

19

Motion Capture Editing and Cleanup Using Control Rig and Sequencer Bonus Material

In the previous chapter we explore Mocap Editing further. This is aimed more towards someone who want to gain further knowledge on this topic. Typically, this would be for someone who wants to be a Character Animator. Going through this material will teach you some extra tricks of the trade and give you a better idea of my workflow.

In this bonus material I will assume you already completed the chapters details in the technical requirements, but especially *Chapter 19, Motion Capture Editing and Cleaning Using Control Rig and Sequencer*.

My descriptions of the steps in this bonus material will be brief and to the point since you should have done most of these steps before. This would be a broad description of the steps, so you'll need the base knowledge of the previous chapters to follow along with this bonus material.

In this chapter we will cover:

- Cleaning the Sitting Idle Animation
- Cleaning the Idle Stand Cycle Animation
- Editing the Walk Cycle Animation
- Cleaning the Button Push Animation

Technical requirements (H1 – Section)

In this chapter we will need to work in Unreal Engine 5 and the Maximo website. You will need the following to complete this chapter.

- A computer that can run basic 3D animation software.

- You need to have installed Unreal Engine 5. You can download it from:
<https://www.unrealengine.com/en-US/download>
- Completed *Chapter 15, Create Control Rig with Basic IK Controls for Robot in UE5*, *Chapter 17, Create Three Simple Animations for the Robot in EU5 Sequencer*, *Chapter 18, Importing Motion Capture onto the Metahuman Control Rig* and *Chapter 19, Motion Capture Editing and Cleaning Using Control Rig and Sequencer*.

Get the Source Animations for the Bonus Material

At the time of writing this book, UE5 was still in Early Access and only the old retargeting tools were available from UE4. This redundant retargeting tool was used to retarget the original animations from Mixamo. The book has since been updated, but I based this lesson on those older retargeted animations since they teach better lessons about the MoCap cleanup process than the ones done with the new retargeting method.

You can download the source animations, that the following lessons are based on, as well as the bonus material animations here: [Link](#)

You just need to add these to your UE project folders.

You can also find the old retargeted animations in the example final project file that can be downloaded from here along with installation instructions: [Link](#)

The animations are under: [Content/Mocap_From_Mixamo/Mocap](#)

Cleaning the Sitting Idle

First, we'll clean the Sitting Idle. We will change the following:

- For the pose to be more neutral.
- Change the hand positions.
- Change how much she leans forward.

1. Open [New Level Sequence](#) in UE to edit this animation in.

2. Drag **MetaHuman** blueprint into the level.
3. Delete the **Control Rig** in Sequencer.
4. Add an **Animation Track** to Sequencer and choose the **Sitting_Rubbing_Arm_meta** animation.
5. Set the **Active Time Range** to the length of the animation.
6. **Bake** this animation to the **Control Rig** so you can edit it in **Sequencer**. The end result should be what is shown in *Figure 19b.1*.

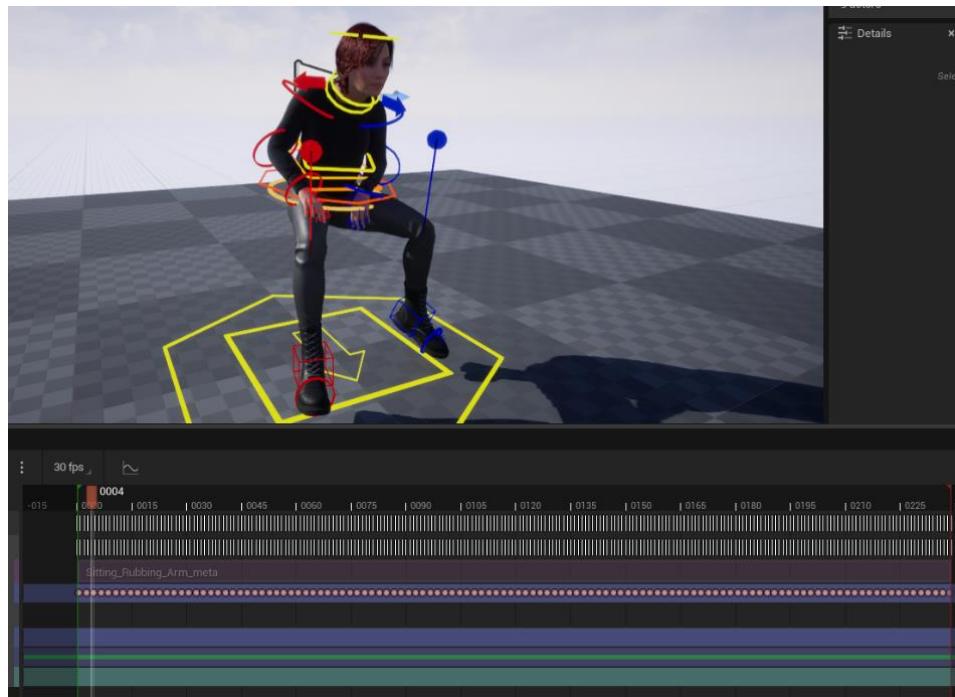


Figure 19b.1 Baked ‘Sitting Rubbing Arm’ Animation to Control Rig

7. Add **Additive Layer** to the Control Rig in **Sequencer**.
8. Turn **Autokey Off**.
9. Make sure **IK/FK keys** are checked to enable IK on the arms and legs as shown in *Figure 19b.2*.

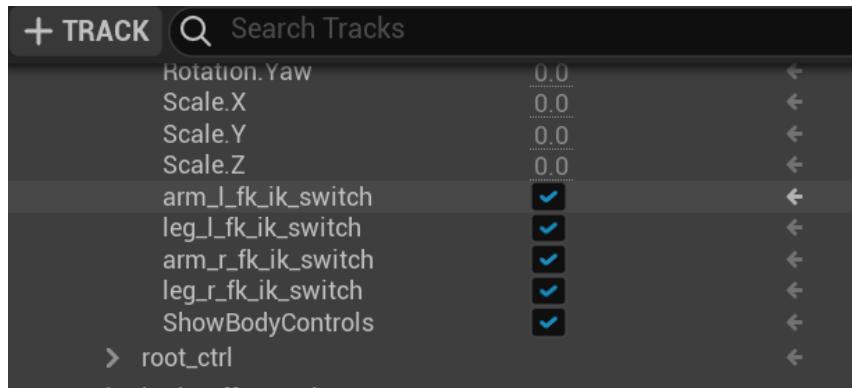


Figure 19b.2 IK/FK Keys Ticked

- Load Sitting Idle **Pose** you created in *Chapter 19, Motion Capture Editing and Cleaning Using Control Rig and Sequencer*, at start of the animation in **Sequencer**. (See *Figure 19b.3*).

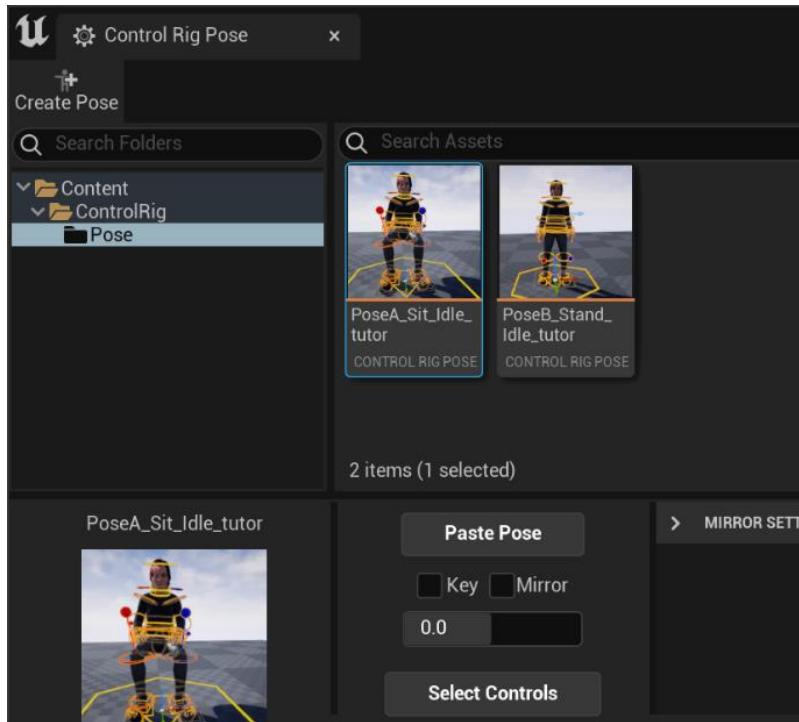
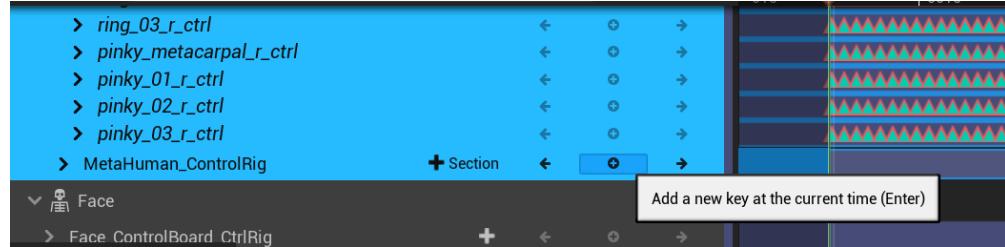


