

Rokoko Smartsuit Pro II + Smartgloves

User Manual

Handbook on getting started, resources, troubleshooting and suggestions for using the Rokoko Smartsuit Pro II + Smartgloves

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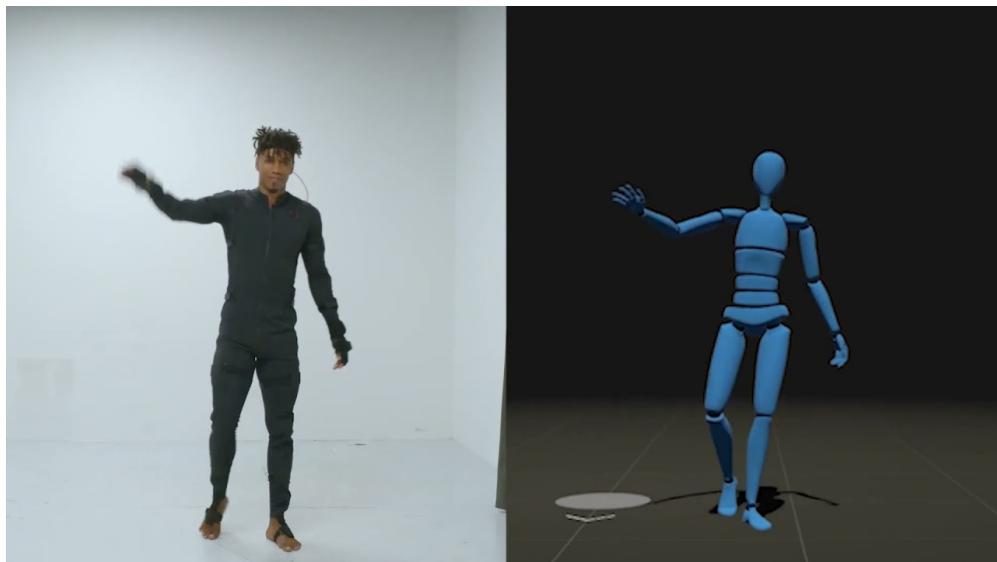
Introduction

Welcome to the Rokoko Pro II Suit + Smartgloves setup manual!

This document was put together by students from the research project DiLimbs from Bauhaus-Universität Weimar during the summer semester of 2023. This guide will walk you through the process of setting up your Rokoko Suit and Smartgloves for motion capture as well as the proposed workflow for retrieving kinetic data which can also be used for gait analysis and further research.

For questions related to this document or require friendly assistance with this technology, please contact the author of this document and currently suit supervisor: [Nelson](#) 😊.

Let's begin!



Useful links

Rokoko website: <https://www.rokoko.com/>

Rokoko Studio: <https://www.rokoko.com/products/studio/download>

Rokoko support: <https://support.rokoko.com/hc/en-us>

Unity plugin (you will need a Unity account!): <https://www.rokoko.com/integrations/unity>

Rokoko tutorial videos: <https://www.youtube.com/@RokokoMotion/playlists>

Vocabulary

- **Project:** container or workspace where you organize and manage your motion capture data and related assets. A project consists of scenes and a project can be seen as an experiment in the context of research.
- **Scene:** used to segment and structure your motion capture work into distinct parts or sequences. A scene consists of animations or clips and can be seen as a participant.
- **Animation/clip:** sequence of recorded movements and poses of an actor or character. This can be seen as a condition.
- **Actor:** person wearing the suit, can be seen as the participant.
- **Turbo mode:** make sure to always work with turbo mode on (little blue bolt on device manager) for better performance.

Important remarks

- Have a measuring tape on hand to measure the participant's height.
- If the suit doesn't connect to your machine after the USB-C configuration, it is probably a firewall issue and you need to put it down and restart Rokoko Studio.
- We usually work with the L size of the suit (we have M and L but the skeleton itself is unique size) because the important aspect is that the straps (placed where the sensors are) are tight enough, so loose suit cloth in shorter people is not an issue.
- Make sure to always have turbo mode activated while recording your animations.

Integrations

You can stream mocap data directly to your favorite 3D software to build a real-time custom animation production pipeline. There are many plugins available but we will focus on Unity.

- Blender
- Houdini
- Unity
- Unreal
- Maya
- Cinema 4D
- Reallusion
- MotionBuilder

Prerequisites

Before proceeding with the setup, make sure you have Rokoko Studio and Unity installed.

System Requirements

Minimum Requirements for Windows:

- Operating System: Windows 10 64-bit.
- CPU: Intel Core i5 (Ivy Bridge) / AMD A10 7850k (Steamroller).
- Memory: 8GB RAM.
- GPU: DX10-supported graphics card.
- Intel Skylake / AMD Ryzen 5 and 16GB RAM recommended.

Minimum Requirements for Mac:

- Operating System: Big Sur.
- CPU: Apple M1.
- Memory: 8GB RAM.
- GPU: Apple M1.

Wi-Fi Router

It is recommended to have a designated router. Since currently there isn't one at the Usability lab and Eduroam is neither designated nor compatible, you will need a mobile phone to act as a mobile hotspot, for which 5 GHz is ideal but 2.4 GHz works also fine. Here is how to set up hotspots on [Android](#) and [iPhone](#).

Power Source

The suit is powered by a power bank and so are the gloves connected to the suit. There are 3 power banks at the Usability lab and a charger. Important: please always make sure they are charged and keep them away from the Sun.

- For Standalone Edition: USB power bank/battery (2A output).
- For Glove-Ready Edition: USB power bank/battery (3A output).

Actor

Unless you have access to a measuring tape, it is important to know the actor's height beforehand. There is also the possibility to measure the actor's limbs when creating their profile. While this option might have better performance when done right, it is demonstrated to be more prone to errors and actually the software does a good estimation by just knowing the height.

You are free to wear clothing both under and on top of the Smartsuit Pro II, as long as it is not made of metal (like a knight's armor). For comfort and accurate placement of the sensors on the body, we recommend wearing only underwear and a t-shirt.

What's in the box?

There are many boxes inside boxes!. The big box contains the suit and the smaller box contains the gloves and their designated cables. The suit box contains:

- **The Smartsuit Pro II** - A textile suit embedded with a skeleton of 19 wired IMU sensors(17 sensors if using the glove because they overlap), a Hub, a USB-A battery connector cable (right-hand-side pocket), and an elastic headband (back pocket). The suit has Wi-fi and bluetooth technology.
- **A USB-C to A cable** to connect the Smartsuit Pro II to your computer for configuration (on the lower back pocket). Note: Later MacBook models do not have a USB-A slot. Please use a dongle as a USB-C to USB-C cable may not work properly).
- **A hanger** to hang the suit to avoid having it all tangled up on the table or chair (also makes it look cooler).

