CHARACTER RIGGING & MOTION CAPTURE

Corso Realtà Virtuale 2022/2023

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WITH BLENDER V2.83

CHARACTER RIGGING

RIGIFY ADD-ON

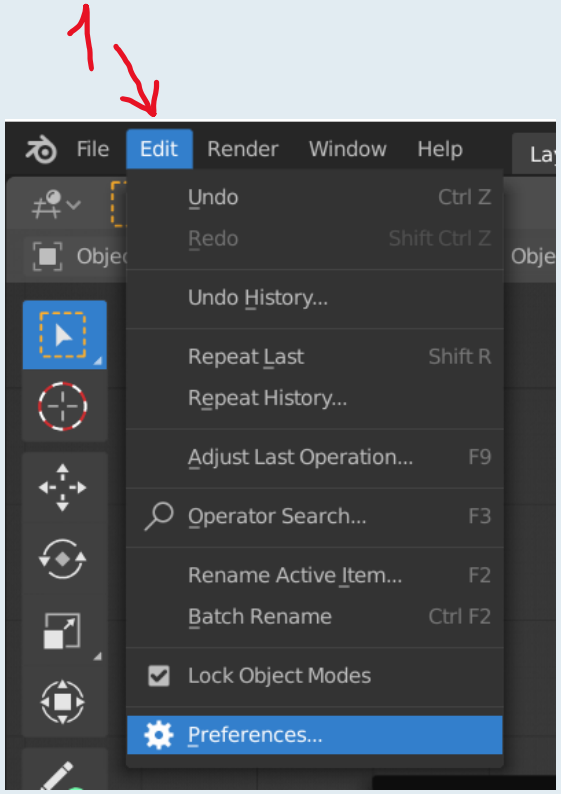
Blender provides a humanoid skeleton for character's rigging with the free add-on *Rigify*.

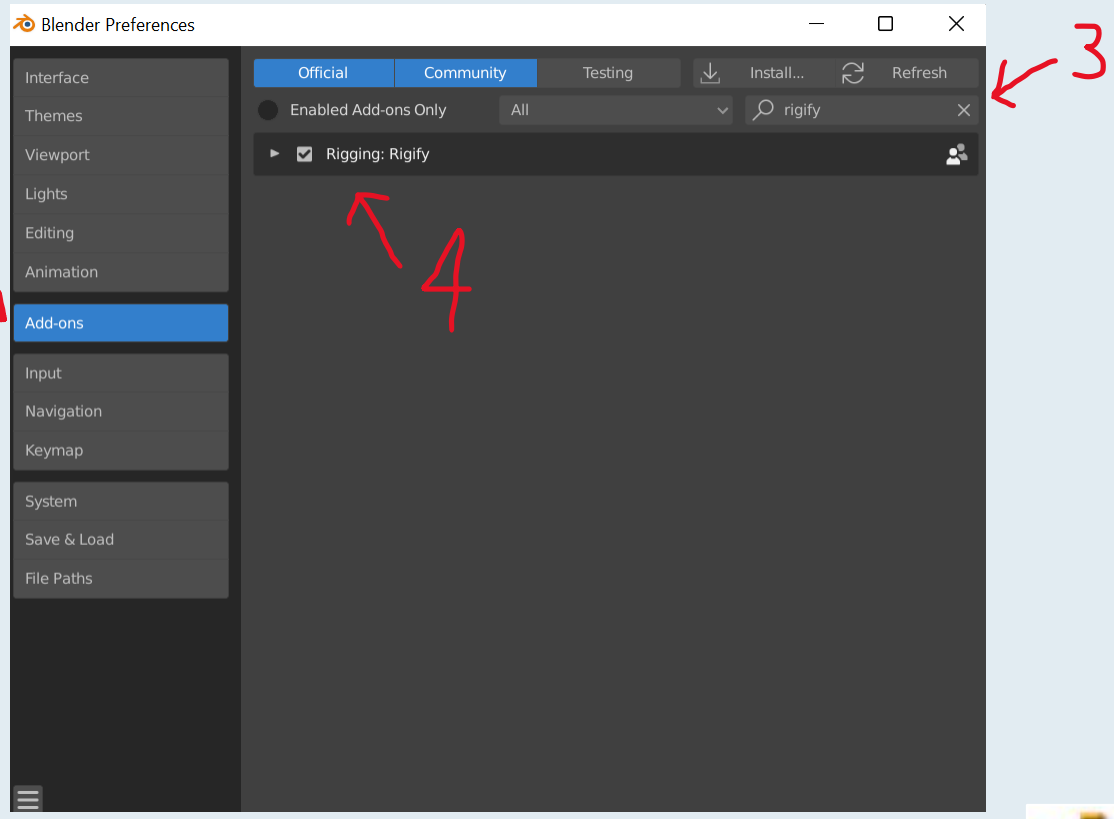
You can add packages/tool to your project in:

1. Edit > Preferences
2. Add-ons
3. Search the package by writing its name in the search box, in our case *Rigify*
4. Add the package by checking the box