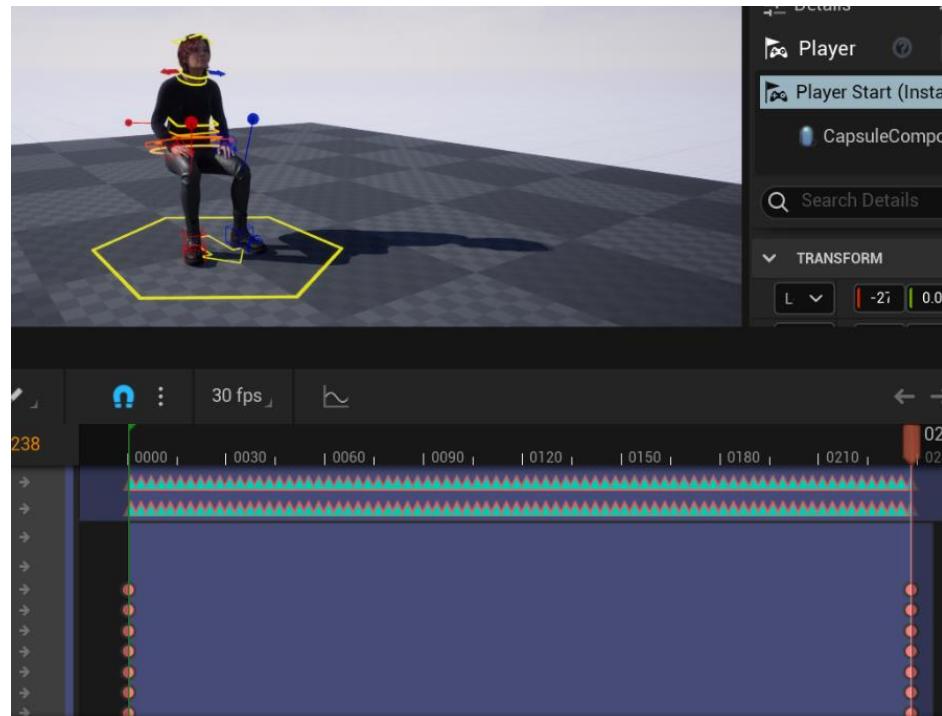
Figure 19b.3 Load Sitting Pose

11. Add keyframes on all the Control Rig controllers on the **Additive Layer** at frame 0000 to key in this sitting pose at the start of the animation timeline as shown in [Figure 19b.4](#).



[Figure 19b.4 Add Keyframe on all the Control Rig Controllers](#)

12. Do the same as [step 11](#) on the last frame to key in the sitting pose on the last frame of the timeline. (See [Figure 19b.5](#))



[Figure 19b.5 Sitting Pose on First and Last Frame](#)

The First and last frame of the animation is now the same so it can seamlessly loop during playback. This is great if we wanted to cycle it longer in our scene. But it still needs a lot of cleaning up.

13. **Delete** all the base Mocap keyframes (apart from the **first** keyframe) from the **hands, fingers, feet, arm pole vectors, clavicles**, and **head**. Do not delete the keyframes on the knee pole vectors to keep legs ‘alive’. (See *Figure 19b.6*)

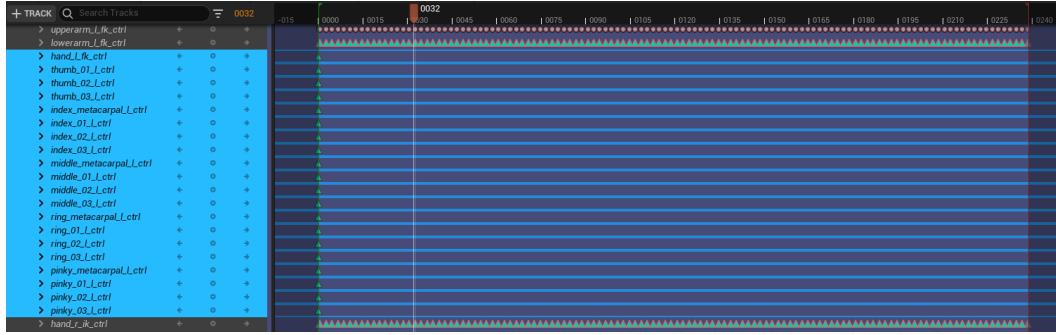


Figure 19b.6 Delete Base Mocap Keyframes

When playing back the animation, you’ll notice there’s far too much hip movement as shown in *Figure 19b.7*. Let’s reduce it down without losing the underlying animation. We call this ‘non-destructive’ editing of mocap.

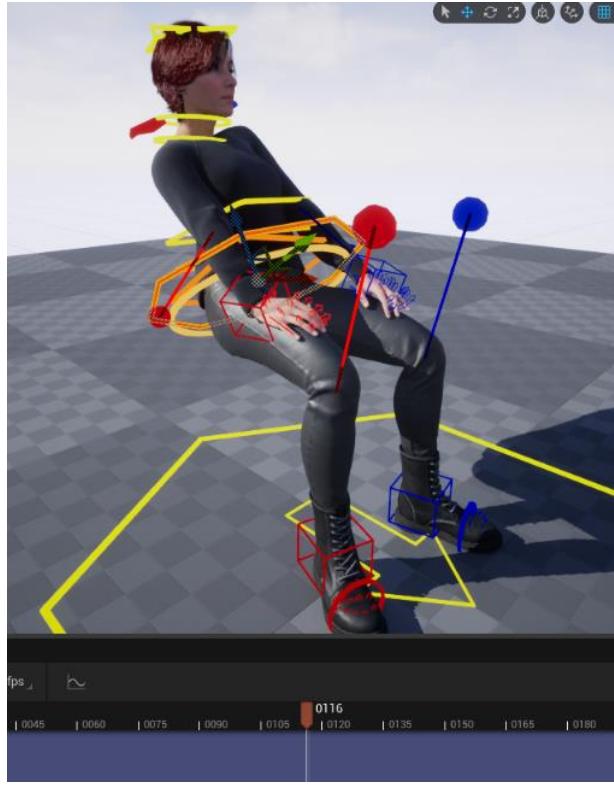


Figure 19b.7 Too Much Hip Movement

We will **reduce** the amount of movement on the **hip**, **spine**, and **neck** controllers by **scaling the animation curves** in **Sequencer Curve Editor**. This includes these controllers:

- **Hips_ctrl** (X, Y and Z position + X, Y and Z rotation curves)
- **spine_02_ctrl** (X, Y and Z rotation curves)
- **spine_03_ctrl** (X, Y and Z rotation curves)
- **neck_01_ctrl** (X, Y and Z rotation curves)

14. To **scale** the curves, we **select all the keyframes** in the animation curve (starting with for example the X channel) and then selecting the **Transform Tool** in the in the Curve Editor toolbar as shown in *Figure 19b.8*.

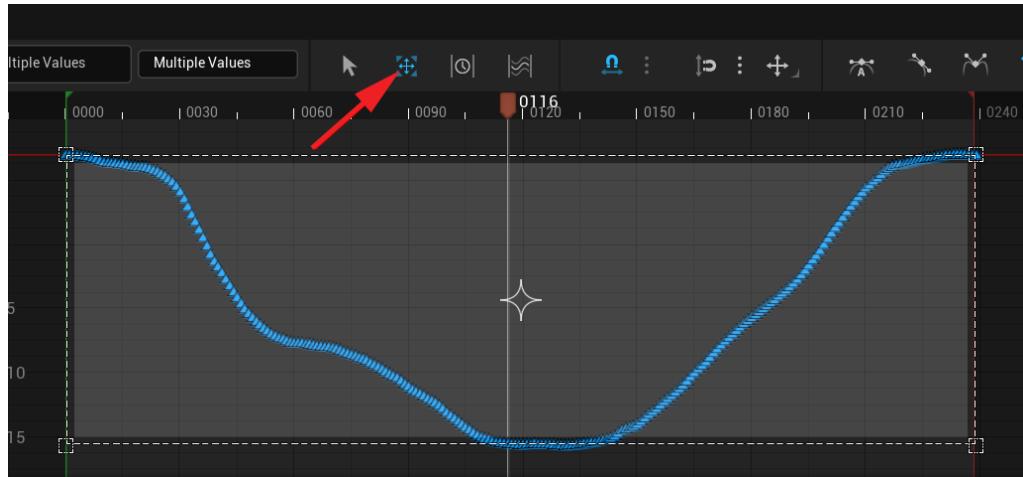


Figure 19b.8 Transform Tool

This Transform tool allows us to edit groups of keyframes at the same time. In the middle of this Transform Tool selection is a star with 4 points. This is the relative pivot of this transform tool. The selected keyframes will move relative to this pivot. We want the start and end pose to stay the same when we scale these curves. Because of this we need to move this relative pivot to be on the start position of the keyframes, so they stay where they are when we scale the curve with the Transform Tool.

15. Move the **relative pivot** of the **Transform Tool** to the position of the **first keyframe** as shown in **Figure 19b.9**.

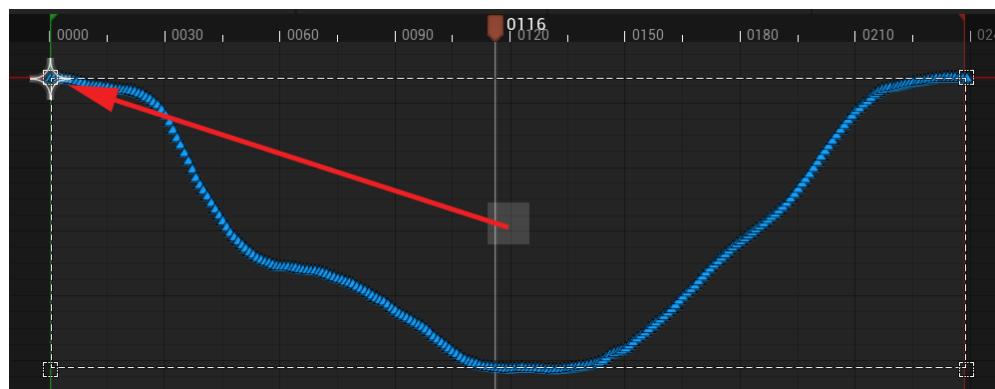


Figure 19b.9 Move the Relative Pivot of the Transform Tool

16. Now to **scale** the animation curve, left click select, hold, and drag the bottom left square to scale the curve as seen in *Figure 19b.10*.

