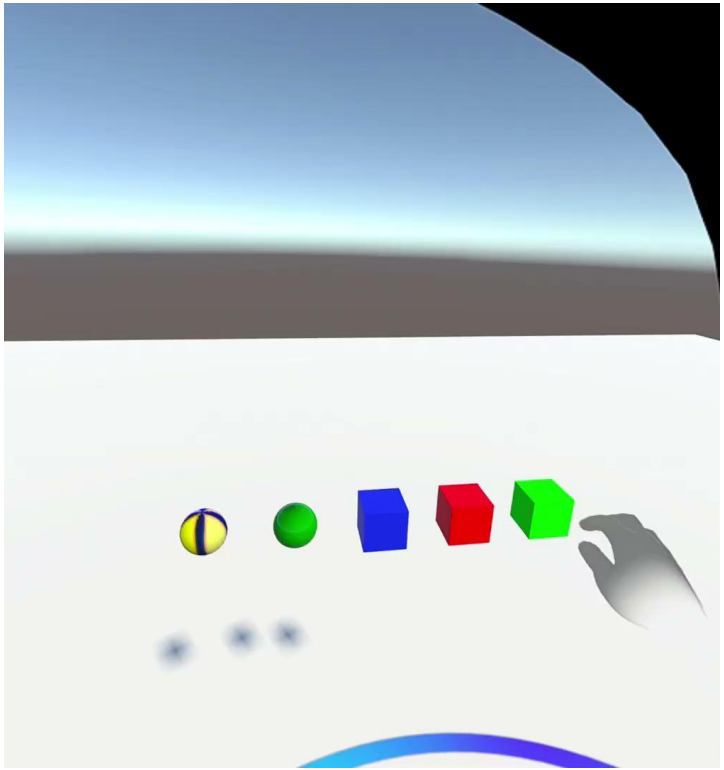
Lab 3 - Body Tracking

Quest Hand Tracking,
Unity Avatar, MediaPipe

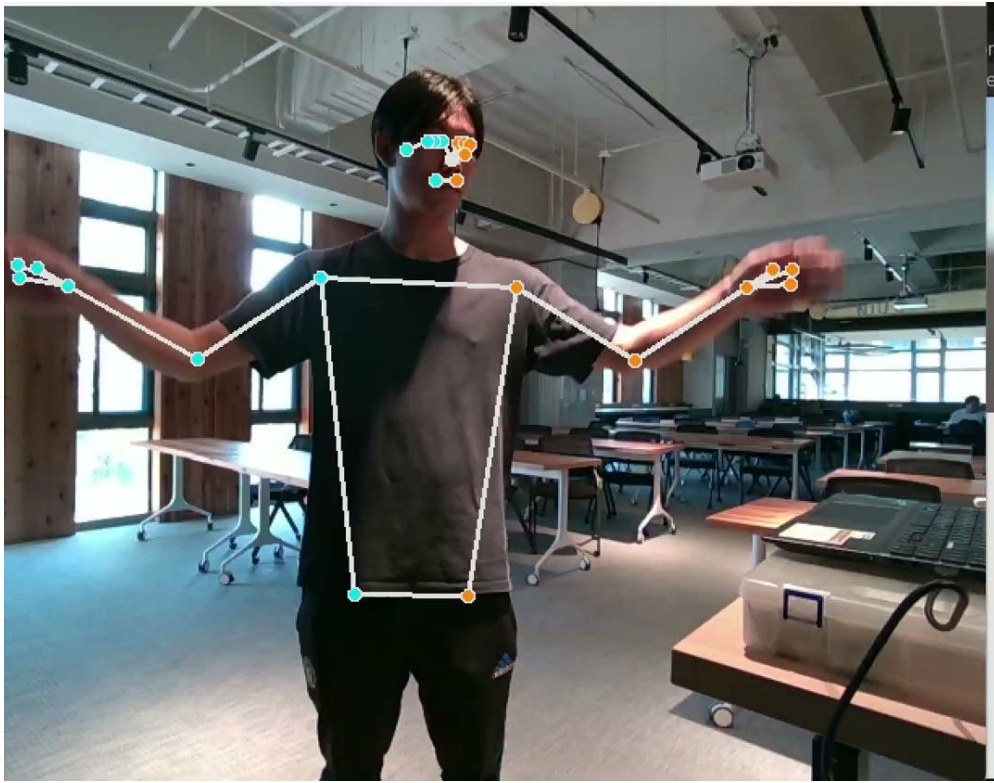
Lab Schedule

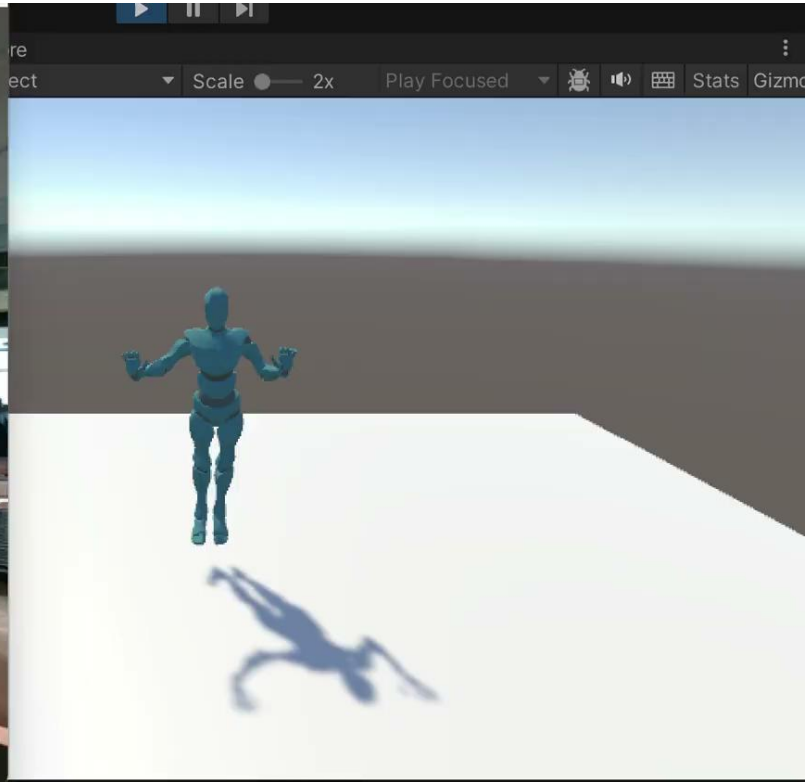
- 9/5 Lab 0 - Bootstrapping
- 9/12 Lab 1 - Marker Detection
- 9/19 Lab 2 - Calibration
- 9/26 Lab 3 - Game Design 1
- 10/3 Lab 4 - Game Design 2
- 10/10 National Holiday (No Class)
- 10/17 UIST (No Physical class)
- 10/24 Midterm Demo

What we will do



What we will do





Outline

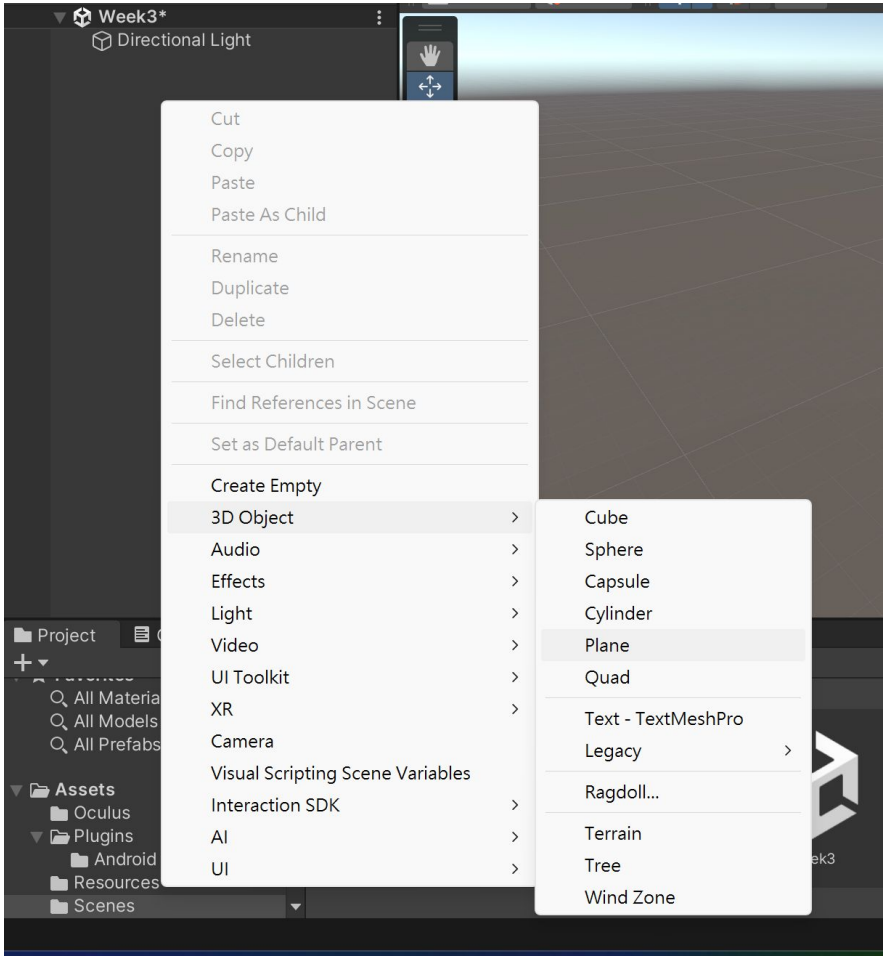
- Hand Tracking - Quest
- Pointable Unity Event Wrapper
- Unity Humanoid Avatar
- Add Walking Animation
- Add Follow VR
- Python Media Pipe
- To Do