https://docs.blender.org/manual/en/latest/addons/index.html

RIGIFY ADD-ON

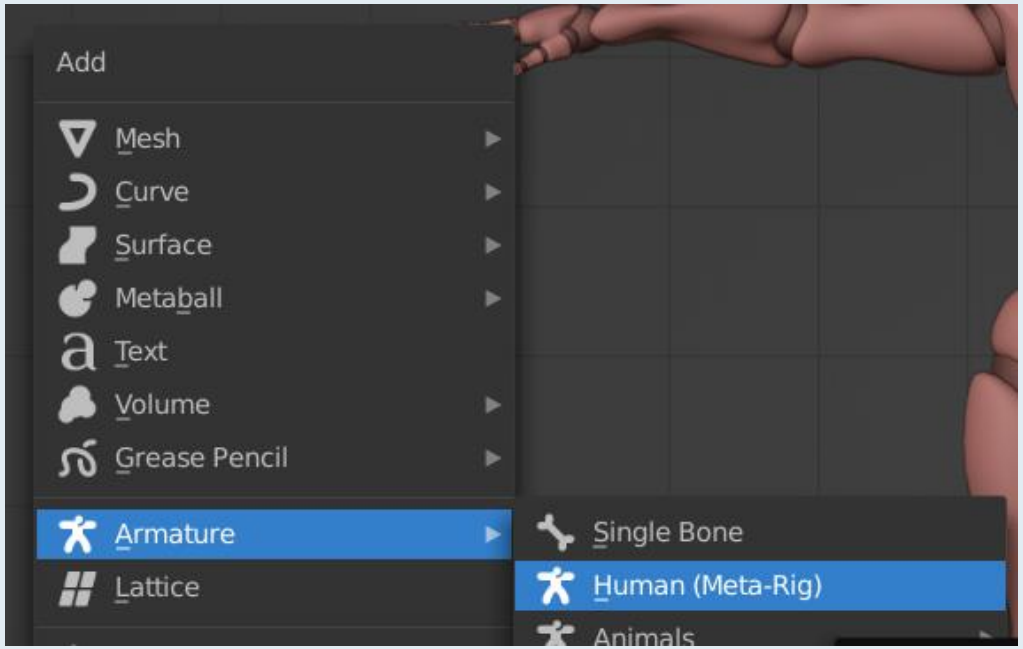




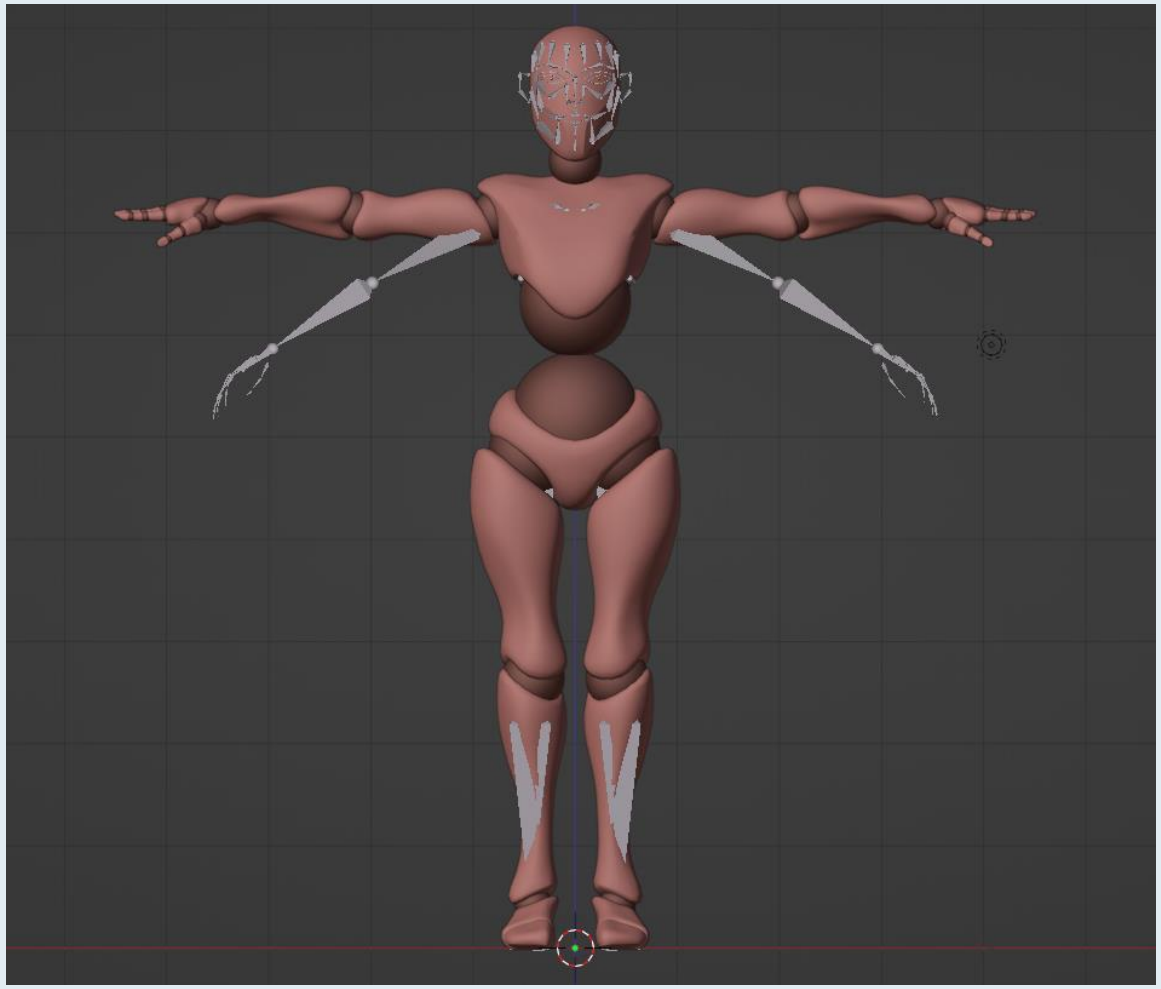
ADD SKELETON

To add a skeleton to the character:

1. Click on the *avatar* collection
2. Click on [shift] + [A] > Armature > Human
3. The object *metarig* appears in the scene, click on it
4. Scale with [S] to make it coincide with the character



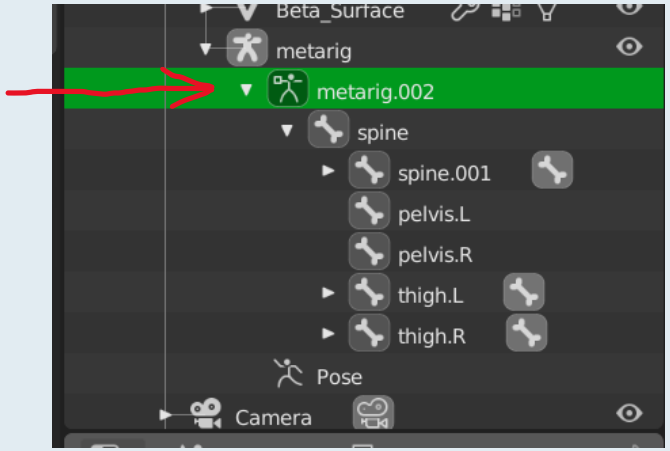
ADD SKELETON



CHANGE THE SKELETON 1/2

You can modify the skeleton:

- Enable Wireframe View with [Z] > Wireframe or the X-Ray view with  in top right
- Click on the *metarig's* children (or switch to Edit Mode) to enable the selection of skeleton's parts