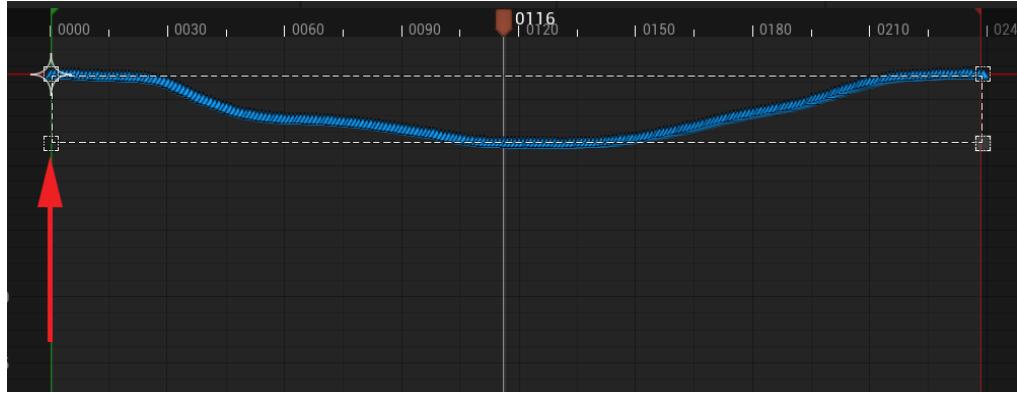


Figure 19b.10 Scale Curve with Transform Tool

17. Do this for all the animation curves of the hip, spine, and neck controllers until the amount of movement reduced to a level that it looks natural for the pose. (See *Figure 19b.11*.)

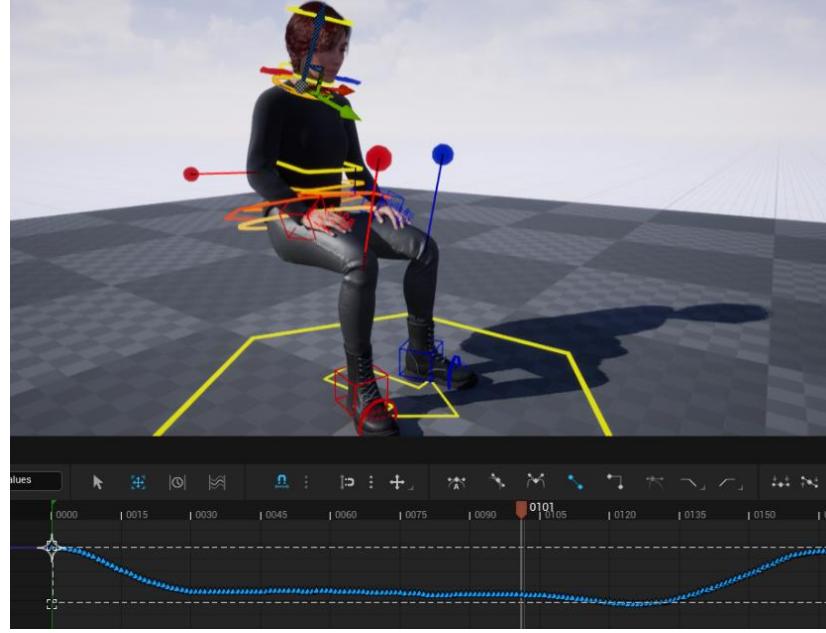


Figure 19b.11 Scaled Curve with Transform Tool Result

Next, we want the hands to lay on the upper legs but also follow the subtle movement of the upper legs. In order for the hands to follow the upper legs accurately we need the hands to follow the FK controllers of the legs. However, currently they're IK. The best way in Sequencer to convert the legs to FK is to Bake Animation Sequence to an animation in UE and to bring this animation back into a new sequence to edit. This is further explained in [Chapter 19, Motion Capture Editing and Cleanup Using Control rig and Sequencer](#), section [Fixing the hands with the Snapper tool](#).

18. **Bake Animation Sequence** by right clicking on **Body** in the **Sequencer TRACK** window and save it as `sitlilde_cleanup_seq_stage1`.
19. **Create** a **new** sequence in **Sequencer**.
20. Drag **Metahuman Blueprint/Rig** into **Sequencer**.
21. **Delete** the **Control Rig**.
22. **Add Animation Track** `sitlilde_cleanup_seq_stage1`.
23. Set the active animation range in the Sequencer timeline to the length of the animation.
24. **Bake** this animation to the Metahuman Controls by right clicking on **Body** in the Sequencer **TRACK** window and then **Rig Bake to Control Rig**.
25. Check the **legs** to be **FK** and the **arms** to be **IK** on the **global_ctrl** in the **TRACK** window. **Delete** all but first keyframes so it remains on those **IK** and **FK** values throughout the animation as shown in [Figure 19b.12](#).

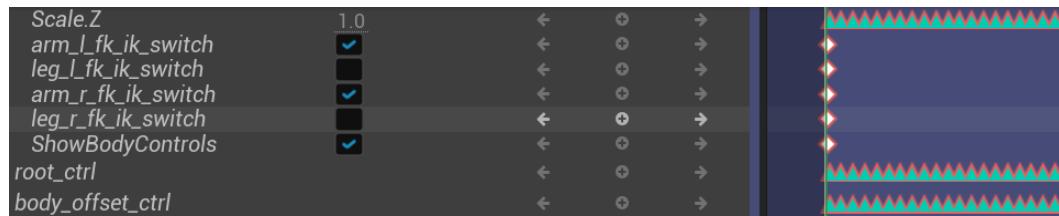


Figure 19b.12 IK and FK Settings, Delete Keyframes

26. **Snap** right hand **IK** controller to the **FK** thigh controller using the Control Rig **Snapper Tool** as shown in *Figure 19b.13*.

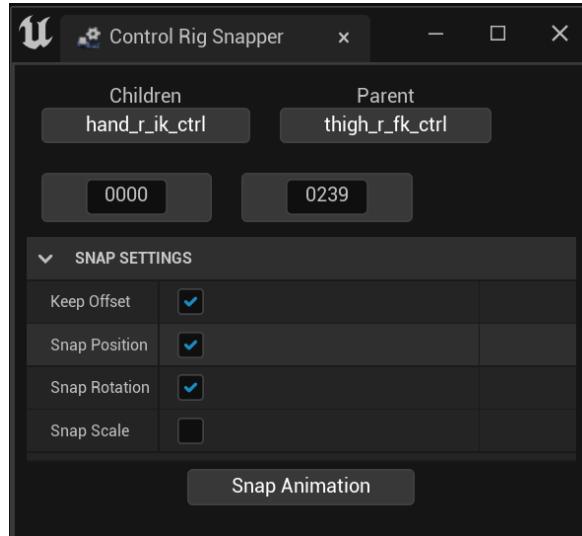


Figure 19b.13 Snap the Right Hand to Right Thigh

27. **Repeat** the same process for snapping the **left hand** to the **right thigh**. As shown in *Figure 19b.14*.

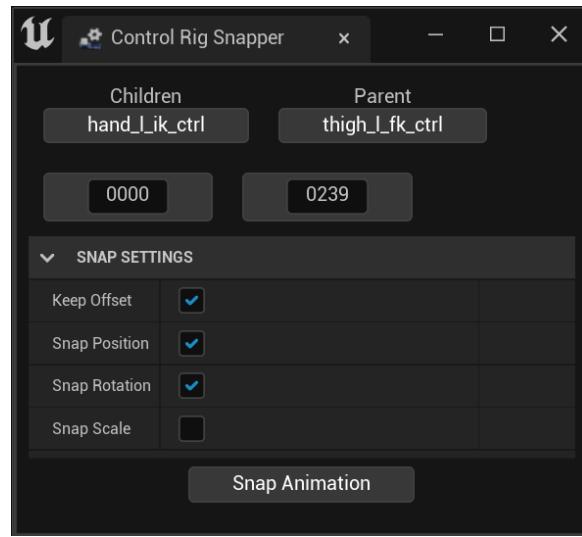


Figure 19b.14 Snap the Left Hand to Left Thigh

28. **Save** the sequence and **Bake Animation Sequence** by right clicking on **Body** in the sequencer **TRACK** window. Save it as the final cleaned up animation.

We have now cleaned the **Sitting Idle**, next let's clean the **Standing Idle**.

Cleaning the Standing Idle Cycle

The **Standing Idle** animation is really easy to edit. We just want to paste the same Idle Pose to the beginning and end of the animation to form a looping cycle.

1. Open **New Level Sequence** in UE to edit this animation in.
2. Drag **MetaHuman** blueprint into the level.
3. Delete the **Control Rig** in Sequencer.
4. Add an **Animation Track** to Sequencer and choose the **Standing_Idle_meta** animation.
5. Set the **Active Time Range** to the length of the animation.
6. **Bake** this animation to the **Control Rig** so you can edit it in **Sequencer**.
7. Add **Additive Layer** to the Control Rig in **Sequencer**.
8. Turn **Autokey Off**.
9. Make sure **IK/FK keys** are checked to enable **IK** on the **arms** and **legs**.
10. With the Poses Tool, on the first frame of the additive layer **Paste Pose** your own Standing Idle Pose you created in *Chapter 19, Motion Capture Editing and Cleaning Using Control Rig and Sequencer*. Otherwise, use the **PoseB_Stand_Idle_tutor** Pose I provide in the final **example project** as shown in *Figure 19b.15*.