Hand Tracking - Quest

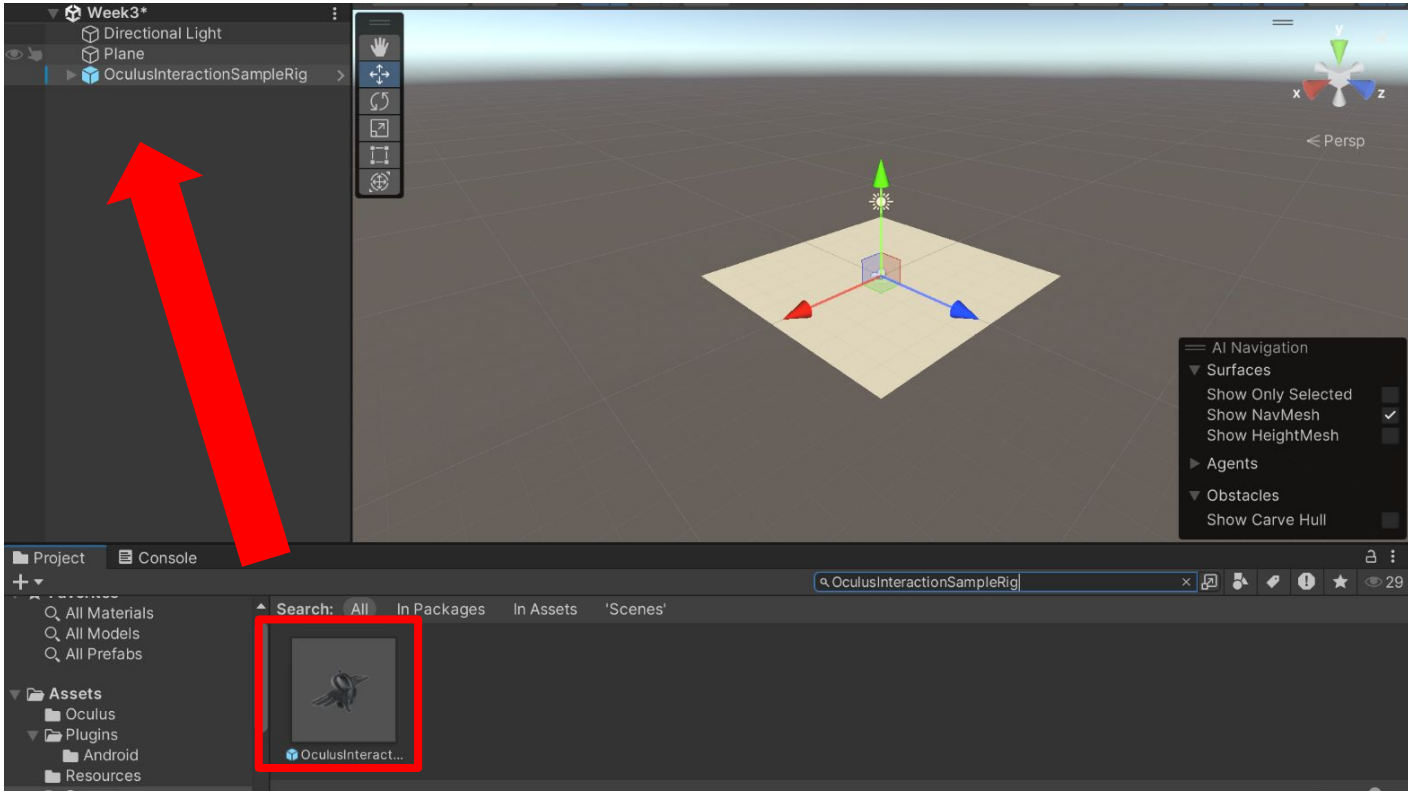
Meta Hand Grab Interactions

- Hand tracking and grabbing virtual objects.
- Documents

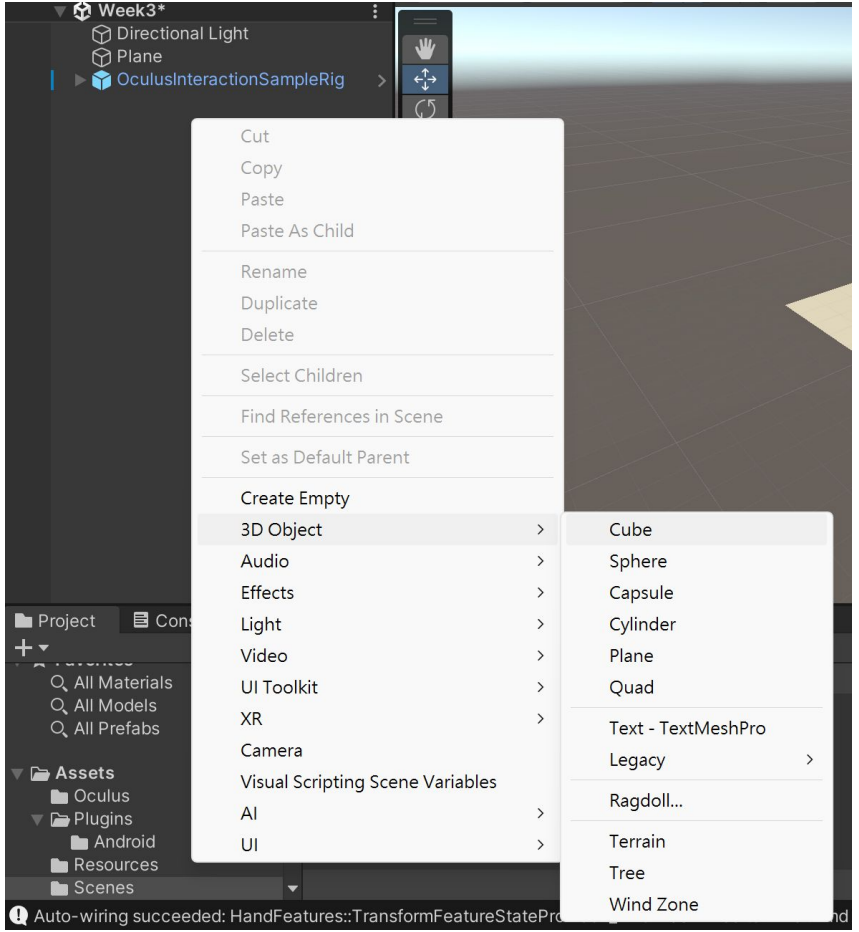
Create a plane



Add Oculus Interaction Sample Rig

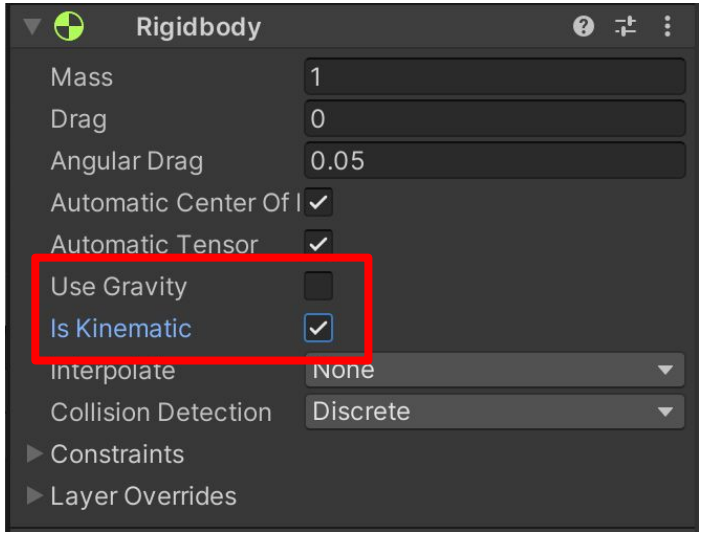


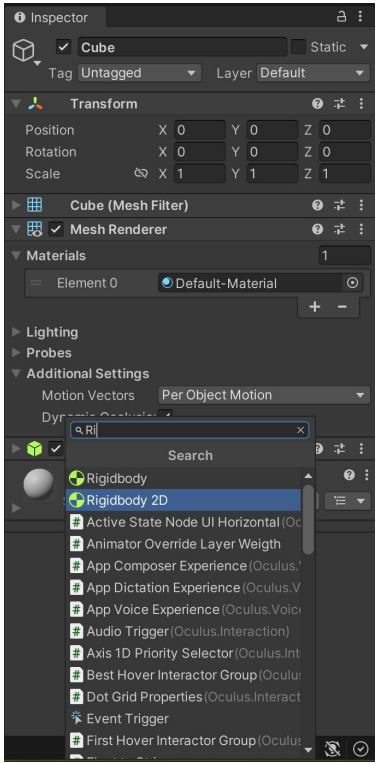
Add Cube


Week3*
Directional Light
Plane
OculusInteractionSampleRig
Cut
Copy
Paste
Paste As Child
Rename
Duplicate
Delete
Select Children
Find References in Scene
Set as Default Parent
Create Empty
3D Object
Audio
Effects
Light
Video
UI Toolkit
XR
Camera
Visual Scripting Scene Variables
AI
UI
Cube
Sphere
Capsule
Cylinder
Plane
Quad
Text - TextMeshPro
Legacy
Ragdoll...
Terrain
Tree
Wind Zone
Project
All Materials
All Models
All Prefabs
Assets
Oculus
Plugins
Android
Resources
Scenes
Auto-wiring succeeded: HandFeatures::TransformFeatureStatePro

Add Rigidbody

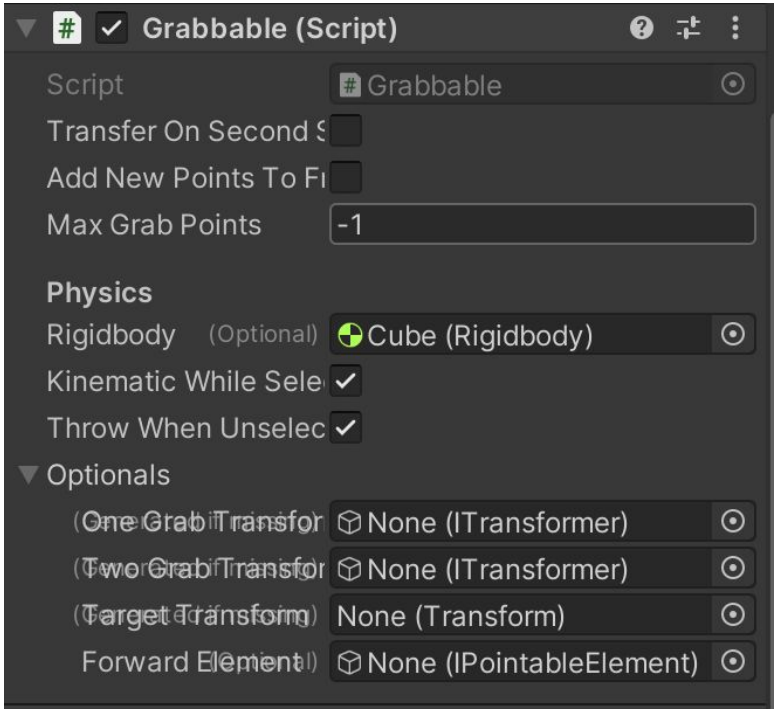
- Gravity: Object fall to the ground.
- Kinematic: Controls whether physics affects the rigidbody.
  - Enabled: Forces, collisions will not affect





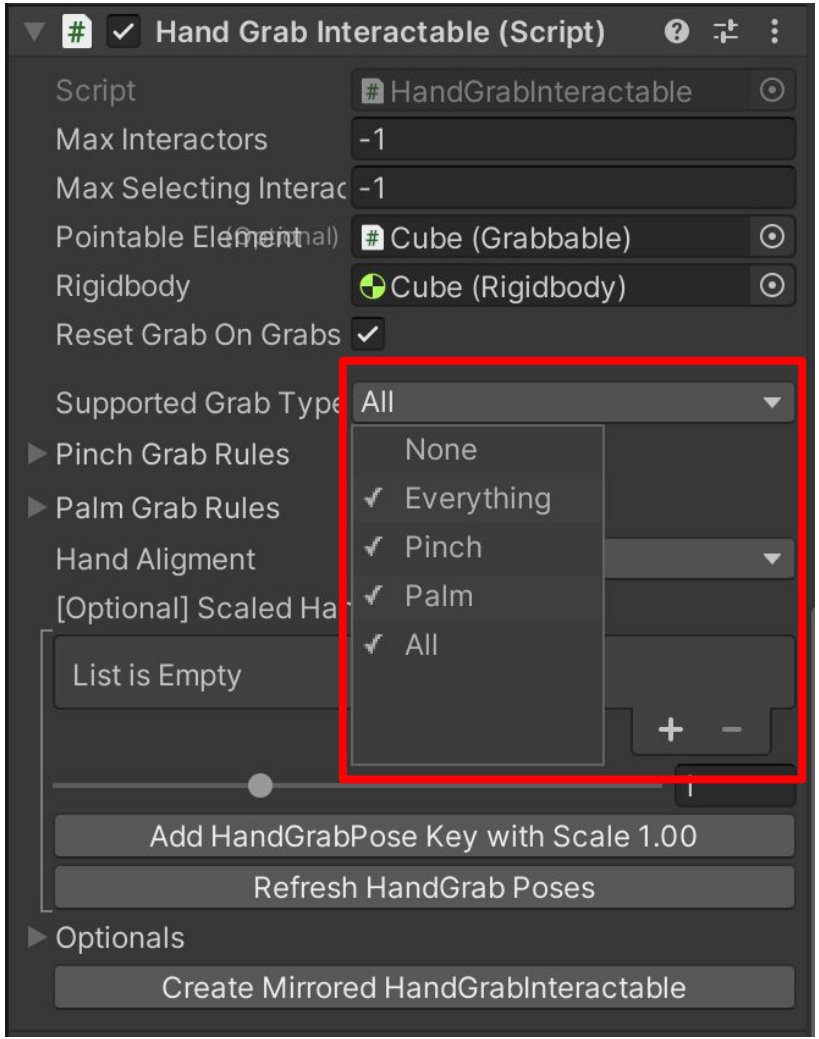
Add Grabbable

- Makes a GameObject rotate, scale, or transform with user interaction.
- Doc



Add Hand Grab Interactable

- Makes an object grabbable by hands.
- Doc



Pointable Unity Event Wrapper

Pointer, Pointer handler and objects

Pointer

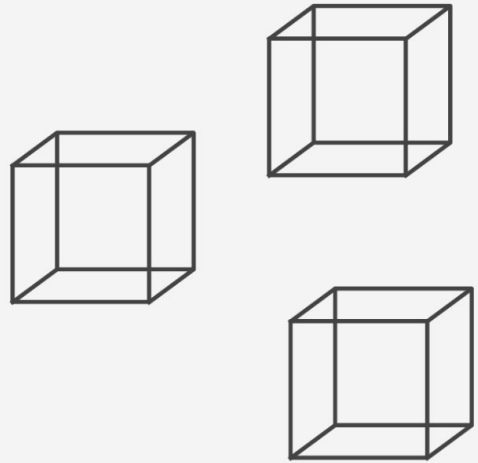
Pointer handler

Grabbable

Input

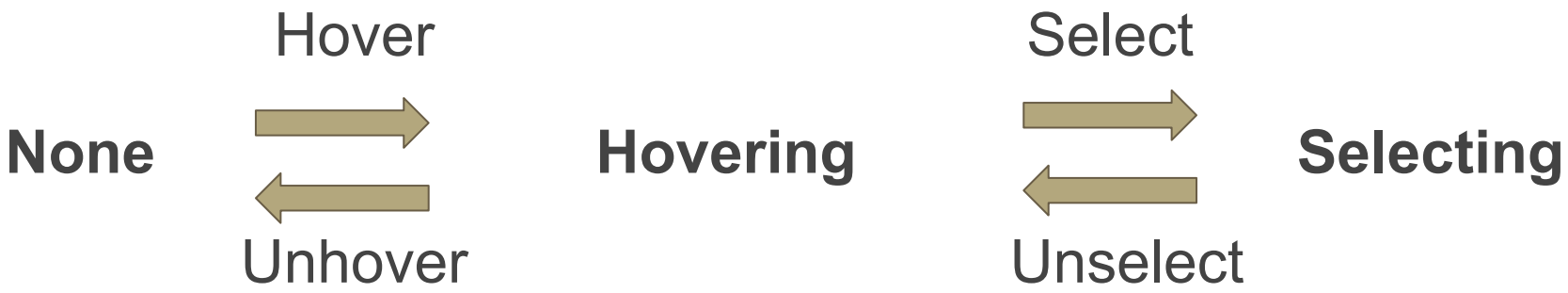
Change

Objects

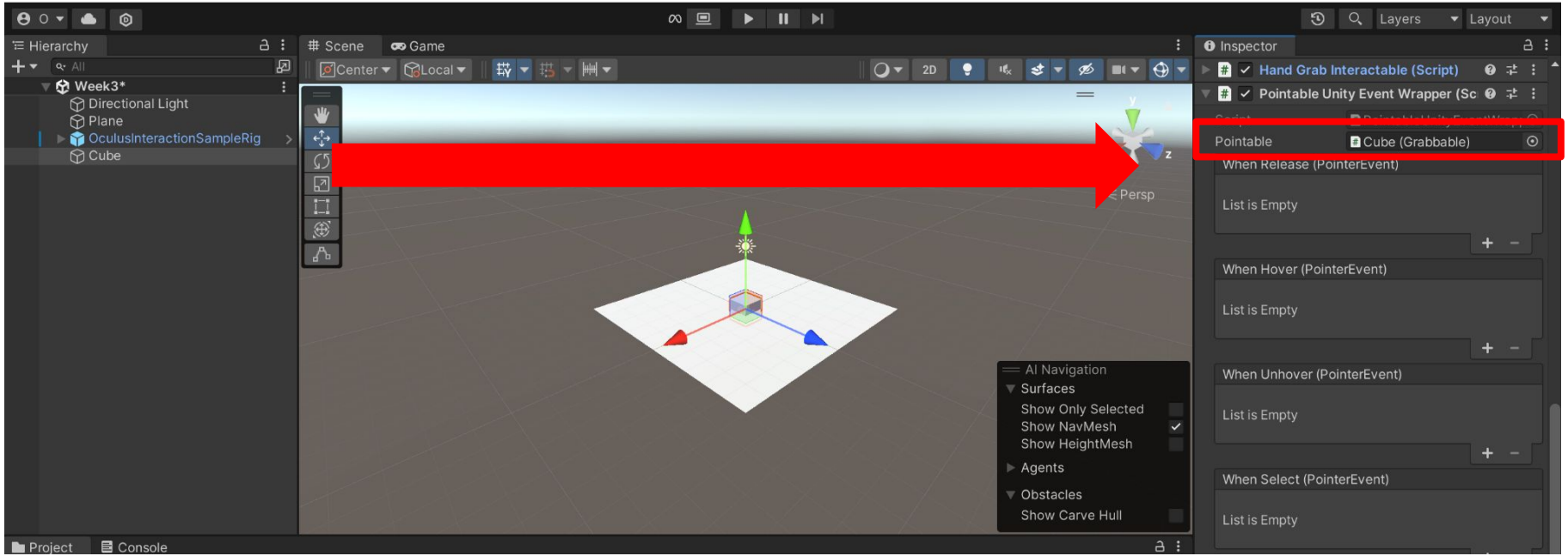


Pointer Events

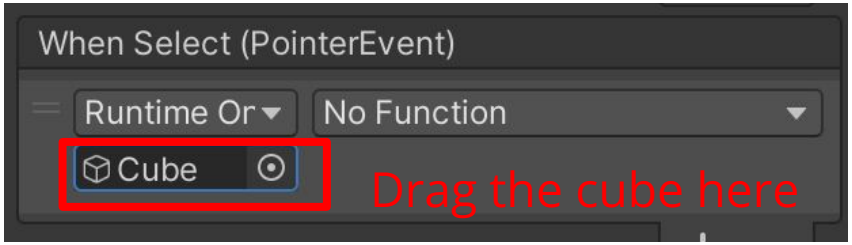
- **Hover:** Being hovered by a pointer.
- **Unhover:** Stopped being hovered by a pointer.
- **Select:** Has performed the Select action.
- **Unselect:** A previous Select state has ended
- **Move:** The pointer was moved on the pointable.
- **Cancel:** Event canceled.