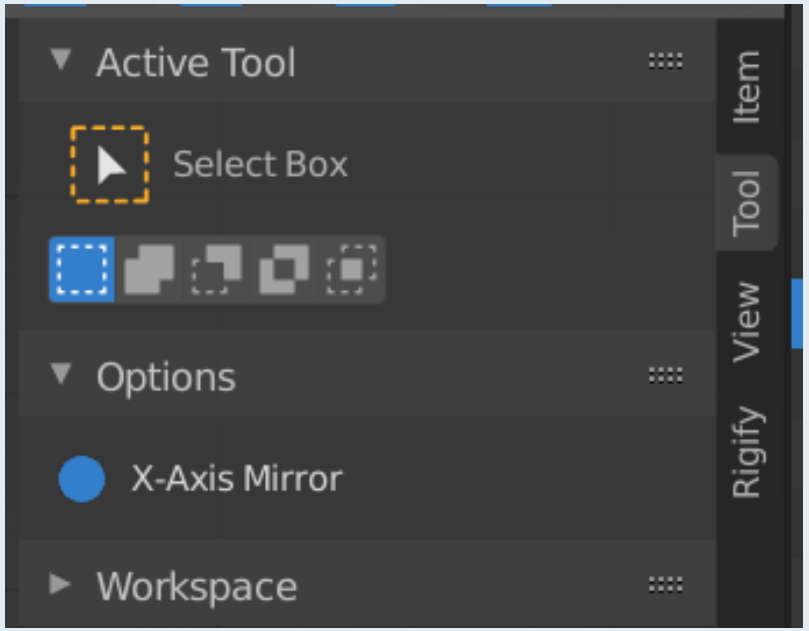
- In the viewport, you can select a single part of the metarig

CHANGE THE SKELETON 2/2

You can adjust the bones to coincide with the avatar with scale [S], grab [G], and rotate [R].

To facilitate this step, you can enable Mirroring of the action along the x axis:

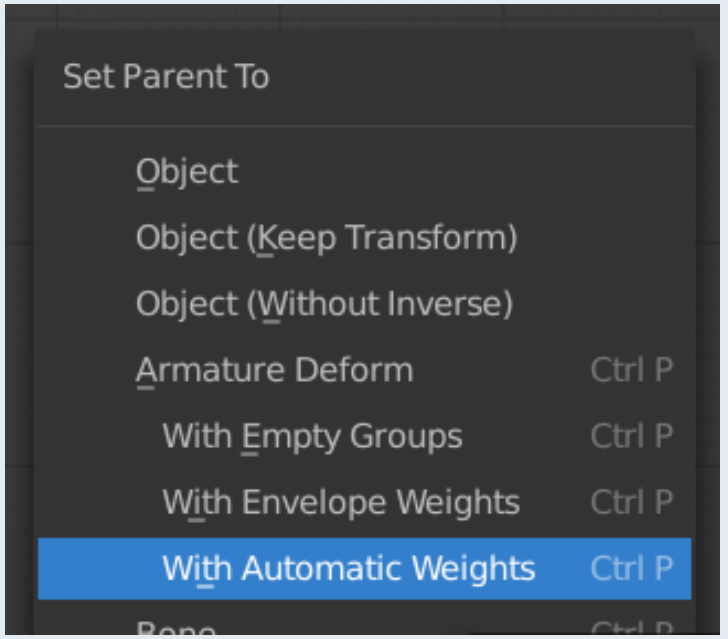
1. Press [N] to see the menu
2. Click on Tool
3. Check the box X-Axis Mirror



PARENT THE MESH

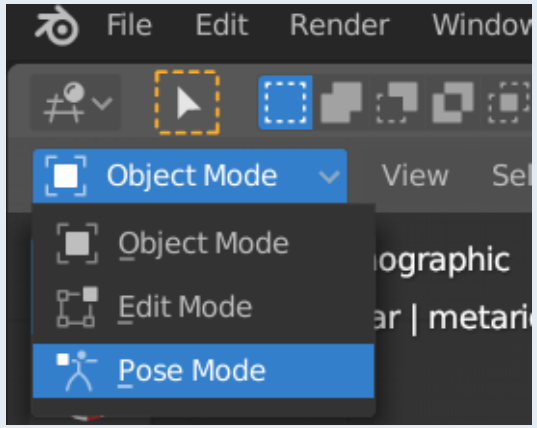
You can parent the character with the rig:

1. Enable Solid View and switch to Object Mode
2. Click on the character's mesh then [shift] + click the rig
3. Press [ctrl]+[P] to parent the character's mesh with the rig
4. Choose the option Armature Deform > With Automatic Weights



POSE MODE

Select the rig and witch to Pose Mode (top left):



Move a bone with [G], you will see that the character’s mesh will follow it.

REDO PARENTING

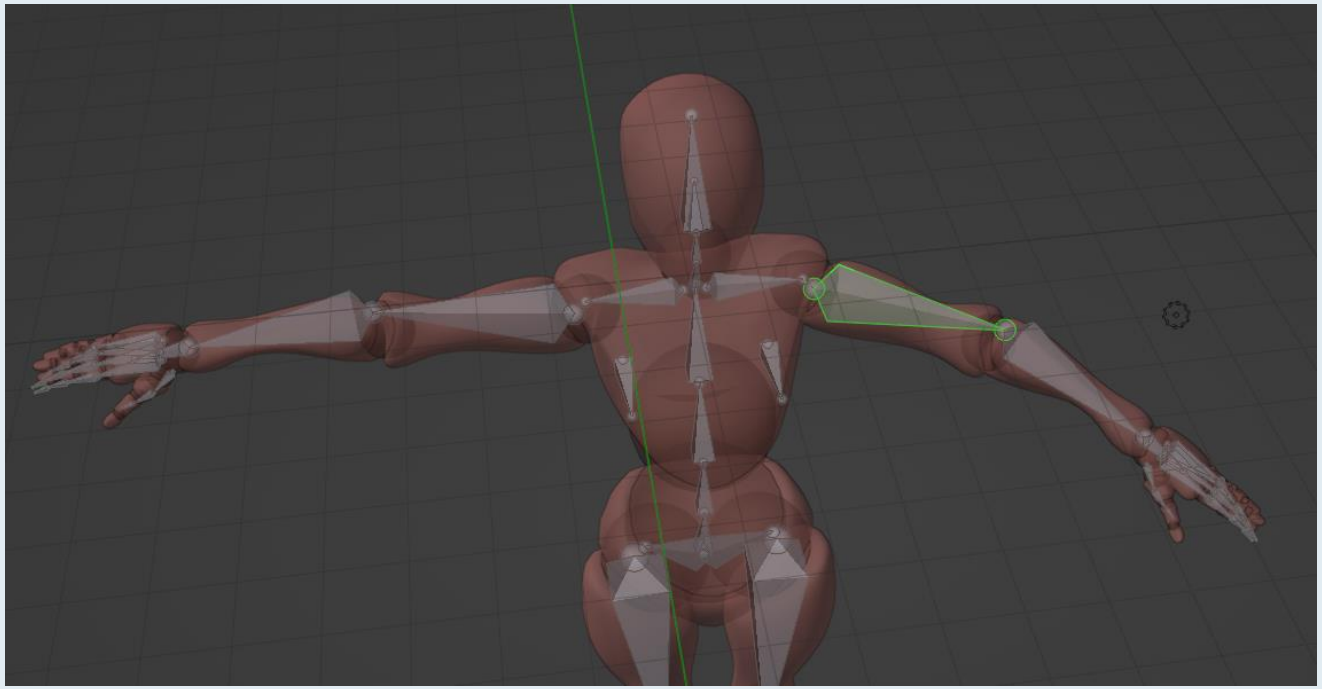
The mesh called Beta_Joints is still fixed

