Lesson Objectives: MLTK-Brain

Indicators of Learner Success

- Able to build the Brain App on their Magic Leap device
- Positive Engagement on Discord

Lower Order Objectives

- Broad grasp of the current state of Magic Leap tooling
- Comfortable navigating MLTK feature set and example scenes
- Able to drag-and-drop MLTK prefabs into their own projects
- Able to access and follow Discord chat
- Comfortable articulating:
    - Value of MLTK and its role in the tooling ecosystem
    - Value of this workshop to colleagues and managers

Higher Order Objectives

- Able to leverage MLTK code in new C# MonoBehaviours
- Apply Best Known Practices for MR Interaction using MLTK
- Habitually give and receive help via Discord

Prerequisite Knowledge

- Intermediate Unity (Prefabs, MonoBehaviors, and Components)
- Basic C# with learner's preferred IDE
- Foundational Spatial Computing Experience
    - Completed HelloCube on a Magic Leap headset
    - Prior experience with Unity XR/AR

Engagement Strategy

- Content feels immediately useful in a professional capacity
- Shared sense of accomplishment from learner-learner sharing

Out of Scope

- Zero Iteration workflows
- Multi-user features of MLTK
- Unity Canvas, Tracked Pose Driver, Magic Leap Camera
- MLSpatialMapper, MLSceneOptimizerBehavior

Post-Workshop Paths

- Remaining MLTK features
- Zero Iteration workflows
- Explore other Discord channels

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April 2nd

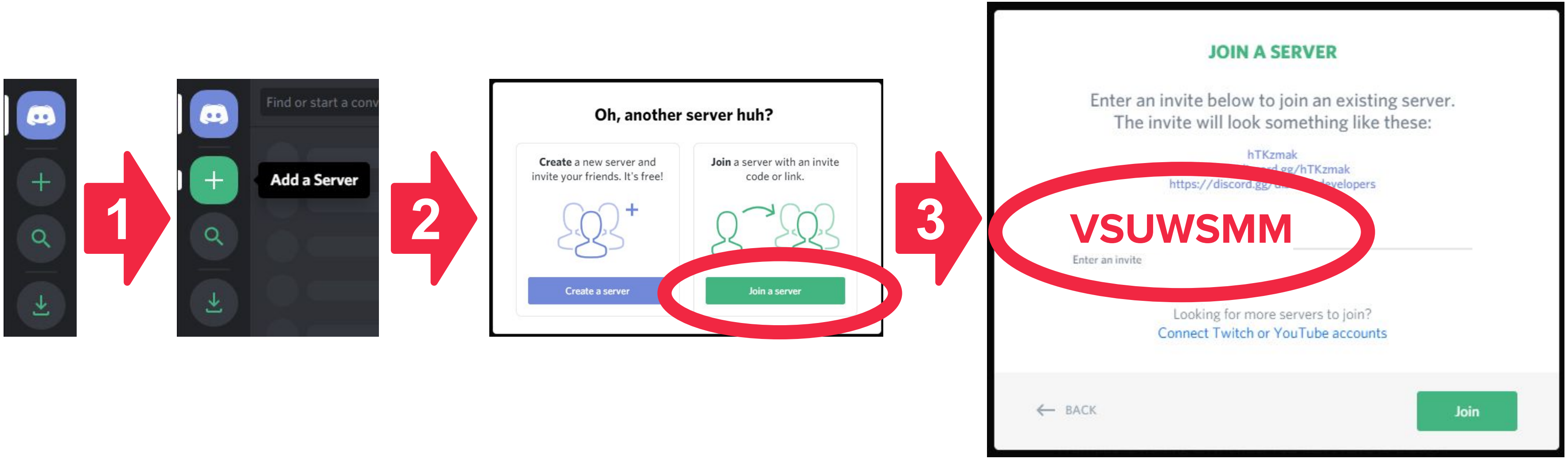
Magic Leap Online Workshop

Rapidly prototype a 3D visualization app

Join us on Discord: discord.gg/VSUWSMM

Have you joined us on Discord yet?

discord.gg/VSUWSMM



Oh, another server huh?

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Join a server with an invite code or link.

JOIN A SERVER

Enter an invite below to join an existing server. The invite will look something like these:

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…rd.gg/hTKzmak
https://discord.gg/… …evelopers

Looking for more servers to join?
Connect Twitch or YouTube accounts

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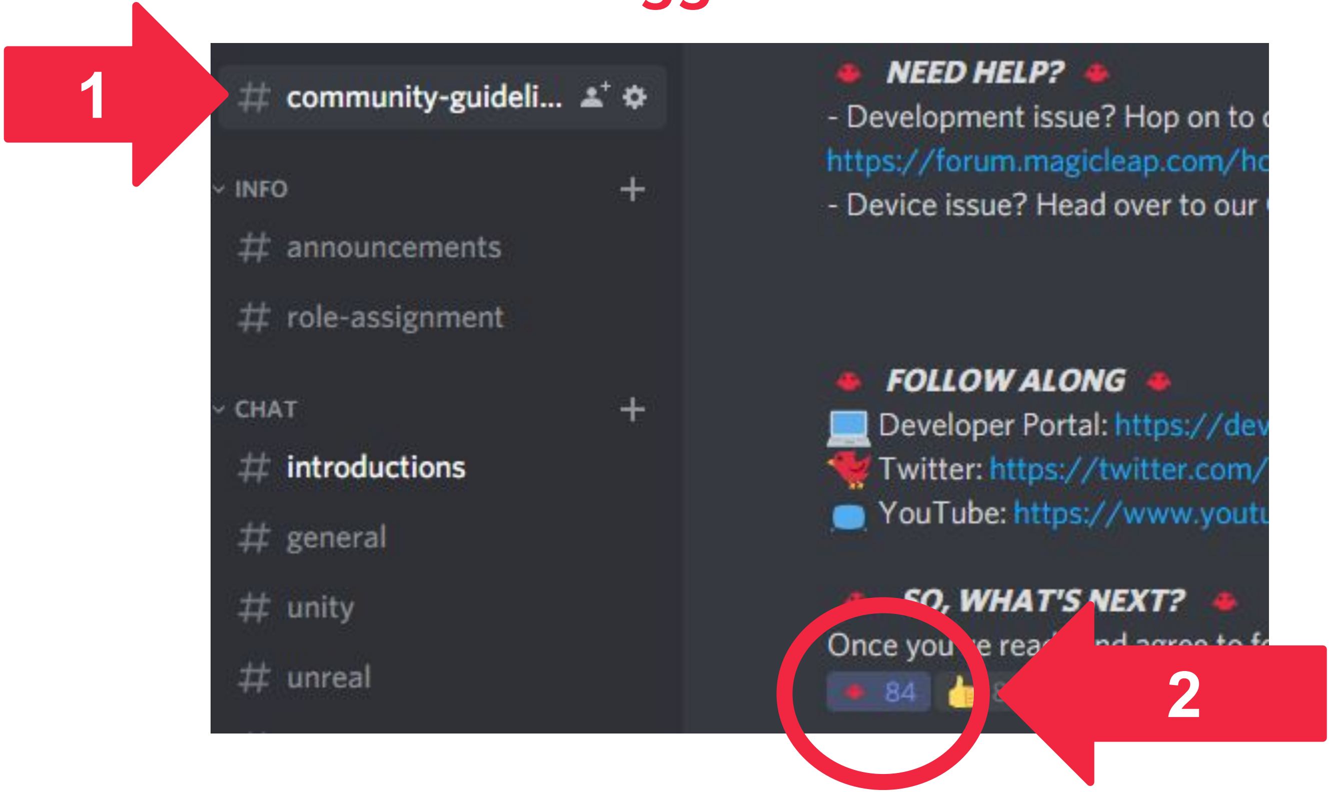

community-guideli...

INFO

- announcements
- role-assignment

CHAT

- introductions
- general
- unity
- unreal

NEED HELP?

- Development issue? Hop on to c
https://forum.magicleap.com/hc
- Device issue? Head over to our

FOLLOW ALONG

💻 Developer Portal: https://dev
🐦 Twitter: https://twitter.com/
YouTube: https://www.youtu

SO, WHAT'S NEXT?

Once you've read and agree to fo

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MAGIC LEAP
2020

Join us on Discord:

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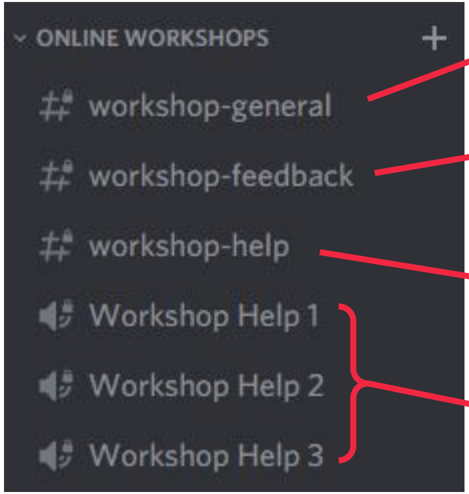


⌄ ONLINE WORKSHOPS +

- workshop-general
- workshop-feedback
- workshop-help
- Workshop Help 1
- Workshop Help 2
- Workshop Help 3

#workshop-general

Drop a meme and say hello

#workshop-feedback

Fill out the Workshop Survey and let us know we can improve for next time in the chat.

#workshop-help

Having trouble? This is your first line of support.

Workshop help 1, 2, 3

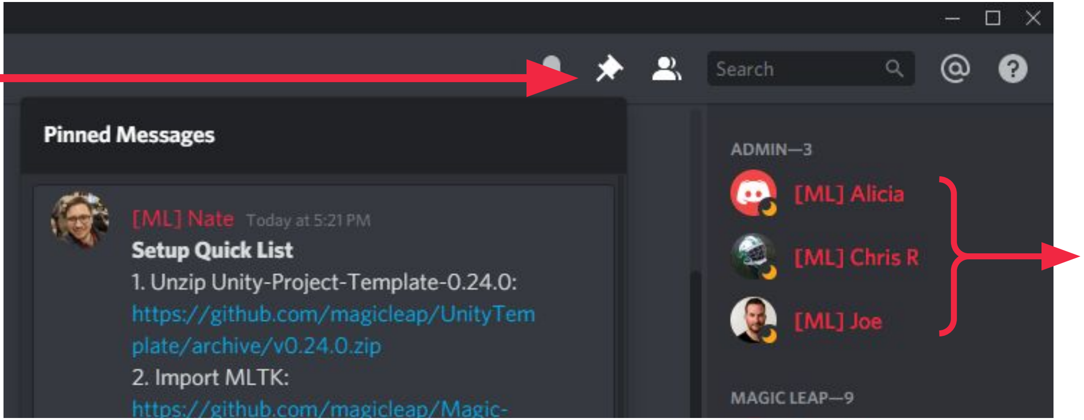
These are audio-only channels. Our Mentors may direct you here to talk through an issue as a group.

Join us on Discord:

discord.gg/VSUWSMM

Pinned Links

Important resources are pinned to each channel. Click the Pin icon for easy reference.



Pinned Messages

[ML] Nate Today at 5:21 PM

Setup Quick List

1. Unzip Unity-Project-Template-0.24.0: https://github.com/magicleap/UnityTemplate/archive/v0.24.0.zip
2. Import MLTK: https://github.com/magicleap/Magic-

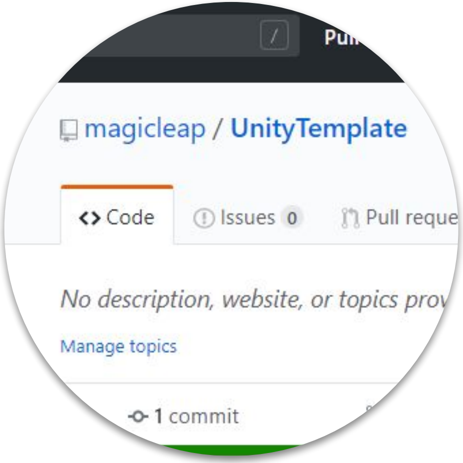
[ML] Mentors

Users with the **[ML]** prefix are from the Magic Leap team, here to answer questions and provide support!

ENVIRONMENT SETUP

Workshop Resources

Unity-Project-Template-0.24.0



magicleap / UnityTemplate

<> Code

No description, website, or topics prov

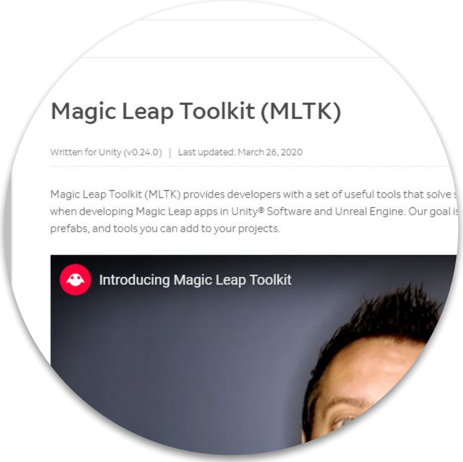
Manage topics

1 commit

Unity 2019.3 Project Template

Open via Unity Hub

MLTK



Magic Leap Toolkit (MLTK)

Written for Unity (v0.24.0) | Last updated: March 26, 2020

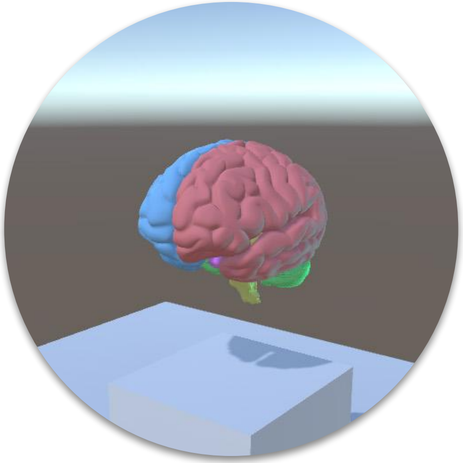
Magic Leap Toolkit (MLTK) provides developers with a set of useful tools that solve s
when developing Magic Leap apps in Unity® Software and Unreal Engine. Our goal is
prefabs, and tools you can add to your projects.

