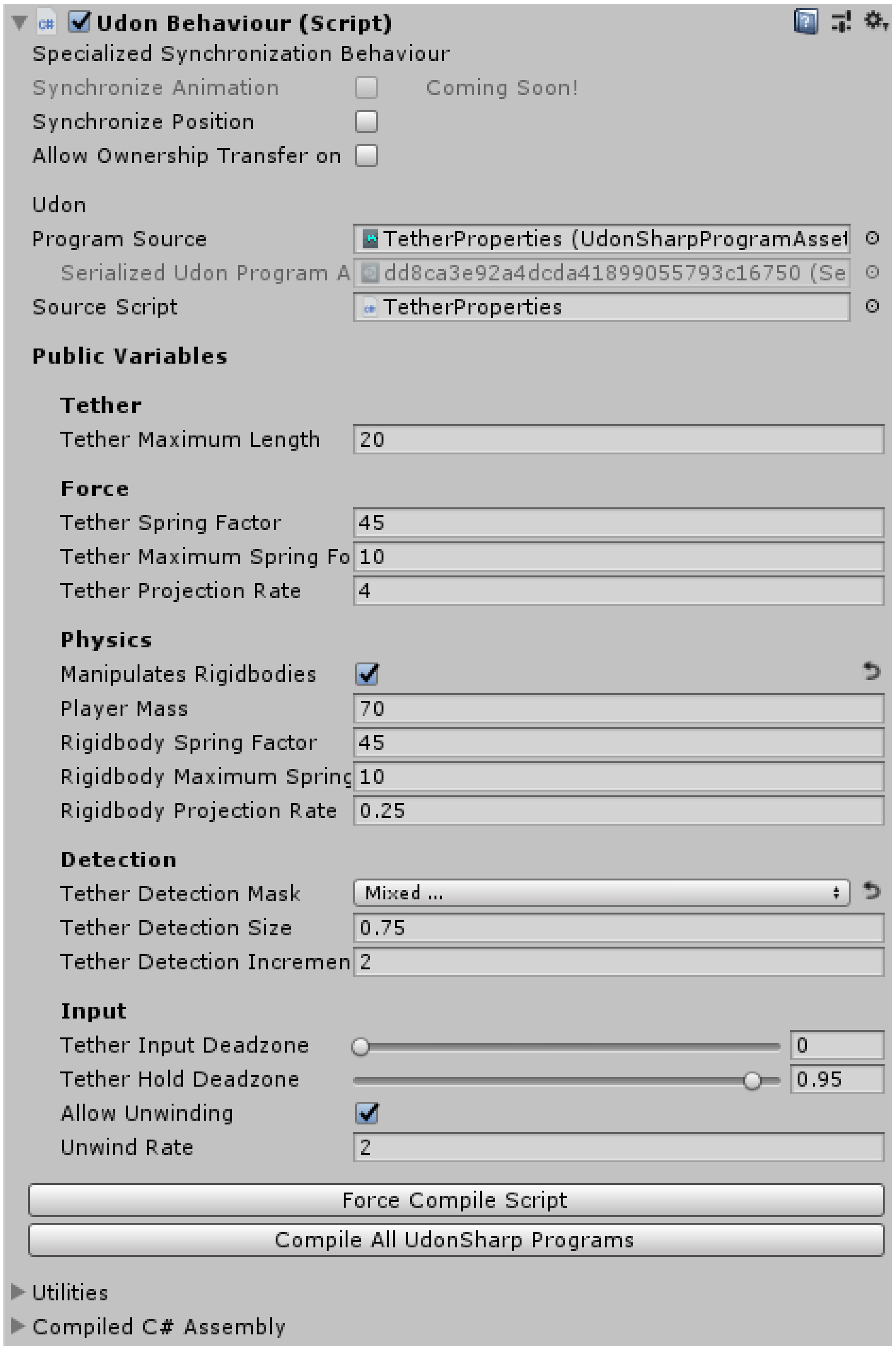
Properties: None (TetherProperties)

5. Drag *TetherVRPickupPrefab* into your scene to add a permanently accessible grapple device for VR users. It is accessible by grabbing behind the player's head.
6. Drag *TetherDesktopPrefab* into your scene to add a permanently accessible grapple device for desktop users. It is accessible in desktop mode by pressing G.
7. If you don't plan on modifying the scripts at all, this and some configuration of the *TetherProperties* scripts on the root objects of these two prefabs is enough to have a functional grappling world. Read on for descriptions on what each of the *TetherProperties* does and how to configure your own grappling rigs.