Before putting on the Smartsuit Pro II, we recommend configuring it first..

Configuration

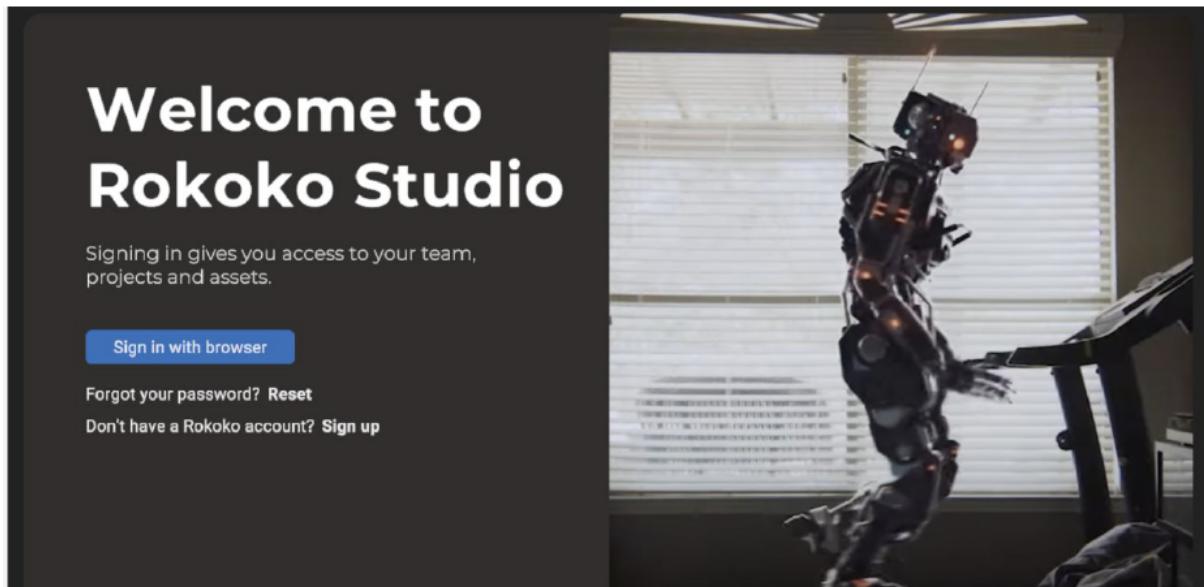
The configuration is the process connecting the suit (and the gloves if using) to your machine via USB to configure the suit's IP address and Wifi connection to your mobile hotspot/router.

Important notice: the main issue when setting up the suit connection is your machine's **firewall**, so it is "advised" to just turn the firewall down during your Rokoko sessions. There are other alternatives proposed [here](#).

The suit can work either online or offline. The online mode is the default and preferred one. In the online mode, the suit (and the gloves) connect to the mobile hotspot (router) through the laptop.

In the offline mode, this works viceversa: the suit acts as a hotspot (without Internet access) and the laptop connects to it, so there is no need for router or Internet access (note: the animations will not upload to Rokoko's cloud until the laptop has Internet access!).

For both modes, you would need to open Rokoko Studio and login with the credentials provided by the suit supervisor. Note: so far we all share the same account, please don't edit or delete projects and scenes that are not yours!.

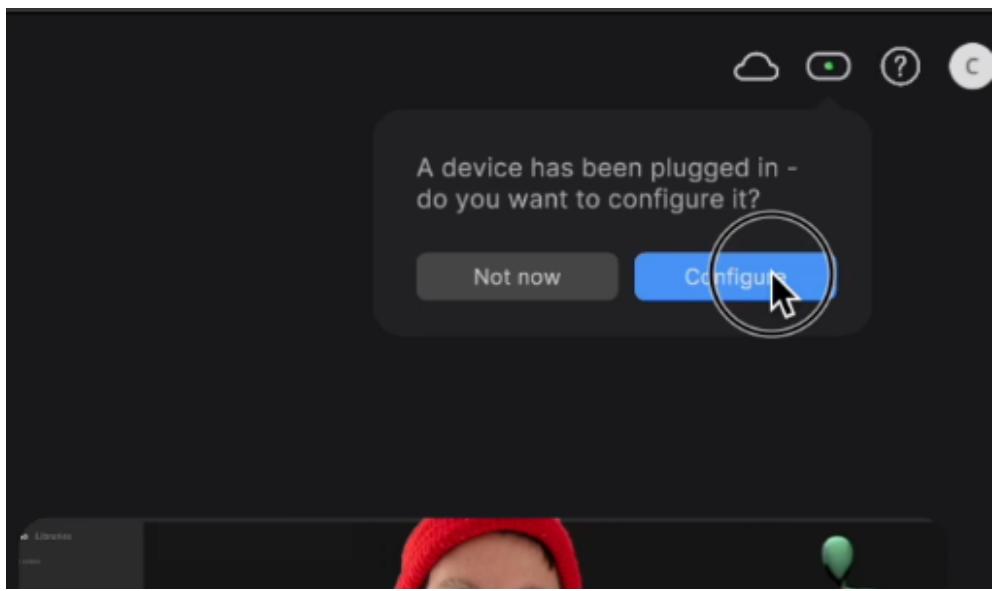


Once logged in through the browser, you can close the browser and create a new project in Rokoko Studio and then create a new scene.

Online Mode

Steps:

- #1. Connect your laptop to your mobile hotspot.
- #2. Hang the Rokoko suit on a non-metallic surface near the computer.
- #3. Connect the USB-C to A cable from the Hub (lower back pocket) to your computer.
- #4. Connect the battery to the USB-A cable (front right pocket). You should now get a notification on Rokoko Studio.



#5. Configure Wi-Fi settings when prompted or through Device Manager (top right corner).

#6. Ensure firmware is up to date. NOTE: If for some reason you need to update the firmware, be cautious that you don't disconnect the suit during this process.

Device Manager

Rokoko Smartsuit Pro (9YL...)