Introducing Magic Leap Toolkit

.unitypackage file

Import into the Unity Project Template

Workshop Assets



.unitypackage file

Import into the Unity Project Template

MLTK should be imported first

otherwise you may see broken references

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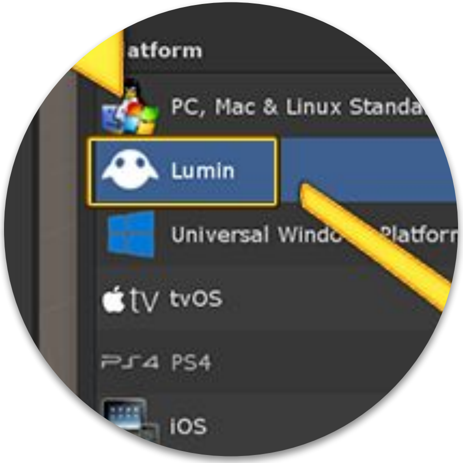
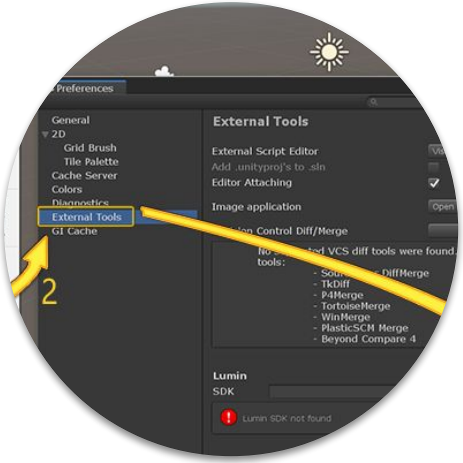
Common Environment Setup Gotchas

Lumin Build Target



- *File* > *Build Settings*
- Select *Lumin* and then click *Switch Platform*

Lumin SDK v0.24.1

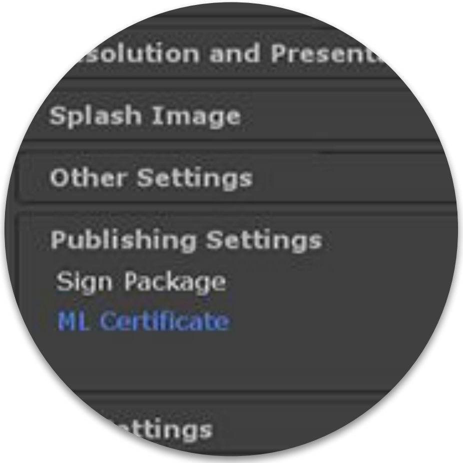


No ted VCS diff tools were found.
tools:
- Sou DiffMerge
- TkDiff
- P4Merge
- TortoiseMerge
- WinMerge
- PlasticSCM Merge
- Beyond Compare 4

Lumin SDK not found

- *Preferences* > *External Tools*
- Set *Lumin SDK* to: *<username>*/MagicLeap/mlsdk/v0.24.1

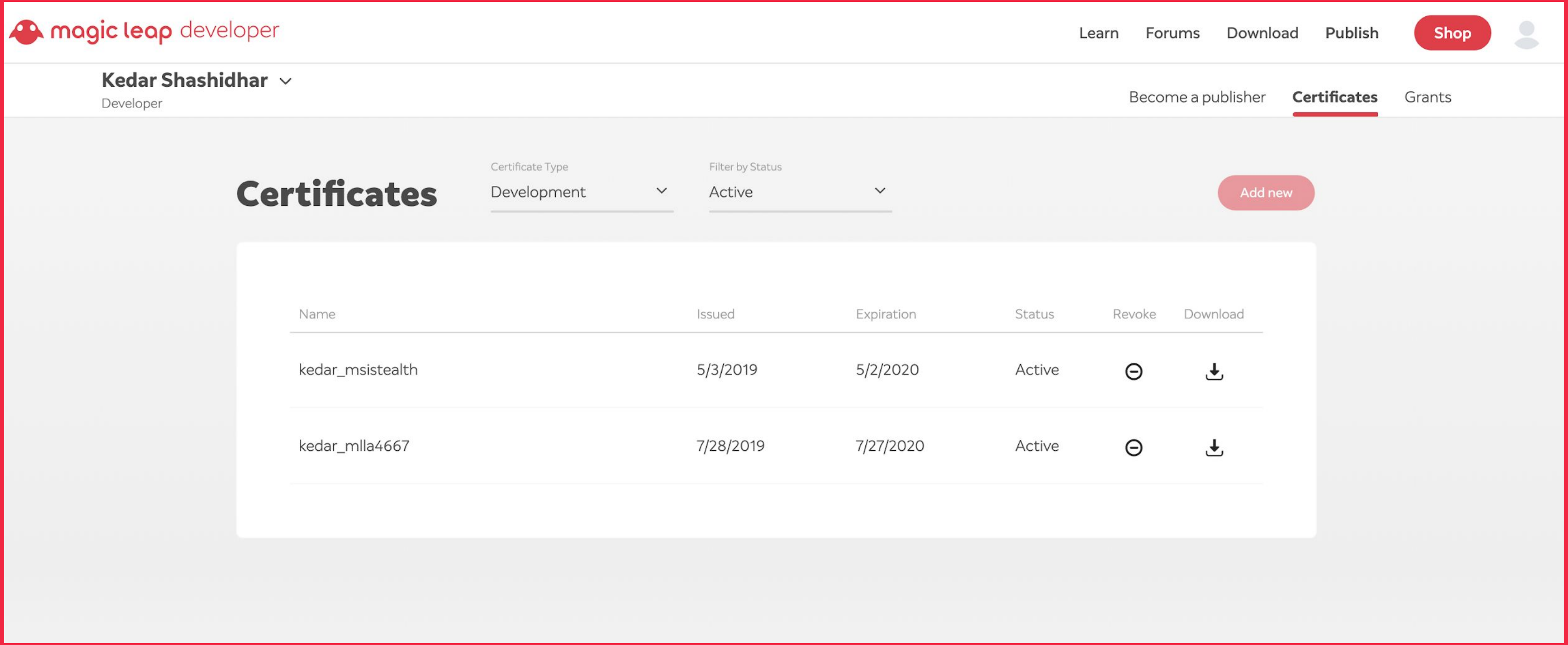
Certificate & Private Key



- *Project Settings* > *Player*
- Select the Lumin tab
- Expand *Publishing Settings*
- Select your ML Certificate

(re)Generating a Certificate

Urgent: The recent Lumin OS 0.98.10 update requires that you generate new certificates. Certificates generated before 3/15/2020 **will not work.**



Certificates

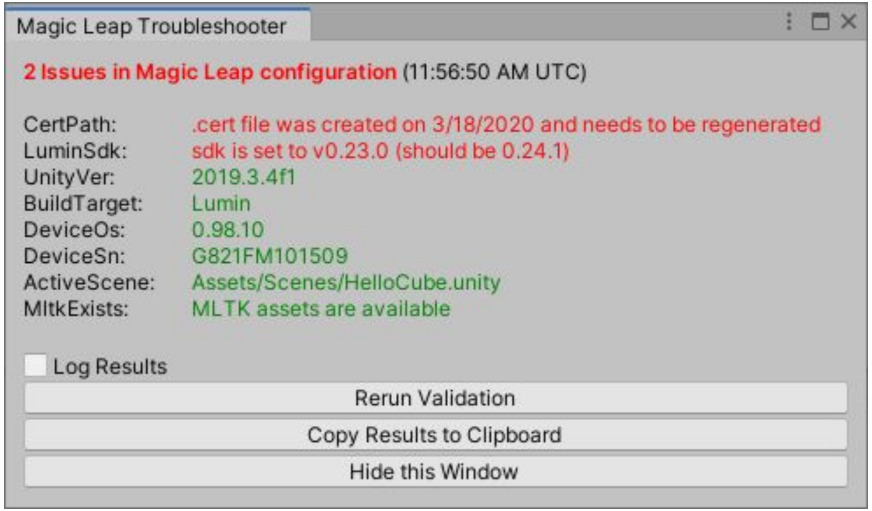
Certificate Type: Development

Filter by Status: Active

Name	Issued	Expiration	Status	Revoke	Download
kedar_msistealth	5/3/2019	5/2/2020	Active	⊖	⤓
kedar_mlla4667	7/28/2019	7/27/2020	Active	⊖	⤓

developer.magicleap.com > Publish > Certificates

Magic Leap Workshop Troubleshooter



Magic Leap Troubleshooter

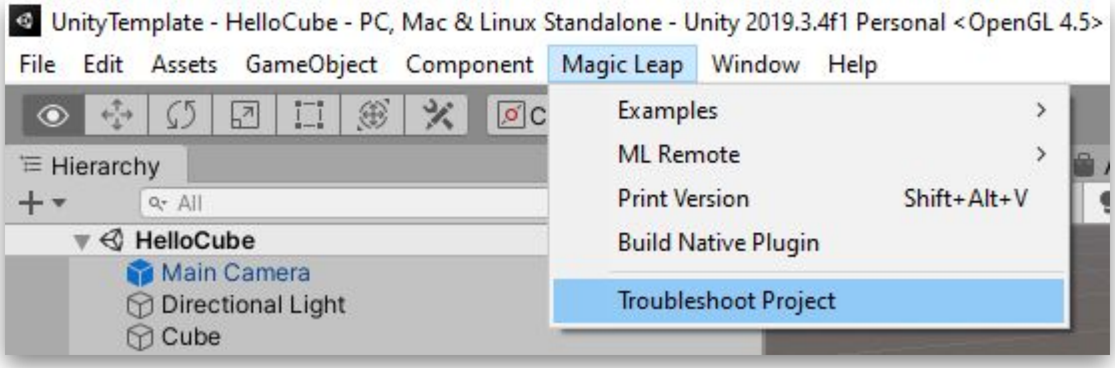
2 Issues in Magic Leap configuration (11:56:50 AM UTC)

```
CertPath:      .cert file was created on 3/18/2020 and needs to be regenerated
LuminSdk:      sdk is set to v0.23.0 (should be 0.24.1)
UnityVer:      2019.3.4f1
BuildTarget:   Lumin
DeviceOs:      0.98.10
DeviceSn:      G821FM101509
ActiveScene:   Assets/Scenes/HelloCube.unity
MltkExists:    MLTK assets are available
```

□ Log Results

MLTroubleshooter.unitypackage is pinned in **#workshop-help**

Once imported, launch from the menu:
Magic Leap > Troubleshoot Project



UnityTemplate - HelloCube - PC, Mac & Linux Standalone - Unity 2019.3.4f1 Personal <OpenGL 4.5>

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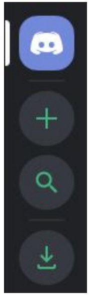
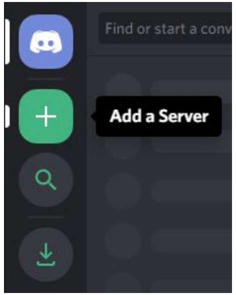


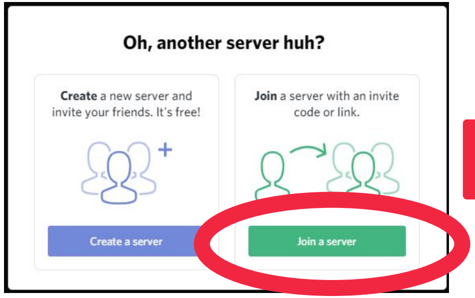
1



Find or start a conv

Add a Server

2



Oh, another server huh?

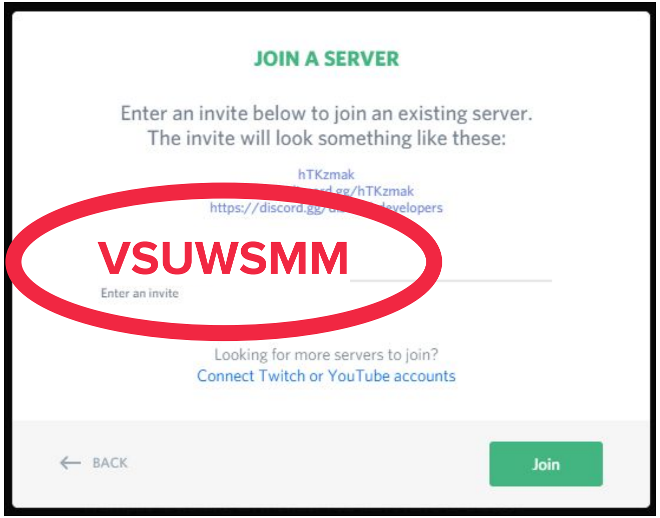
Create a new server and invite your friends. It's free!

Create a server

Join a server with an invite code or link.