Individual Script Guide

TetherProperties

This script stores properties for grapple scripts and does nothing else. Since it is separated from grapple controllers, it can be shared between multiple grapple devices or even swapped out at runtime using your own Udon scripts.



☑ Udon Behaviour (Script)

Specialized Synchronization Behaviour

Synchronize Animation	☐	Coming Soon!
Synchronize Position	☐	
Allow Ownership Transfer on	☐	

Udon

Program Source	TetherProperties (UdonSharpProgramAsset
Serialized Udon Program A	dd8ca3e92a4dcda41899055793c16750 (Se
Source Script	TetherProperties

Public Variables

Tether

Tether Maximum Length	20

Force

Tether Spring Factor	45
Tether Maximum Spring Fo	10
Tether Projection Rate	4

Physics

Manipulates Rigidbodies	✓
Player Mass	70
Rigidbody Spring Factor	45
Rigidbody Maximum Spring	10
Rigidbody Projection Rate	0.25

Detection

Tether Detection Mask	Mixed ...
Tether Detection Size	0.75
Tether Detection Incremen	2

Input

Tether Input Deadzone	0
Tether Hold Deadzone	0.95
Allow Unwinding	✓
Unwind Rate	2

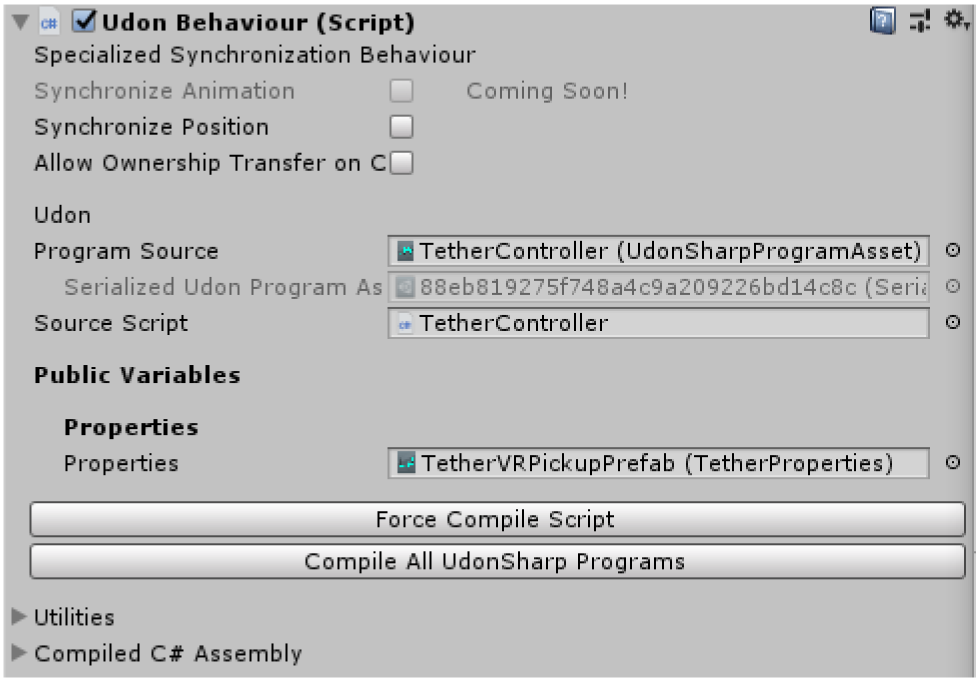
Tether	
Tether Maximum Length	Maximum length of a grapple. Also determines how far the grapple gun can shoot.
Force	
Tether Spring Factor	Force to tug the player back to center with. Gives the grapple a bungee-like springiness.
Tether Maximum Spring Force	Maximum amount of force the tether will tug the player back to the center with. Use this to prevent the grapple from pulling the player too fast.
Tether Projection Rate	Rate to project the player's velocity inside the grapple's sphere. Increasing this makes swinging smoother, but reduces the bounciness of the line.
Physics	
Manipulates Rigidbodies	Whether the grapple should manipulate rigidbodies, rather than swing on them.
Player Mass	Mass of the player. The player will swing on rigidbodies heavier than this.
Rigidbody Spring Factor	Force to tug rigidbodies back to center with. Gives the grapple a bungee-like springiness.
Rigidbody Maximum Spring Force	Maximum amount of force the tether will tug the rigidbody back to the center with. Use this to prevent the grapple from pulling rigidbodies too fast.
Rigidbody Projection Rate	Amount to project the rigidbody's velocity inside the grapple's sphere. Increasing this makes swinging smoother, but reduces the bounciness of the line.
Detection	
Tether Detection Mask	Layers you can grapple on.
Tether Detection Size	How wide to cast a detection ray for finding objects to grapple on.
Tether Detection Increments	Number of times to cast a detection ray. Each ray's size is a division of tetherDetectionSize. Makes auto-aim more accurate.
Input	
Tether Input Deadzone	Deadzone before inputs are accepted. Controllers will probably already have their own deadzone, so this is 0 by default.
Tether Hold Deadzone	Value of input needed to stop unreeling tether.
Allow Unwinding	Whether to allow a tether to unwind if the trigger is pressed only half-way (below tetherHoldDeadzone)
Unwind Rate	Maximum speed at which the tether unwinds.