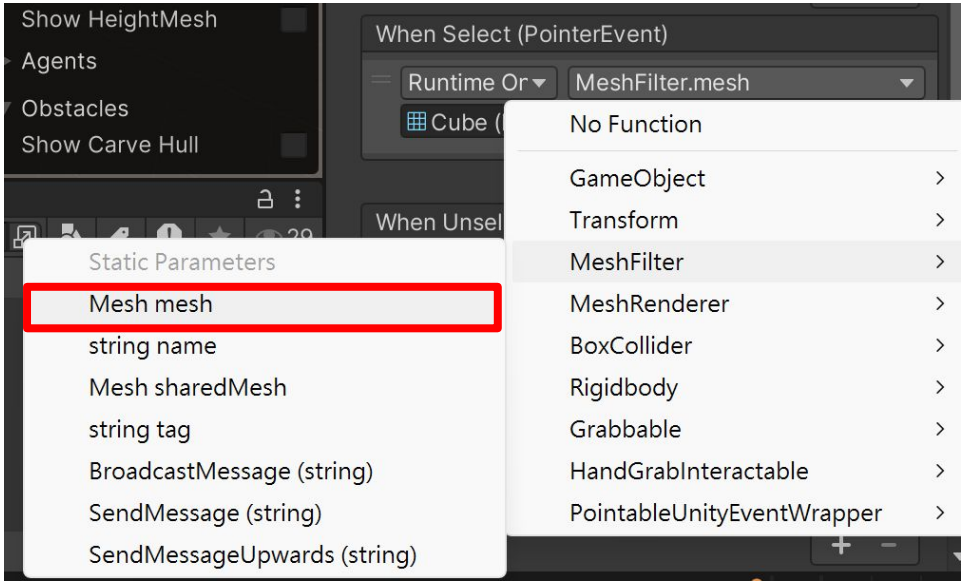
Add Pointable Unity Event Wrapper



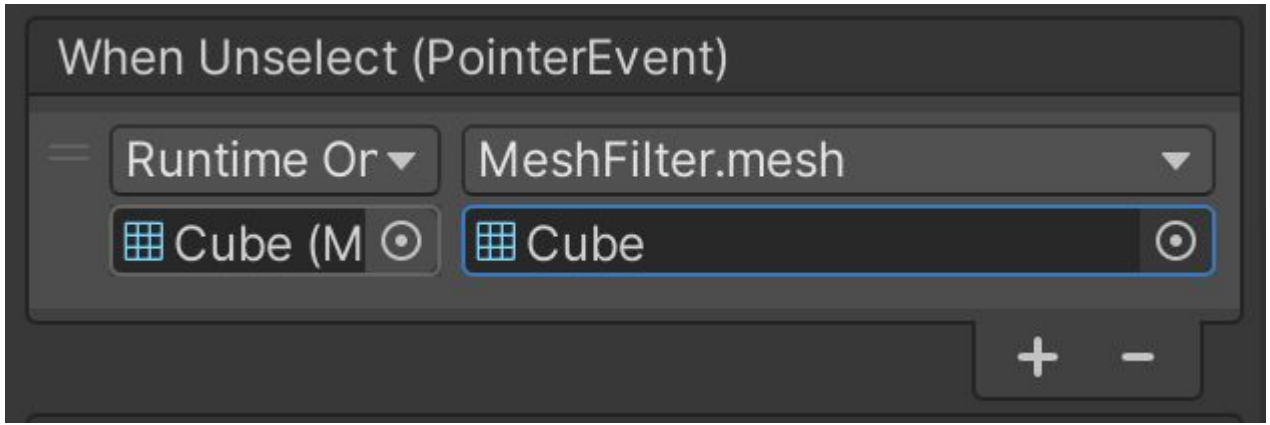
Change shape when grabbed

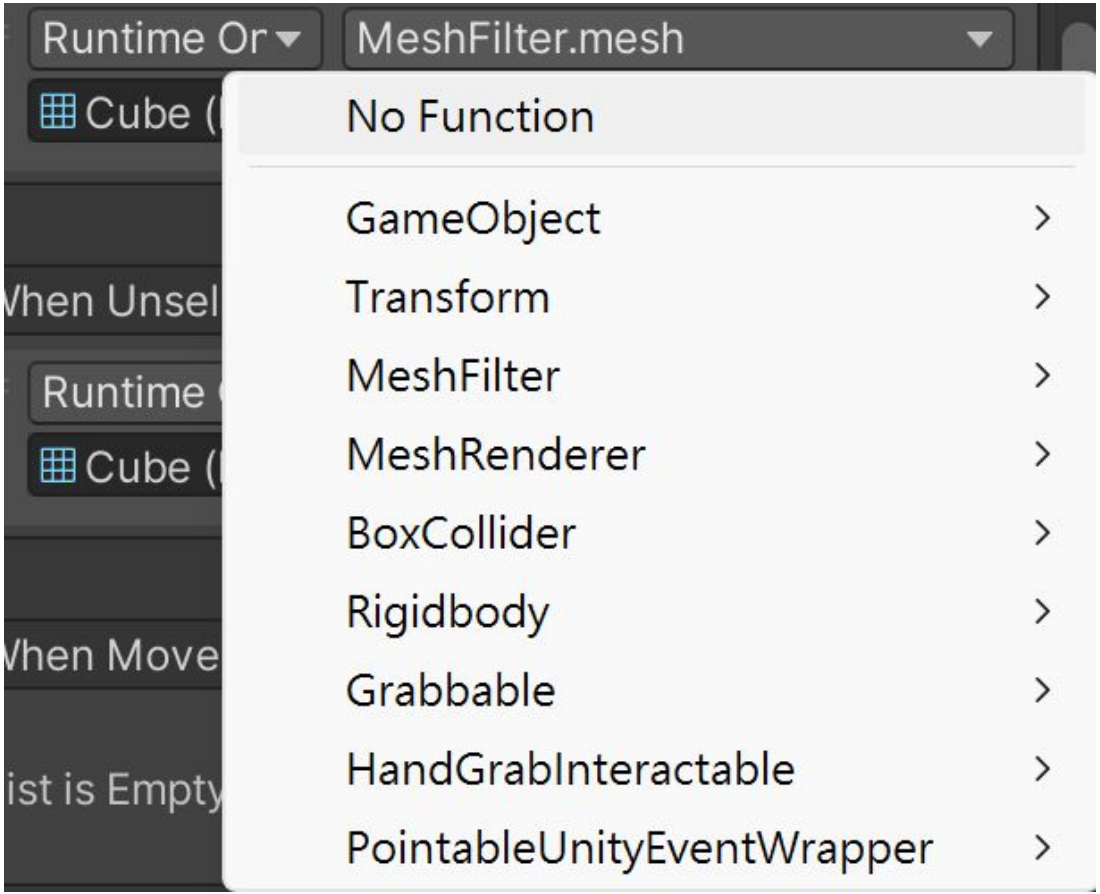


Select mesh



Change shape when ungrabbed



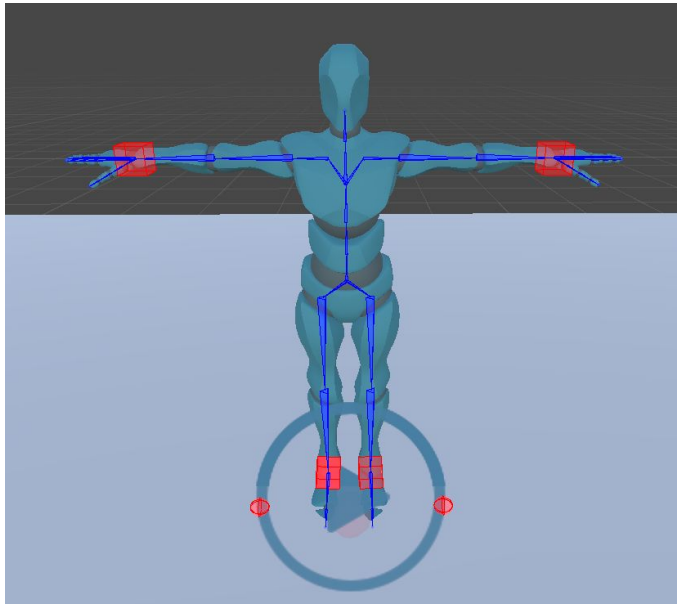

Runtime Or
MeshFilter.mesh
Cube (
No Function
GameObject
Transform
MeshFilter
MeshRenderer
BoxCollider
Rigidbody
Grabbable
HandGrabInteractable
PointableUnityEventWrapper
hen Unsel
Runtime
Cube (
hen Move
ist is Empty

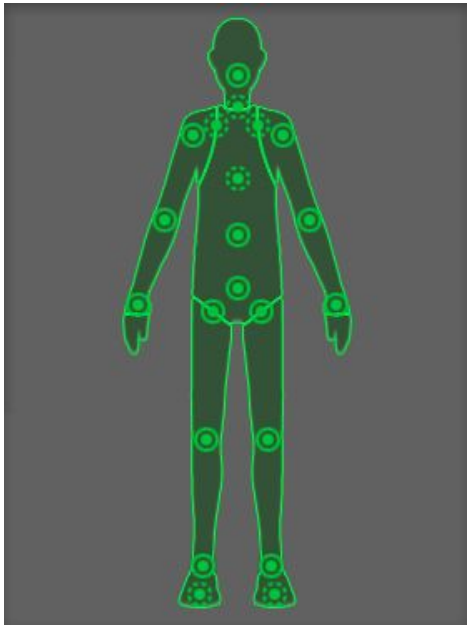
What if we want to track the person without VR ?