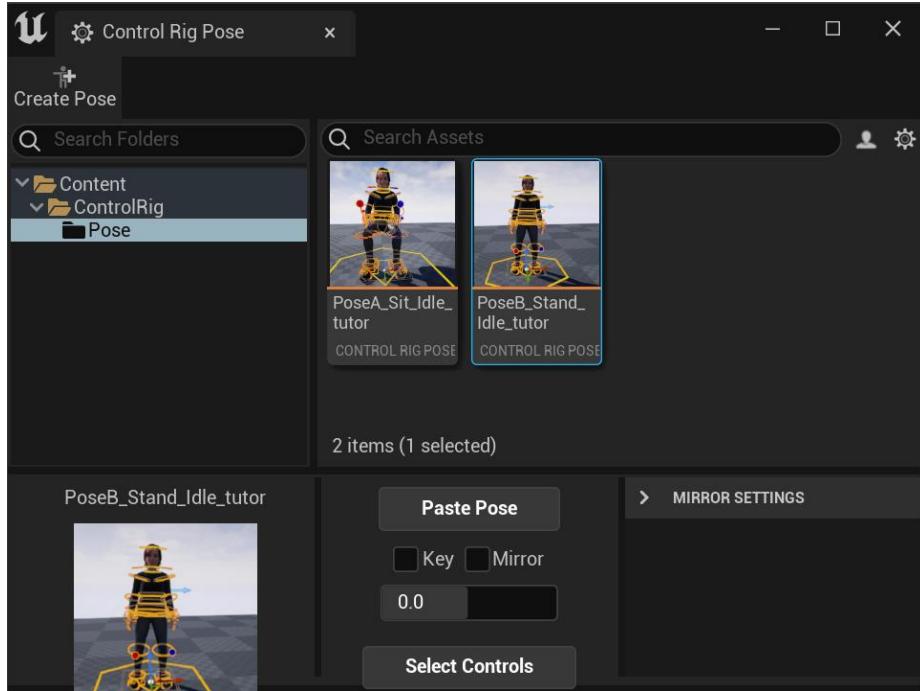


Figure 19b.15: Paste Pose

11. With the **Pose Tool**, **Paste Pose** the same Pose on the last frame to create a looping cycle and set a **keyframe** on all the Controllers on the **Additive Layer**.
12. **Check** the animation by playing it to make sure it looks good.
13. **Save** the sequence and **Bake Animation Sequence** by right clicking on **Body** in the sequencer **TRACK** window. Save it as the final cleaned up animation.

We have now cleaned the **Standing Idle**, next let's clean the **Walk**.

Edit Walk

With the walk animation we want the animation to start and end with the same Idle Pose as the Standing Idle. We will also clean up the feet, so that they make correct contact with the floor to stop any clipping with the ground plane.

Offset Walk with Start and End Pose the Same

First, we need to apply the Standing Idle pose:

1. Open **New Level Sequence** in UE to edit this animation in.
2. Drag **MetaHuman** blueprint into the level.
3. Delete the **Control Rig** in Sequencer.
4. Add an **Animation Track** to Sequencer and choose the **Female_Stop_And_Start_Walking_meta** animation.
5. Set **Active Range** 0–102 as seen in *Figure 19b.16*.

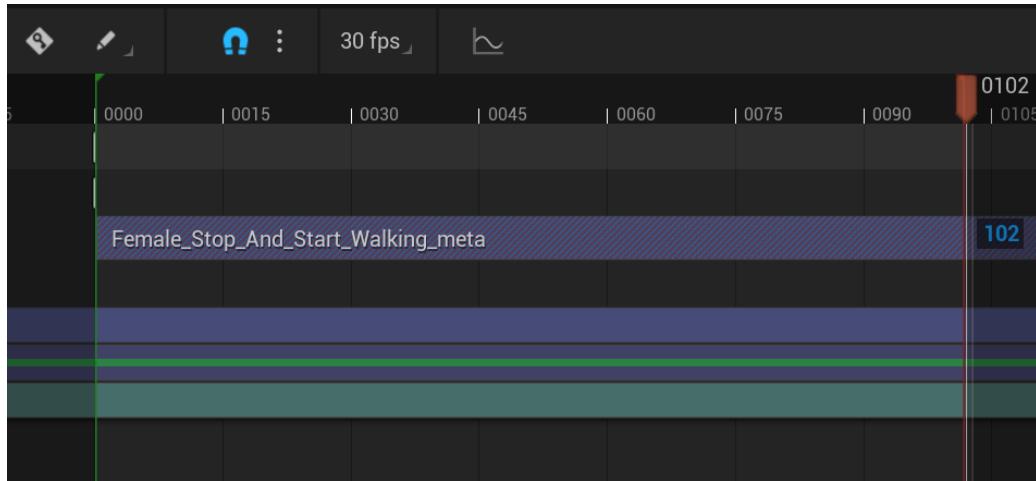


Figure 19b.16: Set Active Range

6. **Bake** this animation to the **Control Rig** so you can edit it in **Sequencer**.
7. Add **Additive Layer** to the Control Rig in **Sequencer**.
8. Turn **Autokey Off**.
9. Make sure **IK/FK keys** are checked to enable **IK** on the **arms** and **legs**.
10. With the Poses Tool, on the first frame of the additive layer **Paste Pose** your own Standing Idle Pose you created in *Chapter 19, Motion Capture Editing and*

Cleaning Using Control Rig and Sequencer. Otherwise, use the **PoseB_Stand_Idle_tutor** Pose I provide in the final [example project](#).

11. Set a **keyframe** on all the Controllers on the **Additive Layer**
12. If the head looks wrong, sometimes you have to set this to **local** on the **head_ctrl** as seen in *Figure 19b.17*.

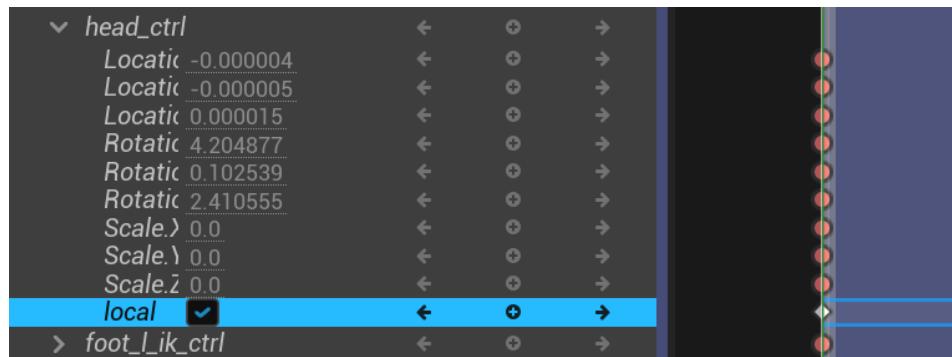


Figure 19b.17: Set Local on Head

13. Go to frame 0102.
14. On the main UE UI, click on **Create** | **Shapes** | **Cube** to create a **Cube** as shown in *Figure 19b.18*. This will be used as a visual marker in the viewport.

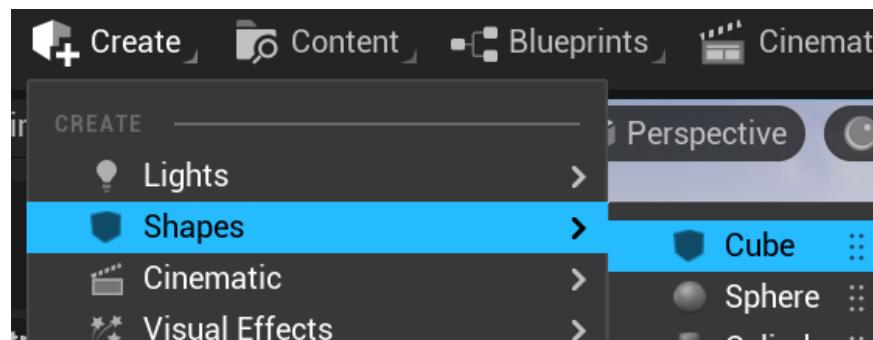
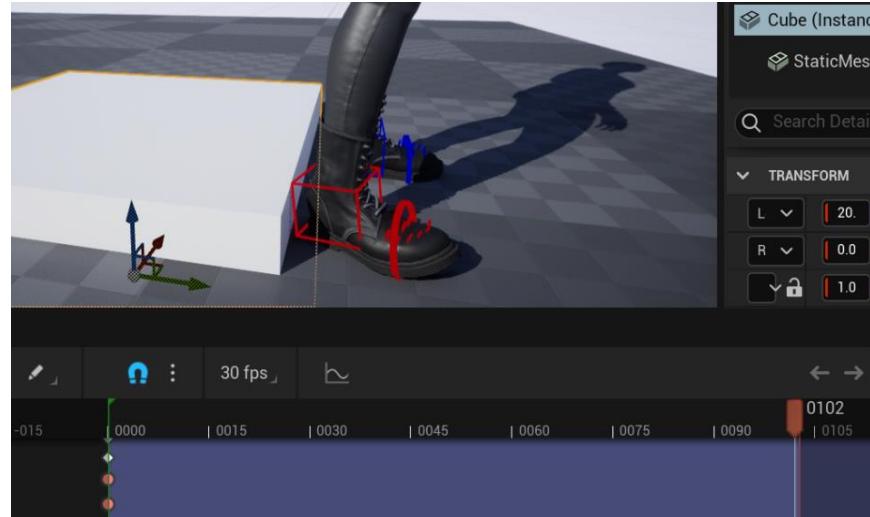


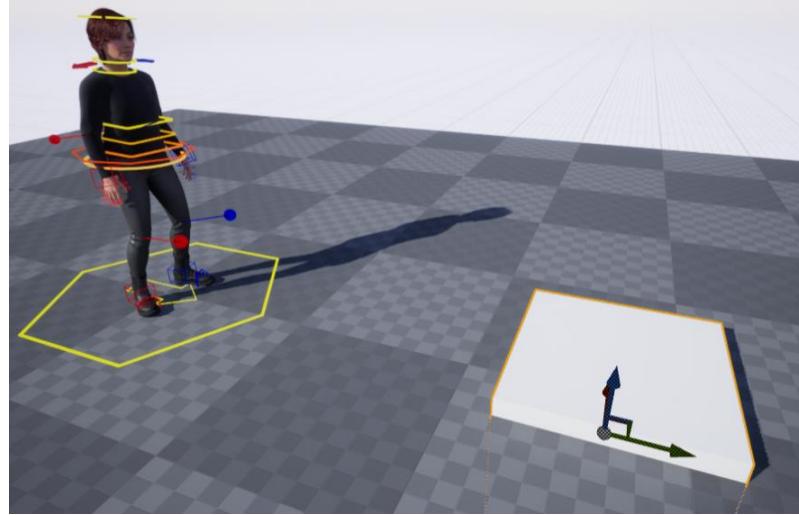
Figure 19b.18: Create Cube

15. Mark the foot position at 0102 by moving the cube just behind the heels of the character as shown in [figure 19b.19](#).