TetherController

This script is where the magic happens. When it receives an input value via *TetherController.SetInput(),* it shoots grapple lines that tether the player to objects. It requires a *TetherProperties* script assigned to it.

The script does not receive input on its own, so you can use one of the provided input scripts or write your own. The input value is analog, so that depressing the trigger only half-way will cause the grapple rope to slowly unwind to its maximum length.

Tethering to moving objects is automatic; the grapple point is stored as a local position to the object it is attached to. Objects can be freely moved around with animators, scripts or rigidbodies, and the player will be dragged along with them.


Udon Behaviour (Script)
Specialized Synchronization Behaviour
Synchronize Animation ☐ Coming Soon!
Synchronize Position ☐
Allow Ownership Transfer on C ☐
Udon
Program Source: TetherController (UdonSharpProgramAsset)
Serialized Udon Program As: 88eb819275f748a4c9a209226bd14c8c (Seri
Source Script: TetherController
Public Variables
Properties
Properties: TetherVRPickupPrefab (TetherProperties)

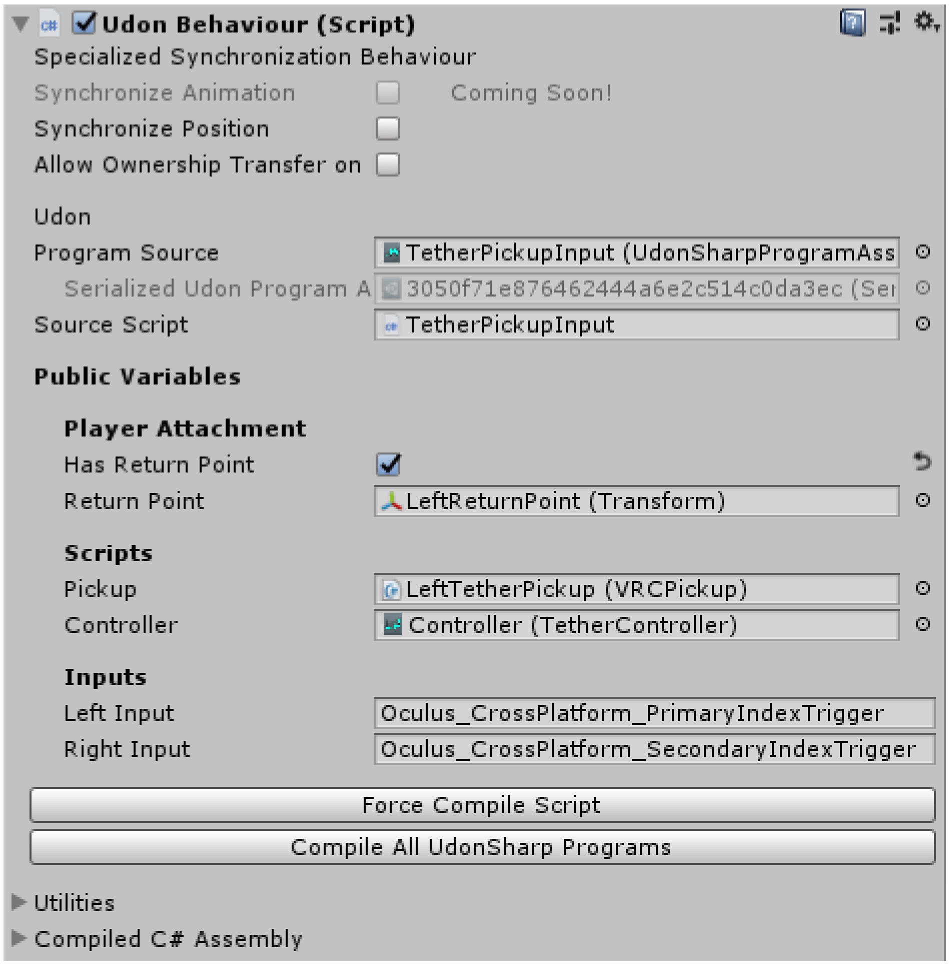
GetInput()	Input value as float with a deadzone applied.
SetInput(float value)	Sets the input value of the controller. Used by TetherPickupInput, TetherAxisInput and TetherButtonInput.
IsInputHeld()	State if the input value is high enough to stop the grapple from unwinding.
GetTethering()	Boolean state if player is tethered to something.
GetTetherLength()	From 0.0-1.0, the length of the tether proportional to its maximum possible length. Useful for animators.
GetActualTetherLength()	Actual length of tether, in meters.
GetTetherObject()	Returns game object the player is attached to.
GetTetherStartPoint()	Vector3 of the starting point of the tether.
GetTetherPoint()	Vector3 of the end point the tether is connected to.
GetTetherNormal()	Vector3 surface normal at the point the tether is connected to. Does not update if the object rotates.
GetTetherUnwindRate()	From 0.0-1.0, the speed at which the grapple gun is unwinding to its maximum length. Useful for animators.