Unity Humanoid Avatar

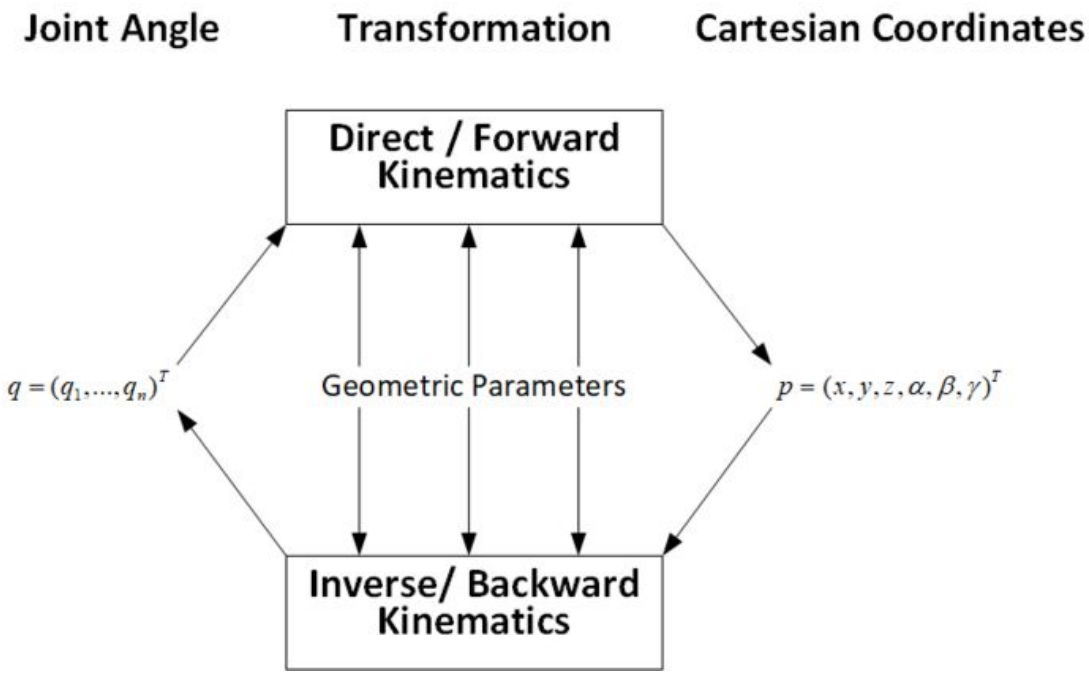
Humanoid Avatars

Special features for working with humanoid characters animation

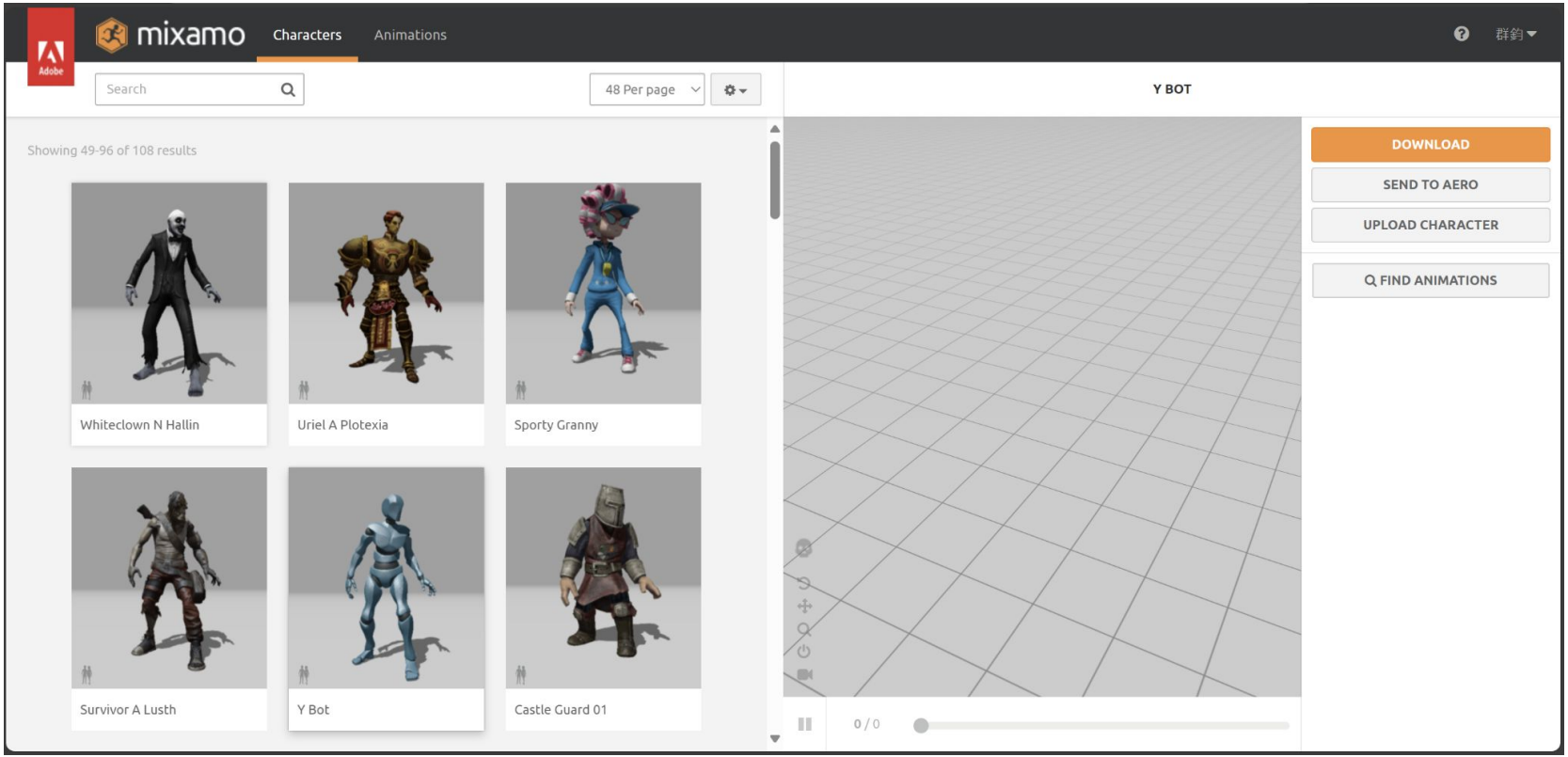




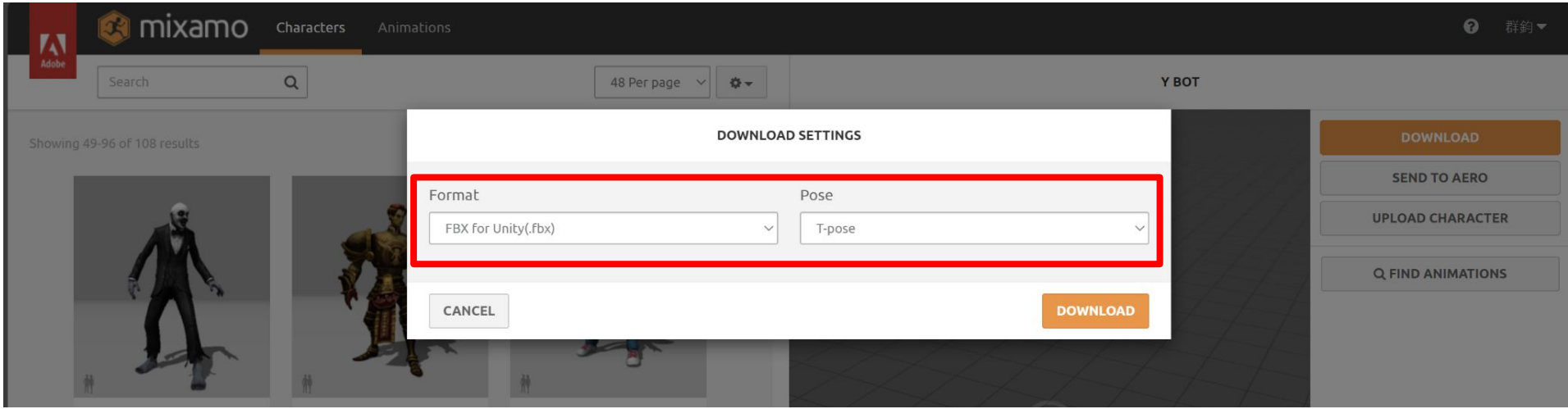
Inverse Kinematics (IK)

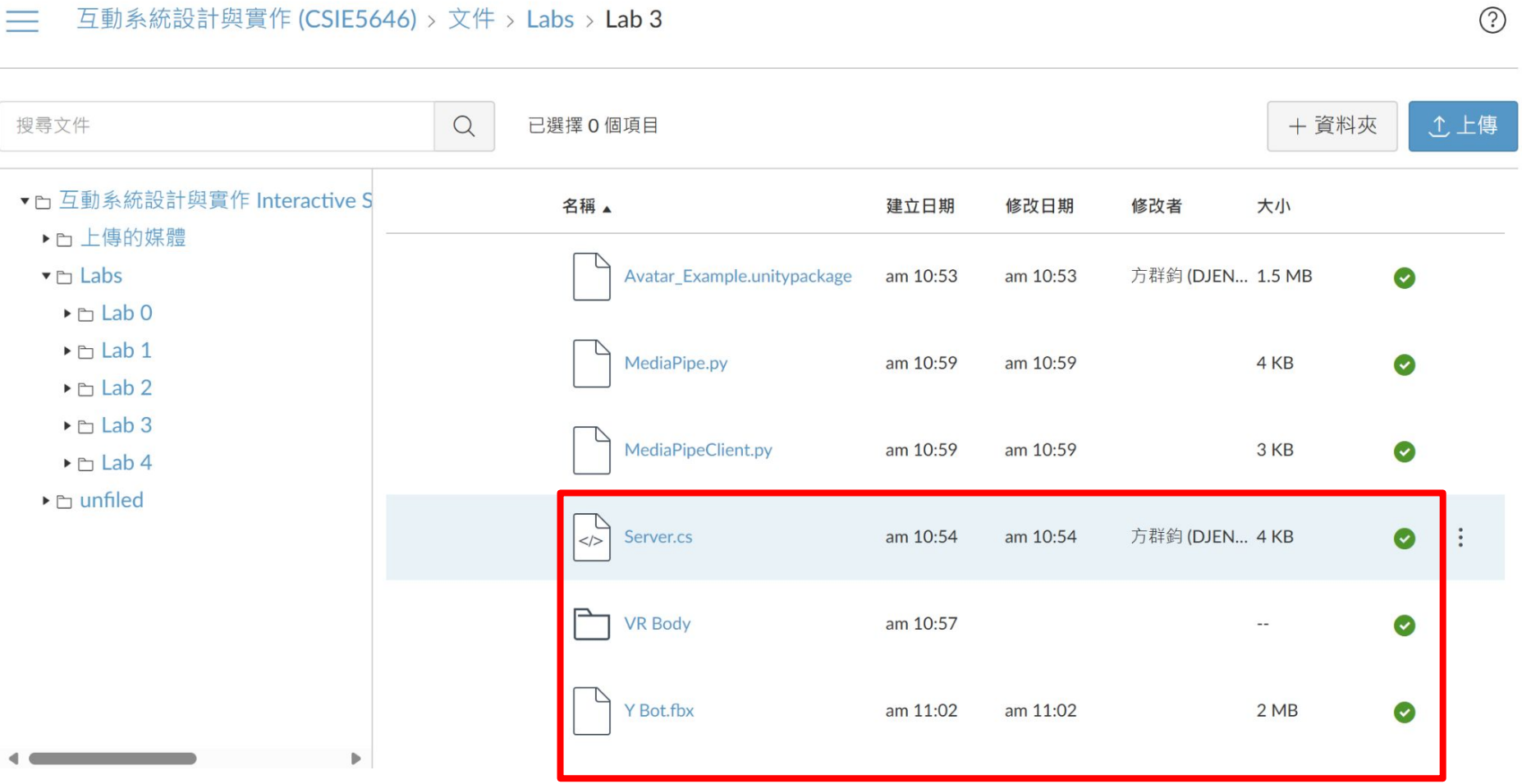


Mixamo link

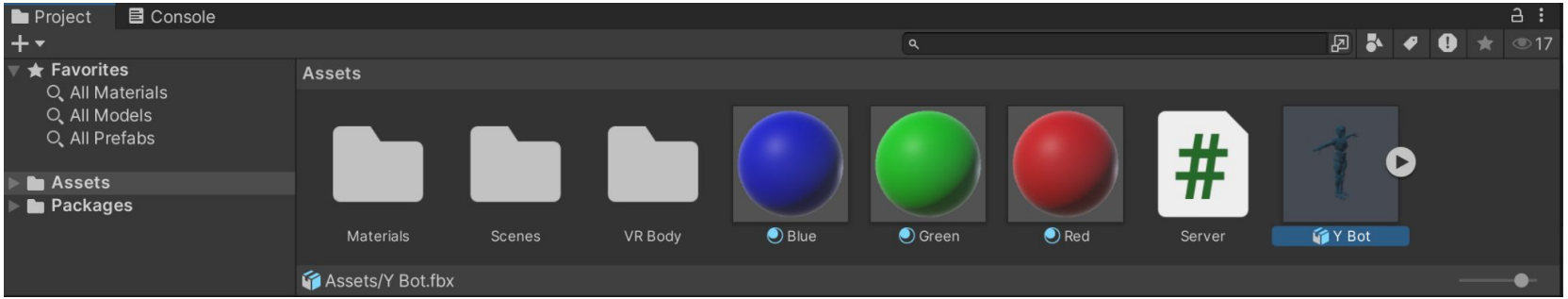

mixamo
Characters
Animations
Search
48 Per page
Y BOT
Showing 49-96 of 108 results
DOWNLOAD
SEND TO AERO
UPLOAD CHARACTER
FIND ANIMATIONS
Whiteclown N Hallin
Uriel A Plotexia
Sporty Granny
Survivor A Lusth
Y Bot
Castle Guard 01
0 / 0

Download Character

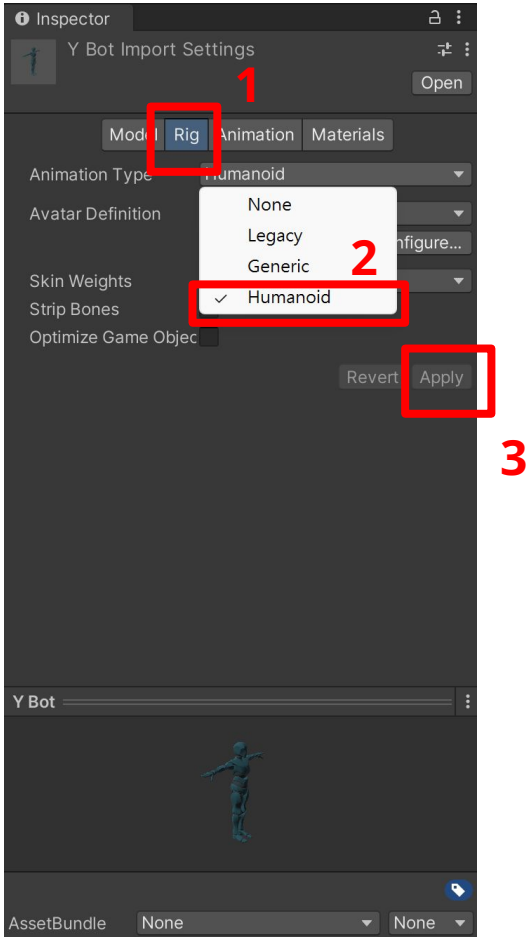



互動系統設計與實作 (CSIE5646) › 文件 › Labs › Lab 3
搜尋文件
已選擇 0 個項目
＋ 資料夾
上傳
互動系統設計與實作 Interactive S
上傳的媒體
Labs
Lab 0
Lab 1
Lab 2
Lab 3
Lab 4
unfiled
名稱
建立日期
修改日期
修改者
大小
Avatar_Example.unitypackage am 10:53 am 10:53 方群鈞 (DJEN... 1.5 MB
MediaPipe.py am 10:59 am 10:59 4 KB
MediaPipeClient.py am 10:59 am 10:59 3 KB
Server.cs am 10:54 am 10:54 方群鈞 (DJEN... 4 KB
VR Body am 10:57 --
Y Bot.fbx am 11:02 am 11:02 2 MB