Join a server

3



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rd.gg/hTKzmak
https://discord.gg/ levelopers

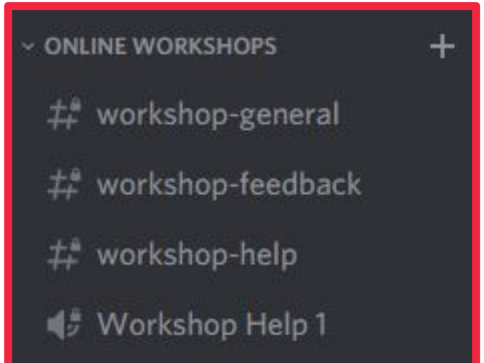
VSUWSMM

Enter an invite

Looking for more servers to join?
Connect Twitch or YouTube accounts

← BACK

Join



ONLINE WORKSHOPS +

workshop-general

workshop-feedback

workshop-help

Workshop Help 1

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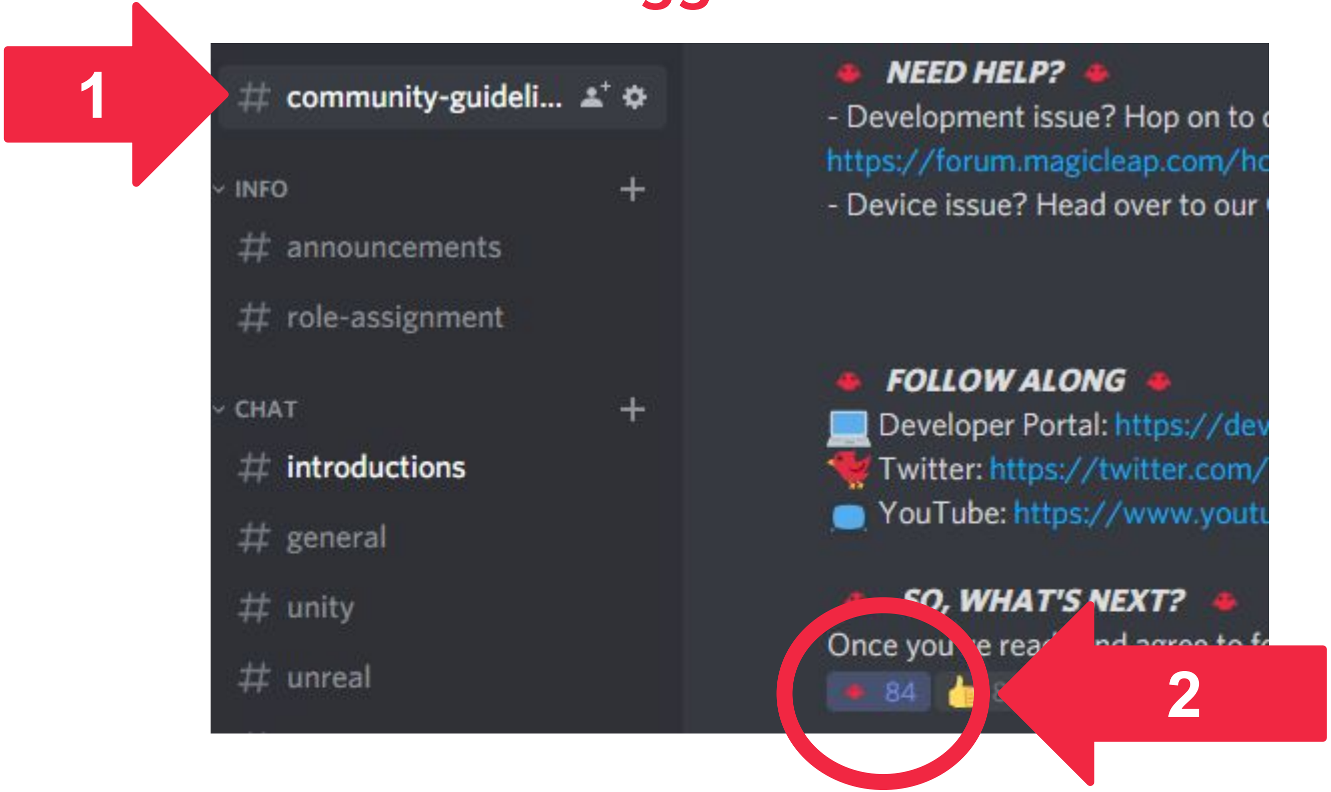

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INFO

- announcements
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- introductions
- general
- unity
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NEED HELP?

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https://forum.magicleap.com/hc
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FOLLOW ALONG

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YouTube: https://www.youtu

SO, WHAT'S NEXT?

Once you e rea nd agree to f

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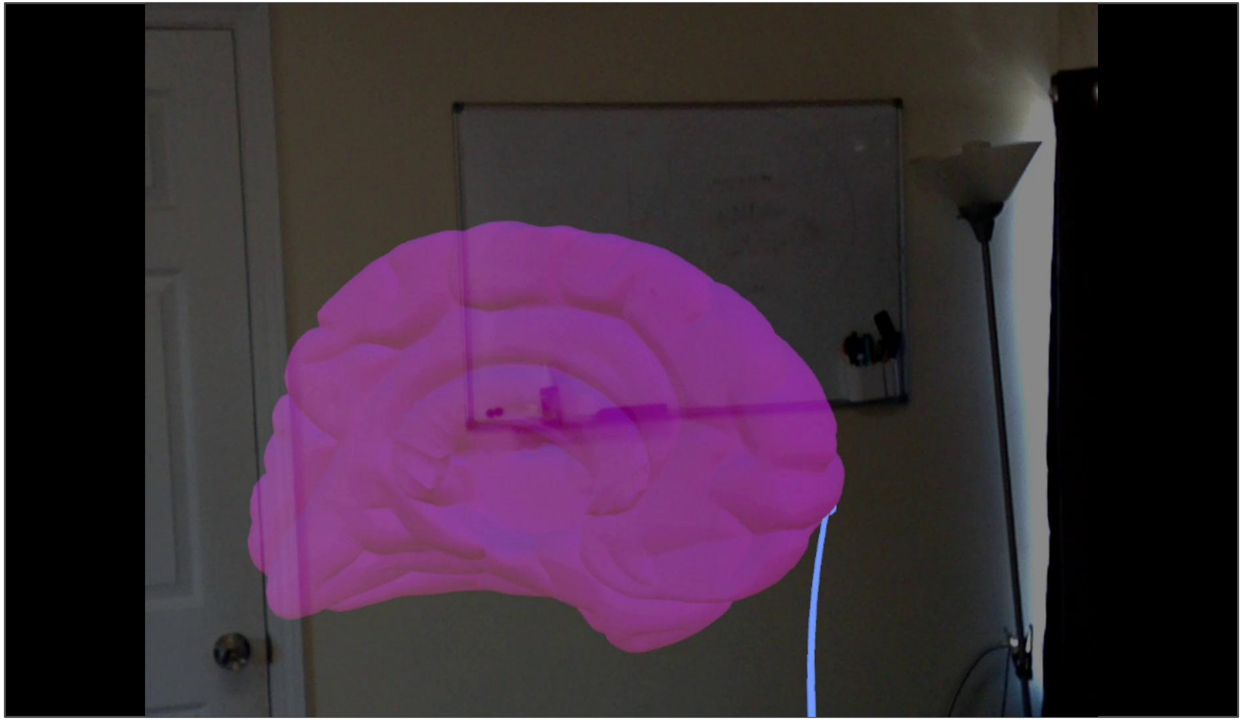
Today's Workshop:
MLTK Brain App



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Meet the Team

Nate Aschenbach

Today's Host

Developer Evangelist

naschenbach@magicleap.com

@inventonater

Kedar Shashidhar

Today's Primary Instructor

Developer Evangelist

kshashidhar@magicleap.com

@kedarshashi

[ML] in #workshop-help

- [ML] Slukas
- [ML] Tricia
- [ML] Filip
- [ML] Josh N
- [ML] Shane Engelman
- [ML] Daniel
- [ML] Alicia
- [ML] Chris R

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Agenda

Environment Set Up

Let’s make sure everyone is ready to rock.

What is Magic Leap Tool Kit?

A high level introduction and map of the current tools.

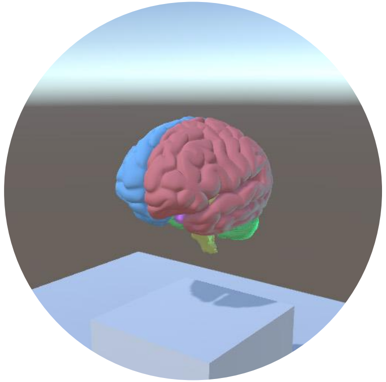
MLTK-Brain Example

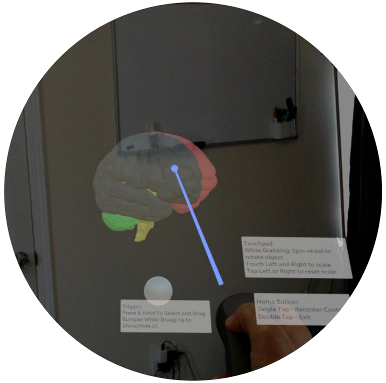
MLTK applied to a medical 3D visualization application.

Wrap Up

Recap what we learned and get ready for next time.

Let us know if we are going too fast!





Touchpad:
While Grabbing, Spin wheel to rotate object
Touch Left and Right to scale
Tap Left or Right to reset scale

Trigger:
Press & Hold To Select and Drag
Bumper While Dragging to Show/Hide UI

Home Button:
Single Tap - Recenter Conte
Double Tap - Exit

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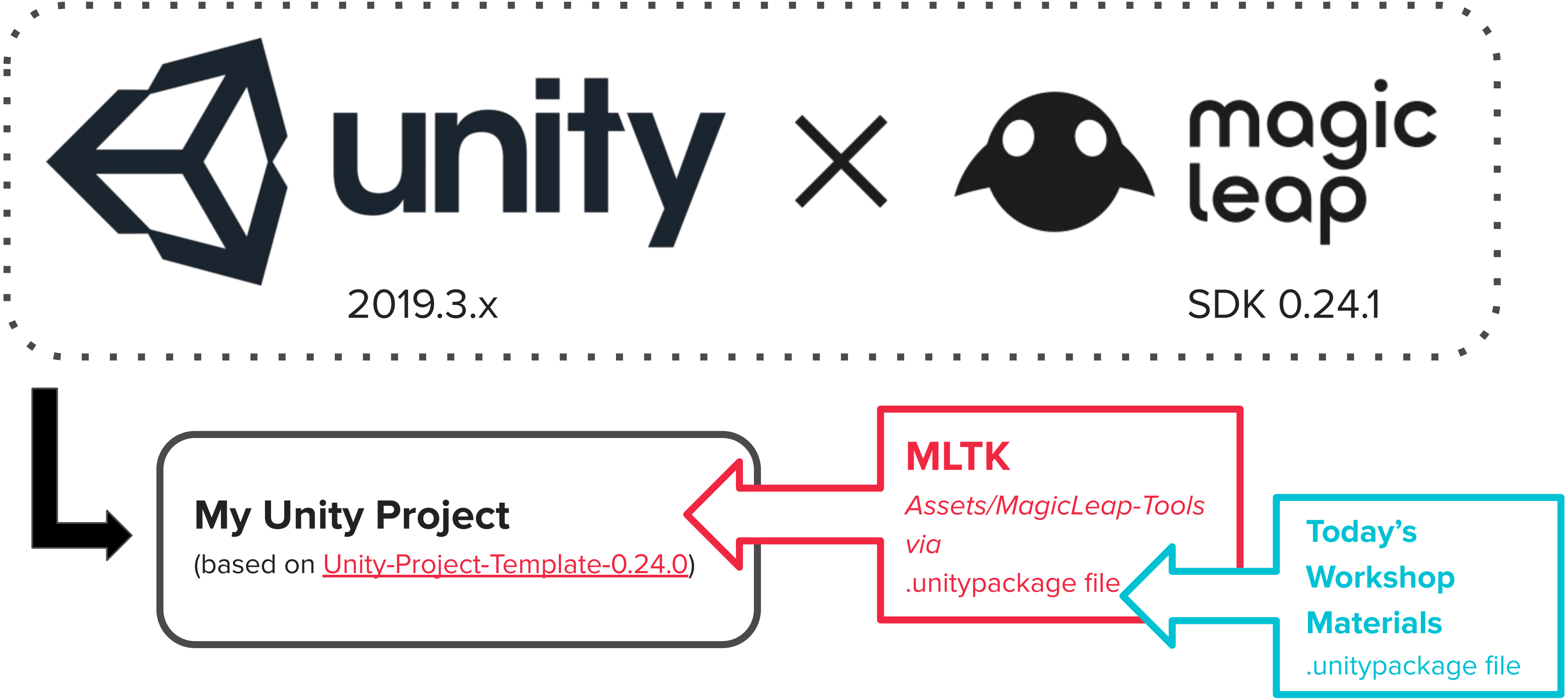
WHAT IS MLTK?



unity × magic leap

2019.3.x

SDK 0.24.1

My Unity Project

(based on Unity-Project-Template-0.24.0)

MLTK

Assets/MagicLeap-Tools
via
.unitypackage file

Today's Workshop Materials

.unitypackage file

What is the Magic Leap Tool Kit?

Magic Leap Toolkit is a collection of Components and Prefabs delivered as a .unitypackage file.

These Prefabs provide developers with useful reusable tools that solve specific real-world problems or to extend functionality for developing Magic Leap apps.

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MLTK Folder Structure

Today...

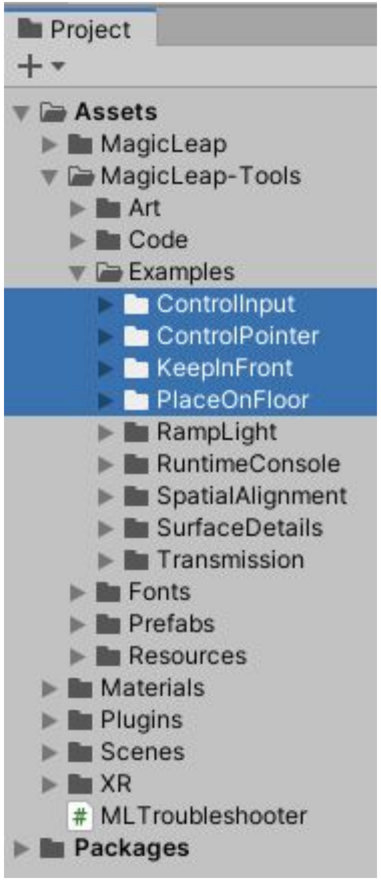
We will learn about these features

- **Control Input**
  Unity event binding and interaction for all Control input events.