You can solve it by repeating the Steps at «Parent the mesh», but now select the Beta_Joints instead of the character:

1. Enable Solid View and switch to Object Mode
2. Click on the Beta_Joints, then [shift] + click on the *metarig*
3. Press [ctrl]+[P]
4. Choose the option Armature > with automatic weights

FINAL RESULT

Switch back to Pose Mode, you will see that now everything follows the bones when you move/scale/rotate them

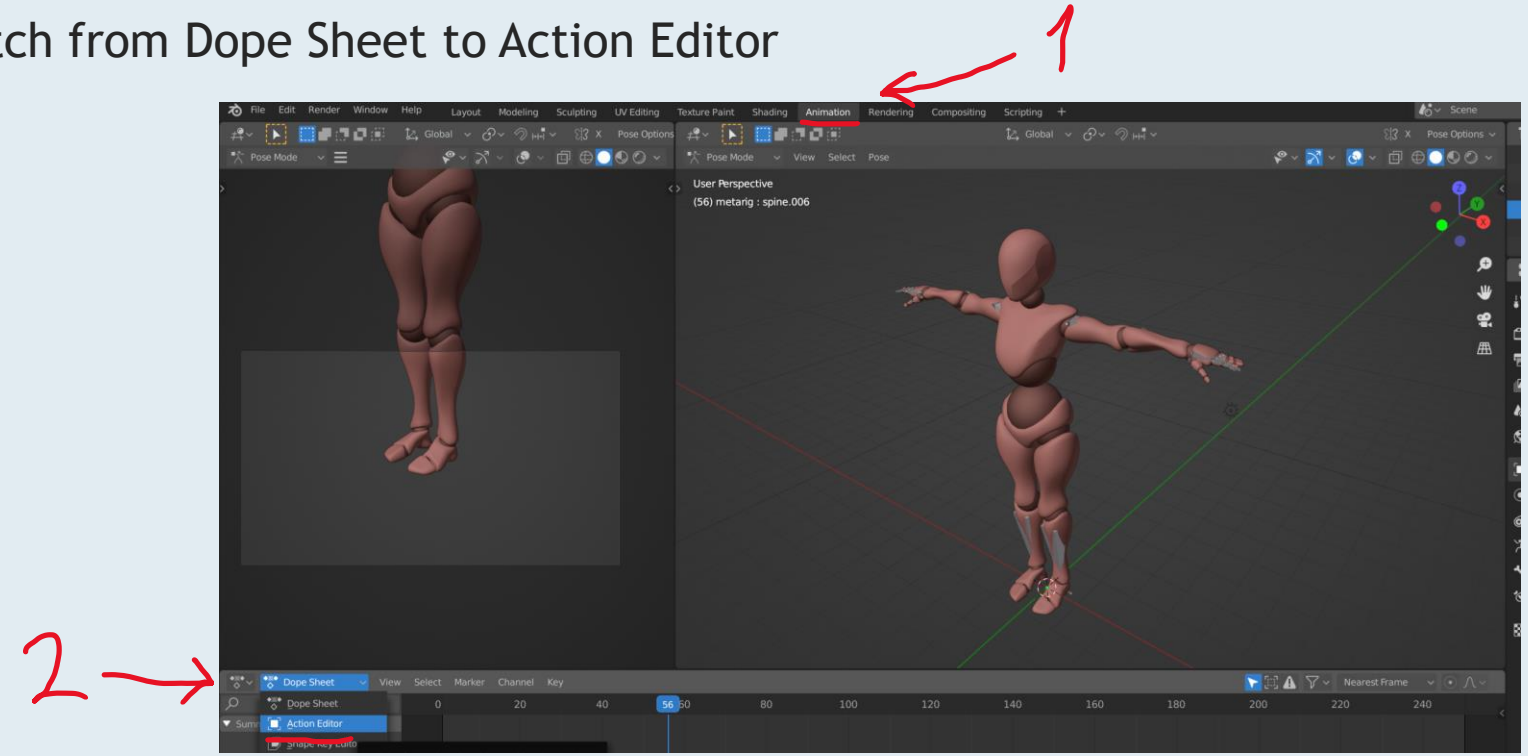


CHARACTER ANIMATION

ANIMATIONS WITH BLENDER

You can animate the character in Blender (and then import the animation in Unity):

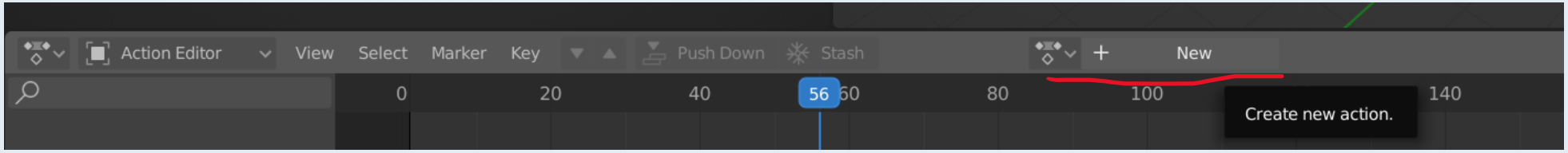
1. Go to Animation tab
2. Switch from Dope Sheet to Action Editor



https://docs.blender.org/manual/en/latest/editors/dope_sheet/action.html

CREATE AN ACTION 1/2

To create a new action click on + New:



When the action is created you can change its name in the text box

CREATE AN ACTION 2/2

You can create an action as you create an animation

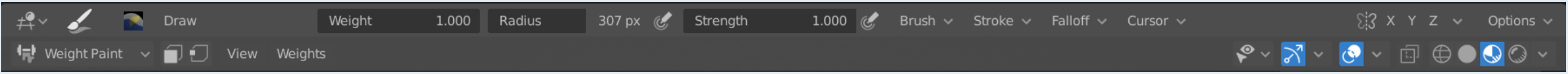
We will create a hand wave animation, calling it *handWave*

1. Switch to Pose Mode
2. Choose the starting frame (we will start with frame 1)
3. Select the hand bones, then grab [G], scale [S] or rotate [R] to adjust the hand position
4. Right click on the bone or press [I] > Add keyframe > LocScaleRot
5. Repeat steps 2-4 increasing the timeframe (we will increase 10 by 10)

WEIGHT PAINT MODE 1/3

Weight Paint mode can be used to define a weighted subset of vertices from a mesh

In Weight Paining mode is possible to assign weights (influence) of the bones to the mesh



The weights can be assigned simply painting the mesh:

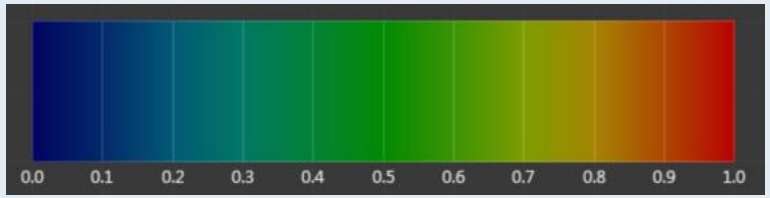
- use Draw to paint
- use Subtract to cancel painting

You can change the brush size and its strength changing Radius and Strength values

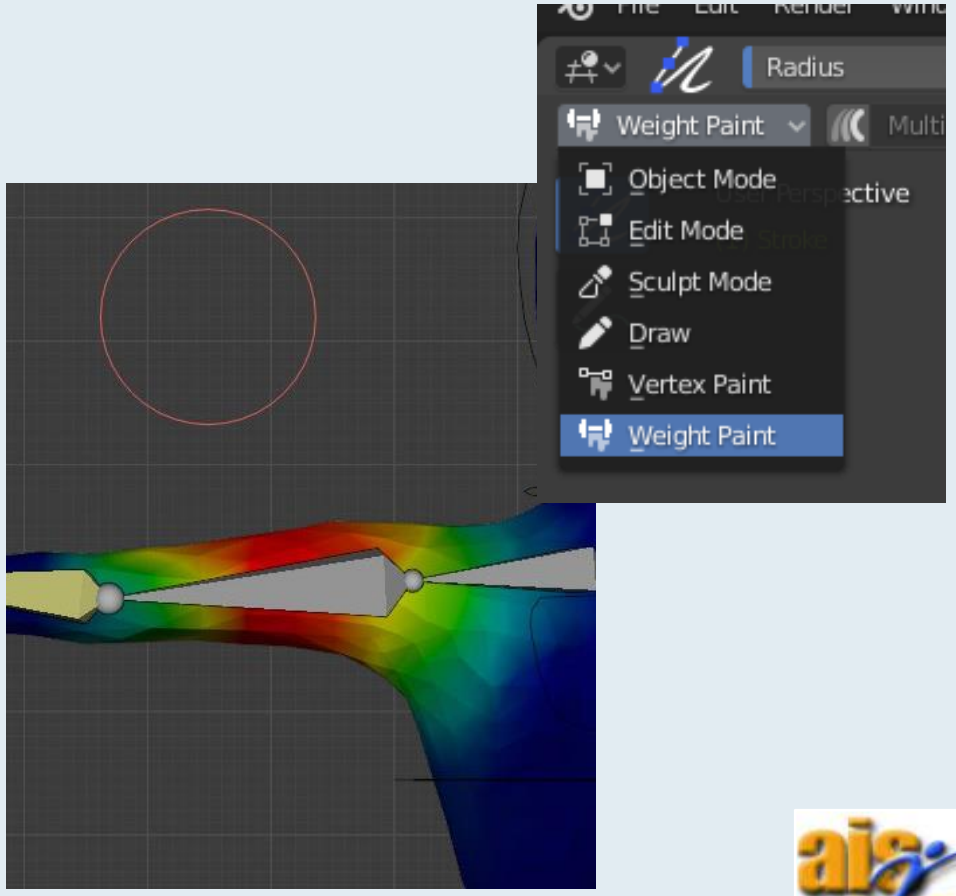
https://docs.blender.org/manual/en/latest/grease_pencil/modes/weight_paint/

WEIGHT PAINT MODE 2/3

The weight of each vertex are expressed with a Weighting Color Code using a gradient color system: blue means unweighted (0) and red is fully weighted (values near to 1)



You can change the weight (color) to be used by the brush defining the **Weight** value.



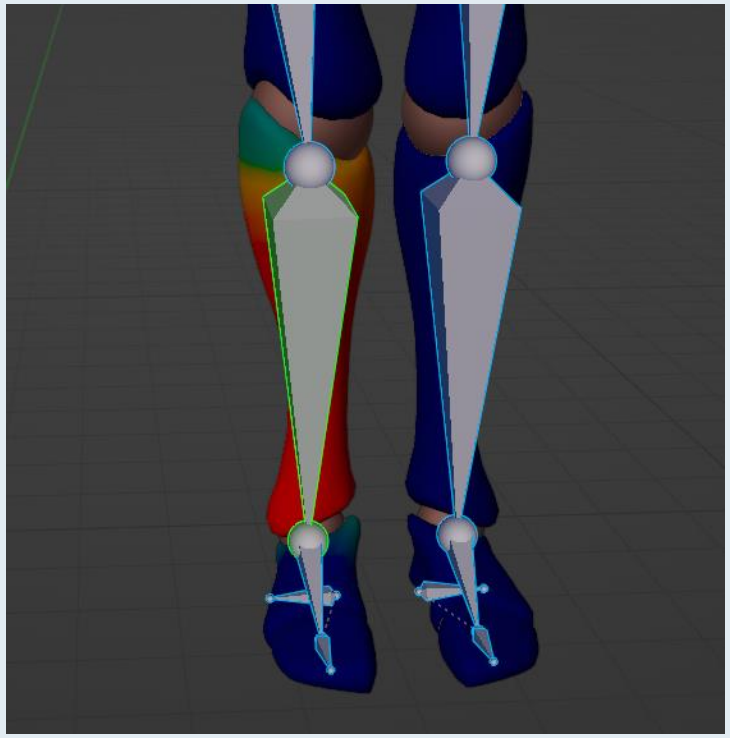
https://docs.blender.org/manual/en/latest/grease_pencil/modes/weight_paint/