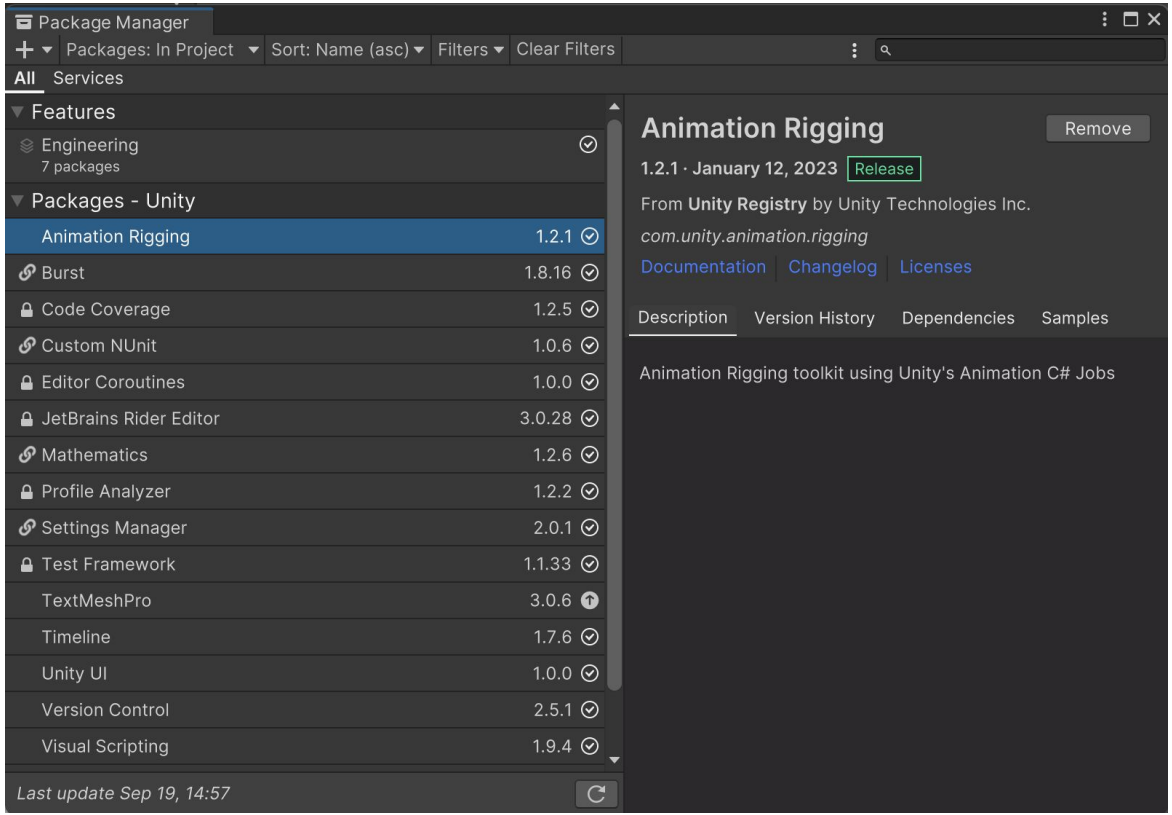
Add them to Unity Asset



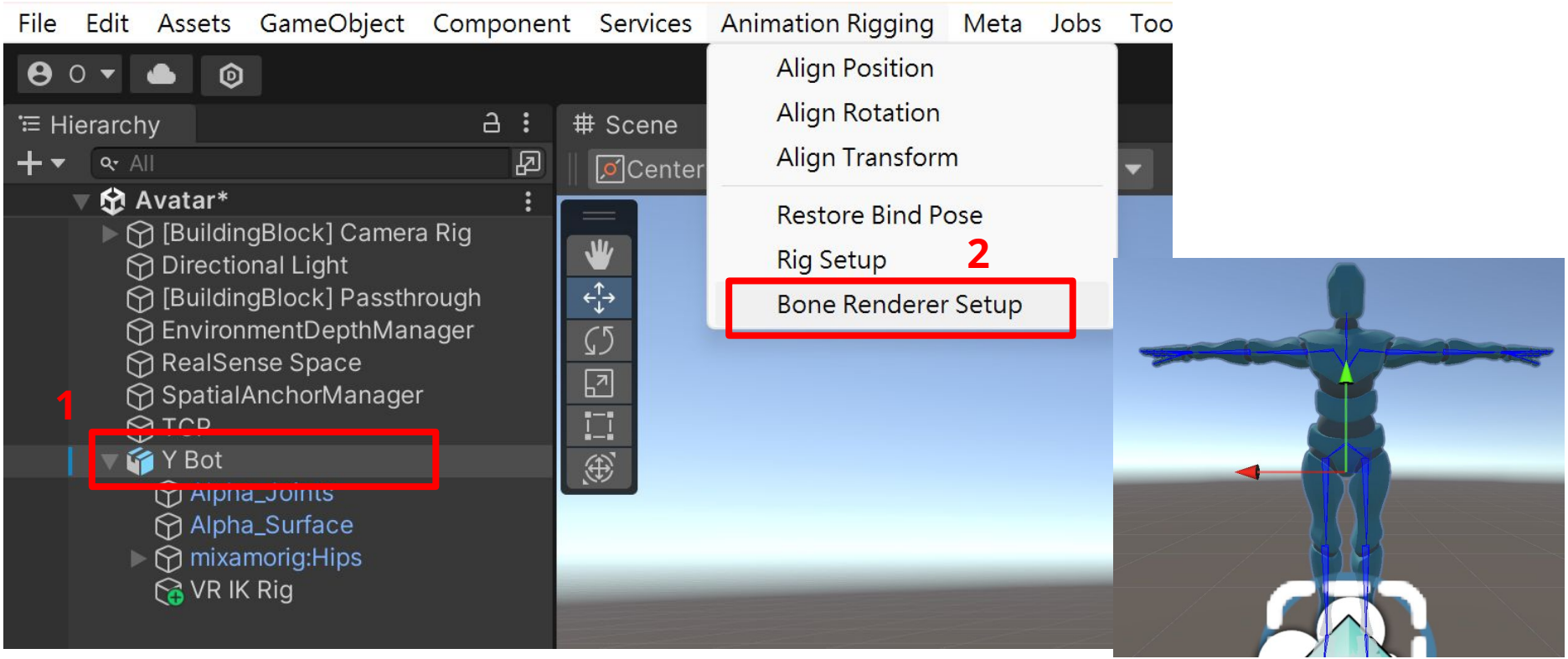
Add Humanoid Rig



Install Animation Rigging 1.2.1 link

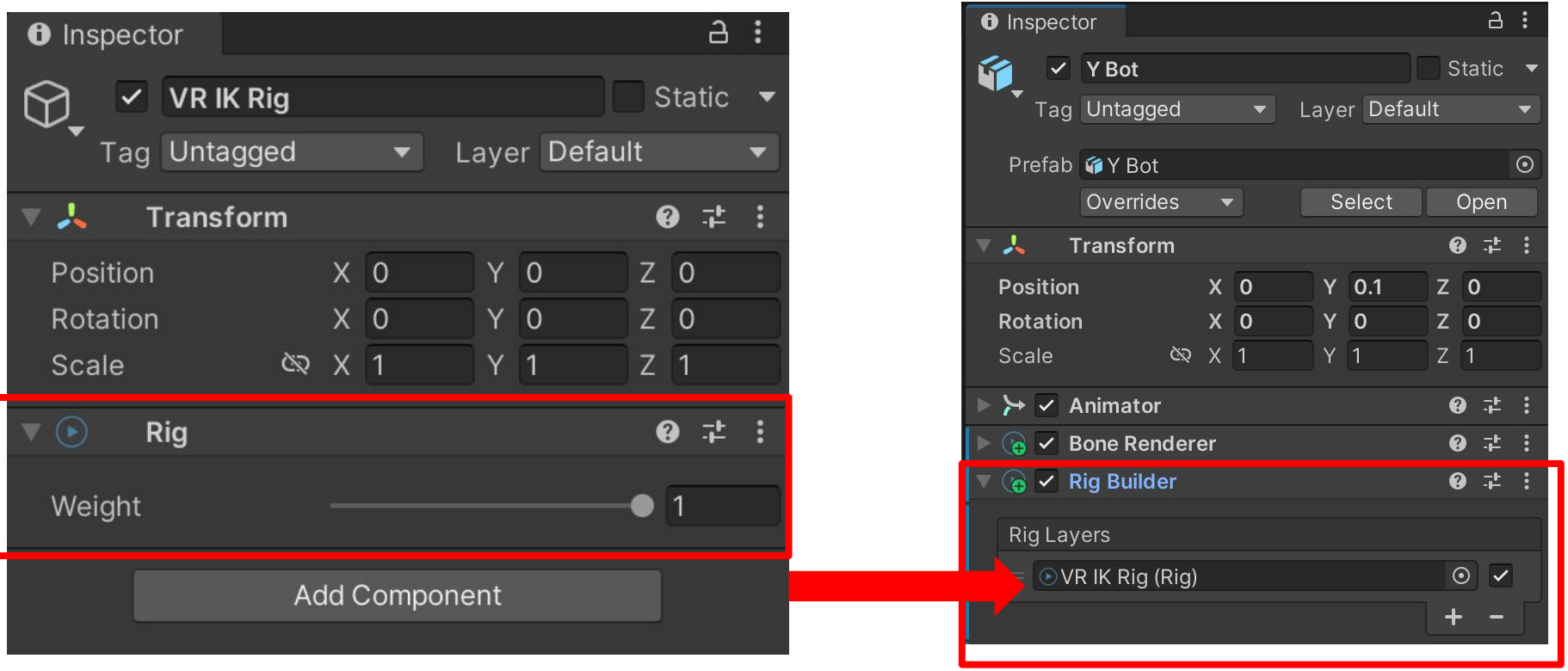


Setup Bone Renderer

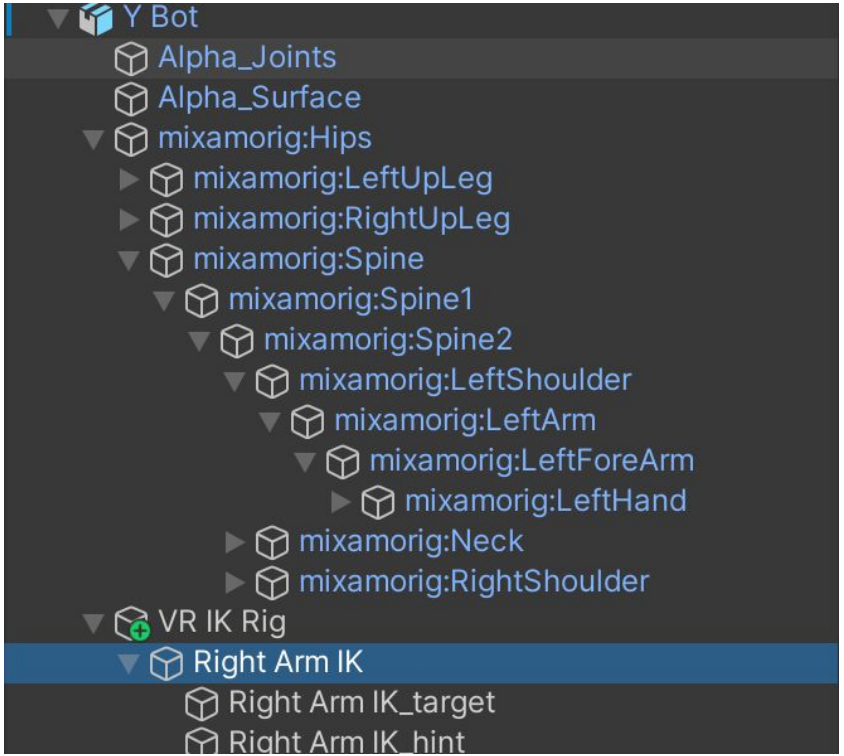


Create Empty GameObject VR IK Rig under avatar

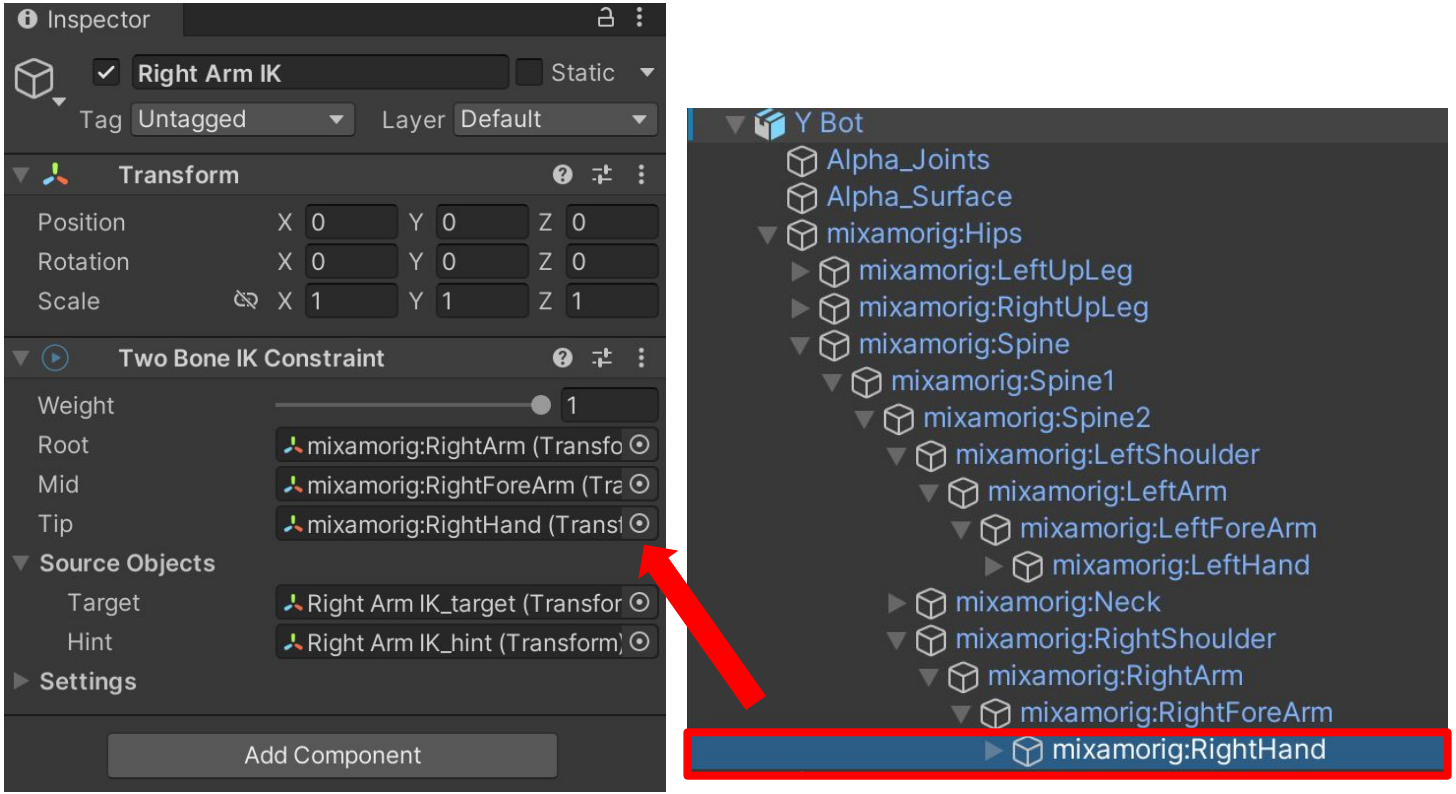
Add Rig & Rig Builder



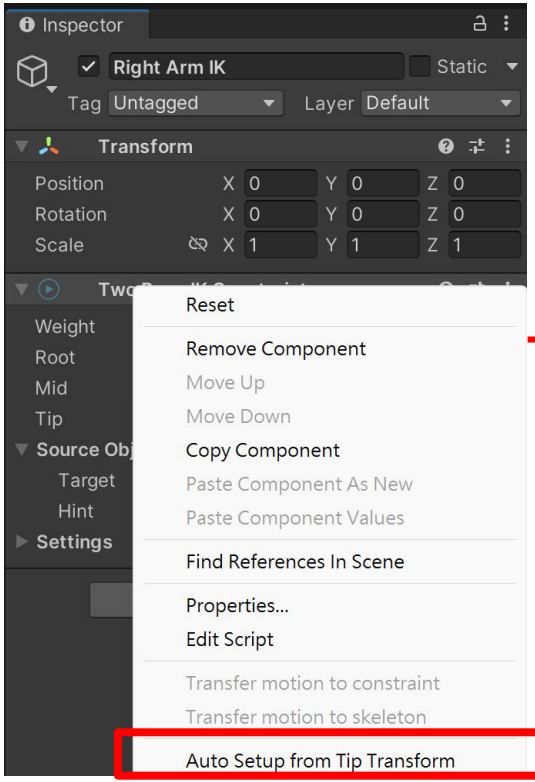
Create Empty GameObject Right Arm IK



Add Two Bone IK Constraint - 1



Add Two Bone IK Constraint - 2



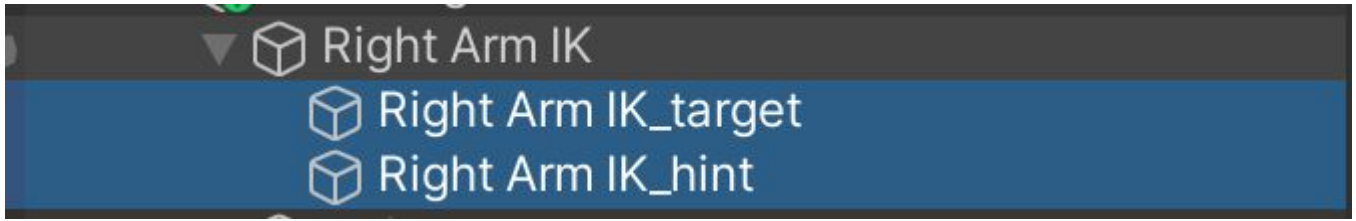
1. Right click Two Bone IK Constraint

2.

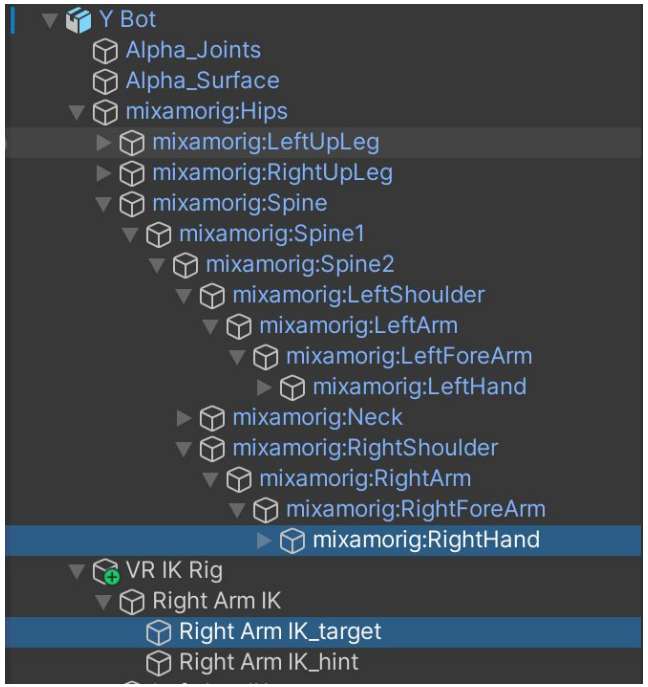
Add Two Bone IK Constraint - 3 link

Target - Source GameObject that specifies the desired position of the Tip.