[Figure 19b.19: Mark Foot Position](#)

16. With the **Poses Tool**, on frame 0102 of the additive layer **Paste Pose** the Standing Idle Pose again as shown in [Figure 19b.20](#). **Keyframe** this pose on the **Additive Layer**.



[Figure 19b.20: Paste Pose](#)

Because the pose was created on the origin of the Control Rig, the pasted pose will snap it back to that position. In this case we want that offset so she doesn't just walk on the spot like she does now when you play this animation. This is what the Cube is for. Now we have a visual guide of the original offset and where the feet should be at the end of the animation.

17. On frame 0102 Select the **root_ctrl** and the **body_offset_ctrl** together and **move** them in the **Y Axis** so that the heels of the feet are back against the **Cube** and in the same position before you pasted the pose as shown in *Figure 19b.21*.

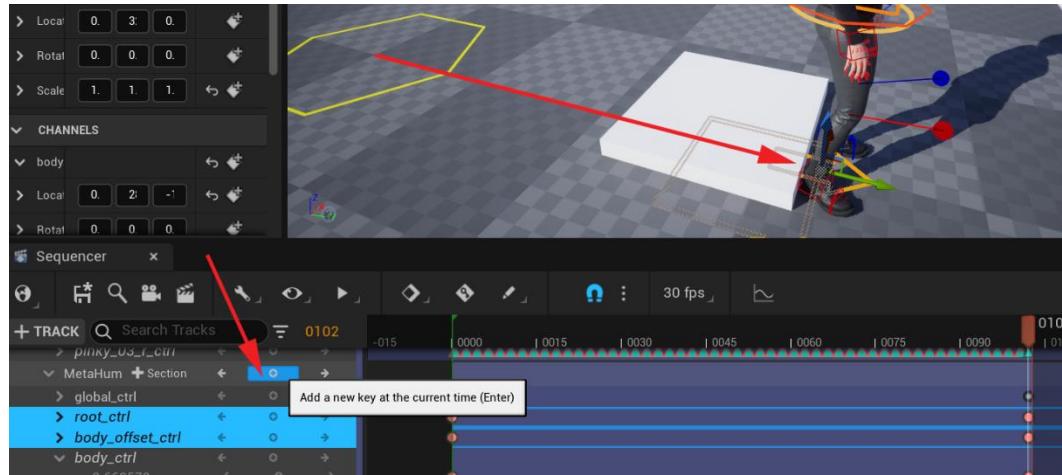


Figure 19b.21: Move Back to Original End Offset

18. Set a keyframe for these two controllers on frame 0102 as shown in *Figure 19b.21*.

We moved the **root_ctrl** with the **body_offset_ctrl** so that the root and the hips stay in the same relative position, on the last frame, as on the first frame to aid blending between animations. Why we do this is further explained in *Chapter 19, Motion Capture Editing and Cleanup Using Control Rig and Sequencer*, section *Planning Your MoCap Edit, Figure 19.1*.

We now have the same Idle Pose at the beginning and end of the animation so it can blend seamlessly to the other animations. Next, we need to clean up the feet.

Right Foot Clean

Next, we will Look at the right foot. When you scrub or play the animation timeline, you will see the feet clipping or sliding when it is not supposed to on the ground. Let us fix the vertical clipping first, then after, the sliding on the right foot. By sliding I mean to say that when the foot is supposed to be planted on the ground it slides instead. This is often the case since the proportions of the mocap actors or animation sources are often different from that of the final model and on top of that we changed the start and end pose.

1. On the **additive** animation layer, set a keyframe on frame 0031, when the foot falls and correct the clipping of the foot with the floor as seen in *Figure 19b.22*.

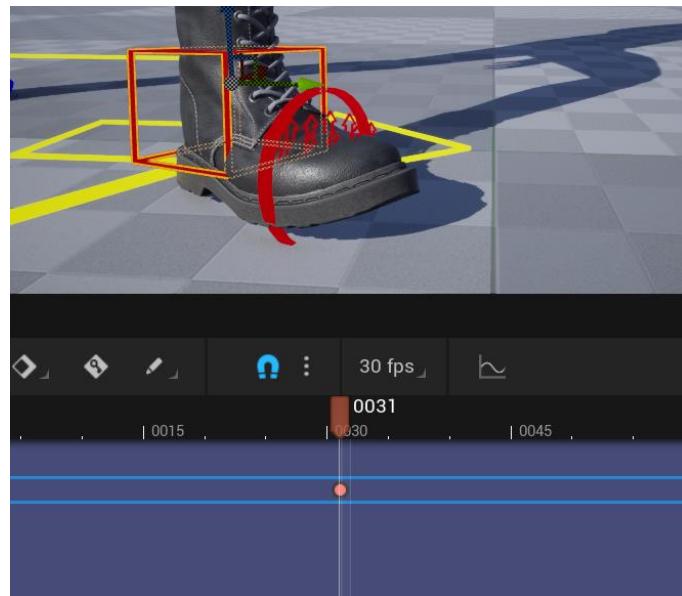


Figure 19b.22 Correct Foot on Frame 0031

2. On the **additive** animation layer, set a keyframe on frame 0066, when foot falls again and correct the clipping of the foot with the floor as seen in *Figure 19b.23*.

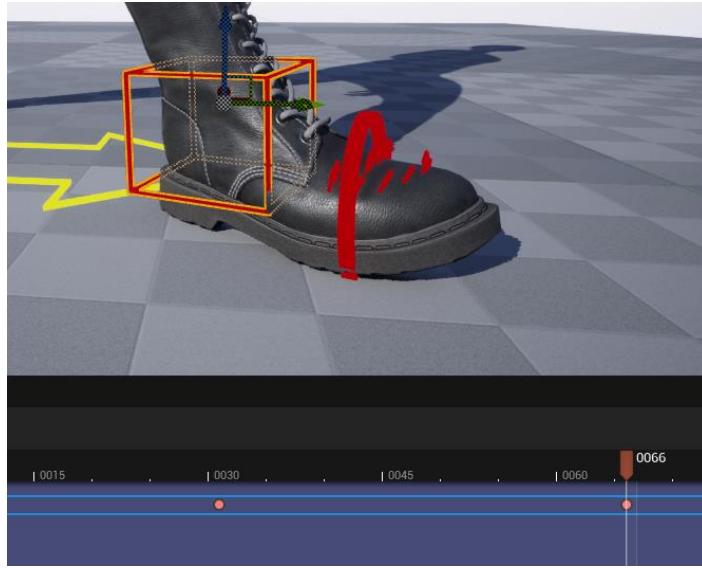


Figure 19b.23 Correct Foot on Frame 0066

3. Scrub the timeline between frame 0031 and 0066.

You'll notice the foot still need to be corrected with in-between keyframes. However, before we set keyframes that will fix the clipping with the floor, we need to also see at what frames we want to keep the foot at the same height. We want to set 'anchor' keyframes here to preserve the height, where we want to keep the current height. Then we set the keyframes that will adjust the height for the parts where the foot clips the floor.

4. Set an **anchor** keyframe on the **additive** animation layer on frame 0045 to preserve the height before the foot lifts again as seen in **Figure 19b.24**.

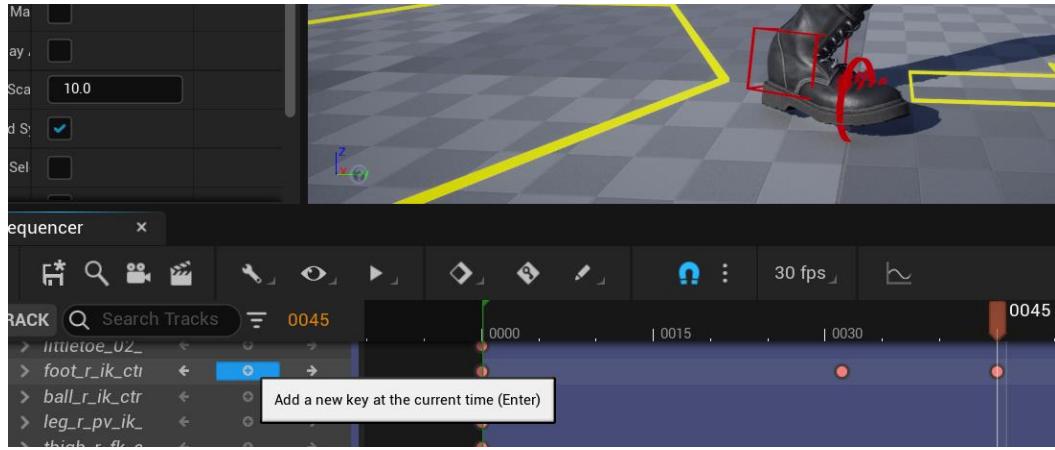


Figure 19b.24 Correct Foot on Frame 0045

- Scrub the timeline to see that the toe is clipping at frame 0050 as seen in **Figure 19b.25**.