WEIGHT PAINT MODE 3/3

- Select the rig and then [shift] + select the mesh
- Switch to Weight Paint Mode

You can:

- select a single bone with [shift] + left mouse button
- paint on the mesh to define the bone's influence on it



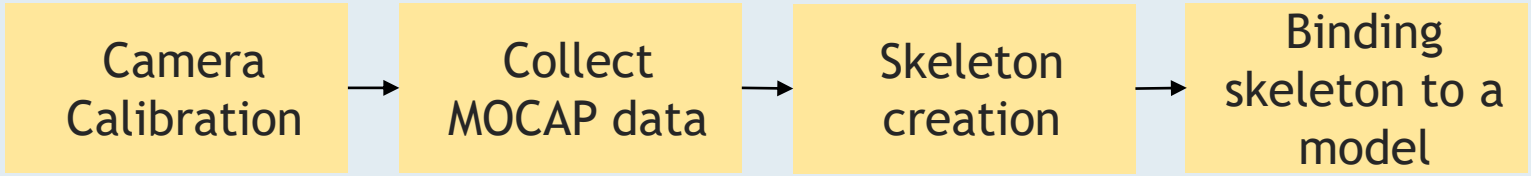
https://docs.blender.org/manual/en/latest/grease_pencil/modes/weight_paint/

MOTION CAPTURE

MOTION CAPTURE PIPELINE

Motion Capture is a technology for digitally recording specific movements of a person and translating them into animation data to use in a 3D software

It is useful to get the character animation you need, without the need to set every single keyframe of manual animation



MOTION CAPTURE DATA

Blender works with motion capture data in .bhv format

We will use data from the Carnegie-Mellon Graphics Lab Motion Capture Database:

cgspeed - The Daz-friendly BVH release of CMU's motion capture database (google.com)

which consists in a large set of human motions captured with a Vicon motion capture system and converted into .bvh files

In particular, the .zip file you can find in the Ex02-02 folder in github, cointains data from the first directory in the link: Zip file for BVH directories 01-09