TetherPickupInput

Example input script for VRC_Pickup-based grapple guns. The VRC_Pickup component must be on the same game object.

The *PrimaryIndexTrigger* and *SecondaryIndexTrigger* inputs are used to read analog trigger values instead of using *OnPickupUseDown().* The script will send its input values to the assigned *TetherController.*

Enable *Has Return Point* and assign a game object as a *Return Point* to enable player attachment -- when the player lets go of the grapple gun, it will attach to its return point and stay there until the player grabs it again. In the example prefab, the grapples are attached behind the player's head.


Udon Behaviour (Script) ✓

Specialized Synchronization Behaviour

Synchronize Animation	☐	Coming Soon!
Synchronize Position	☐	
Allow Ownership Transfer on	☐	

Udon

Program Source	TetherPickupInput (UdonSharpProgramAss
Serialized Udon Program A	3050f71e876462444a6e2c514c0da3ec (Sei
Source Script	TetherPickupInput

Public Variables

Player Attachment

Has Return Point	✓
Return Point	LeftReturnPoint (Transform)

Scripts

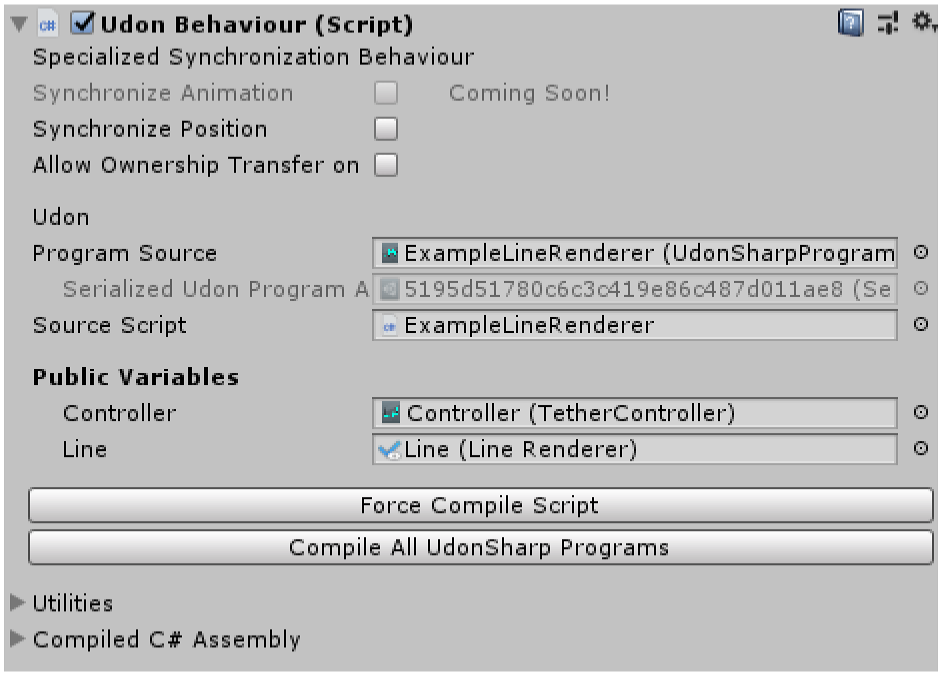
Pickup	LeftTetherPickup (VRCPickup)
Controller	Controller (TetherController)