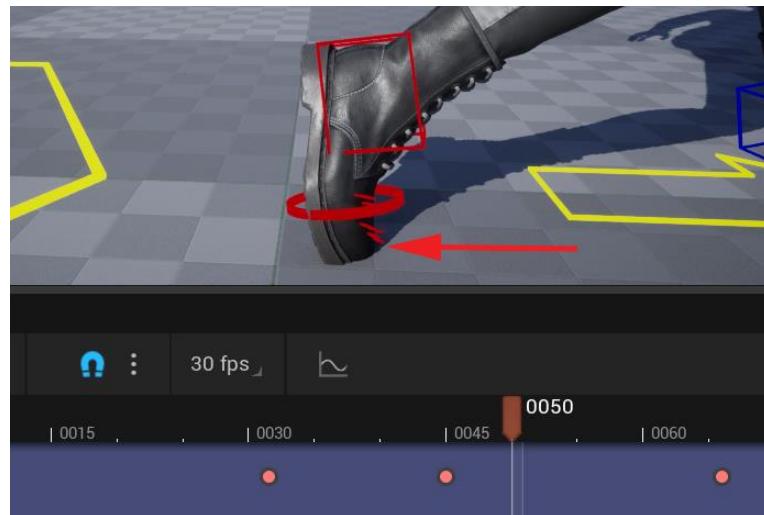


Figure 19b.25 Toe Clipping on Frame 0050

- On frame 0050 move the right foot upwards and set a keyframe on the **additive** animation layer as shown in **Figure 19b.26**.

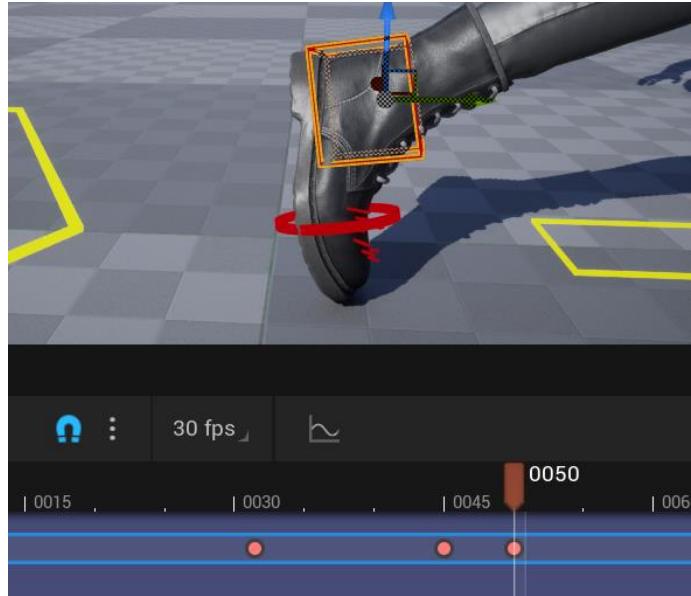


Figure 19b.26 Correct Foot on Frame 0050

7. Scrub the timeline to look at the results of these corrections between frame 0031 and 0066 on the right foot.

If you eliminated the vertical clipping of the foot with the floor, move on to the next section of time in the timeline.

8. Scrub the timeline between 0066 and 0102 and look at when the foot lifts and falls and where we want to preserve the height with anchor keyframes. Also look at when the foot clips the floor.
9. Next, set a height anchor keyframe at 0077 before foot lifts again to preserve the height between frames 0066 and 0077 as shown in *Figure 19b.27*.

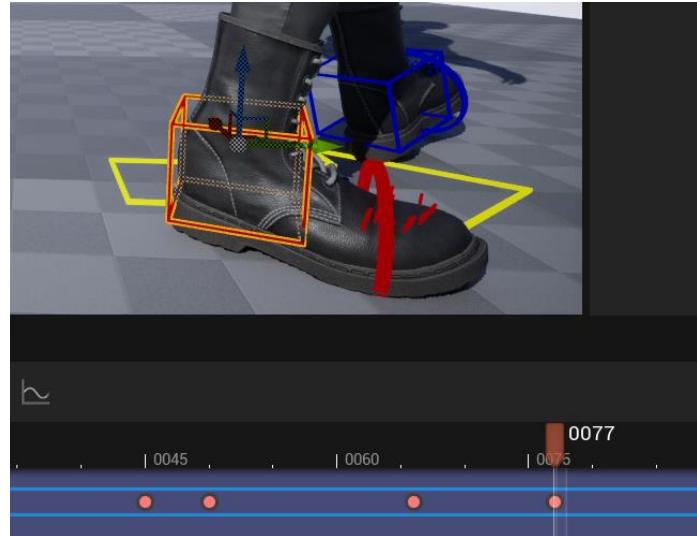


Figure 19b.27 Set height Anchor keyframe on 0077

10. Also set an anchor keyframe at 0098 on the **additive** animation layer when the foot falls to keep the end height of the right foot.

The foot is clipping at frame 0085 as shown in *Figure 19b.28*.

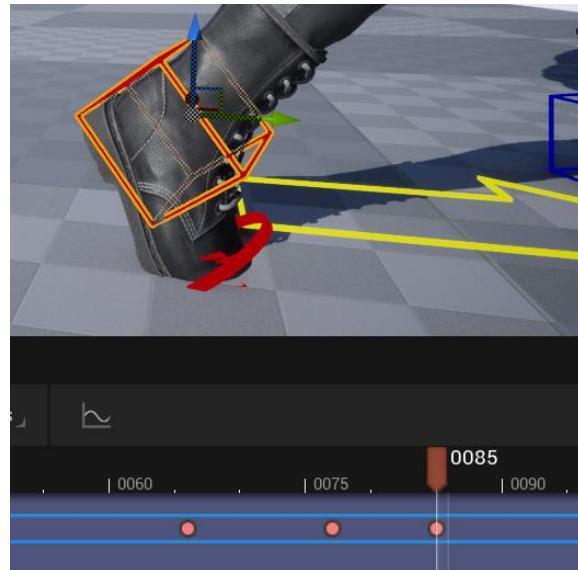


Figure 19b.28 Foot Clipping Floor

11. Lift the foot at frame 0085 to correct the clipping and set a keyframe on the **additive** layer as shown in *Figure 19b.29*.

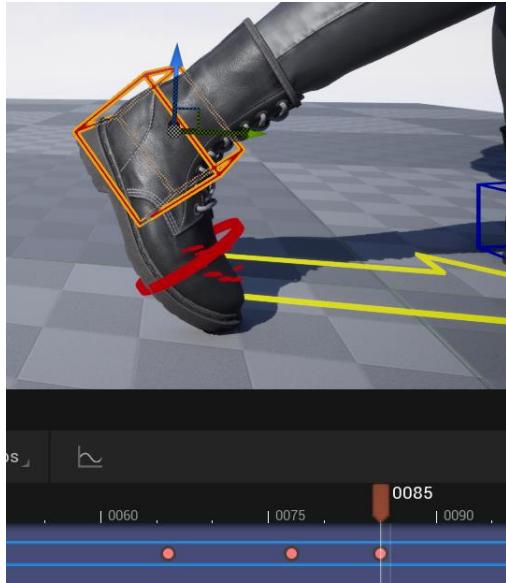


Figure 19b.29 Correct Clipping on Frame 0085

However, after this correction, if you scrub the timeline between frame 0077 and 0085, you'll notice that the foot now lifts too soon because of the height adjustment keyframe on 0085. Let us fix that.

12. On frame 0080, move the foot down to keep contact with the floor and set a keyframe on the **additive** layer as shown in *Figure 19b.30*.

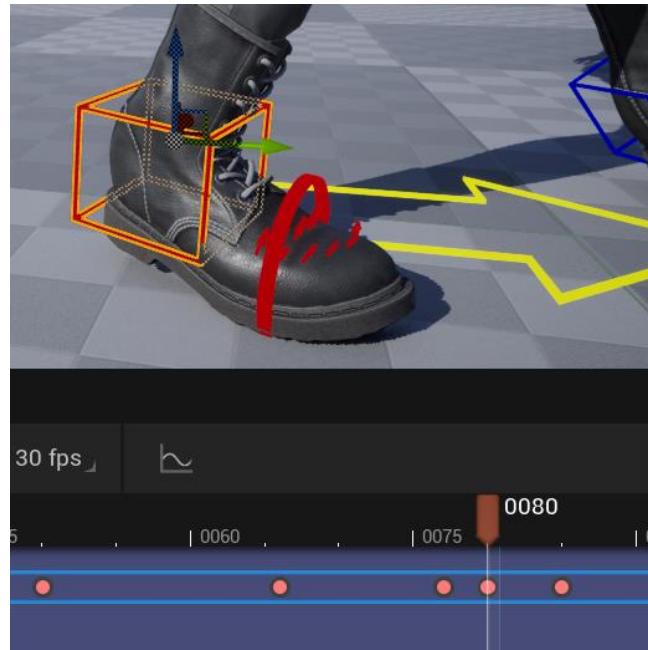


Figure 19b.30 Correct Foot Height Lower on Frame 0080

We have now fixed the worst of the vertical clipping of the right foot with the floor, but it still slides around when it should be planted like between frame 0031 to 0044. Let us fix that with the **Snapper** tool.

13. Open the **Snapper** tool from the **Animation** tab. For **Children** select `foot_r_ik_ctrl`. Set the range from 0031 to 0044. Check **on**, **Keep Offset**, **Snap Position** and **Snap Rotation**. Keep the **Parent** to **World** as shown in *Figure 19b.31*.