- **Control Pointer**
  A spatial targeting, selecting, and manipulation system that displays weight and other physical characteristics

- **Keep In Front**
  Keeps digital content in users view

- **Place on Floor**
  Provides a starting position for an app's main content without user input or complex setups



```
Project
+ ▾
▼ Assets
  ▶ MagicLeap
  ▼ MagicLeap-Tools
    ▶ Art
    ▶ Code
    ▼ Examples
      ▶ ControlInput
      ▶ ControlPointer
      ▶ KeepInFront
      ▶ PlaceOnFloor
      ▶ RampLight
      ▶ RuntimeConsole
      ▶ SpatialAlignment
      ▶ SurfaceDetails
      ▶ Transmission
    ▶ Fonts
    ▶ Prefabs
    ▶ Resources
  ▶ Materials
  ▶ Plugins
  ▶ Scenes
  ▶ XR
  # MLTroubleshooter
▶ Packages
```

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Today...

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- **Keep In Front**
  Keeps digital content in users view
- **Place on Floor**
  Provides a starting position for an app's main content without user input or complex setups

Not today...

Please explore these other features on your own!

- **Interactive Objects *New!***
  A set of user inputs and objects that are part of the HandInput system
- **Hand Input *New!***
  A plug-and-play tool that provides stable, smooth hand tracking for keypoints in any hand pose
- **Playspace *New!***
  Users define an area in their space for use in an app
- **SimpleHandPointer *New!***
  An alternative to the Control Pointer to enable hand input
- **Ramp Light**
  A shading technique which maximizes the visual quality of Magic Leap's additive display.
- **Transmission**
  A cross-platform, multiplayer solution for connecting devices over LAN
- **Spatial Alignment**
  Visual alignment for peers connected with Transmission
- **Runtime Console**
  Viewing log messages while running an app
- **Surface Details**
  A solution to identify different surface types

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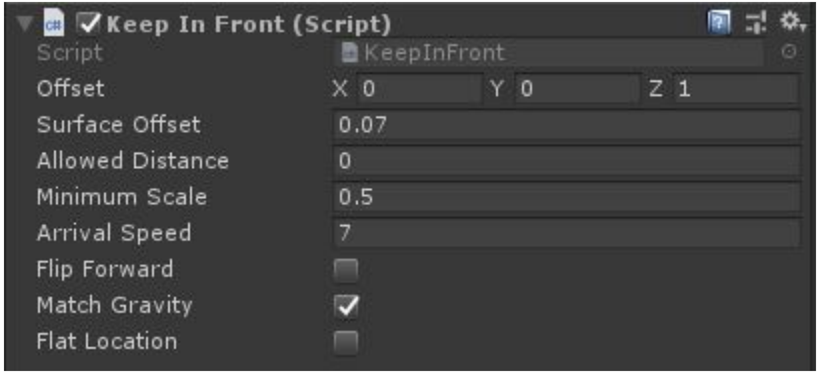
Keep In Front

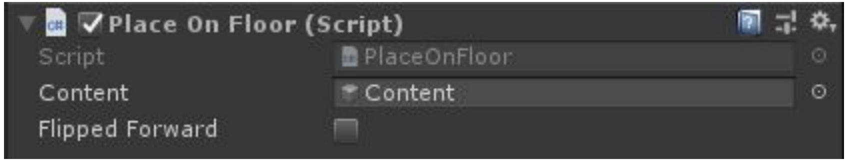


Keep In Front (Script)

Script	KeepInFront
Offset	X 0 Y 0 Z 1
Surface Offset	0.07
Allowed Distance	0
Minimum Scale	0.5
Arrival Speed	7
Flip Forward	□
Match Gravity	☑
Flat Location	□

Keep In Front is a component that keeps content in the user view while respecting other objects in the scene and attempts to stay in front of them.

Place On Floor



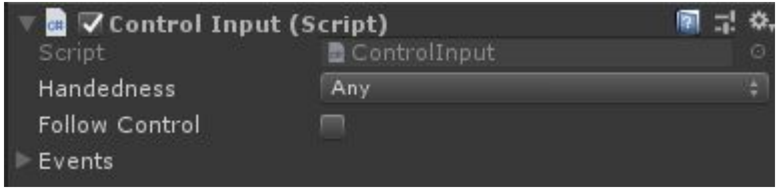
Script: PlaceOnFloor

Content: Content

Flipped Forward: □

Place On Floor helps locate an area on the floor of the user’s space where an app can place digital content.

Control Input



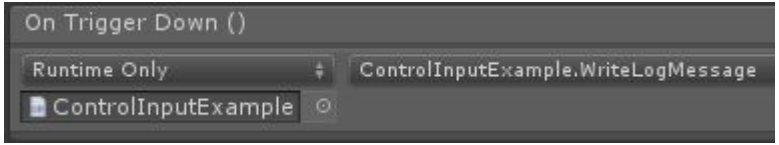
☑ Control Input (Script)

Script: ControlInput

Handedness: Any

Follow Control: □

Events



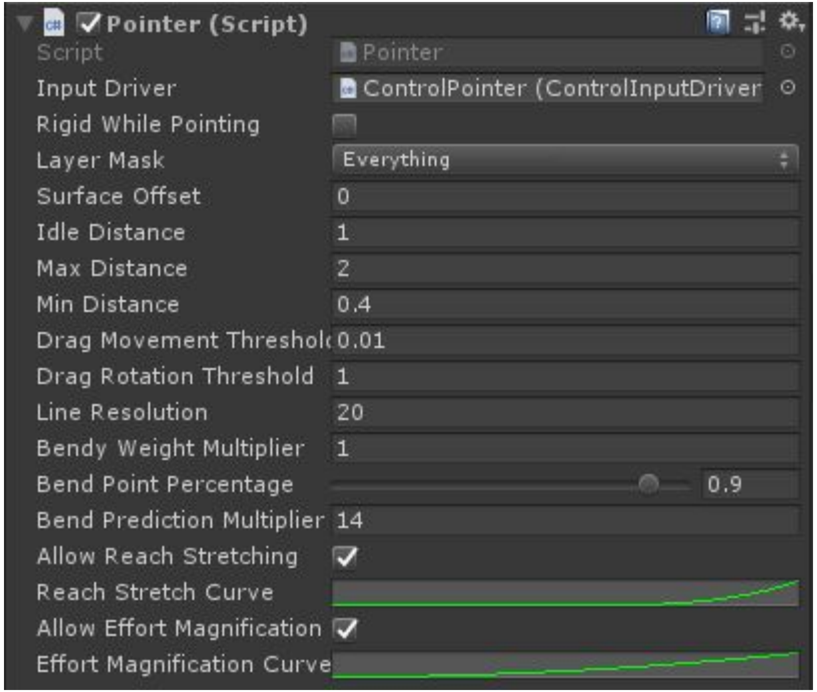
On Trigger Down ()

Runtime Only | ControlInputExample.WriteLogMessage

ControlInputExample

Control Input component provides you with a comprehensive set of Unity events for interactivity with the Magic Leap Control.

Control Pointer



☑ Pointer (Script)

Script: Pointer

Input Driver: ControlPointer (ControlInputDriver

Rigid While Pointing: ☐

Layer Mask: Everything

Surface Offset: 0

Idle Distance: 1

Max Distance: 2

Min Distance: 0.4

Drag Movement Threshol: 0.01

Drag Rotation Threshold: 1

Line Resolution: 20

Bendy Weight Multiplier: 1

Bend Point Percentage: 0.9

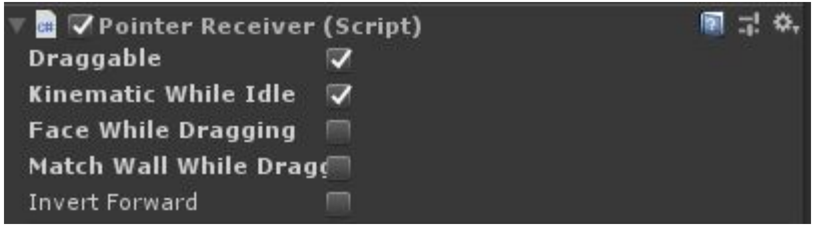
Bend Prediction Multiplier: 14

Allow Reach Stretching: ☑

Reach Stretch Curve

Allow Effort Magnification: ☑

Effort Magnification Curve



☑ Pointer Receiver (Script)

Draggable: ☑

Kinematic While Idle: ☑

Face While Dragging: ☐

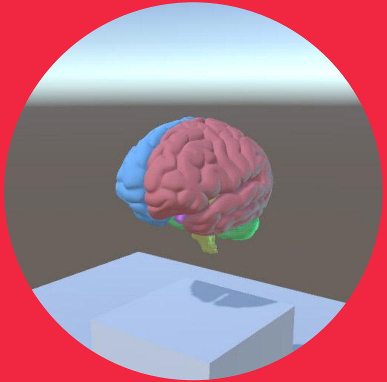
Match Wall While Dragg: ☐

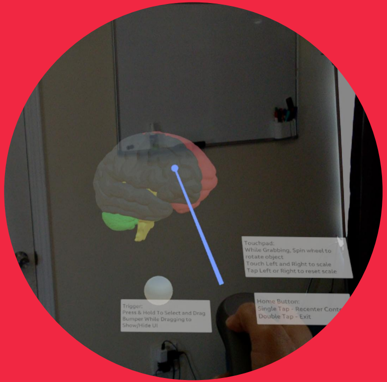
Invert Forward: ☐

Control Pointer provides a pointer for the manipulation and movement of digital objects with the Control. Control Pointer includes components that let users target, select/deselect, and drag/drop objects.

00

Workshop Time

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Touch Left and Right to scale
Tap Left or Right to reset scale
Trigger:
Press & Hold To Select and Drag
Bumper While Dragging to Show/Hide UI
Home Button:
Single Tap - Recenter Conte
Double Tap - Exit

Workshop Unitypackage

Models

- Brain.fbx - model

Prefabs

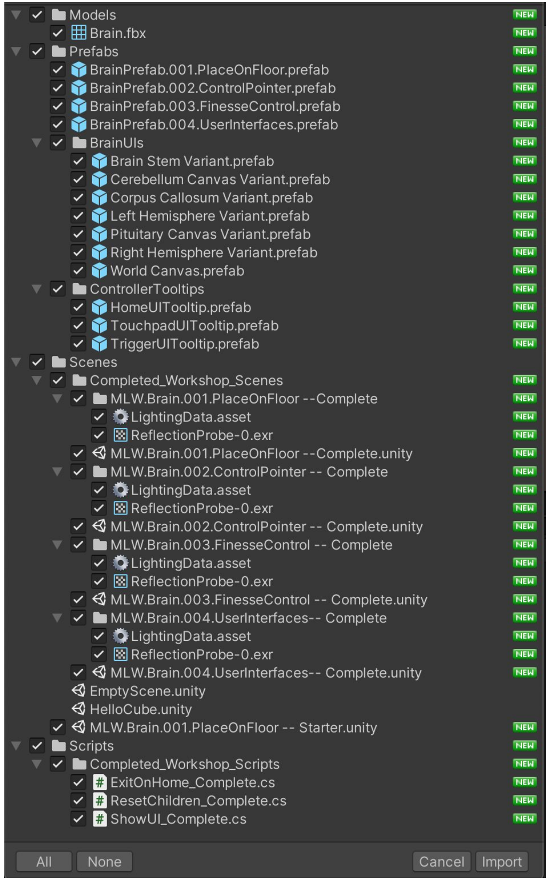
- Completed prefabs for each lesson module
- User Interfaces

Scenes

- Starter Scenes
- Completed Scenes for each lesson modules

Scripts

- Completed Logic Scripts for this project



```
▼ ☑ Models                                                   NEW
    ☑ Brain.fbx                                              NEW
▼ ☑ Prefabs                                                  NEW
    ☑ BrainPrefab.001.PlaceOnFloor.prefab                    NEW
    ☑ BrainPrefab.002.ControlPointer.prefab                  NEW
    ☑ BrainPrefab.003.FinesseControl.prefab                  NEW
    ☑ BrainPrefab.004.UserInterfaces.prefab                  NEW
  ▼ ☑ BrainUIs                                               NEW
      ☑ Brain Stem Variant.prefab                            NEW
      ☑ Cerebellum Canvas Variant.prefab                     NEW
      ☑ Corpus Callosum Variant.prefab                       NEW
      ☑ Left Hemisphere Variant.prefab                       NEW
      ☑ Pituitary Canvas Variant.prefab                      NEW
      ☑ Right Hemisphere Variant.prefab                      NEW
      ☑ World Canvas.prefab                                  NEW
  ▼ ☑ ControllerTooltips                                     NEW
      ☑ HomeUITooltip.prefab                                 NEW
      ☑ TouchpadUITooltip.prefab                             NEW
      ☑ TriggerUITooltip.prefab                              NEW
▼ ☑ Scenes
  ▼ ☑ Completed_Workshop_Scenes                              NEW
    ▼ ☑ MLW.Brain.001.PlaceOnFloor --Complete                NEW
        ☑ LightingData.asset                                 NEW
        ☑ ReflectionProbe-0.exr                              NEW
      ☑ MLW.Brain.001.PlaceOnFloor --Complete.unity          NEW
    ▼ ☑ MLW.Brain.002.ControlPointer -- Complete             NEW
        ☑ LightingData.asset                                 NEW
        ☑ ReflectionProbe-0.exr                              NEW
      ☑ MLW.Brain.002.ControlPointer -- Complete.unity       NEW
    ▼ ☑ MLW.Brain.003.FinesseControl -- Complete             NEW
        ☑ LightingData.asset                                 NEW
        ☑ ReflectionProbe-0.exr                              NEW
      ☑ MLW.Brain.003.FinesseControl -- Complete.unity       NEW
    ▼ ☑ MLW.Brain.004.UserInterfaces-- Complete              NEW
        ☑ LightingData.asset                                 NEW
        ☑ ReflectionProbe-0.exr                              NEW
      ☑ MLW.Brain.004.UserInterfaces-- Complete.unity        NEW
    EmptyScene.unity
    HelloCube.unity
    ☑ MLW.Brain.001.PlaceOnFloor -- Starter.unity            NEW
▼ ☑ Scripts                                                  NEW
  ▼ ☑ Completed_Workshop_Scripts                             NEW
      ☑ ExitOnHome_Complete.cs                               NEW
      ☑ ResetChildren_Complete.cs                            NEW
      ☑ ShowUI_Complete.cs                                   NEW
```