Info Wi-Fi Setup Firmware Diagnostics

Device name	Rokoko Smartsuit Pro
Device type	Smartsuit Pro II
Firmware version	2.7.3-r
Serial number	SALW0MGYLCG
Production assembly	50300001
Device ID	0x27004C4D465016203632330

Need help to set up your device? Read our guide →

Smartglove Left connected via USB | View

Device Manager

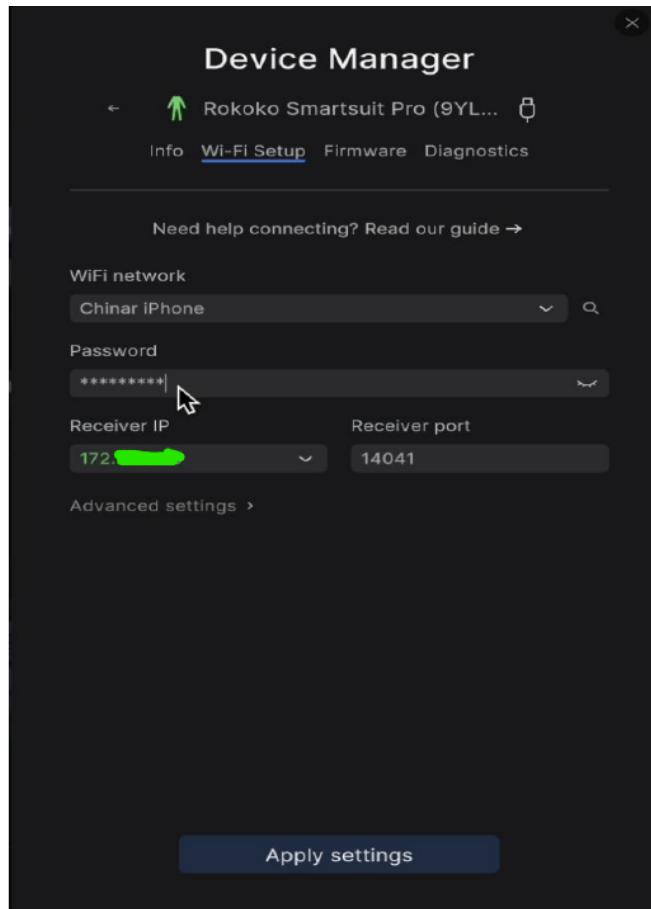
Rokoko Smartsuit Pro (9YLG)

Smartglove Left

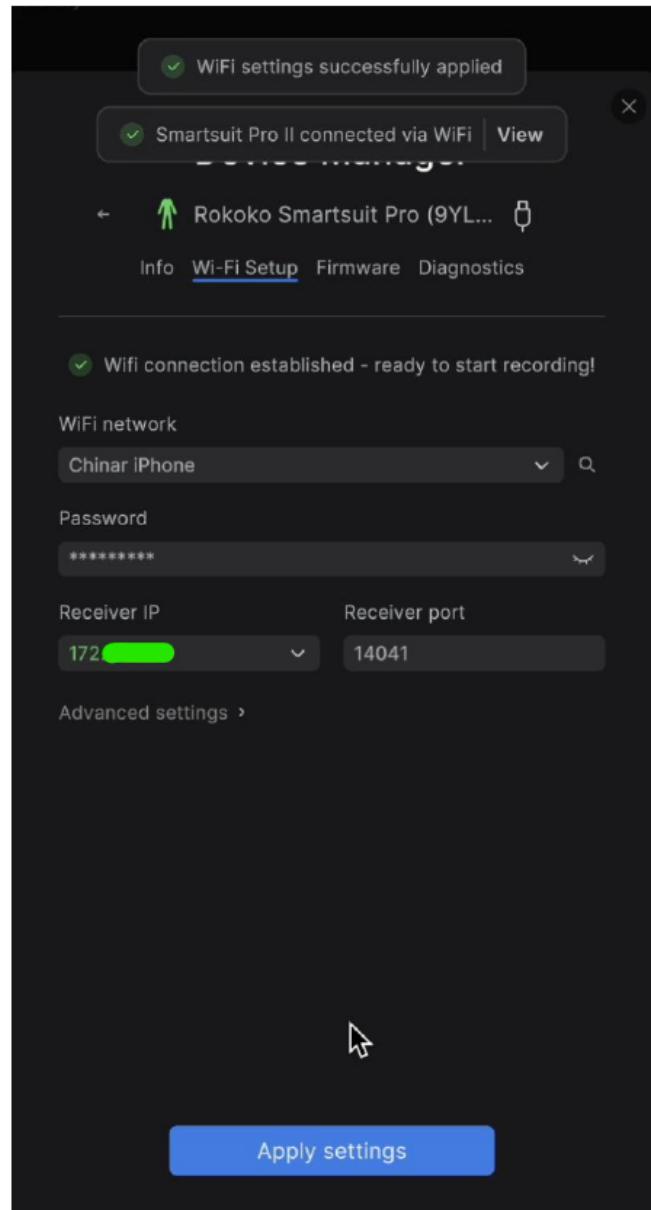
Failed to receive USB message

#7. Connect to your mobile hotspot or designated router. If at this point and after refreshing the list you don't see your hotspot, it is probably a problem with your machine's firewall. So please try to disable it, close Rokoko Studio, open it again and try once more.

#8. Regarding the IP address, this should be the same one from your laptop which is also connected to your mobile hotspot. For that, access the terminal "cmd" and type "ipconfig" for Windows and "curl ifconfig.me" for Mac. The one we are looking for is IPv4 address. Copy that and paste it into the suit's configuration. The receiver port should be the one suggested by default.



#9. Apply settings and you should get a notification for success.



#10. Verify the suit setup by checking the sensor dots. By now you should see 2 suits on the device manager: one connected via USB-C and one connected via Wi-fi. If the Wi-fi one doesn't remain connected after unplugging the USB-C cable, then the configuration was not successful and you should try again.

#11. For configuring the gloves, please follow the same steps by plugging the gloves with their designated USB-C cable to your machine (configure one glove at the time).

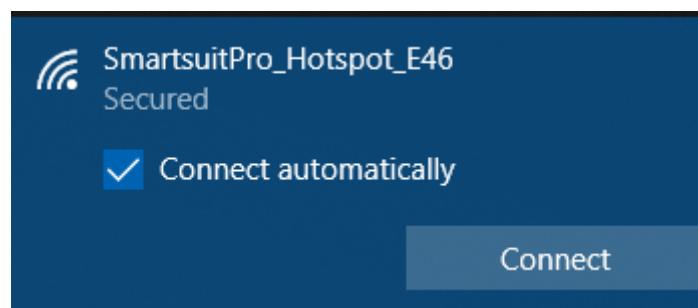
Offline Mode/Hotspot Mode

With the Internal WiFi hotspot mode you can connect the Smartsuit Pro directly to your computer, without the need for an external network or router. This will not provide similar performance in terms of range and stability of frame rate when compared with a dedicated router. This mode is only possible if your machine has a Wifi module, which usually laptops do but desktop computers don't.