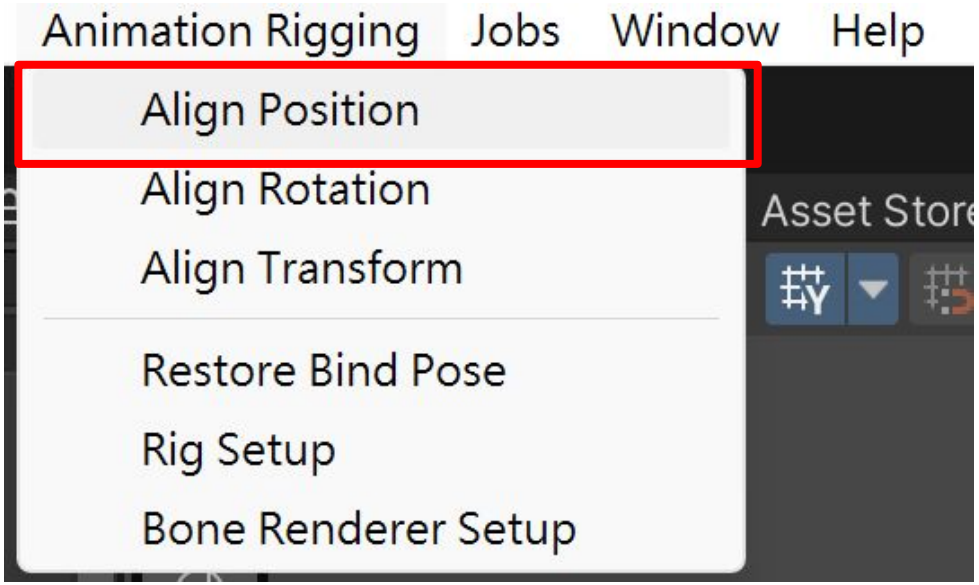
Hint - Optional Source GameObject, whose position is used to specify the direction the limb should be oriented when it bends.



Align target with Avatar hand

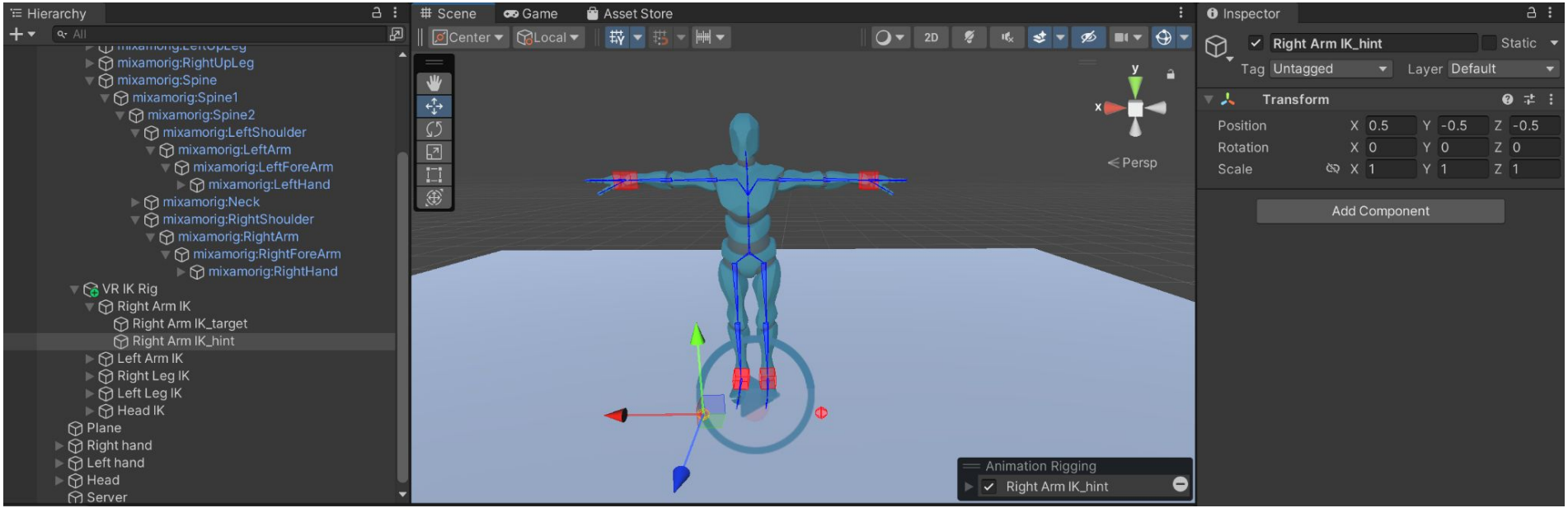


1. Select both

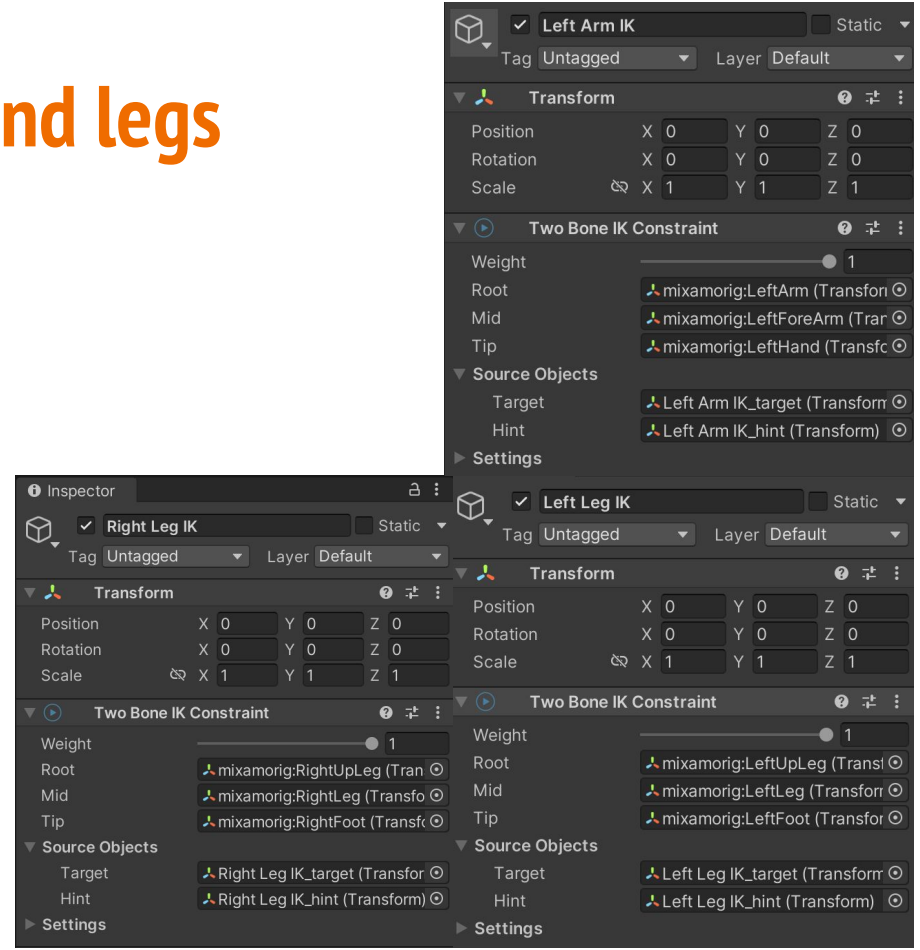


2. Align Position

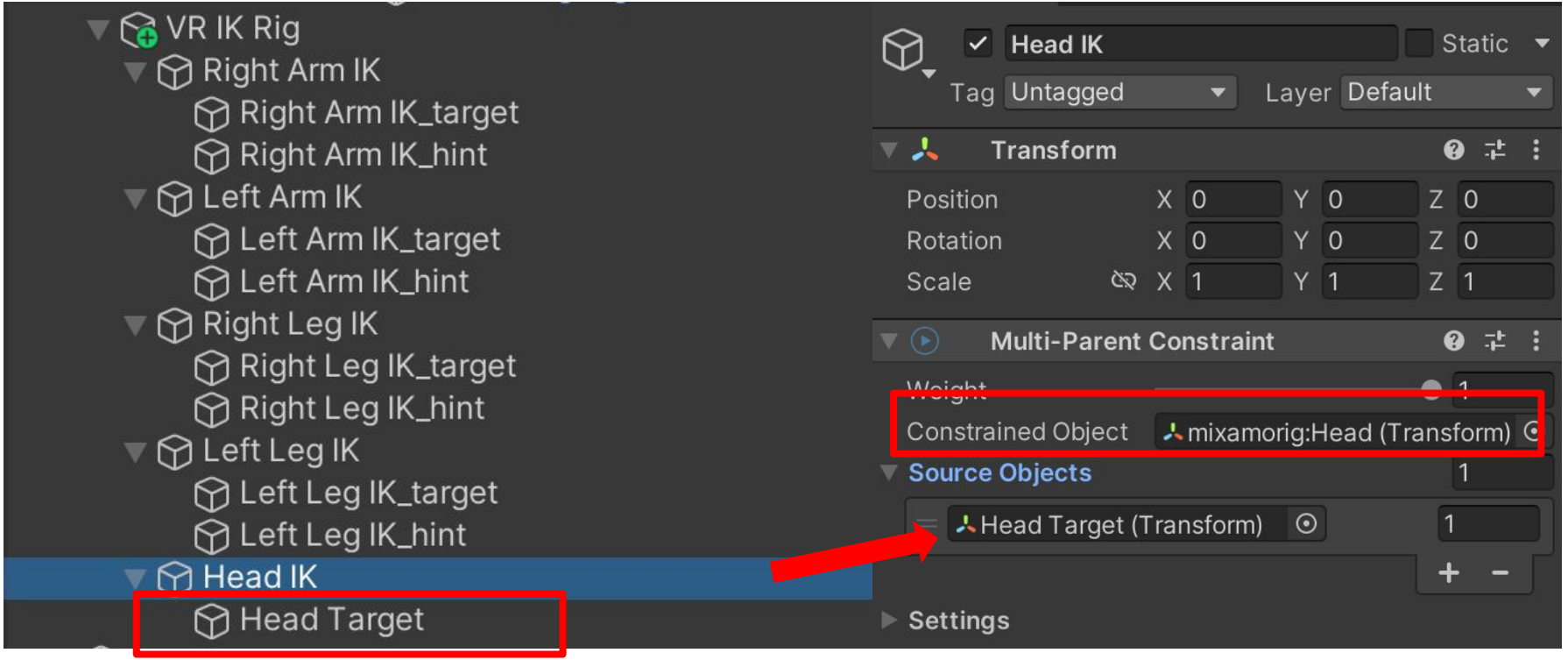
Move hint next to the Avatar



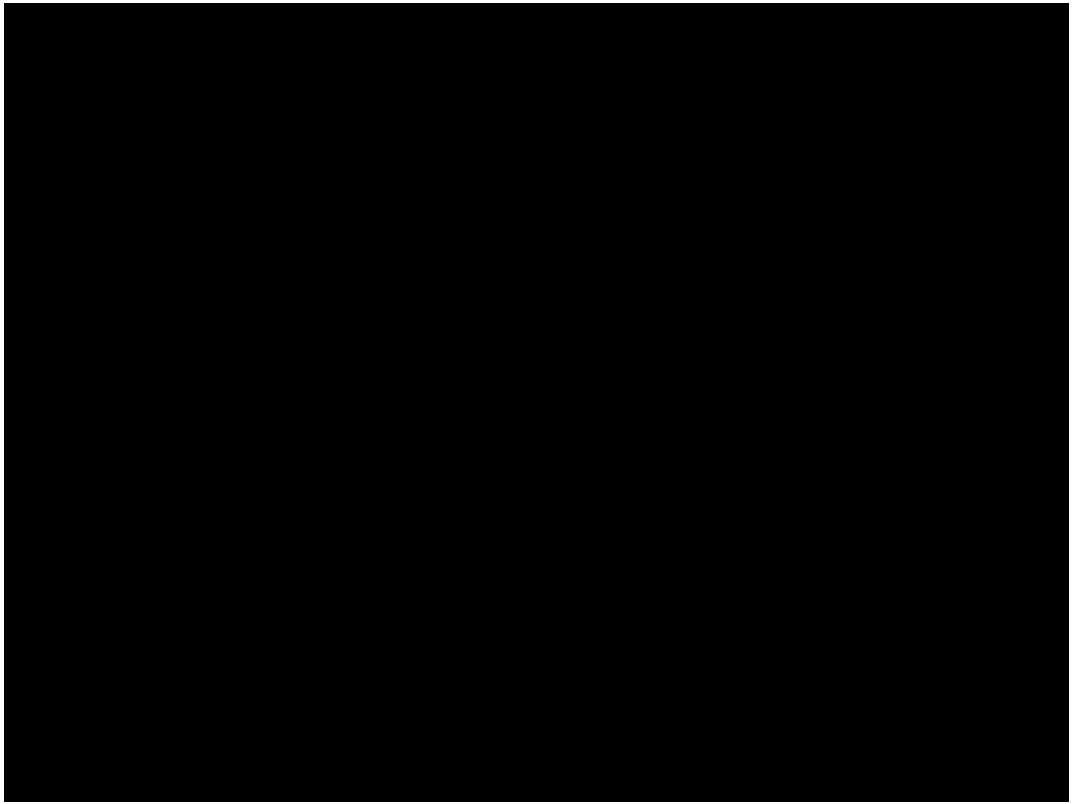
Repeat the steps for hands and legs



Head IK link

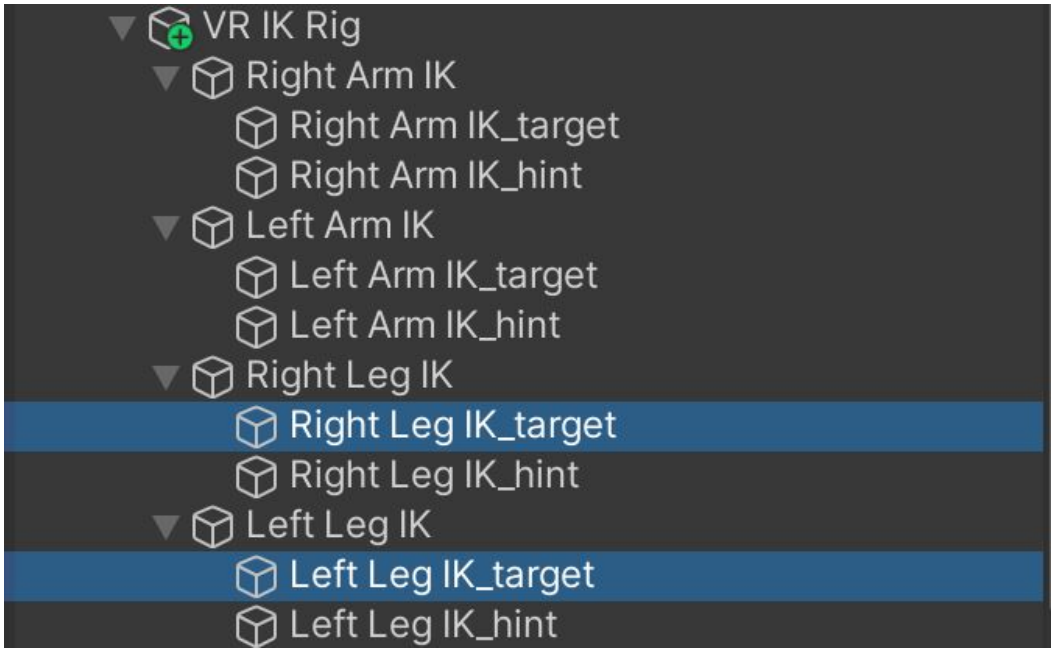

VR IK Rig
Right Arm IK
Right Arm IK_target
Right Arm IK_hint
Left Arm IK
Left Arm IK_target
Left Arm IK_hint
Right Leg IK
Right Leg IK_target
Right Leg IK_hint
Left Leg IK
Left Leg IK_target
Left Leg IK_hint
Head IK
Head Target
Head IK
Static
Tag Untagged
Layer Default
Transform
Position X 0 Y 0 Z 0
Rotation X 0 Y 0 Z 0
Scale X 1 Y 1 Z 1
Multi-Parent Constraint
Constrained Object mixamorig:Head (Transform)
Source Objects 1
Head Target (Transform) 1
Settings