Completed Scenes & Associated Prefabs

Scene Name	Associated Prefab
MLW.Brain.001.PlaceOnFloor -- Starter.unity	No associated prefab
MLW.Brain.001.PlaceOnFloor -- Complete.unity	BrainPrefab.001.PlaceOnFloor
MLW.Brain.002.ControlPointer -- Complete.unity	BrainPrefab.002.ControlPointer
MLW.Brain.003.FinesseControl -- Complete.unity	BrainPrefab.003.FinesseControl
MLW.Brain.004.UIControl -- Complete.unity	BrainPrefab.004.UIControl

01

Place On Floor

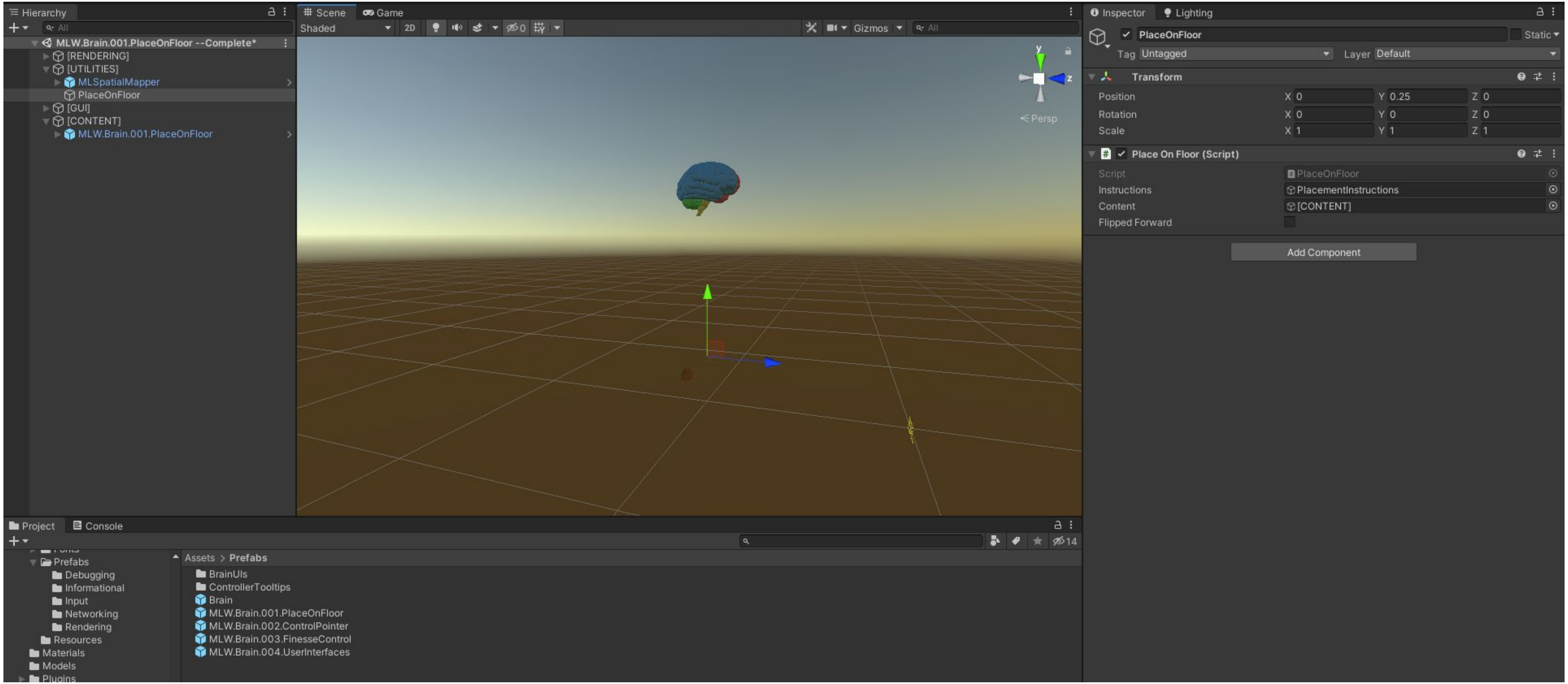
Add Brain Model to Our Scene

1. Open the MLW.001.PlaceOnFloor -- Starter Scene
2. Create a new gameobject and rename it to “**[CONTENT]**” and place it at the origin
3. Add the **BrainPefab.001.PlaceOnFloor** Prefab from the *Assets/Prefabs* folder to your Scene under the **[CONTENT]** Game Object in your Hierarchy
   a. Set position transform to (0,1,0)
   b. Set scale transform to (0.25,0.25,0.25)
4. Rebuild the Lighting. Open the lighting menu under Windows > Rendering > Lighting Settings. Scroll to the bottom of the window and hit the generate lighting button.

Set Up A Starting Place for our Application

1. Under **“[UTILITIES]”** create a new gameobject called “**PlaceOnFloor”** and place it at the origin
2. Add the component **PlaceOnFloor** to the gameobject
3. Create a new gameobject and rename it to “**[GUI]**” and place it at the origin
4. Add the prefab **PlacementInstructions** from *Assets/Prefabs/* as a child of “**[GUI]”**
5. Add the component **KeepInFront** to the prefab
6. In the **PlaceOnFloor** gameobject:
    a. Add a reference to **PlacementInstructions** in the Instructions field
    b. Add a reference to **[CONTENT]** in the content field

MLW.001.PlaceOnFloor -- Starter



MLW.Brain.001.PlaceOnFloor --Complete*
- [RENDERING]
- [UTILITIES]
  - MLSpatialMapper
  - PlaceOnFloor
- [GUI]
- [CONTENT]
  - MLW.Brain.001.PlaceOnFloor

☑ PlaceOnFloor □ Static

Tag Untagged Layer Default

Transform

Position	X 0	Y 0.25	Z 0
Rotation	X 0	Y 0	Z 0
Scale	X 1	Y 1	Z 1

☑ Place On Floor (Script)

Script	PlaceOnFloor
Instructions	PlacementInstructions
Content	[CONTENT]
Flipped Forward	□

- Prefabs
  - Debugging
  - Informational
  - Input
  - Networking
  - Rendering
  - Resources
- Materials
- Models
- Plugins

Assets > Prefabs

- BrainUIs
- ControllerTooltips
- Brain
- MLW.Brain.001.PlaceOnFloor
- MLW.Brain.002.ControlPointer
- MLW.Brain.003.FinesseControl
- MLW.Brain.004.UserInterfaces

[PAUSE]

Build to Device / Run in Zero Iteration / Questions

Review of MLW.001.PlaceOnFloor

1. Removed default content in starter scene
2. Added the Brain Prefab to the scene
3. Created a reference to global [CONTENT] gameobject in PlaceOnFloor component

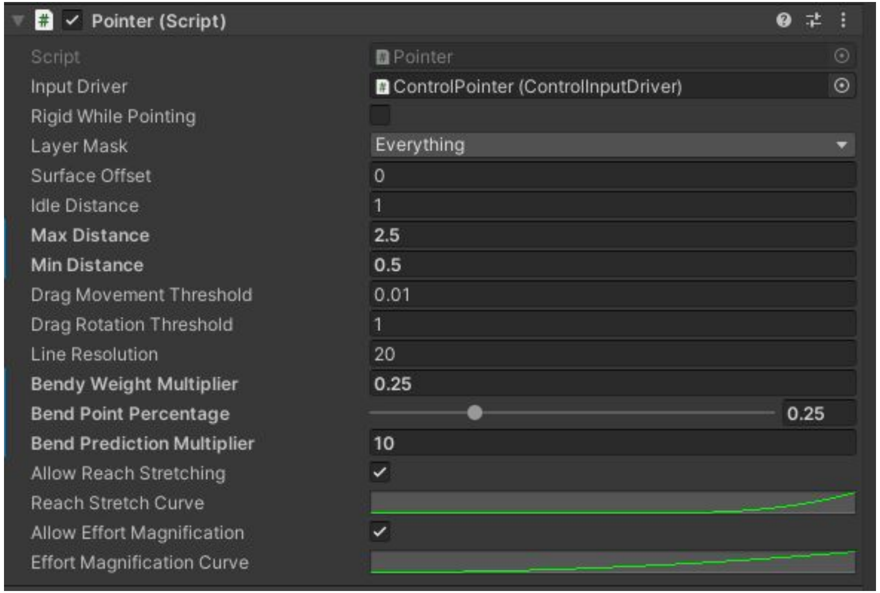
02

Control Pointer

Add a Control Pointer to the Scene

1. Create an empty game object in the Hierarchy and rename it as [INPUT]
   a. Set its transform to be at the origin.
2. Drag the ControlPointer prefab from /Assets/MagicLeap-Tools/Prefabs/Input into the Hierarchy as a child of the [INPUT] gameobject.
   a. Set the following parameters on your Pointer Script

Max Distance	2.5
Min Distance	0.5
Bendy Weight Multiplier	0.25
Bend Point Percentage	0.25
Bend Prediction Multiplier	10



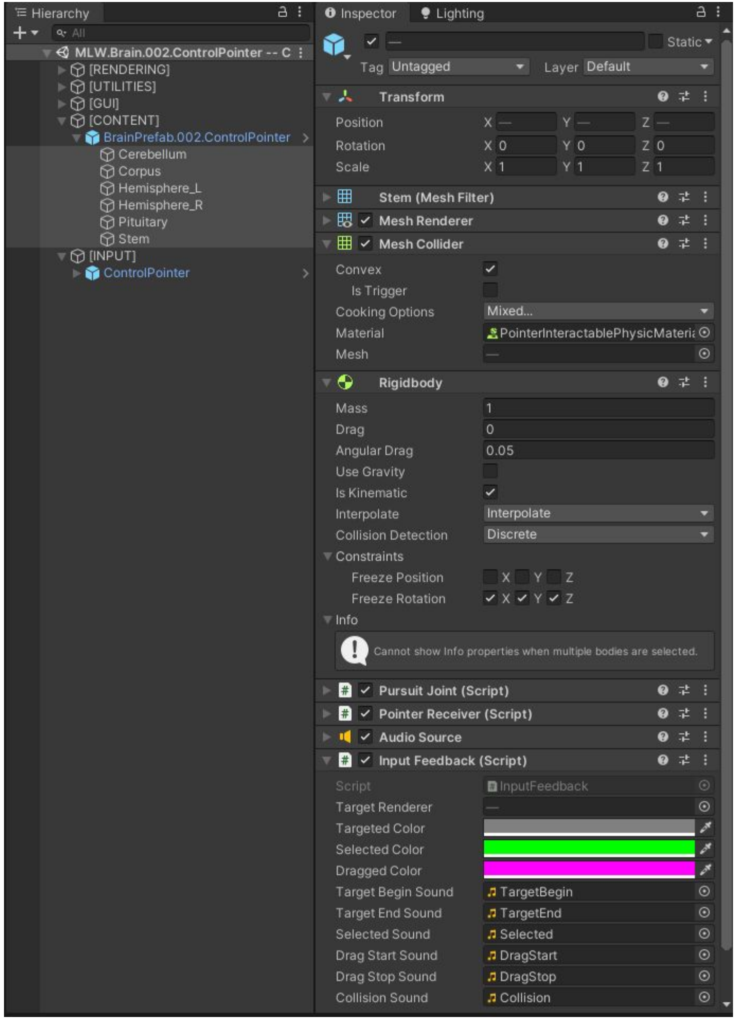
☑ Pointer (Script)

Script	Pointer
Input Driver	ControlPointer (ControlInputDriver)
Rigid While Pointing	□
Layer Mask	Everything
Surface Offset	0
Idle Distance	1
Max Distance	2.5
Min Distance	0.5
Drag Movement Threshold	0.01
Drag Rotation Threshold	1
Line Resolution	20
Bendy Weight Multiplier	0.25
Bend Point Percentage	0.25
Bend Prediction Multiplier	10
Allow Reach Stretching	✓
Reach Stretch Curve	
Allow Effort Magnification	✓
Effort Magnification Curve	

Adding Pointer Intractability to the Brain Model

Select all the children objects of the **Brain Prefab**. Add the following components and properties

1. Add a **Mesh Collider** component
   a. Check “Convex” in inspector
   b. Add “PointerInteractablePhysicMaterial” to the colliders Material Field
2. Add a **Pointer Receiver** component
   a. This will automatically add a rigidbody
   b. Check “**Is Kinematic**”
3. Add **Input Feedback** component
   a. Add audio clip references for each sound sample.