With the suit on (this is, power bank plugged in through the front right pocket), hold the power button on the back for 5 seconds. You should get some LED light blinking but if you don't just wait a few more seconds until it starts blinking.



At about the same time, a new hotspot device should have appeared on your machine's network search. Connect to it, the password is: *justimagine*. If the Wi-Fi configuration window asks you for a PIN number, please disregard and click on "Connect using a security key instead", then enter the password *justimagine*



Congratulations, you have now successfully connected your Smartsuit using the Hotspot mode, a gray avatar should appear in Rokoko Studio, as well as an "unpaired input device" in the right-hand side panel. To switch back to the "regular" external Wi-Fi mode, hold the power button again.

Wearing the suit: becoming a superhero!

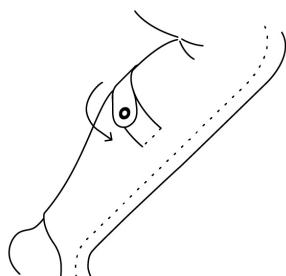
You are free to wear clothing both under and on top of the Smartsuit Pro II, as long as it is not made of metal (like a knight's armor). For comfort and accurate placement of the sensors on the body, we recommend wearing only underwear and a t-shirt. It is recommended to not wear shoes but you can fit your suit feet inside your shoes if they are big enough.

To begin, unzip the back pocket and locate the headband.



Remember to put on the headband with the head sensor placed in the position you prefer (we recommend within the highlighted area).

Please double-check that the sensors are placed in parallel with your body segments and tighten the straps.



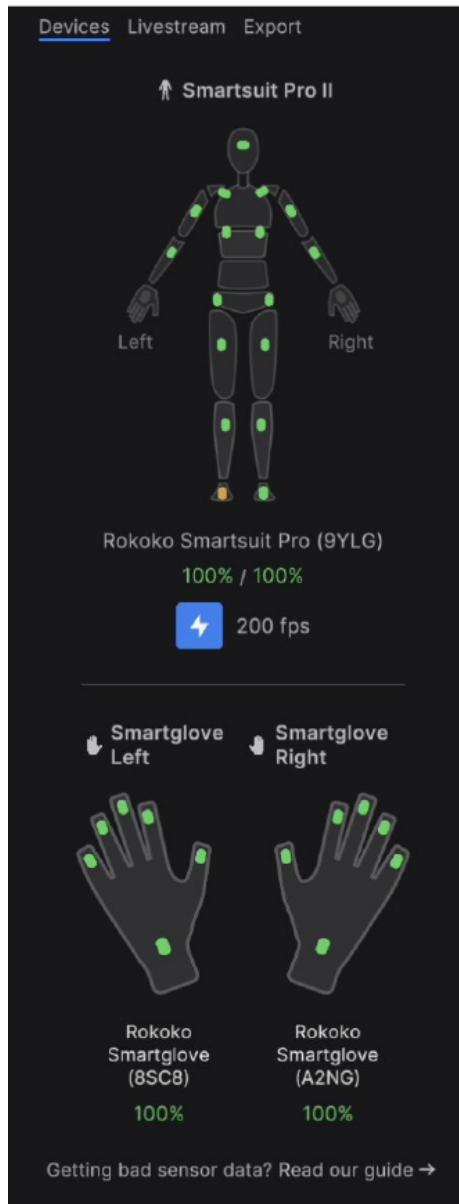
If you are also connecting the gloves, make sure the USB cable sticks out through your hand and connect it to the glove once you put it on; otherwise, just keep the cable between the

suit and your skin so it doesn't pop out. Note: Connect the Smartgloves to the Smartsuit before powering up.

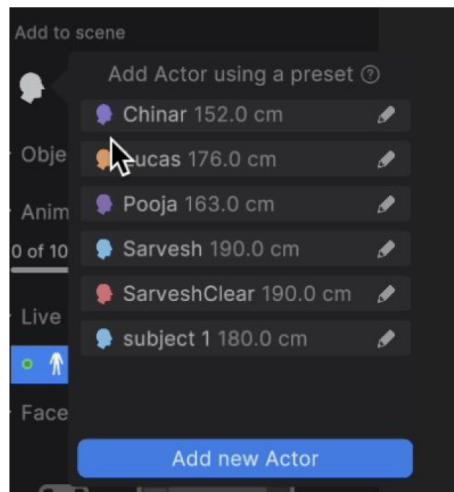


Motion capturing: recording animations

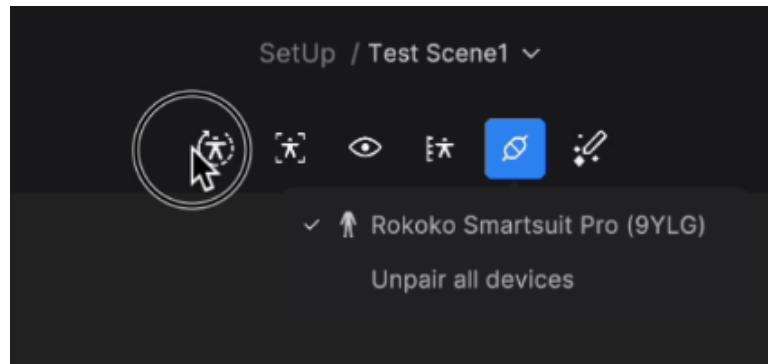
After connecting the suit, make sure that all sensors are green and report good connectivity and to have turbo mode always on for better performance. For understanding the meaning of the LED light colors of the control device on the lower back pocket, please refer [here](#).



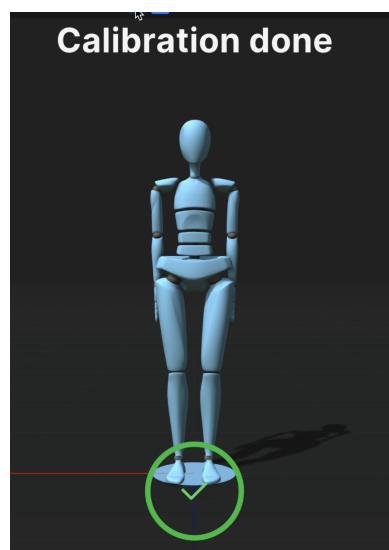
#1. Add an actor or create a new one.



#2. Click on the added actor and click on the top icon “Pair with live input” to pair the actor with the suit (and gloves if using).