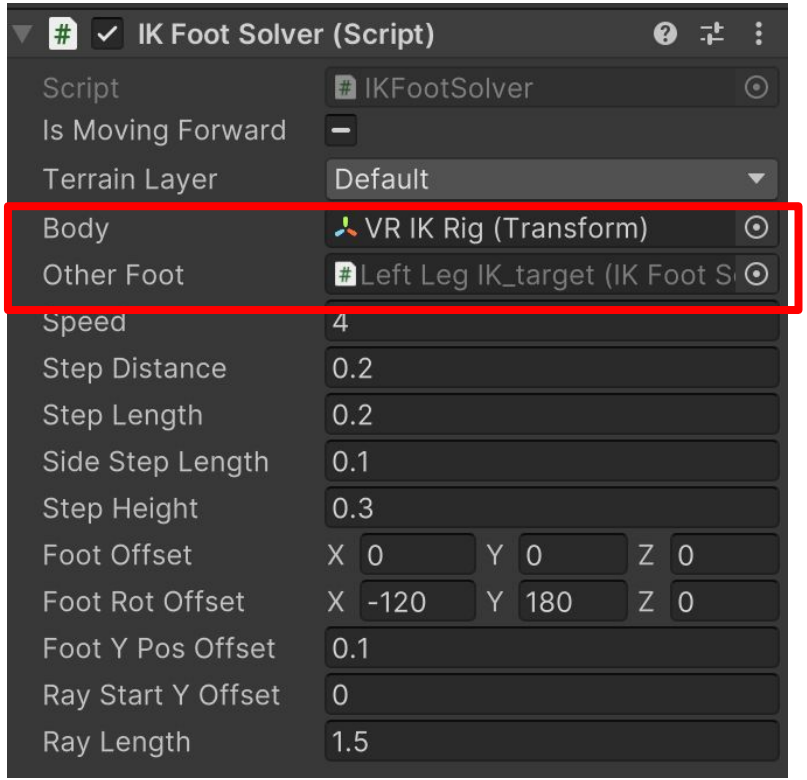
Test your avatar



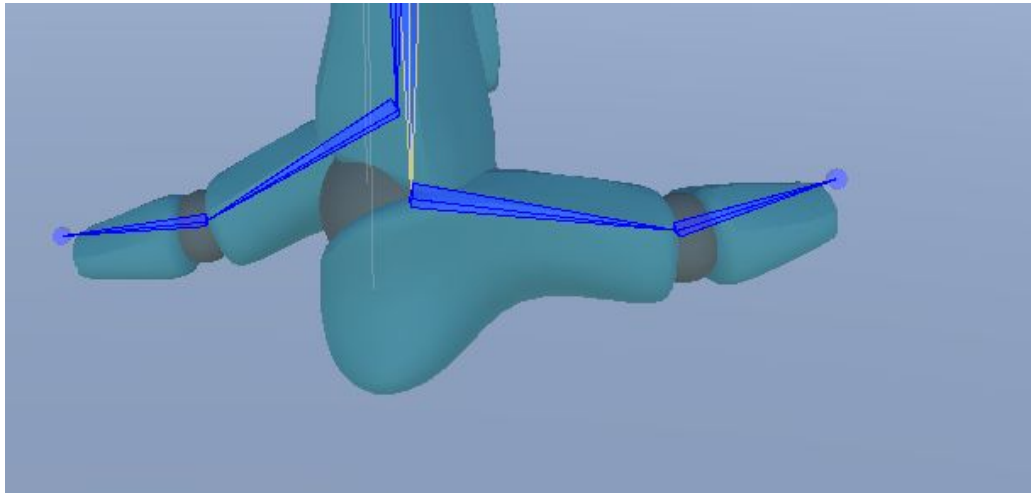
Add Walking Animation

Add IK Foot Solver Script





Modify Offset



IK Foot Solver (Script)

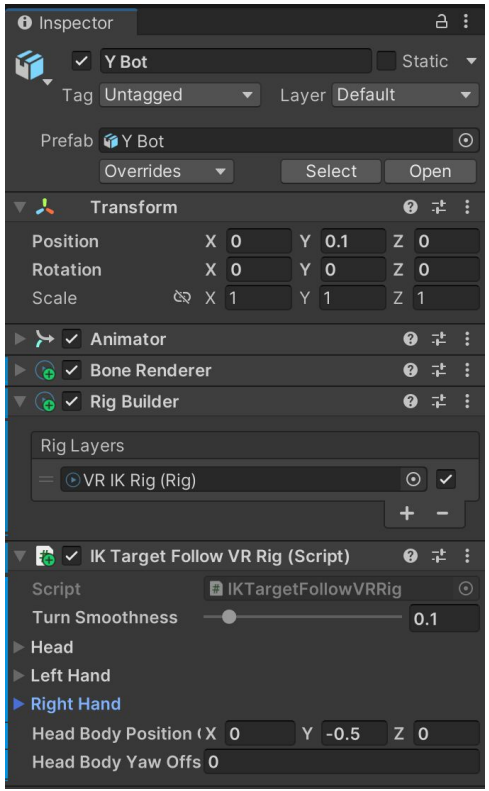
Script	IKFootSolver
Is Moving Forward	–
Terrain Layer	Default
Body	VR IK Rig (Transform)
Other Foot	Left Leg IK_target (IK Foot S
Speed	4
Step Distance	0.2
Step Length	0.2
Side Step Length	0.1
Step Height	0.3
Foot Offset	X 0 Y 0 Z 0
Foot Rot Offset	X -120 Y 180 Z 0
Foot Y Pos Offset	0.1
Ray Start Y Offset	0
Ray Length	1.5

Add Follow VR

Create empty GameObjects

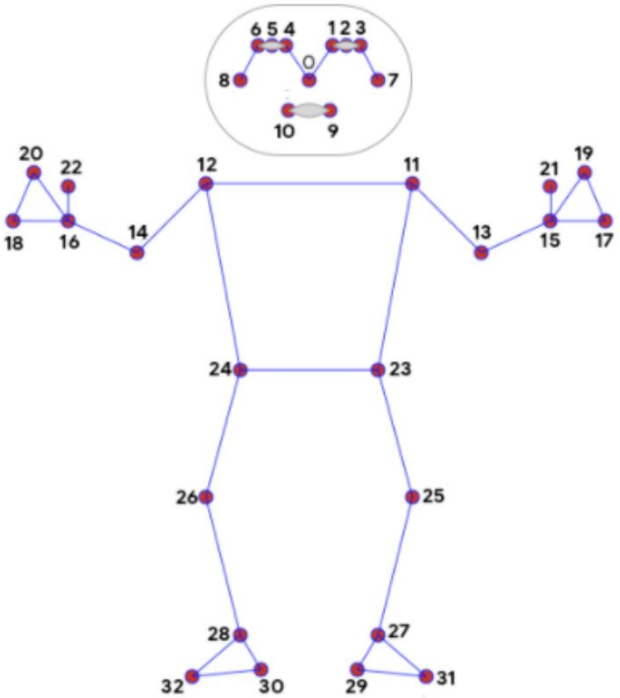
- Better create under RealSense Space Transform

Add IK Target Follow VR Rig



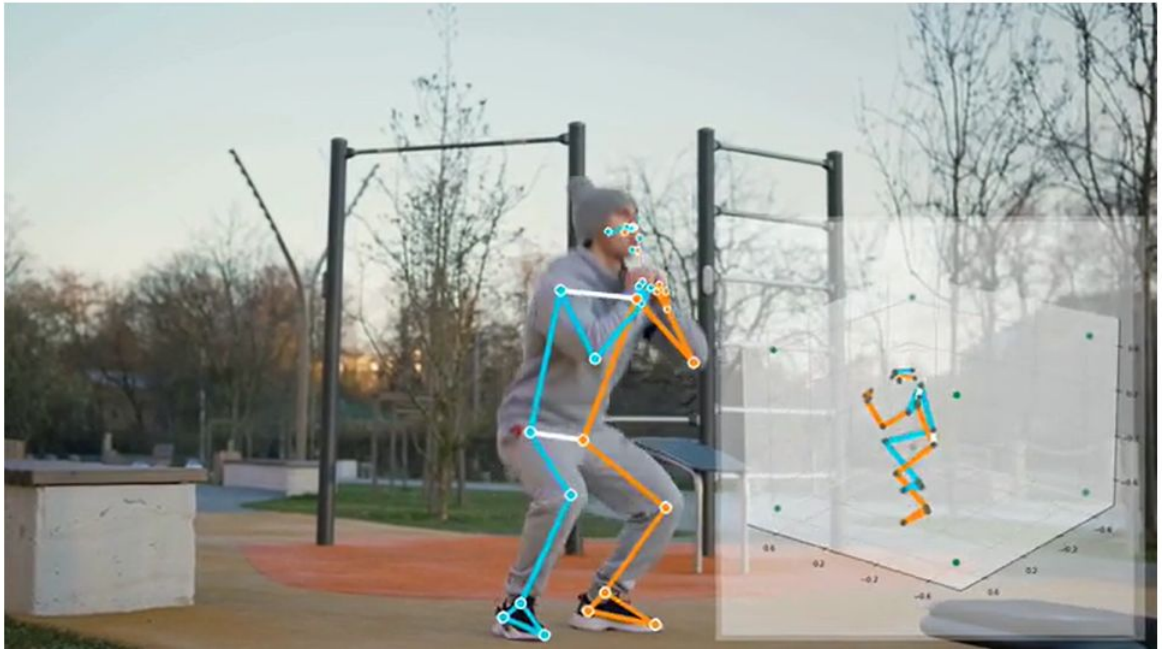
Python Media Pipe

MediaPipe Pose Link

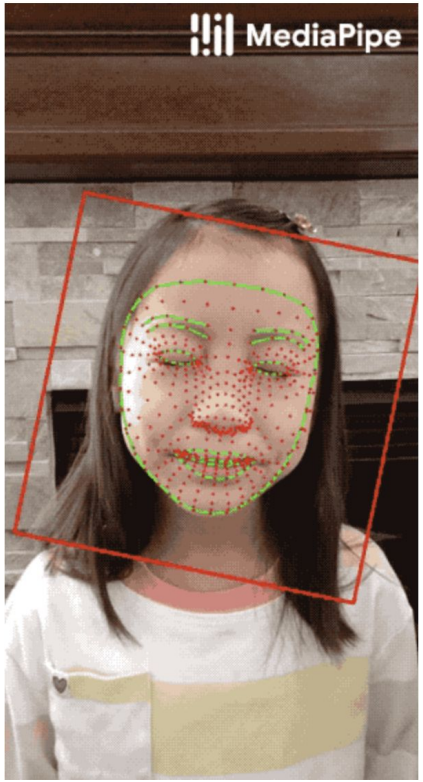


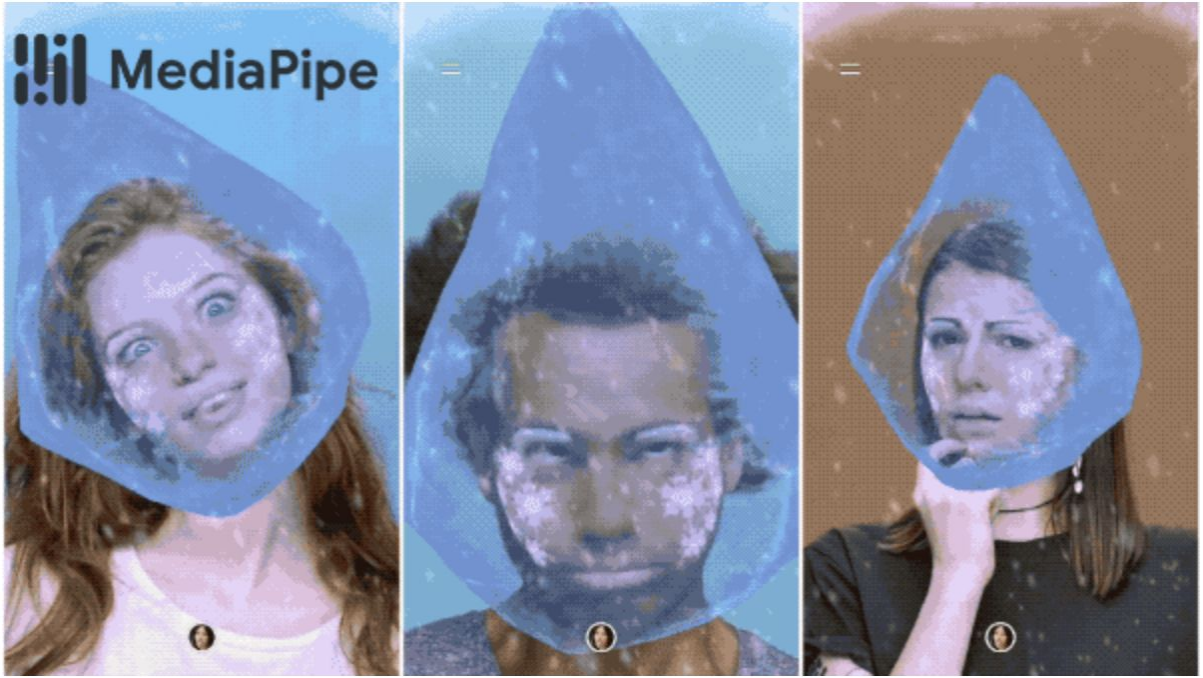
0. nose
1. left_eye_inner
2. left_eye
3. left_eye_outer
4. right_eye_inner
5. right_eye
6. right_eye_outer
7. left_ear
8. right_ear
9. mouth_left
10. mouth_right
11. left_shoulder
12. right_shoulder
13. left_elbow
14. right_elbow
15. left_wrist
16. right_wrist
17. left_pinky
18. right_pinky
19. left_index
20. right_index
21. left_thumb
22. right_thumb
23. left_hip
24. right_hip
25. left_knee
26. right_knee
27. left_ankle
28. right_ankle
29. left_heel
30. right_heel
31. left_foot_index
32. right_foot_index