MLW.Brain.002.ControlPointer -- C
[RENDERING]
[UTILITIES]
[GUI]
[CONTENT]
BrainPrefab.002.ControlPointer
Cerebellum
Corpus
Hemisphere_L
Hemisphere_R
Pituitary
Stem
[INPUT]
ControlPointer

Tag Untagged Layer Default

Transform
Position X — Y — Z —
Rotation X 0 Y 0 Z 0
Scale X 1 Y 1 Z 1

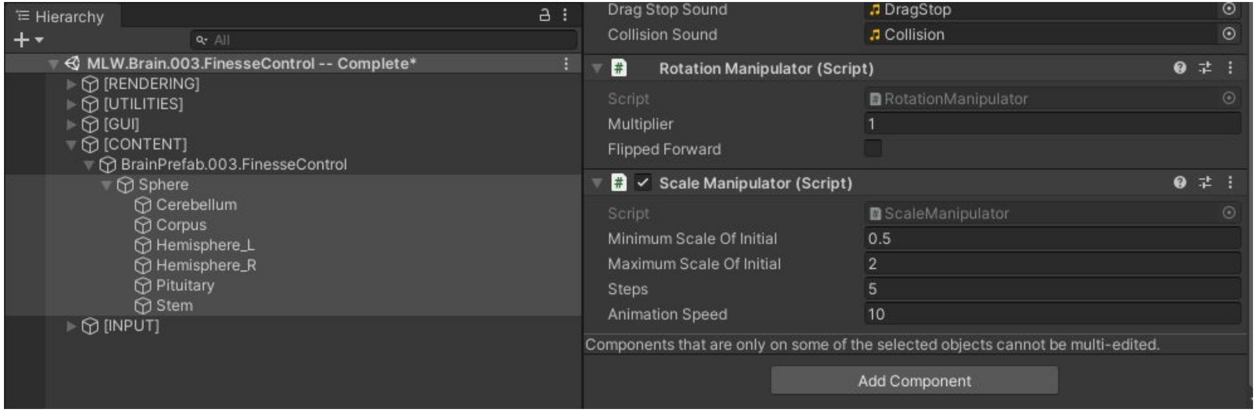
Stem (Mesh Filter)
☑ Mesh Renderer
☑ Mesh Collider
Convex ☑
Is Trigger □
Cooking Options Mixed...
Material PointerInteractablePhysicMateri
Mesh —

Rigidbody
Mass 1
Drag 0
Angular Drag 0.05
Use Gravity □
Is Kinematic ☑
Interpolate Interpolate
Collision Detection Discrete
Constraints
Freeze Position □ X □ Y □ Z
Freeze Rotation ☑ X ☑ Y ☑ Z
Info
Cannot show Info properties when multiple bodies are selected.

☑ Pursuit Joint (Script)
☑ Pointer Receiver (Script)
☑ Audio Source
☑ Input Feedback (Script)
Script InputFeedback
Target Renderer —
Targeted Color
Selected Color 🟩
Dragged Color
Target Begin Sound TargetBegin
Target End Sound TargetEnd
Selected Sound Selected
Drag Start Sound DragStart
Drag Stop Sound DragStop
Collision Sound Collision

Add Rotatability and Scalability to All Interactable Objects.

1. Select all children components of the Brain Prefab and add a “**Rotation Manipulator**” and “**Scale Manipulator**” Script. This allows the use of:
   - The radial dial to rotate objects when selected
   - Left and Tight tap on the Touchpad to scale up and down
   - Force Press on the Touchpad to Reset the scale



```
▼ MLW.Brain.003.FinesseControl -- Complete*
  ▶ [RENDERING]
  ▶ [UTILITIES]
  ▶ [GUI]
  ▼ [CONTENT]
    ▼ BrainPrefab.003.FinesseControl
      ▼ Sphere
          Cerebellum
          Corpus
          Hemisphere_L
          Hemisphere_R
          Pituitary
          Stem
  ▶ [INPUT]
```

Drag Stop Sound: DragStop
Collision Sound: Collision

Rotation Manipulator (Script)
Script: RotationManipulator
Multiplier: 1
Flipped Forward: □

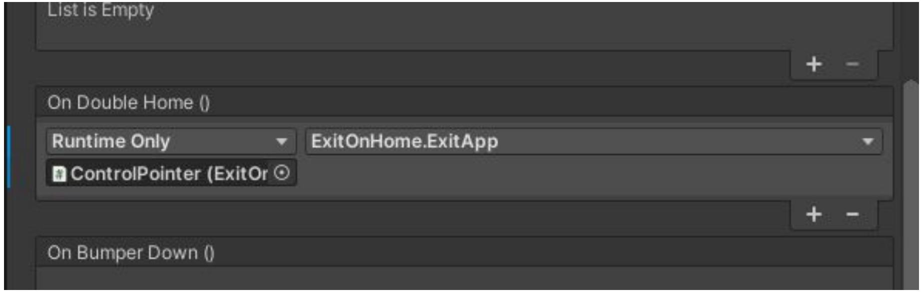
☑ Scale Manipulator (Script)
Script: ScaleManipulator
Minimum Scale Of Initial: 0.5
Maximum Scale Of Initial: 2
Steps: 5
Animation Speed: 10

Components that are only on some of the selected objects cannot be multi-edited.

Setting Up Double Tap Home to Exit App

1. In your scripts folder create a script called “ExitOnHome”
   a. Add a single function called ExitApp with the following code.
2. Add the **ExitOnHome** script as a component on the **ControlPointer** gameobject
3. On the **ControlInput** component in **ControlPointer** in the “On Double Home ()” event callback. Add a new callback and reference the **ControlPointer** gameobject.
   a. Select **ExitOnHome.ExitApp** as the function to call.

```
    public void ExitApp()
     {
#if UNITY_EDITOR
            Debug.Log("Exit to Home: Unity Editor
Quit");
            UnityEditor.EditorApplication.isPlaying =
false;
#else
            Application.Quit();
#endif
     }
```



List is Empty

On Double Home ()

Runtime Only

ExitOnHome.ExitApp

ControlPointer (ExitOr

On Bumper Down ()

[PAUSE]

Build to Device / Run in Zero Iteration / Questions

Review of MLW.002.ControlPointer

1. Added a controller pointer prefab to your scene and control parameters
2. Created a script ExitOnHome.cs that exits your application
3. Added an event callback in ControlInput to the ExitOnHome.cs Script on Double Tap Home
4. Enabled basic pointer interaction to each brain game object by adding colliders & MLTK scripts
5. Enabled rotation and scale manipulation to each brain game object by adding MLTK scripts

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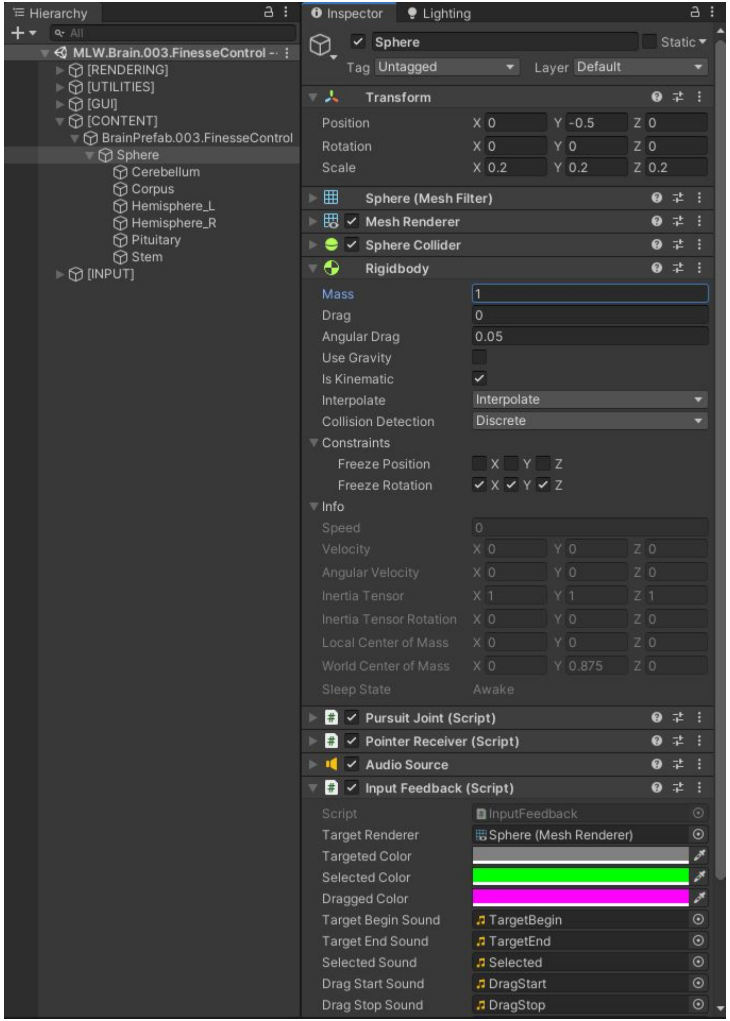
03

Finesse Control

MLW.Brain.003.FinesseControl

Adding a way to globally control the brain model

1. Right Click on the Brain Prefab in your scene hierarchy and select “Open Prefab Asset”
2. Right click on the root gameobject and navigate to *3D Object > Sphere* to add a sphere gameobject to your prefab
   a. Set position transform to (0,-0.5,0)
   b. Set scale transform to (0.2,0.2,0.2)
   c. Drag all brain game objects to be a child of the sphere
3. Add the following components to your **Sphere**.
   a. Pointer Receiver
   b. Rotation Manipulator
   c. Scale Manipulator
   d. Input Feedback
   e. MSA Source
4. Set “Is Kinematic” in Rigidbody to True
5. Add “PointerInteractablePhysicMaterial” to Sphere Collider
6. Add audio clip references in Input Feedback



```
▼ MLW.Brain.003.FinesseControl -
  ▶ [RENDERING]
  ▶ [UTILITIES]
  ▶ [GUI]
  ▼ [CONTENT]
    ▼ BrainPrefab.003.FinesseControl
      ▼ Sphere
          Cerebellum
          Corpus
          Hemisphere_L
          Hemisphere_R
          Pituitary
          Stem
  ▶ [INPUT]
```

☑ Sphere ☐ Static

Tag Untagged Layer Default

Transform
Position X 0 Y -0.5 Z 0
Rotation X 0 Y 0 Z 0
Scale X 0.2 Y 0.2 Z 0.2

Sphere (Mesh Filter)
☑ Mesh Renderer
☑ Sphere Collider

Rigidbody
Mass 1
Drag 0
Angular Drag 0.05
Use Gravity ☐
Is Kinematic ☑
Interpolate Interpolate
Collision Detection Discrete
Constraints
Freeze Position ☐ X ☐ Y ☐ Z
Freeze Rotation ☑ X ☑ Y ☑ Z
Info
Speed 0
Velocity X 0 Y 0 Z 0
Angular Velocity X 0 Y 0 Z 0
Inertia Tensor X 1 Y 1 Z 1
Inertia Tensor Rotation X 0 Y 0 Z 0
Local Center of Mass X 0 Y 0 Z 0
World Center of Mass X 0 Y 0.875 Z 0
Sleep State Awake

☑ Pursuit Joint (Script)
☑ Pointer Receiver (Script)
☑ Audio Source
☑ Input Feedback (Script)
Script InputFeedback
Target Renderer Sphere (Mesh Renderer)
Targeted Color ⬜
Selected Color 🟩
Dragged Color 🟪
Target Begin Sound TargetBegin
Target End Sound TargetEnd
Selected Sound Selected
Drag Start Sound DragStart
Drag Stop Sound DragStop

Resetting the Brain using the Home Button

1. Create a script called ResetChildren.cs
2. Add the following private member variables

```
//Setting the following private member variables
private Vector3[] _originalPositions;
private Quaternion[] _originalRotations;
private Vector3[] _originalScales;
private bool _initialized = false;
```

3. Add the following functionality in Start()

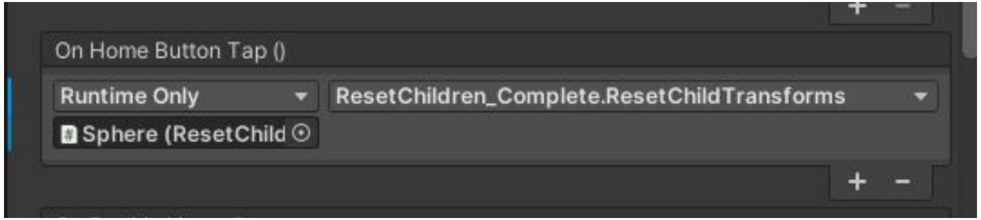
```
void Start()
    {
        if (transform.childCount > 0)
        {
            _originalPositions = new Vector3[transform.childCount];
            _originalRotations = new Quaternion[transform.childCount];
            _originalScales = new Vector3[transform.childCount];

            for(int i = 0; i < transform.childCount; i++)
            {
                _originalPositions[i] = gameObject.transform.GetChild(i).localPosition;
                _originalRotations[i] = gameObject.transform.GetChild(i).localRotation;
                _originalScales[i] = gameObject.transform.GetChild(i).localScale;
            }
        }
        _initialized = true;
    }
```

Resetting the Brain using the Home Button

1. In **ResetChildren.cs** add a function ResetChildTransforms()

```
public void ResetChildTransforms()
{
    if(_initialized)
    {
        for (int i = 0; i < transform .childCount ; i++)
        {
            Transform child = gameObject .transform.GetChild(i);
            child .localPosition  = _originalPositions[i];
            child .localRotation  = _originalRotations[i];
            child .localScale  = _originalScales[i];
        }
    }
}
```

2. Add **ResetChildren.cs** as a component on the **Sphere** gameobject
3. In your **ControlPointer** gameobject in the **ControlInput** component, add a callback to On Home Button Tap()



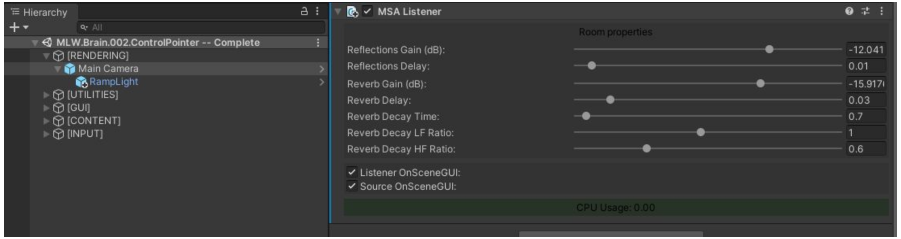
On Home Button Tap ()

Runtime Only ▾ ResetChildren_Complete.ResetChildTransforms ▾

Sphere (ResetChild ⊙

Adding Audio Spatialization to Interaction Sounds

1. On the **Main Camera** gameobject under rendering. Add an **MSA Listener** Component
2. Select all interactable brain components:
    a. Add an **MSA Source** Component
    b. On the **Audio Source**:
        i. Check the **Spatialize** box
        ii. Set **Spatial Blend** parameter to 3D



Hierarchy

- MLW.Brain.002.ControlPointer -- Complete
  - [RENDERING]
    - Main Camera
      - RampLight
  - [UTILITIES]
  - [GUI]
  - [CONTENT]
  - [INPUT]