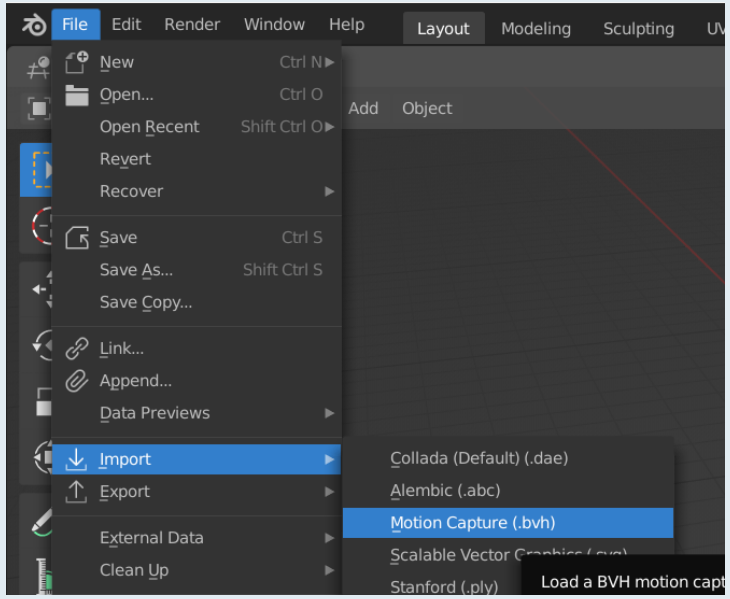
IMPORT .BVH DATA

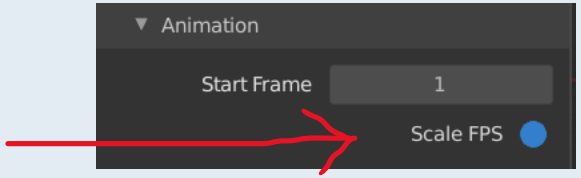
Unzip the folder with .bvh files

1. In Blender top menu on the left, select Files > Import > Motion Capture (.bvh)

2. Navigate to bvh_files > 03 and select the first file in the folder

3. Check **Scale FPS** on the left to adjust the animation to the frame rate of our scene, and confirm





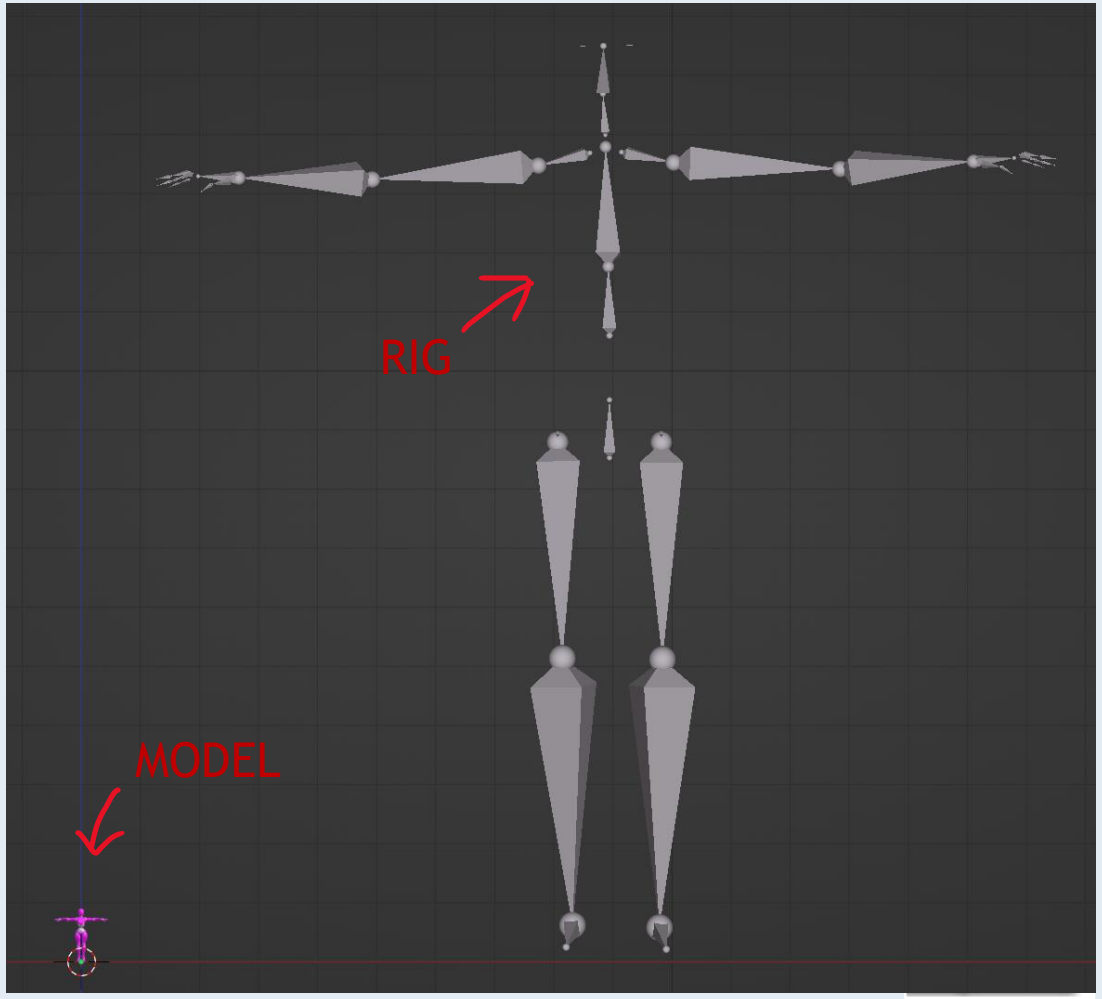
IMPORT CHARACTER MODEL

Now we must import a character to assign the rig to

1. In the top menu, select File > Import > FBX

2. select the Humanoid.fbx you find in the Ex02_02 folder and confirm

We have to rescale the rig dimensions to the character’s ones



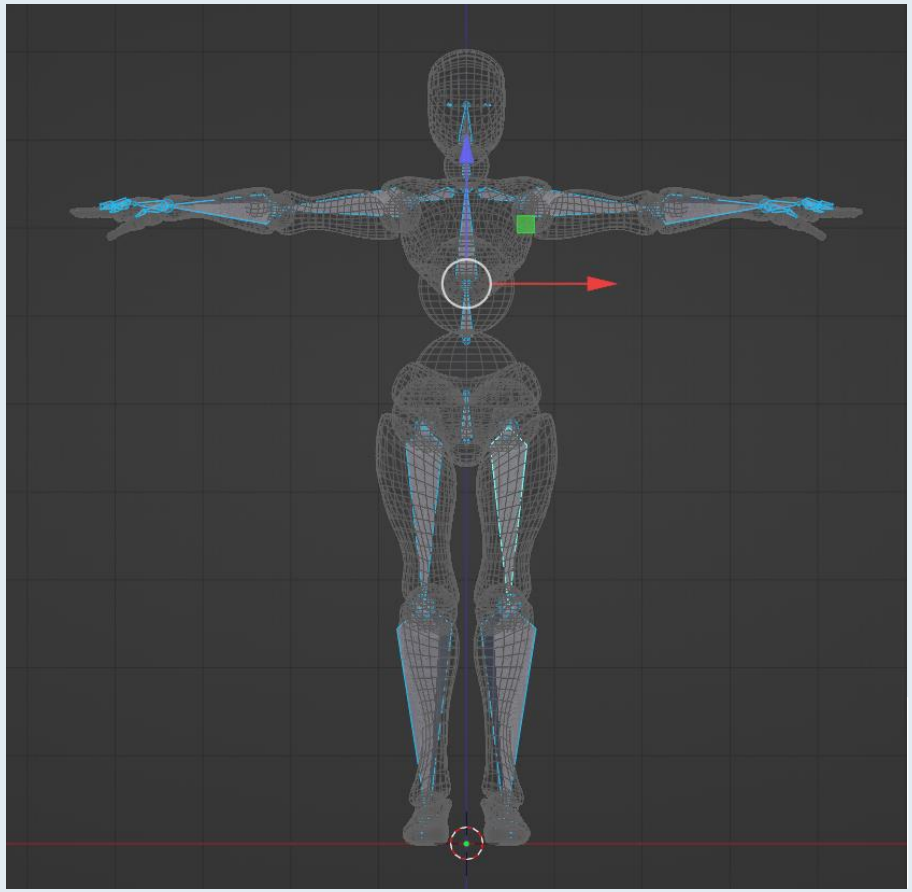
ADJUST THE RIG

After selecting the starting frame in the Timeline (in this case frame 1):

1. Select the rig and, in Object Mode, scale it to the character's dimension with **[G]**

2. Switch to Edit Mode and to wireframe view with **[Z] > Wireframe**

3. Select all the bones with **[A]** and move the rig with **[G]** to adjust its position



CREATE A NEW RIG

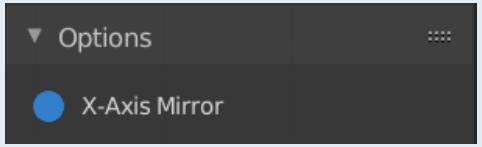
After checking the Rigify Add-On in Edit > Preferences > Add-ons:

1. In Object Mode, use **[shift] + [A] > Armature > Human (meta-rig)** to create a new rig

2. Adjust the rig on the character with **[S], [G] and [R]**

3. In Edit Mode, delete all the unnecessary bones

TIP: activate mirroring by checking Tool > Option > X-Axis Mirror in the right menu



PARENTING

You can now parent the character with the rig

In Object Mode:

1. Click on the character's mesh then [shift] + click the created *metarig*
2. Press [ctrl] + [P] to parent the character's mesh with the rig
3. Choose the option Armature Deform > With Automatic Weights
4. Select Beta_Joints then [shift] + click the created *metarig*
5. Repeat steps 2-3

ROKOKO PLUGIN 1/2

We have to retarget (assign motion capture data to our rig) the imported rig

We will use the Rokoko plugin for Blender v. 1.1.1: Releases · Rokoko/rokoko-studio-live-blender (github.com)