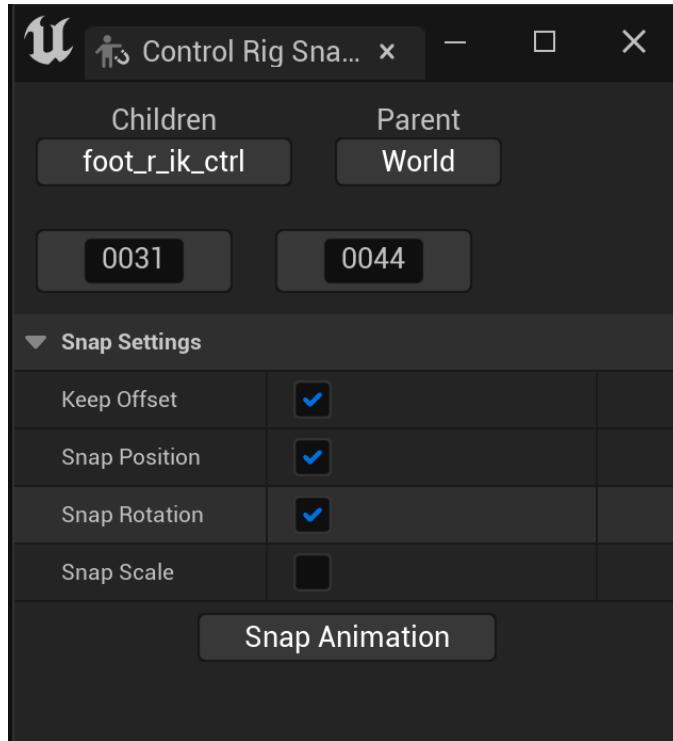


Figure 19b.31 Snapper Tool Settings

14. Click **Snap Animation** on the **Snapper** tool to snap the foot controller.

Note

The Snapper tool snaps the keyframes on the base layer of the animation, not the Additive Layer.

15. To get rid of a glitch after the snapping range on the base layer of the animation, **delete** 5 keyframes just after the last keyframe of the snapping range. This is keyframe 0045, 0046, 0047, 0048 and 0049.

However, when you delete these keyframes the toe now clips the floor again at frame 0047 as shown in *Figure 19b.32*. Let us correct that.

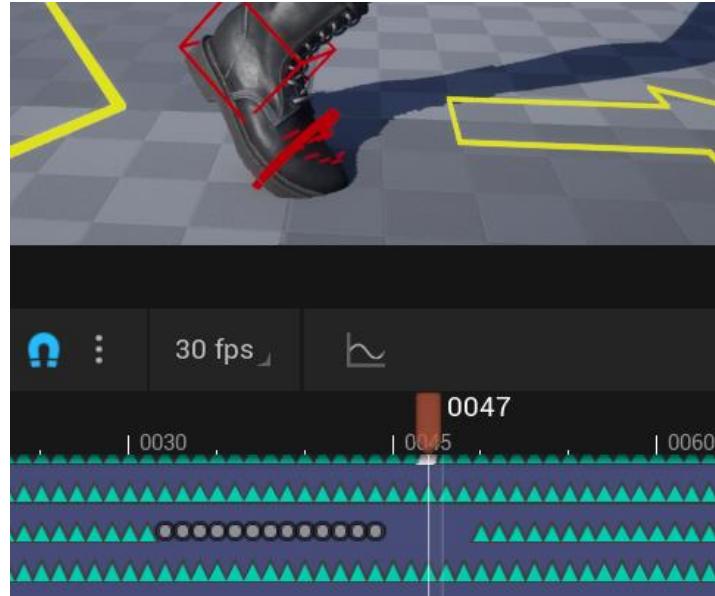


Figure 19b.32 Clipping Toe on 0047

16. On frame 0047 and on the **base** layer of the animation lift the right foot to correct the clipping and set a keyframe as shown in *Figure 19b.33*.

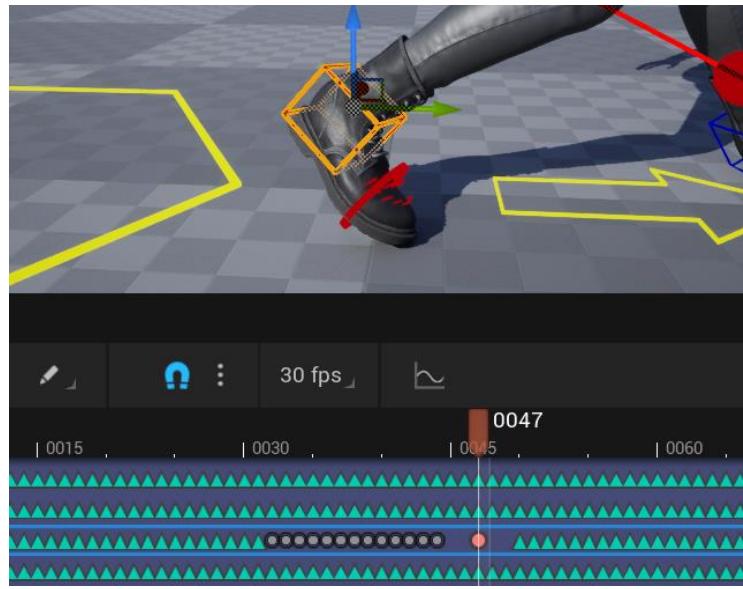


Figure 19b.33 Foot Corrected on Frame 0047

Now let's fix the sliding on the second step.

17. In the **Snapper** tool, for **Children** select **foot_r_ik_ctrl**. Set the range from **0066** to **0077**. Check **on**, **Keep Offset**, **Snap Position** and **Snap Rotation**. Keep the **Parent** to **World** as shown in *Figure 19b.34*.

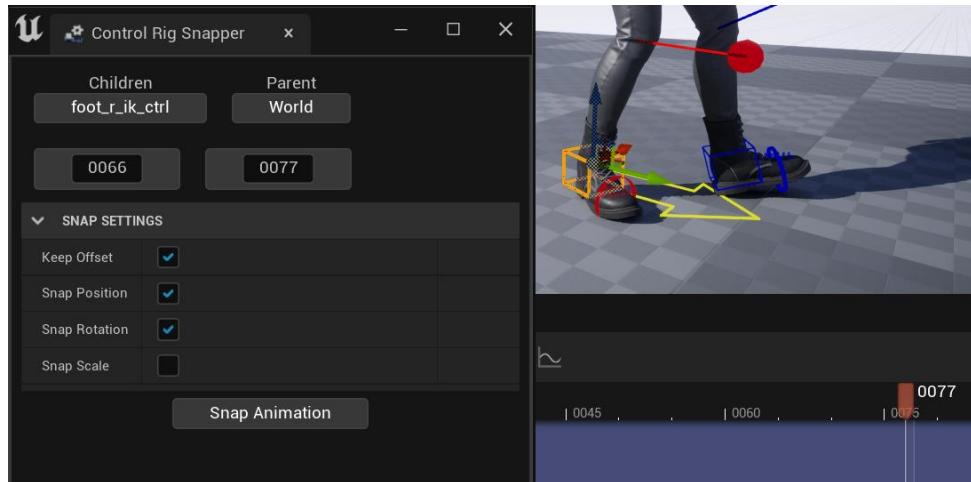


Figure 19b.34 Use Snapper Tool for Second Step

18. To get rid of the **glitch** after the snapping range on the **base** layer of the animation, **delete** 5 keyframes just after the last keyframe of the snapping range. This is keyframe **0078, 0079, 0080, 0081** and **0082** (see *Figure 19b.35*).

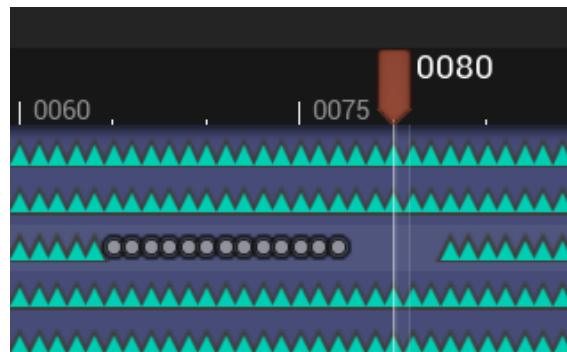


Figure 19b.35 Delete Keyframes to Fix Foot Glitch After Snap

When you now scrub the timeline, you'll notice that there is a little foot slide between frames 0077 to 0083. Let's fix that now.

19. At frame 0080 move foot back and up a bit to reduce the sliding as seen in *Figure 19b.36*.

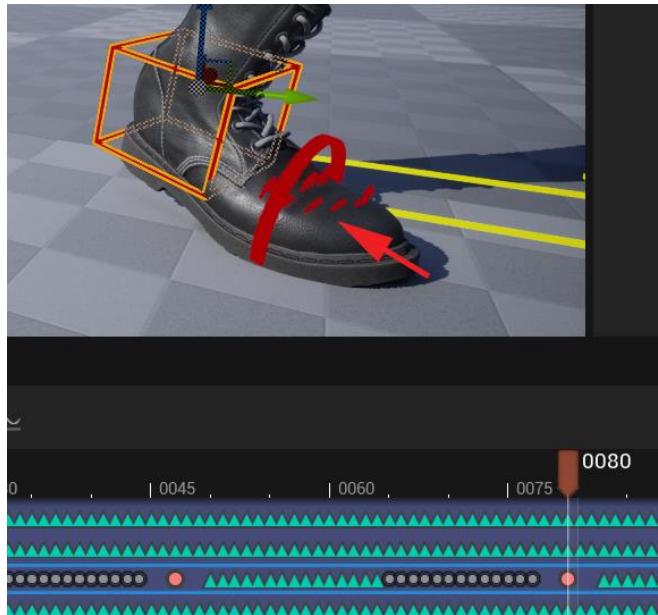


Figure 19b.36 Correct Foot Slide After Snap on Frame 0080

Now let's go back to beginning frames of the animation and look at foot slide before she starts walking. Particularly from frame 0000 to 0010 the foot should be planted and it's not perfectly planted. Sometimes we say the foot is 'swimming' if we observe this, but it means the same thing as sliding. This is easily fixed with the **Snapper** tool.