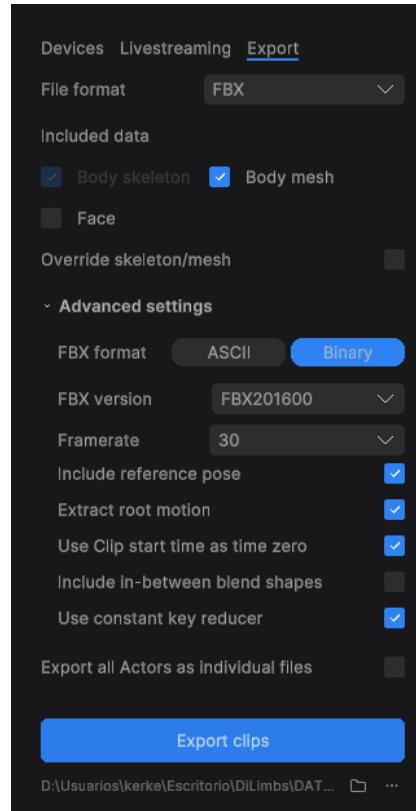


#3. Calibrate your actor and click on “Follow actor” if you want the camera to follow the actor during the animation.



#4. Click record to record the animation or live stream it to a plugin like Unity.
Congratulations! You recorded your first motion capture animation. Remember that it is advised to re-calibrate between animations.

#5. Export your animations as FBX format to later import it to Unity. Make sure “Root motion” is enabled and that the selected skeleton is the default by Rokoko (Newton).



Unity livestream plugin

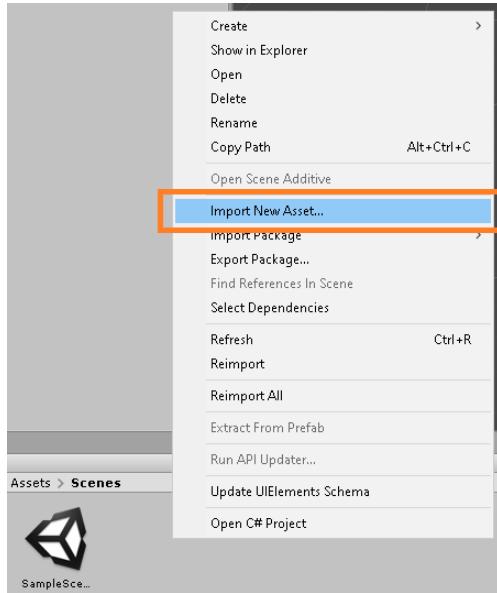
For an illustrative tutorial on how to livestream the mocap from Rokoko Studio to Unity please follow this short video tutorial by Rokoko:
<https://youtu.be/aT1qb8AtfoM?si=2SKjrn8K-Q0LhYAg>

Importing animations to Unity

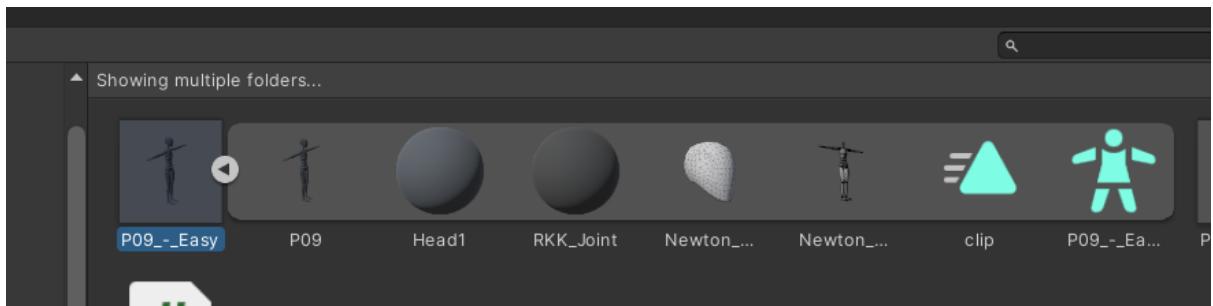
[Reference guide](#). Steps:

#1. Export with the body skeleton by default in Rokoko Studio (known as Newton skeleton).

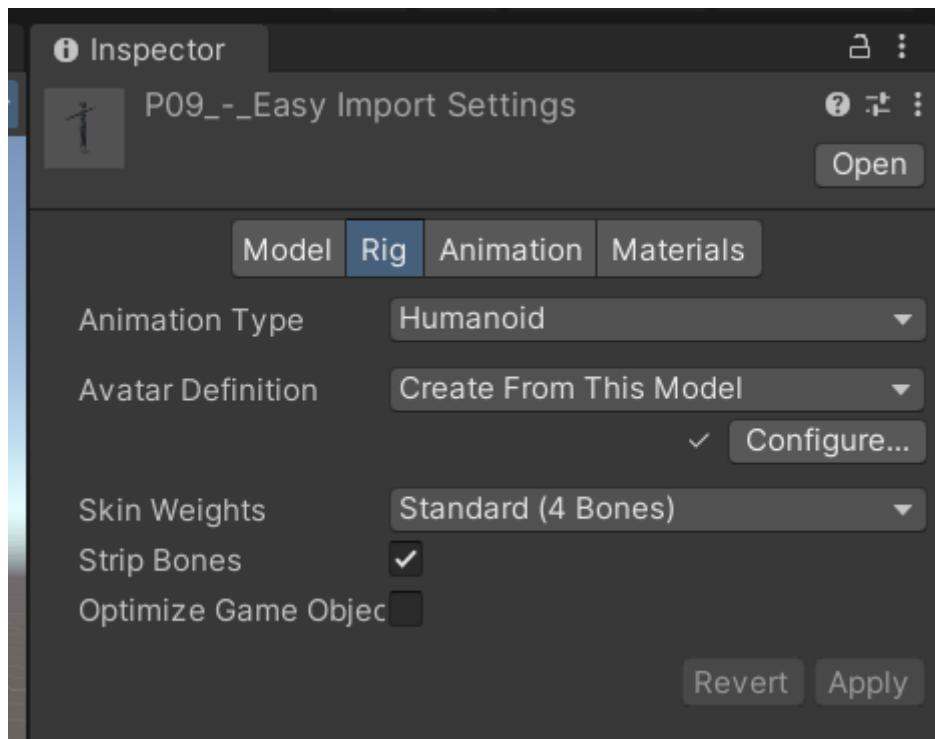
#2. In your Unity project, right-click in your assets folder and select Import New Asset.