Inputs

Left Input	Oculus_CrossPlatform_PrimaryIndexTrigger
Right Input	Oculus_CrossPlatform_SecondaryIndexTrigger

ExampleLineRenderer

A basic example for visualizing the tether using a line renderer. Assign a *TetherController* and *LineRenderer* and customize as needed. The Line Renderer component must be on the same game object.



Udon Behaviour (Script)

Specialized Synchronization Behaviour

Synchronize Animation ☐ Coming Soon!

Synchronize Position ☐

Allow Ownership Transfer on ☐

Udon

Program Source: ExampleLineRenderer (UdonSharpProgram

Serialized Udon Program A: 5195d51780c6c3c419e86c487d011ae8 (Se

Source Script: ExampleLineRenderer

Public Variables

Controller: Controller (TetherController)

Line: Line (Line Renderer)

Force Compile Script

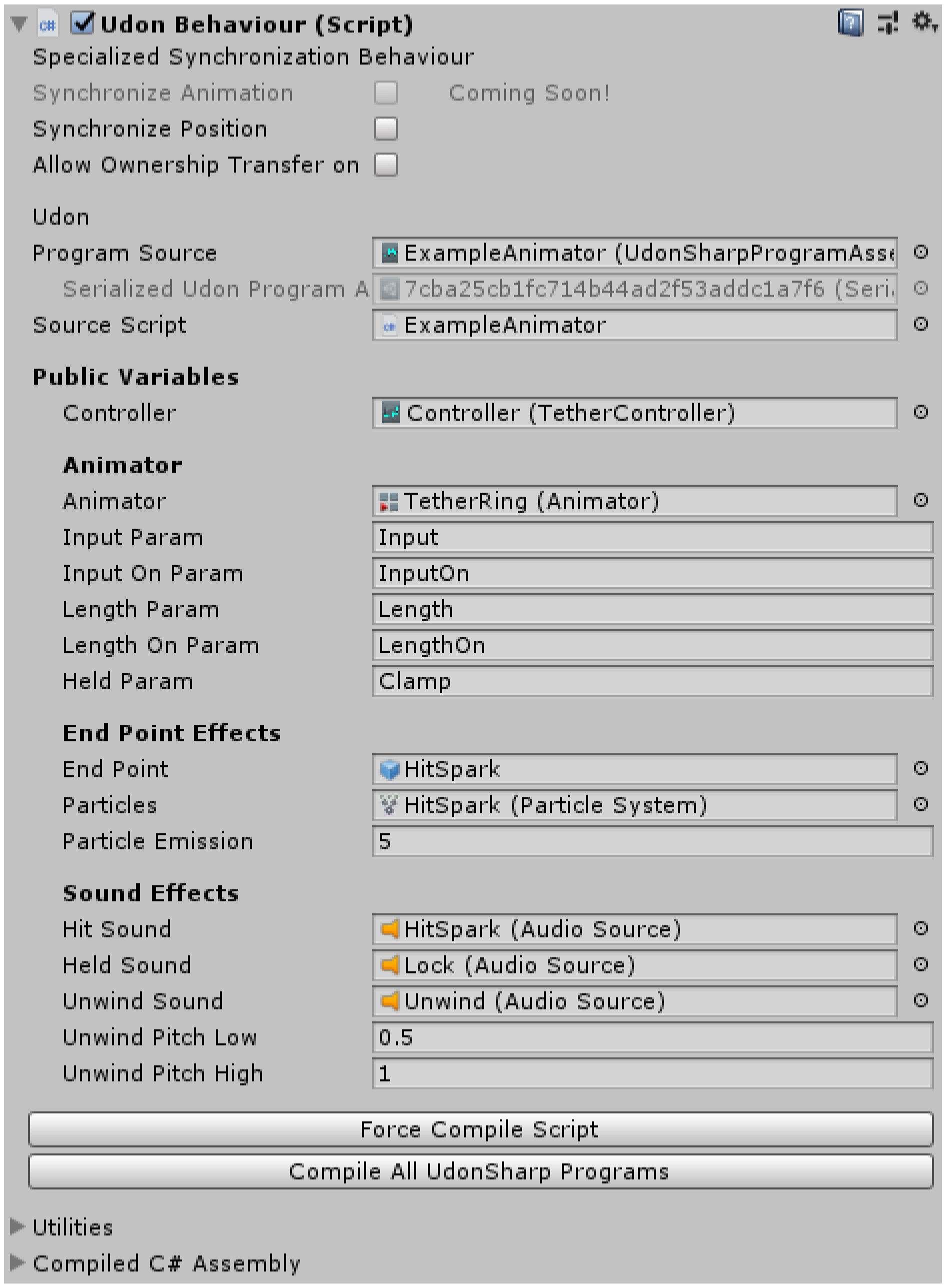
Compile All UdonSharp Programs

Utilities

Compiled C# Assembly