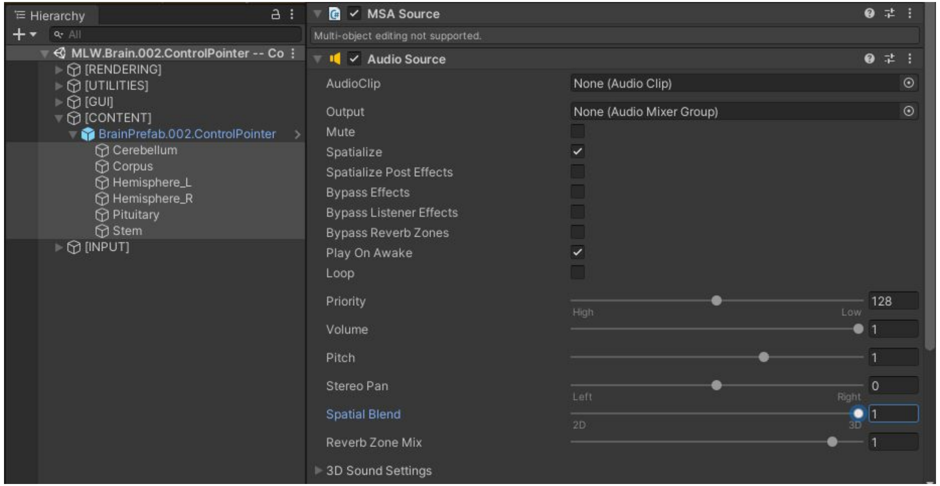
☑ MSA Listener

Room properties

Reflections Gain (dB):	-12.041
Reflections Delay:	0.01
Reverb Gain (dB):	-15.917(
Reverb Delay:	0.03
Reverb Decay Time:	0.7
Reverb Decay LF Ratio:	1
Reverb Decay HF Ratio:	0.6

☑ Listener OnSceneGUI:
☑ Source OnSceneGUI:

CPU Usage: 0.00



Hierarchy

- MLW.Brain.002.ControlPointer -- Co
  - [RENDERING]
  - [UTILITIES]
  - [GUI]
  - [CONTENT]
    - BrainPrefab.002.ControlPointer
      - Cerebellum
      - Corpus
      - Hemisphere_L
      - Hemisphere_R
      - Pituitary
      - Stem
  - [INPUT]

☑ MSA Source

Multi-object editing not supported.

☑ Audio Source

AudioClip	None (Audio Clip)
Output	None (Audio Mixer Group)
Mute	□
Spatialize	☑
Spatialize Post Effects	□
Bypass Effects	□
Bypass Listener Effects	□
Bypass Reverb Zones	□
Play On Awake	☑
Loop	□
Priority (High – Low)	128
Volume	1
Pitch	1
Stereo Pan (Left – Right)	0
Spatial Blend (2D – 3D)	1
Reverb Zone Mix	1

▸ 3D Sound Settings

[PAUSE]

Build to Device / Run in Zero Iteration / Questions

Review of MLW.003.FinessePointer

1. Modified the Brain Prefab in the scene with a global sphere object that parents brain game objects
2. Added full pointer interaction to the Sphere gameobject
3. Created a ResetChildren.cs script that resets the transforms of all children gameobjects
4. Added an event callback in ControlInput to ResetChildren on Single Tap Home
5. Added audio spatialization to input feedback sounds

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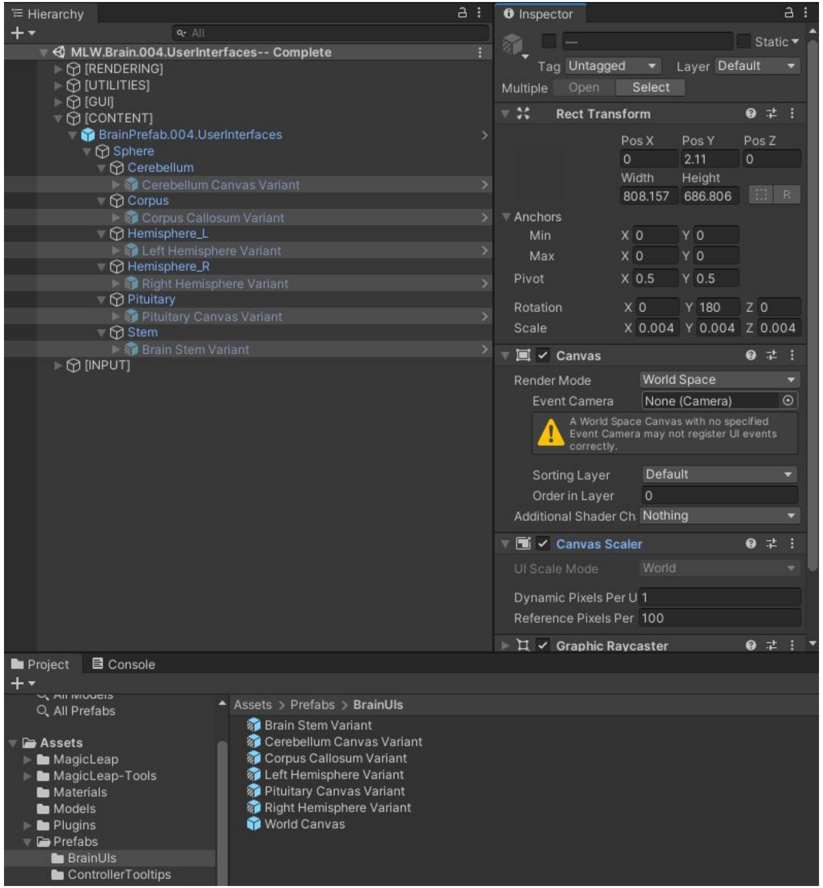
04

UI Control

MLW.Brain.004.UIControl

Adding UIs to each Brain Component

1. In Assets/Prefabs/BrainUIs drag each brain component UI to the hierarchy as a child of each brain component model.
   a. Disable all UI components



```
MLW.Brain.004.UserInterfaces-- Complete
  [RENDERING]
  [UTILITIES]
  [GUI]
  [CONTENT]
    BrainPrefab.004.UserInterfaces
      Sphere
        Cerebellum
          Cerebellum Canvas Variant
        Corpus
          Corpus Callosum Variant
        Hemisphere_L
          Left Hemisphere Variant
        Hemisphere_R
          Right Hemisphere Variant
        Pituitary
          Pituitary Canvas Variant
        Stem
          Brain Stem Variant
  [INPUT]
```

Tag Untagged Layer Default

Multiple

Rect Transform

Pos X 0 Pos Y 2.11 Pos Z 0

Width 808.157 Height 686.806

Anchors

Min X 0 Y 0

Max X 0 Y 0

Pivot X 0.5 Y 0.5

Rotation X 0 Y 180 Z 0

Scale X 0.004 Y 0.004 Z 0.004

☑ Canvas

Render Mode World Space

Event Camera None (Camera)

A World Space Canvas with no specified Event Camera may not register UI events correctly.

Sorting Layer Default

Order in Layer 0

Additional Shader Ch Nothing

☑ Canvas Scaler

UI Scale Mode World

Dynamic Pixels Per U 1

Reference Pixels Per 100

☑ Graphic Raycaster

```
All Models
All Prefabs
Assets
  MagicLeap
  MagicLeap-Tools
  Materials
  Models
  Plugins
  Prefabs
    BrainUIs
    ControllerTooltips
```

Assets > Prefabs > BrainUIs

- Brain Stem Variant
- Cerebellum Canvas Variant
- Corpus Callosum Variant
- Left Hemisphere Variant
- Pituitary Canvas Variant
- Right Hemisphere Variant
- World Canvas

Displaying and Hiding the UIs with the Control Bumper

1. Create a script called **ShowUI.cs**
2. Add MagicLeapTools as a namespace.
3. Add the following public and private member variables

```
using MagicLeapTools;


private bool _enabled =  false;
public PointerReceiver pointer;
```

4. Create Two New Functions, EnableUI() and HideUI()

```
public void EnableUI(){
   if(pointer != null){
       if (pointer .Dragging){
           _enabled = !_enabled;
           gameObject. SetActive(_enabled);
       }
   }
   else{
       Debug. Log("Null Pointer in Parent");
  }
}

public void HideUI(){
    _enabled = false;
    gameObject. SetActive(_enabled);
}
```

Displaying and Hiding the UIs with the Control Bumper

1. Inside **ResetChildren.cs** make the following modification to the ResetChildTransforms() function

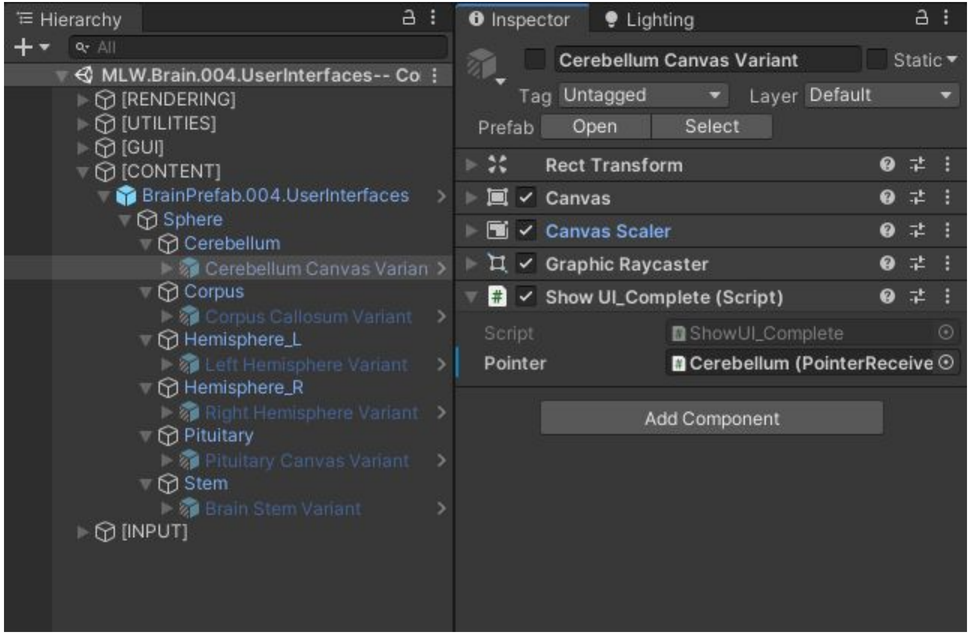
```
public void ResetChildTransforms()
    {
        if(_initialized)
        {
            for (int i = 0; i < transform.childCount; i++)
            {
                Transform child = gameObject.transform.GetChild(i);
                child.localPosition = _originalPositions[i];
                child.localRotation = _originalRotations[i];
                child.localScale = _originalScales[i];

                ShowUI_Complete showUI = child.GetComponentInChildren<ShowUI_Complete>();
                if (showUI != null)
                {
                    showUI.HideUI();
                }

            }
        }
    }
```

Displaying and Hiding the UIs with the Control Bumper

1. Select all 6 BrainUI Objects. Add ShowUI as a script to all of them.
    a. For each **ShowUI** component add a reference to the “**PointerReceiver**” component in its parent game object



Cerebellum Canvas Variant

Tag Untagged Layer Default

Prefab

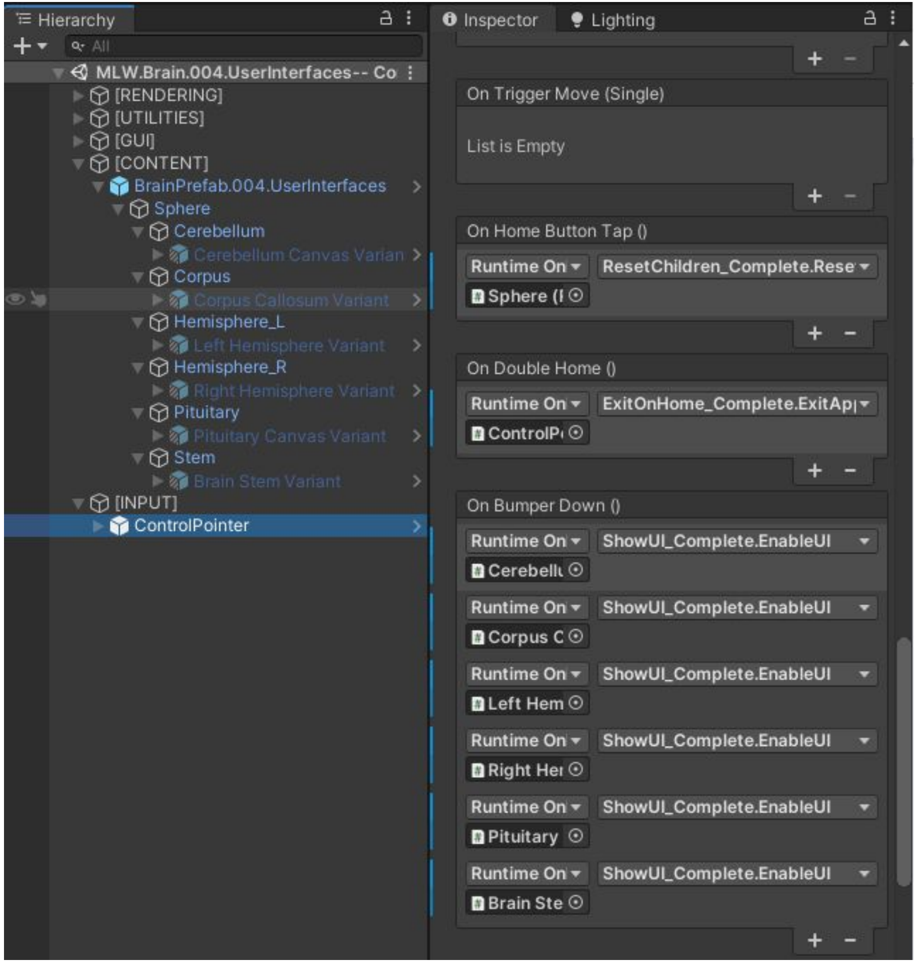
☑ Show UI_Complete (Script)