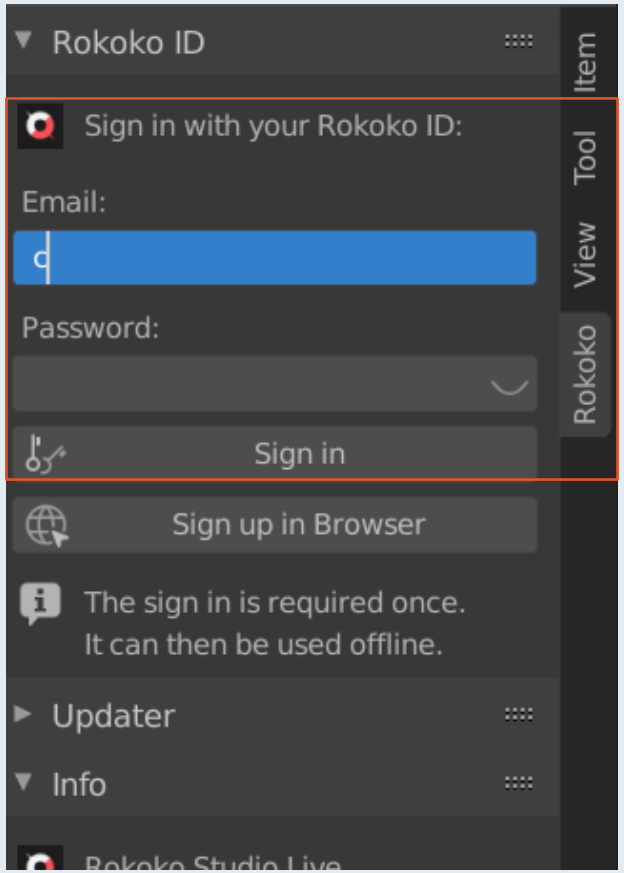
You can find the plugin in the github folder Ex02-02

1. In the top menu, on the left, Select Edit > Preferences > Add-ons
2. Click Install a select the Rokoko-plugin.zip in the folder
3. Search the Rokoko add-on
4. Check the add-on box and confirm

ROKOKO PLUGIN 2/2

Subscribe to Rokoko on the website:
https://www.rokoko.com/

1. In the right menu select Rokoko
2. Insert the Email and the Password you used to register in Rokoko website
3. Sign In

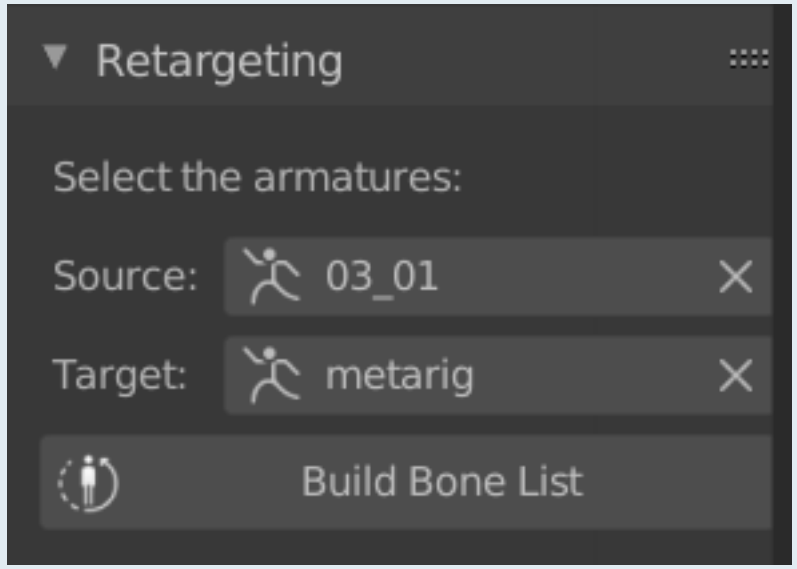


RETARGET ANIMATION 1/2

5. Select the Retargeting panel

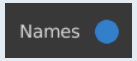
6. Select as:
    4. Source: the Motion Capture rig -> 03_01
    5. Target: the rigify rig -> metarig

7. Click on Build Bone List



RETARGET ANIMATION 2/2

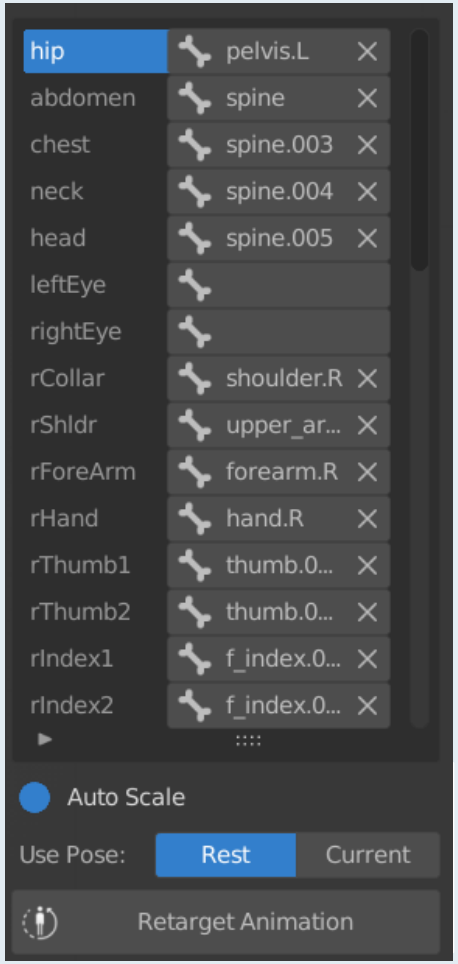
Rokoko will automatically assign each bone of our rig to the bones of MC's rig

1. We can manually check the Bone List in order to correct the errors
    - Tip: select a rig and click on Object Data Properties  on the right and check Names in Viewport Display section (

) to display bones' names

2. Finally, we can click Retarget Animation

3. Press [spacebar] to see the result!

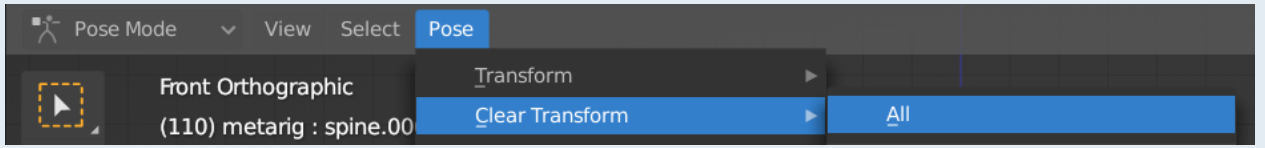


FINAL TOUCHES

- Generally, you want a model which moves in-place:
  - Select the Graph Editor 

  - Search for *Location* in the search bar
  - Select all the curves related to Location and delete them with [canc] > Delete Keyframes

- Move the character at the centre of the axes:
  - In Pose Mode, select the rig with [A]
  - Select Pose > Clear Transform > All



- To adjust the bones' influence on the character's body parts, use Weight Paint