real-world 3D coordinates

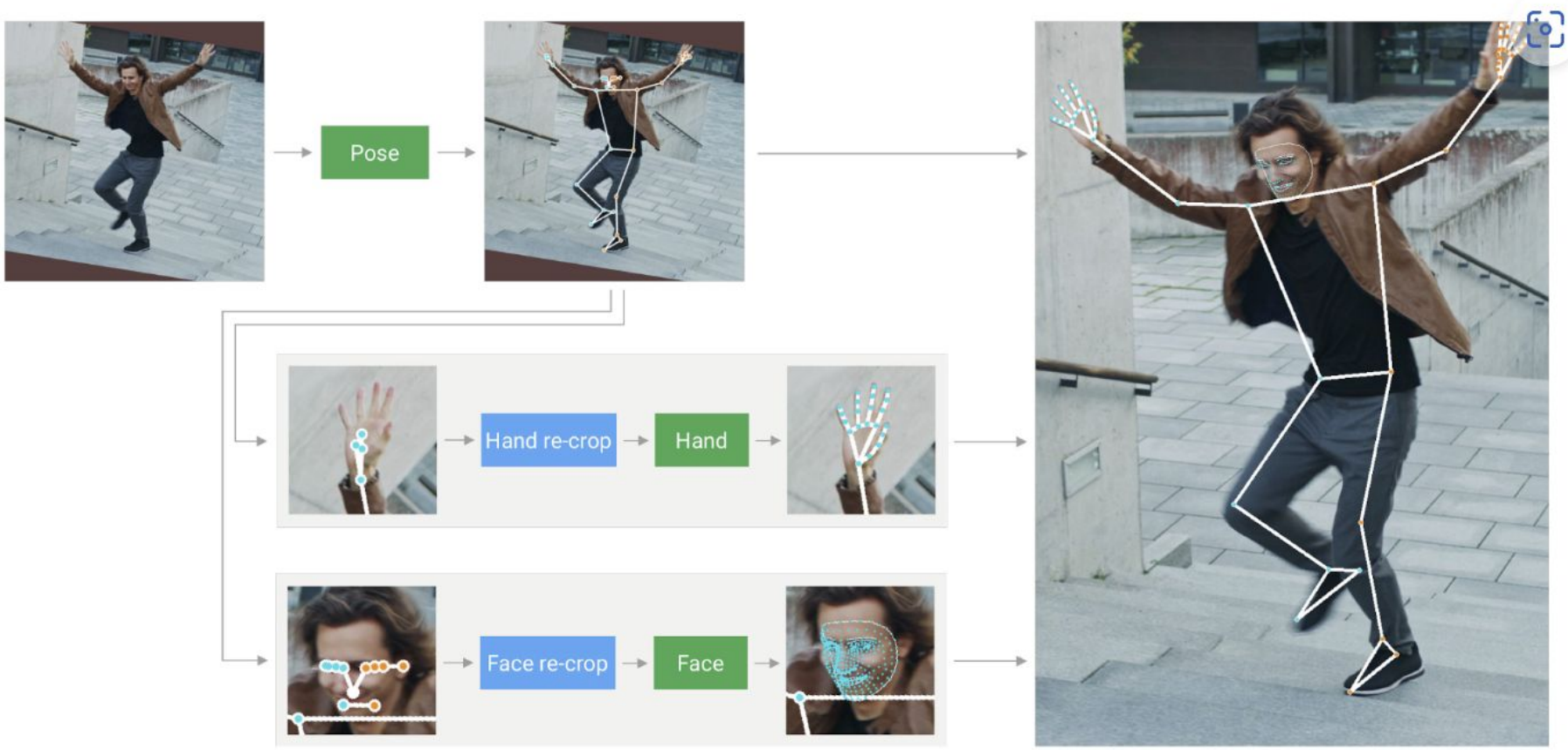


MediaPipe Face Mesh





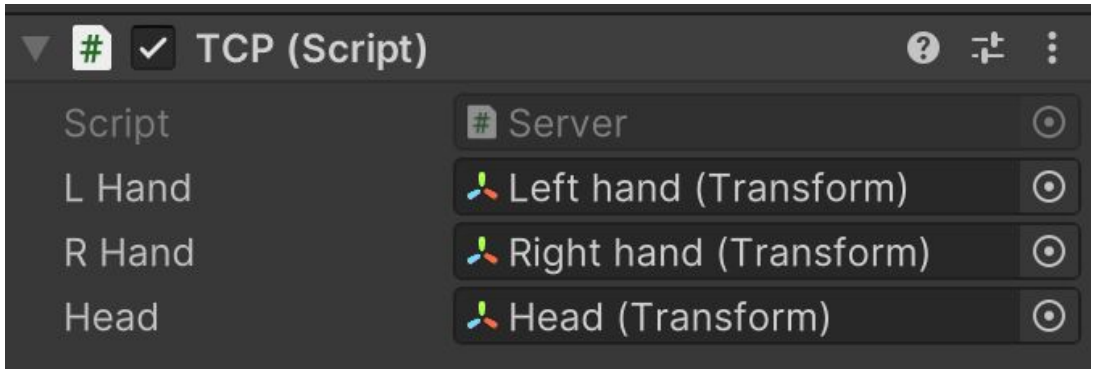
MediaPipe Holistic


Pose
Hand re-crop
Hand
Face re-crop
Face

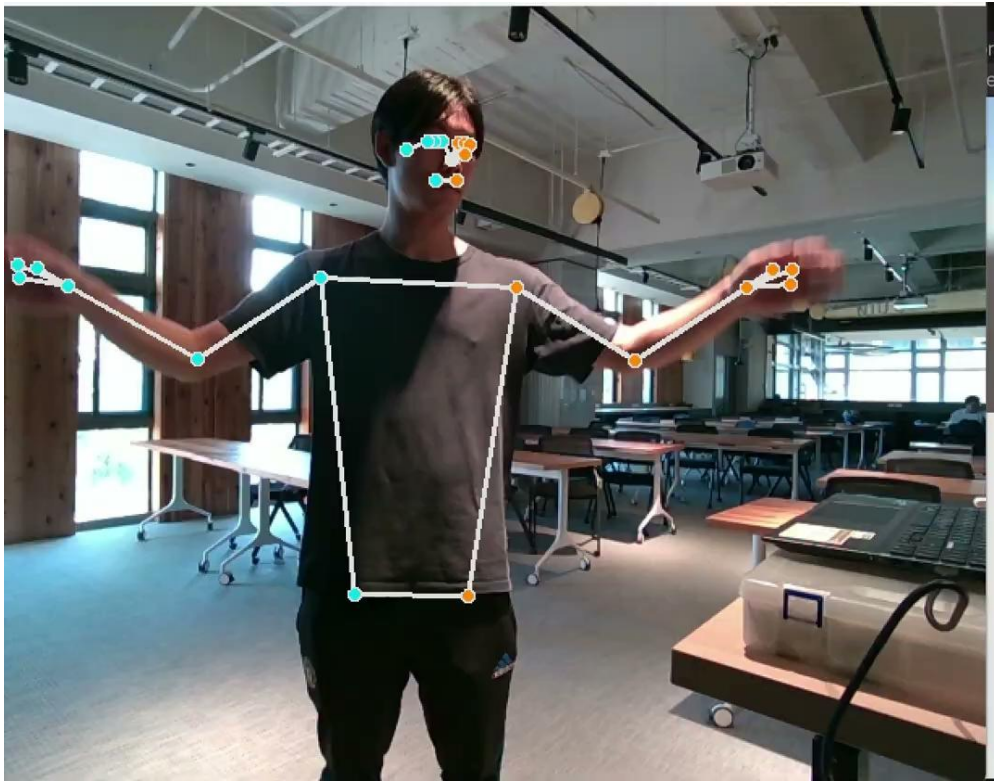
MediaPipeClient.py

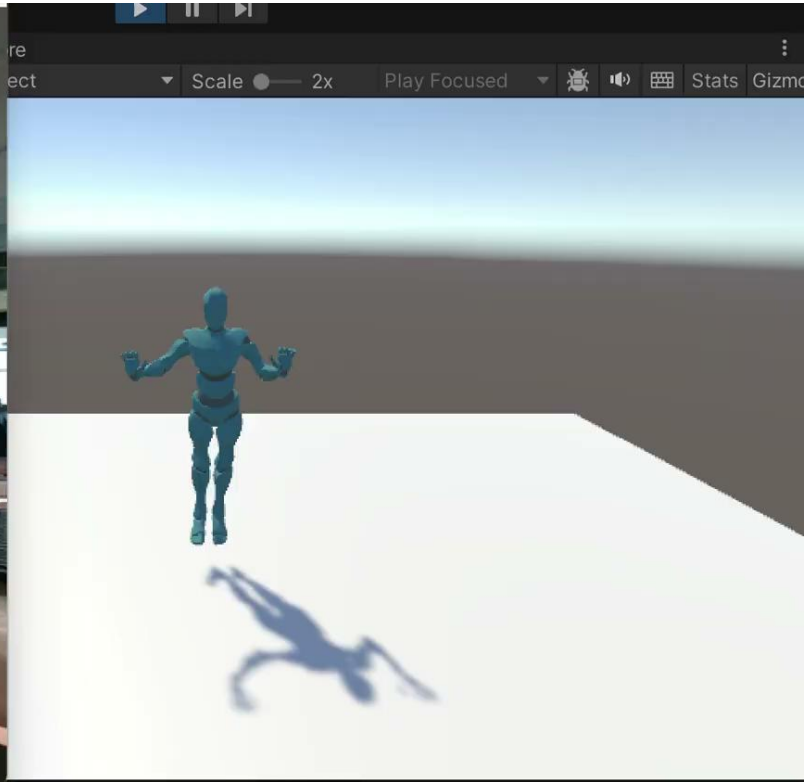
```
color_image = np.asanyarray(color_frame.get_data())
detection_results = mp.detect(color_image)
color_image = mp.draw_landmarks_on_image(color_image, detection_results)
skeleton_data = mp.skeleton(color_image, detection_results, depth_frame)
if skeleton_data is not None:
    send(sock, skeleton_data)
```

Add Server in Unity



Result

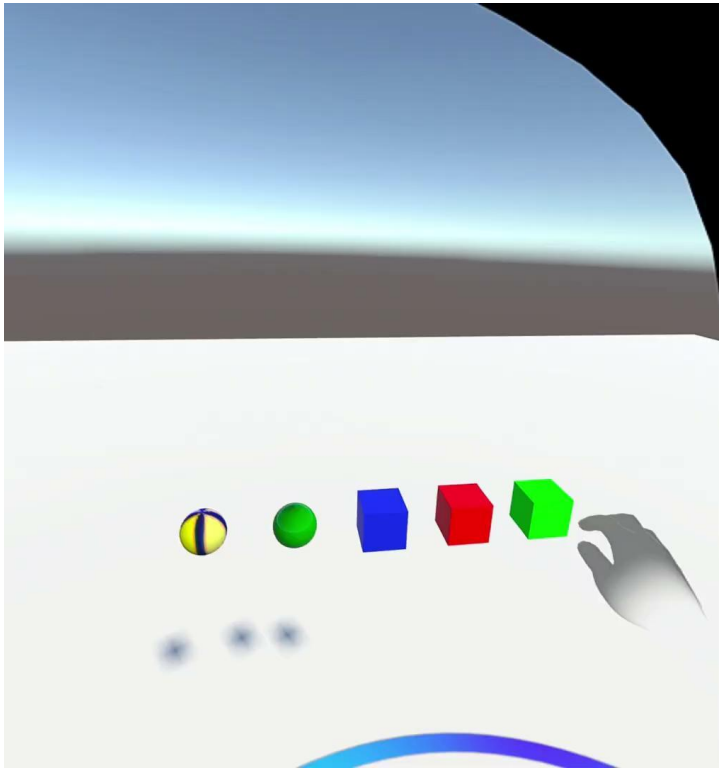




To Do

Basic - 1

- Object A:
  - Change color when user hovering above.
  - Change to another color when grabbed.
- Object B:
  - Change shape when grabbed.
  - Change back to original shape when released.



Basic - 2

- **Implement a avatar that follows player action in Quest 3.**
  - **Use Lab 1&2 to calibrate RealSense and Unity, and apply the transformation matrix on human skeleton.**

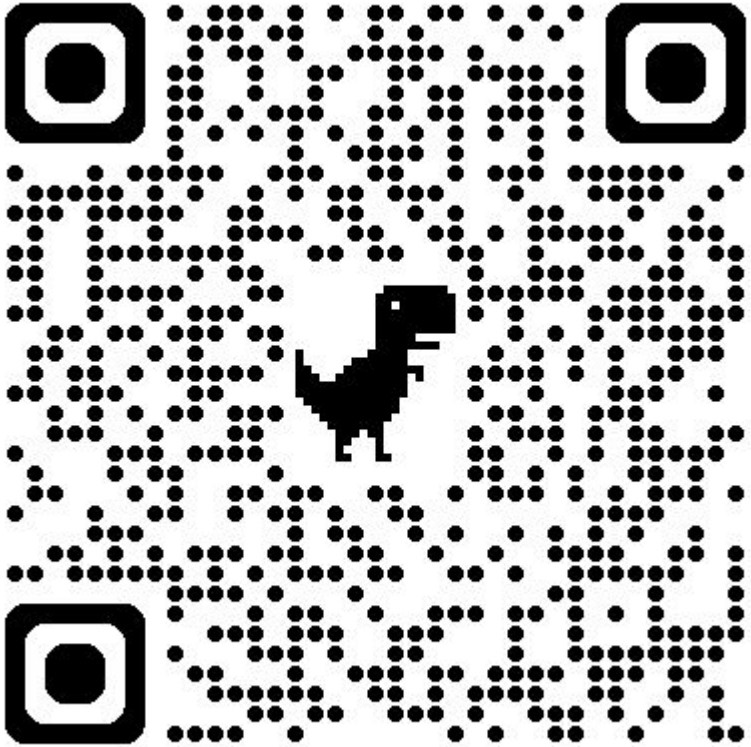
Bonus

- Improve the avatar.
  - Increase tracking points.
    - Avatar will follow player more precisely.
  - Add animation.
    - More smoothly and can do complex poses.
    - Mixamo Animations , Tutorial

Report

- Summarize what you did in this lab.
  - Show the basic and bonus you implemented.
  - Use screenshots & video demos to show your results.
- What you did to improve this device. Or how you can improve this device.
- Anything related to this lab.

Feedback



https://forms.gle/JWbUarYzF3MVvEWQ9