ExampleAnimator

Example script for managing a grapple gun animator and its sound and particle effects. This is used in the provided prefabs, but can be reused if you set up your animation controllers the same way the script expects.



Udon Behaviour (Script)

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Synchronize Position	☐
Allow Ownership Transfer on	☐

Udon

Program Source	ExampleAnimator (UdonSharpProgramAss
Serialized Udon Program A	7cba25cb1fc714b44ad2f53addc1a7f6 (Seri
Source Script	ExampleAnimator

Public Variables

Controller	Controller (TetherController)

Animator

Animator	TetherRing (Animator)
Input Param	Input
Input On Param	InputOn
Length Param	Length
Length On Param	LengthOn
Held Param	Clamp

End Point Effects

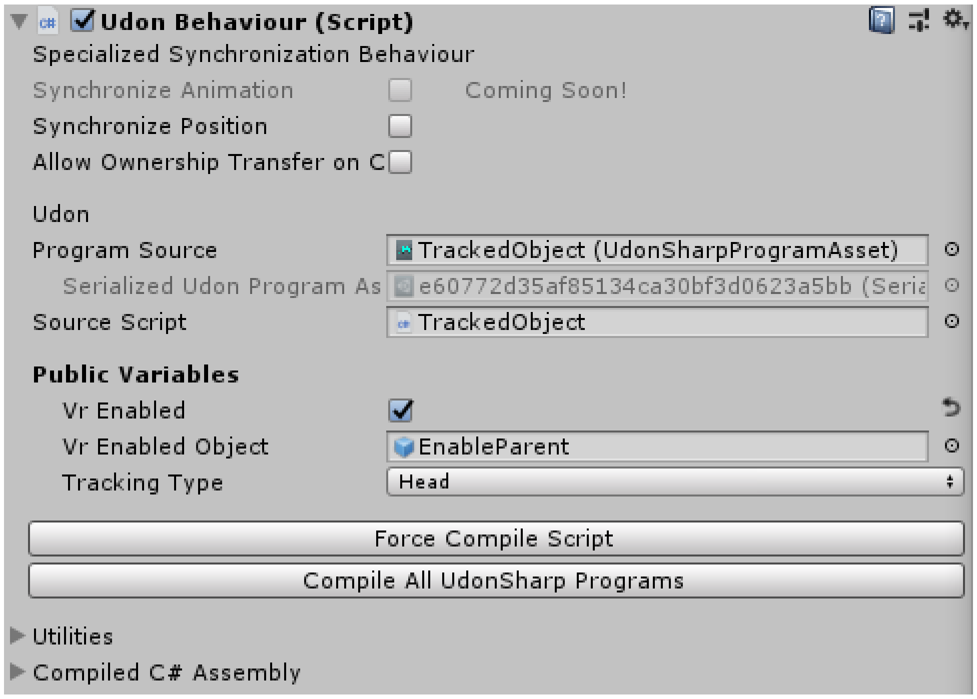
End Point	HitSpark
Particles	HitSpark (Particle System)
Particle Emission	5