Script ShowUI_Complete

Pointer Cerebellum (PointerReceive

Displaying and Hiding the UIs with the Control Bumper

1. In the **ControlPointer** game object on the **ControlInput** component, add callbacks for each of the **ShowUI** objects and their respective **EnableUI**() functions.



```
MLW.Brain.004.UserInterfaces-- Co
  [RENDERING]
  [UTILITIES]
  [GUI]
  [CONTENT]
    BrainPrefab.004.UserInterfaces
      Sphere
        Cerebellum
          Cerebellum Canvas Varian
        Corpus
          Corpus Callosum Variant
        Hemisphere_L
          Left Hemisphere Variant
        Hemisphere_R
          Right Hemisphere Variant
        Pituitary
          Pituitary Canvas Variant
        Stem
          Brain Stem Variant
  [INPUT]
    ControlPointer
```

On Trigger Move (Single)

List is Empty

On Home Button Tap ()

Runtime On	ResetChildren_Complete.Rese
Sphere (I	

On Double Home ()

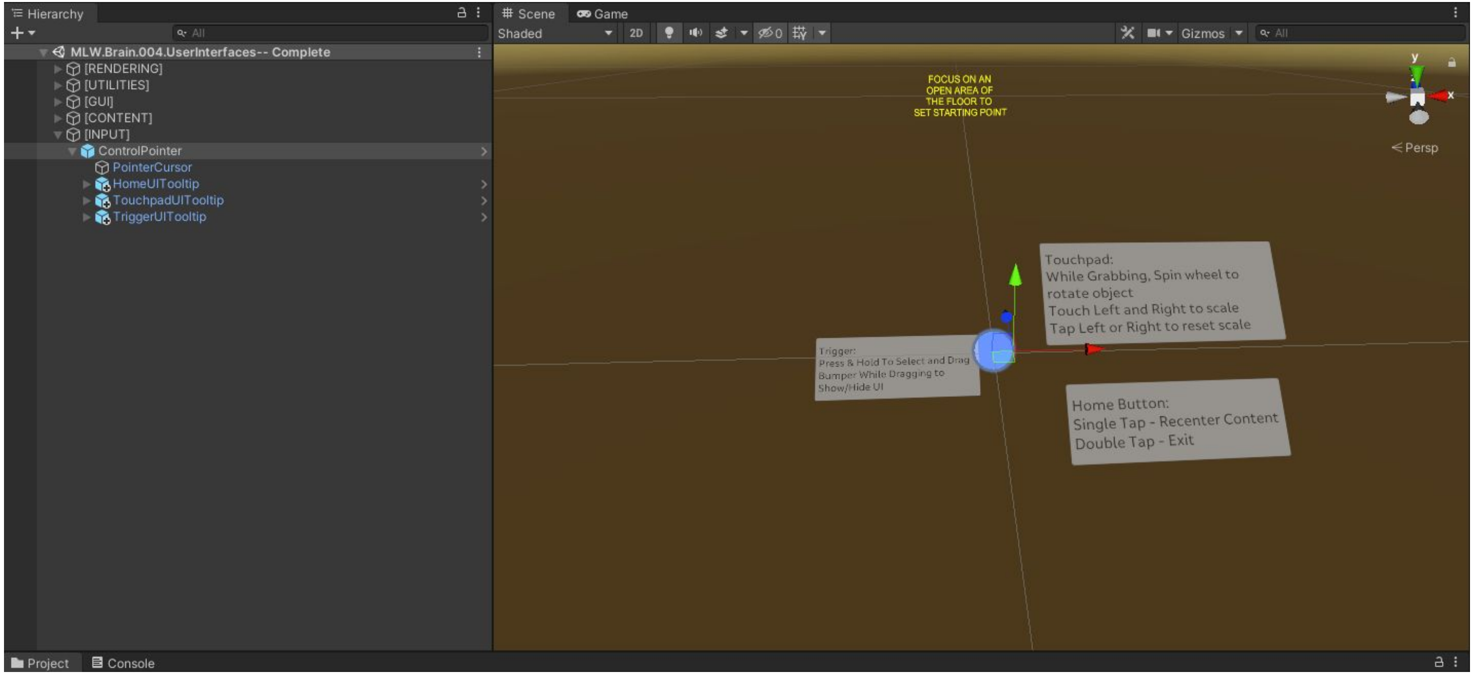
Runtime On	ExitOnHome_Complete.ExitAp
ControlP	

On Bumper Down ()

Runtime On	ShowUI_Complete.EnableUI
Cerebellu	
Runtime On	ShowUI_Complete.EnableUI
Corpus C	
Runtime On	ShowUI_Complete.EnableUI
Left Hem	
Runtime On	ShowUI_Complete.EnableUI
Right Hei	
Runtime On	ShowUI_Complete.EnableUI
Pituitary	
Runtime On	ShowUI_Complete.EnableUI
Brain Ste	

Adding Tooltip Instruction Displays on the Control

1. In *Assets/Prefabs/ControllerTooltips* drag all three tooltip prefabs to be children of the **ControlPointer** gameobject.



Touchpad:
While Grabbing, Spin wheel to
rotate object
Touch Left and Right to scale
Tap Left or Right to reset scale

Trigger:
Press & Hold To Select and Drag
Bumper While Dragging to
Show/Hide UI

Home Button:
Single Tap - Recenter Content
Double Tap - Exit

[PAUSE]

Build to Device / Run in Zero Iteration / Questions

Review of MLW.004.UIControl

1. Added Brain UI prefabs to each brain gameobject
2. Created a ShowUI script that enables, disables, and hides the UI components
3. Modified the ResetChildren script to disable all UIs on home button press
4. Added the ShowUI script as a component on each brain UI
5. Added callback references to ShowUI script on bumper press in Control Input
6. Added Controller Toooltip prefabs as children of the ControlPointer gameobject

WRAP UP

Today...

We learned about these features

- **Control Input**
  Unity event binding and interaction for all Control input events.
- **Keep In Front**
  Keeps digital content in users view
- **Place on Floor**
  Provides a starting position for an app's main content without user input or complex setups
- **Control Pointer**
  A spatial targeting, selecting, and manipulation system that displays weight and other physical characteristics

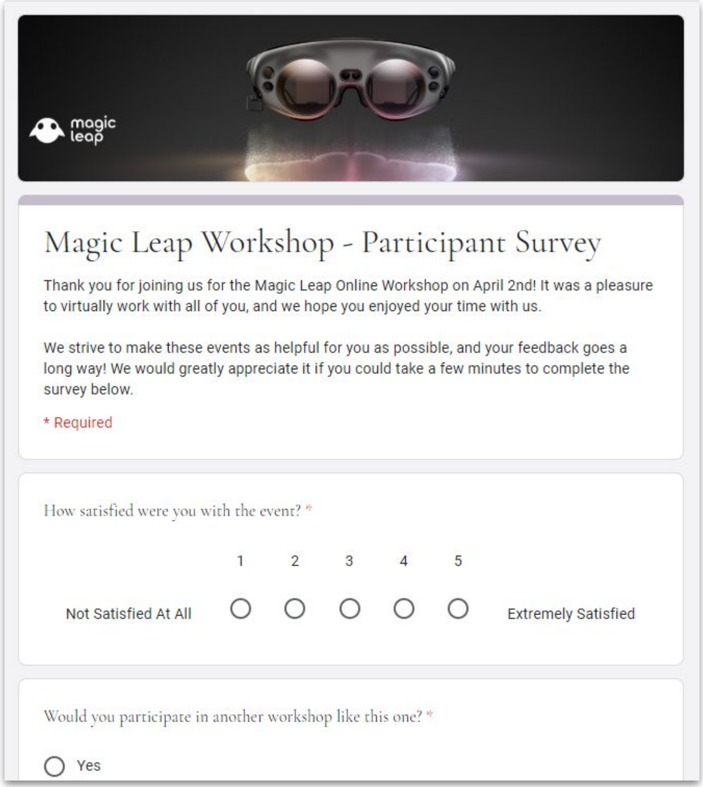
Not today...

Please explore these other features on your own!

- **Interactive Objects *New!***
  A set of user inputs and objects that are part of the HandInput system
- **Hand Input *New!***
  A plug-and-play tool that provides stable, smooth hand tracking for keypoints in any hand pose
- **Playspace *New!***
  Users define an area in their space for use in an app
- **SimpleHandPointer *New!***
  An alternative to the Control Pointer to enable hand input
- **Ramp Light**
  A shading technique which maximizes the visual quality of Magic Leap's additive display.
- **Transmission**
  A cross-platform, multiplayer solution for connecting devices over LAN
- **Spatial Alignment**
  Visual alignment for peers connected with Transmission
- **Runtime Console**
  Viewing log messages while running an app
- **Surface Details**
  A solution to identify different surface types

Help us Improve!

Link to the survey is pinned in **#workshop-feedback**



Magic Leap Workshop - Participant Survey

Thank you for joining us for the Magic Leap Online Workshop on April 2nd! It was a pleasure to virtually work with all of you, and we hope you enjoyed your time with us.

We strive to make these events as helpful for you as possible, and your feedback goes a long way! We would greatly appreciate it if you could take a few minutes to complete the survey below.

* Required

How satisfied were you with the event? *

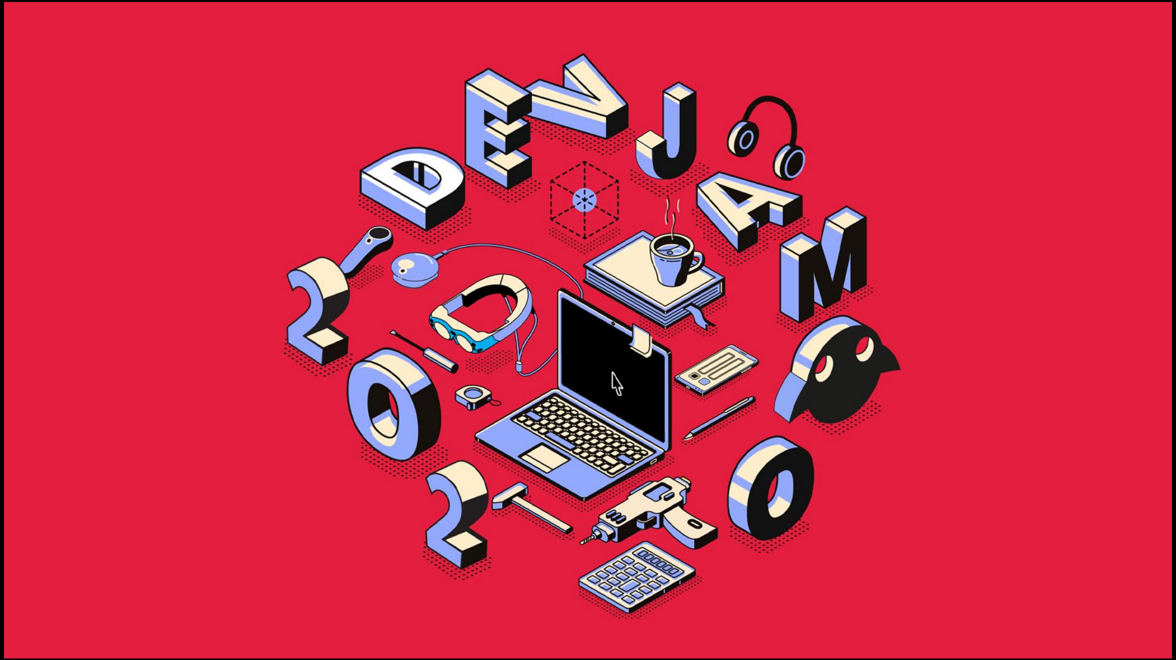
	1	2	3	4	5	
Not Satisfied At All	○	○	○	○	○	Extremely Satisfied

Would you participate in another workshop like this one? *

○ Yes

forms.gle/jz7Mt9W7bGvQUpq97

SPRING 2020 #MLDEVJAM



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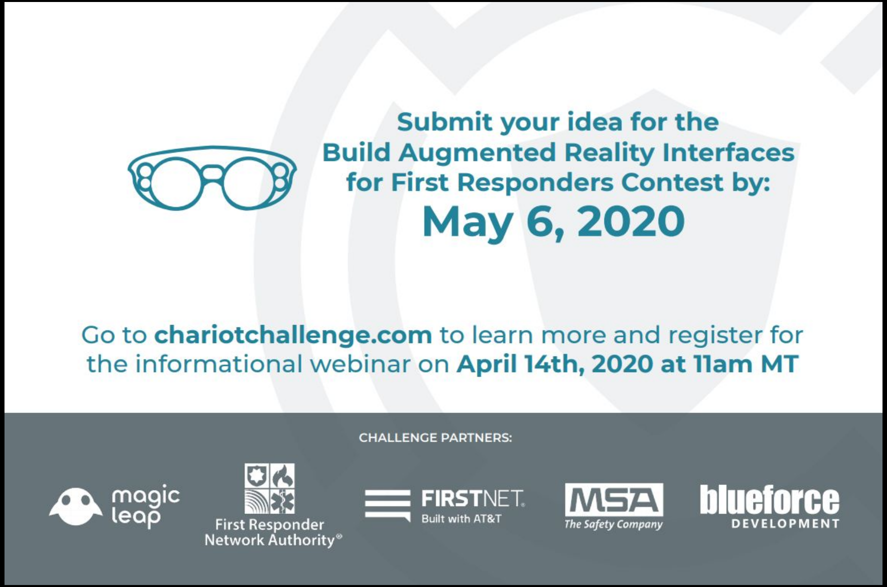

Submit your idea for the Build Augmented Reality Interfaces for First Responders Contest by:

May 6, 2020

Go to **chariotchallenge.com** to learn more and register for the informational webinar on **April 14th, 2020 at 11am MT**

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SEE YOU
NEXT TIME!