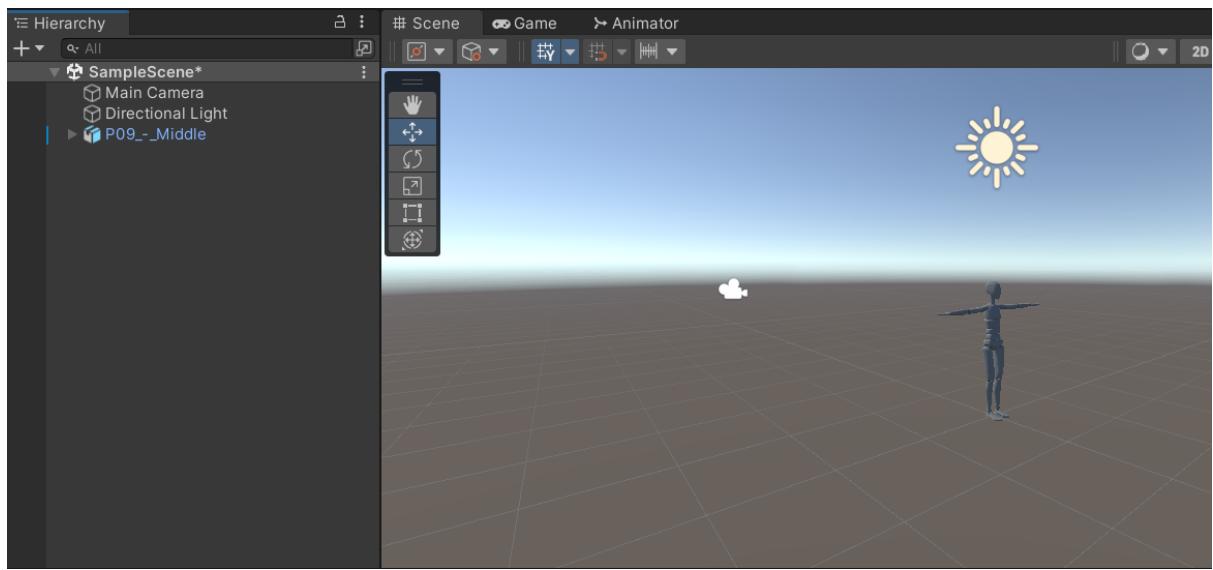
#3. Select your FBX file and select Import. This asset now contains both the avatar and the animation clip.



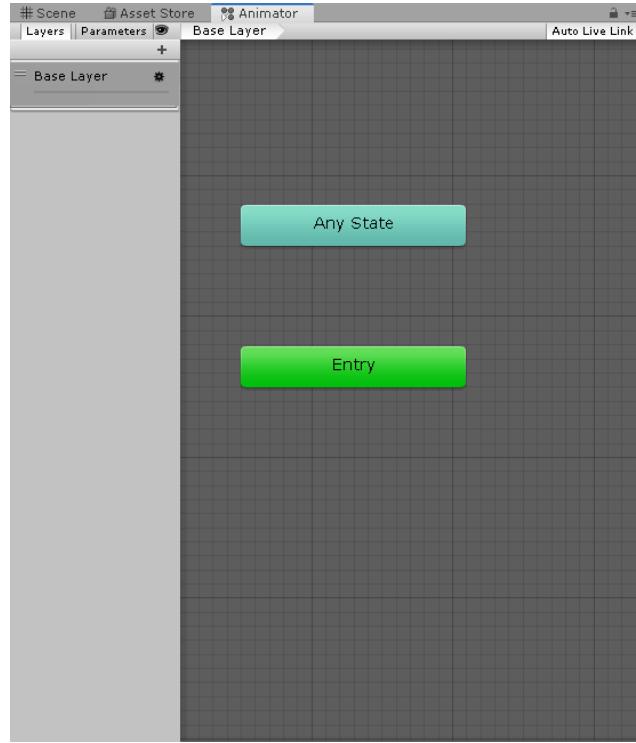
#4. Select the asset and choose Animation Type: Humanoid in the Rig tab of the Inspector pane on the right.



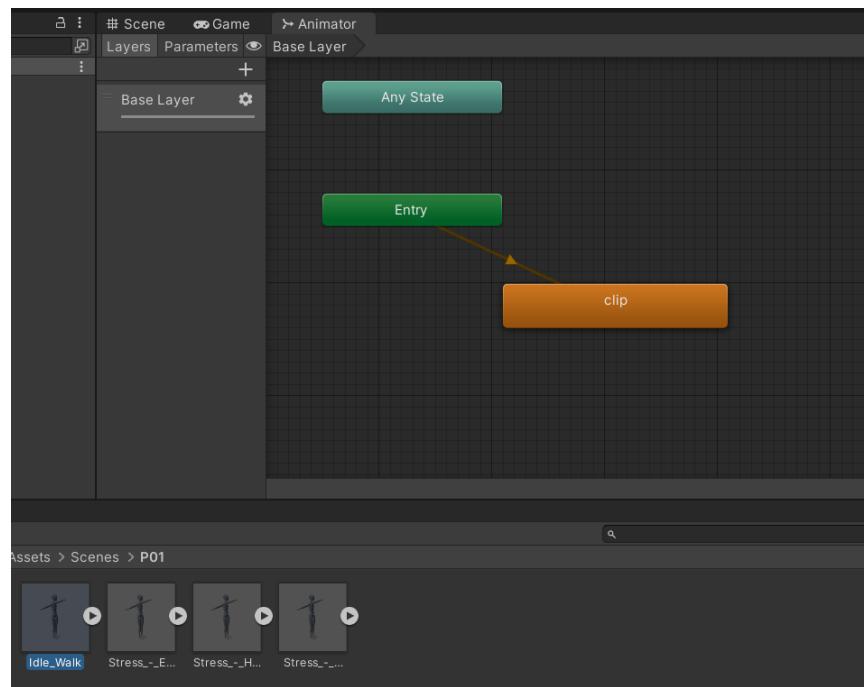
#5. Drag the asset into the scene.