Sound Effects

Hit Sound	HitSpark (Audio Source)
Held Sound	Lock (Audio Source)
Unwind Sound	Unwind (Audio Source)
Unwind Pitch Low	0.5
Unwind Pitch High	1

TrackedObject

Attaches an object to one of the three player tracking points. Also disables or enables the *VR Enabled Object* if whether the player is in VR or not matches the *VR Enabled* flag. You can use this to make grapples that are enabled only in desktop or only in VR.



Udon Behaviour (Script) [✓]

Specialized Synchronization Behaviour

Synchronize Animation	☐	Coming Soon!
Synchronize Position	☐	
Allow Ownership Transfer on C	☐	

Udon

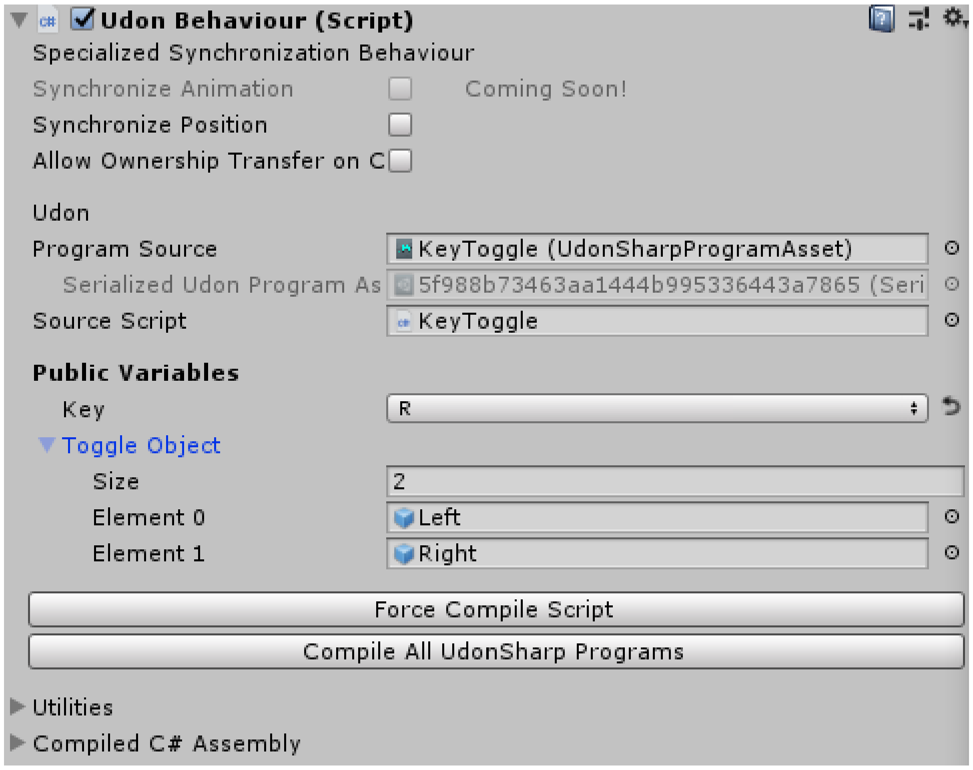
Program Source	TrackedObject (UdonSharpProgramAsset)
Serialized Udon Program As	e60772d35af85134ca30bf3d0623a5bb (Seria
Source Script	TrackedObject

Public Variables

Vr Enabled	✓
Vr Enabled Object	EnableParent
Tracking Type	Head

KeyToggle

Toggles an array of game objects on or off when the corresponding key is pressed.



Udon Behaviour (Script)
Specialized Synchronization Behaviour
Synchronize Animation ☐ Coming Soon!
Synchronize Position ☐
Allow Ownership Transfer on C ☐

Udon
Program Source: KeyToggle (UdonSharpProgramAsset)
Serialized Udon Program As: 5f988b73463aa1444b995336443a7865 (Seri
Source Script: KeyToggle

Public Variables
Key: R
Toggle Object
Size: 2
Element 0: Left
Element 1: Right