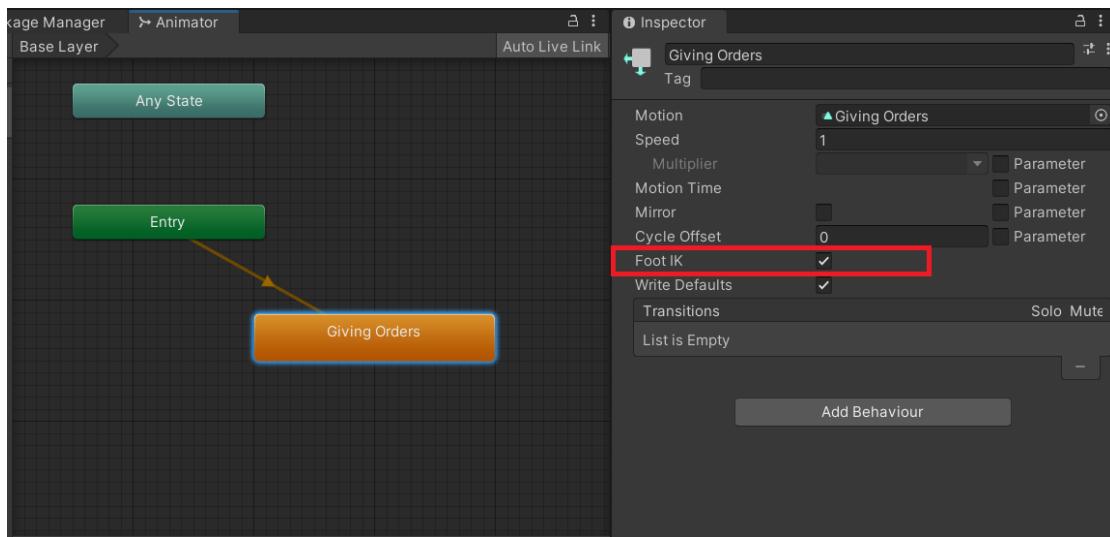
#6. Create an animation controller: Right-click in your assets folder and select Create > Animator Controller. Double-click the created Animator Controller to open the Animator window.



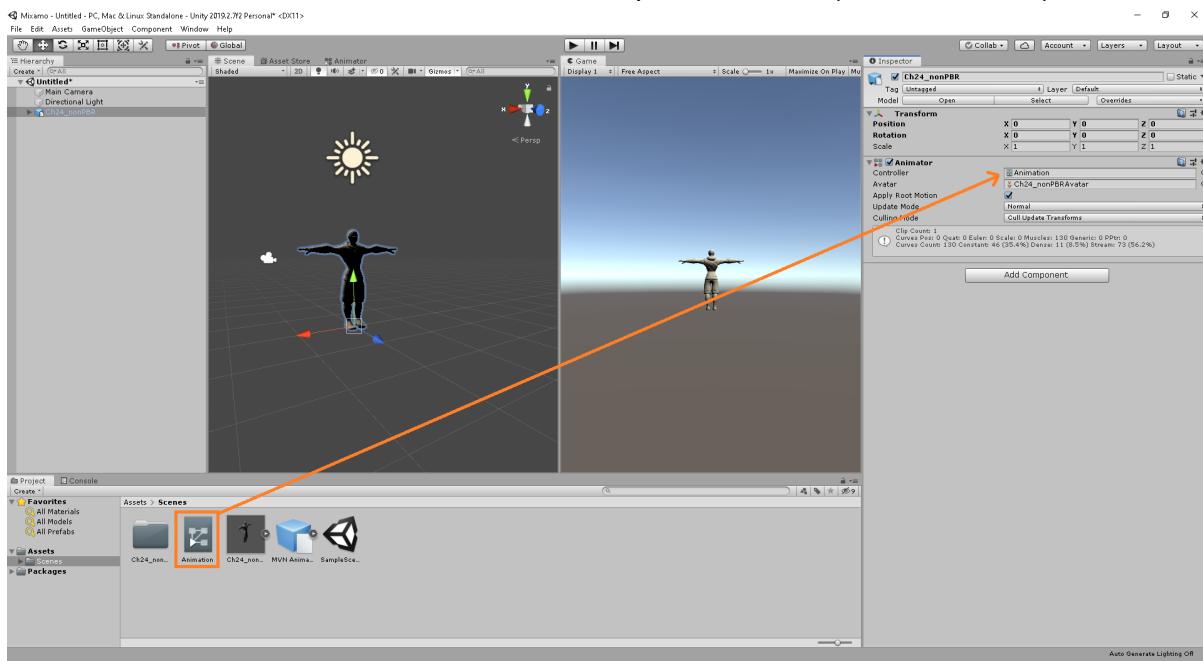
#7. Drag your asset into the animator window.



#8. In order to prevent foot sliding select the imported animation and check the "Foot IK" box in the Inspector right panel.



#9. To add animation to the character, select the character in your scene and drag the Animation Controller into the Controller in the Inspector window (under Animator).



#10. You can now click the play button on the top panel and you should see your character performing the animation that you recorded with the Rokoko suit. Congratulations!

Gait script: retrieving gait features

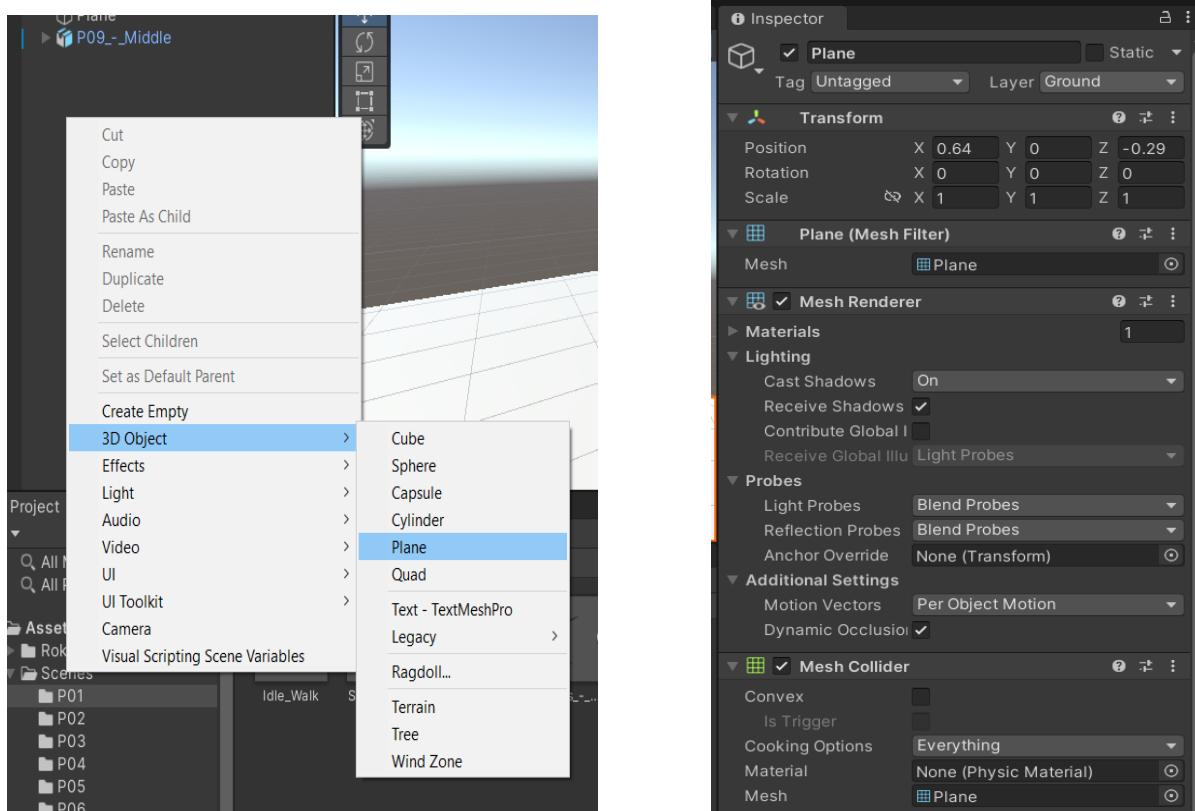
The script GaitAnalysisScript.cs developed by the author of this document (Nelson) retrieves the following gait features and saves them into a CSV file:

- **Leg length** of the actor, which is also taken for normalizing all data between participants (ratios).
- **Step length**: distance between the feet when both are on the ground.
- **Stride width**: lateral distance between the feet, indicates balance.
- **Stride length**: distance between two consecutive points of contact with the ground of the same foot.
- **Stride time**: time duration of a stride.
- **Velocity**: velocity of walking taken by the hip node.
- **Acceleration**: acceleration of walking taken by the hip node.
- **Foot grounded**: indicate whether the foot is in contact with the ground.
- **Joint angles**: angular information of the joints.

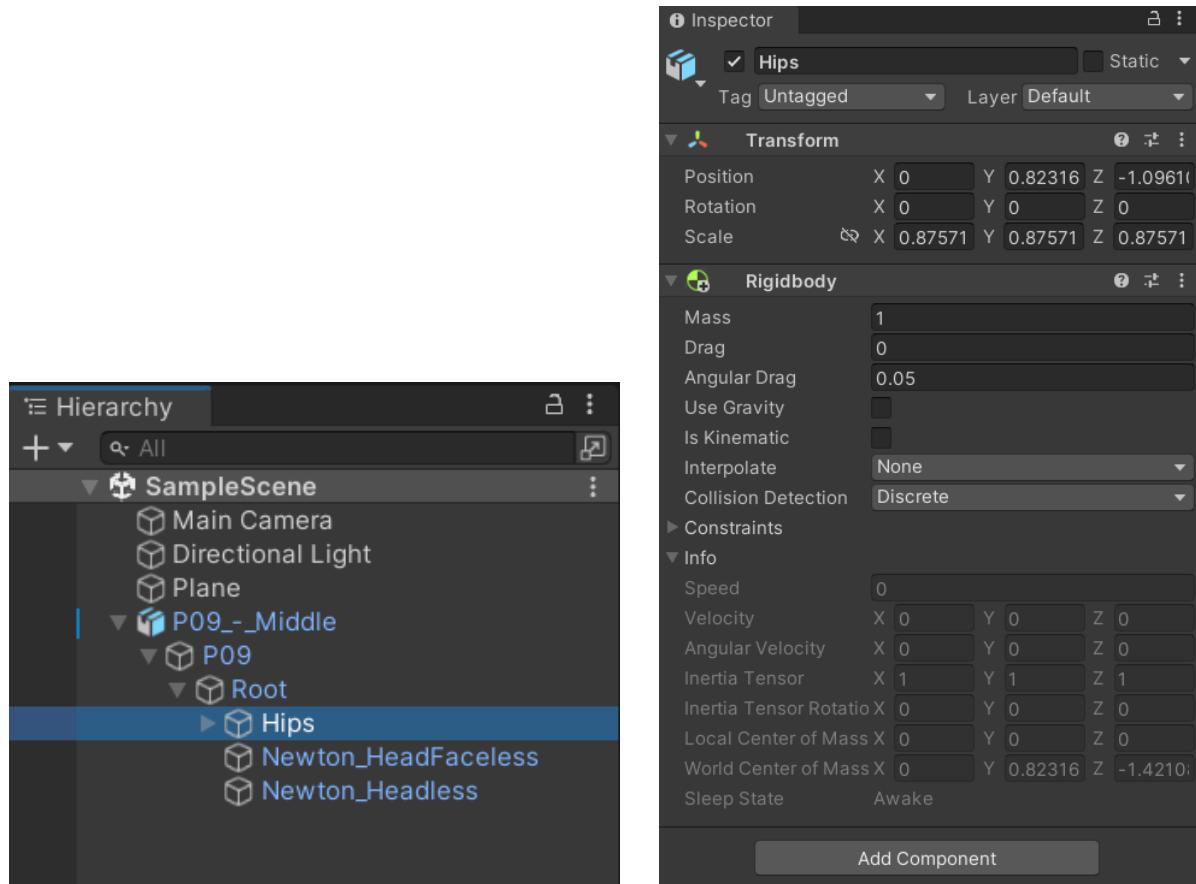
Steps to follow for the implementation:

#1. Import the GaitAnalysisScript.cs script provided on Moodle to your Assets folder or desired location in your Unity project.

#2. Create a plane named “Plane” and in the Inspector click "Add Component" and search for "Mesh Collider" to add a collider to the plane, which should match the shape of the plane. Set the layer to "Ground" or any other name you prefer. This should match the LayerMask in the code.



#3. For measuring velocity, we need to add a Rigidbody component to the hip node. Click on your character on the hierarchy menu and look for the hip node. Then go to Inspector > Add Component > Rigidbody. However, disable “Use Gravity”.



#4. Attach the script GaitAnalysisScript.cs by dragging it from the assets folder onto the root node of your character's game object. Set the path to the output csv file in the Inspector.

#5. Congratulations! You can now click play and the gait information will be retrieved. Stop the animation manually when the character doesn't move anymore.

Disclaimer

This document was put together by students from the research project DiLimbs from Bauhaus-Universität Weimar during the summer semester of 2023. The proposed steps and guidelines are based on the experience of one semester working with the Rokoko Smartsuit Pro II and Smartgloves and are influenced by the goal of retrieving kinetic data for gait analysis. The scripts and methods presented are open source and free for suggestion, modification and further development. We hope these guidelines serve a good initial help when getting in touch with this technology and we wish you a happy work! 😊.

References

Rokoko: Getting started with your Smartsuit Pro II:

<https://support.rokoko.com/hc/en-us/articles/4410409192849-Getting-started-with-your-Smartsuit-Pro-II>.

Rokoko: Find out the Receiver IP Address:

<https://support.rokoko.com/hc/en-us/articles/4410479046545-Find-out-the-Receiver-IP-Address>.

FBX import into Unity:

https://base.movella.com/s/article/FBX-import-into-Unity?language=en_US.