20. In the **Snapper** tool, for **Children** select `foot_r_ik_ctrl`. Set the range from 0000 to 0010. Check **on**, Keep Offset, Snap Position and Snap Rotation. Keep the **Parent** to **World** as shown in *Figure 19b.37*.

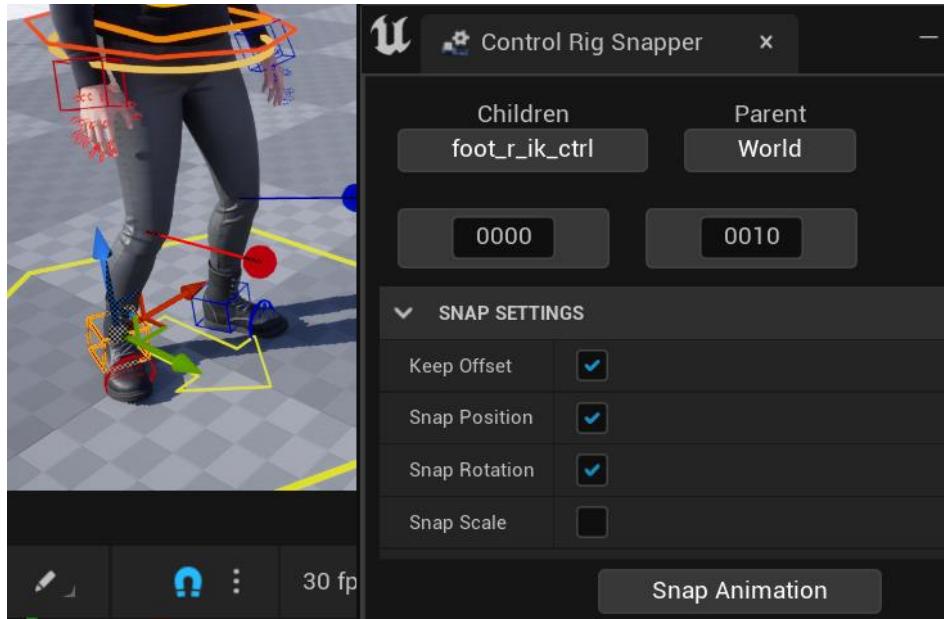


Figure 19b.37 Snap Frame 0000 to 0010

21. To get rid of a **glitch** after the snapping range on the **base** layer of the animation, **delete** 5 keyframes just after the last keyframe of the snapping range. This is keyframe 0011, 0012, 0013, 0014 and 0015 (see *Figure 19b38*).

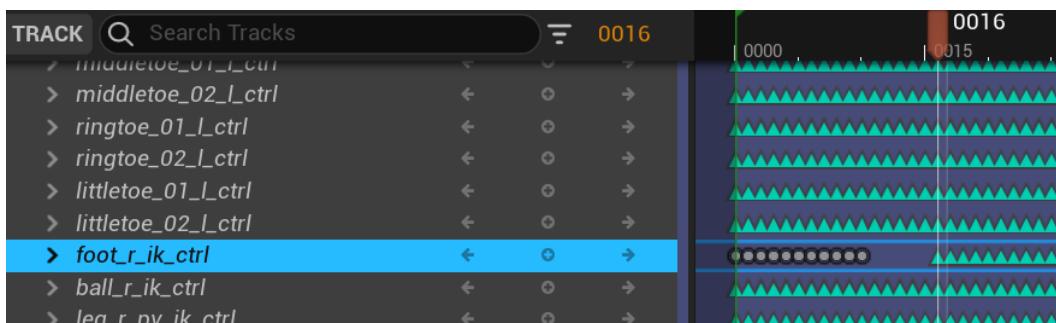


Figure 19b38 Delete Keyframes

Now scrub the timeline and look at the resulting animation on the foot. It feels like it is going back too much and doesn't look natural. Let's create some more space to put down custom keyframes to fix this.

22. **Delete** keyframe 0017 to 0023 on the **base** layer of the animation and create a corrective keyframe on frame 0016 by moving the foot forwards a bit as shown in *Figure 19b39*.

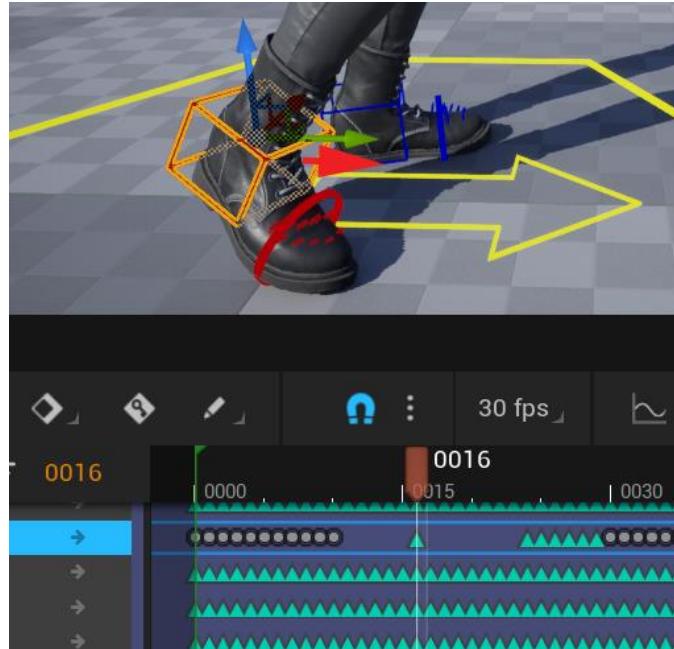


Figure 19b39 Correct Foot on Frame 0016

You have now successfully cleaned up the right foot animation. Now let's do the same for the left foot.

Left Foot Clean

First, we will fix vertical clipping and then the sliding like we did on the right foot.

When you scrub the timeline and look at the left foot, it stays planted in the beginning but sinks into the ground as it goes towards frame 0026, before it lifts. Let's correct that.

1. On the **additive** animation layer set an **anchor** keyframe on frame 0000 on the left foot controller, then scrub to frame 0026 of the timeline as shown in *Figure 19b.40*.

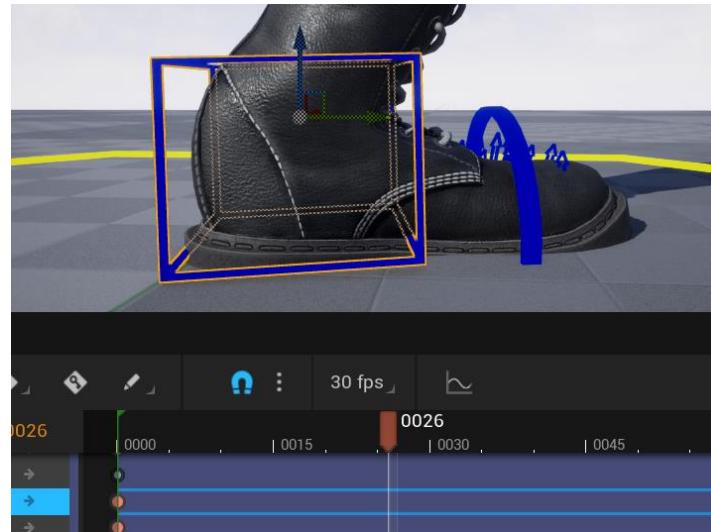


Figure 19b.40 Left Foot Anchor Keyframe on Frame 0000

2. On the **additive** animation layer create a keyframe on frame **0026** and correct the foot upwards so it doesn't clip the floor anymore as shown in **Figure 19b.41**.

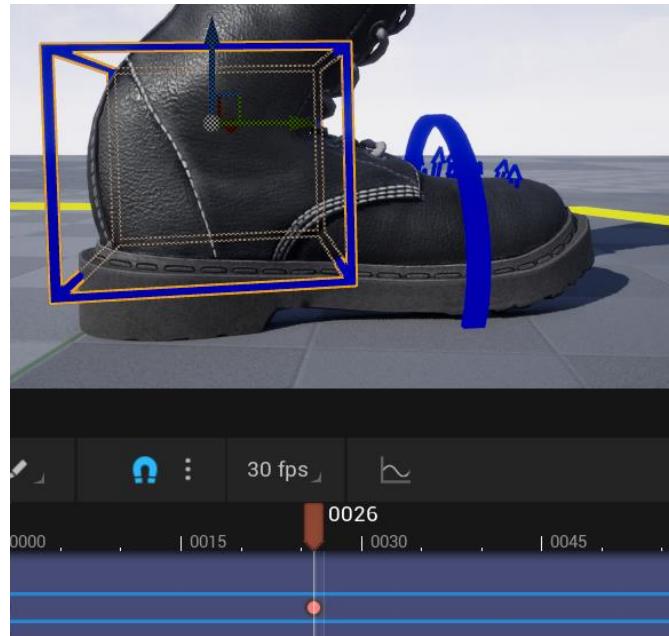


Figure 19b.41 Correct Foot on Frame 0026

- Now scrub the timeline to frame 0051 when foot is fully planted again. Adjust the foot upwards a bit and rotate it also, so it is in full contact with the floor. Set a keyframe on the **additive** animation layer on frame 0051 as shown in *Figure 19b.42*.

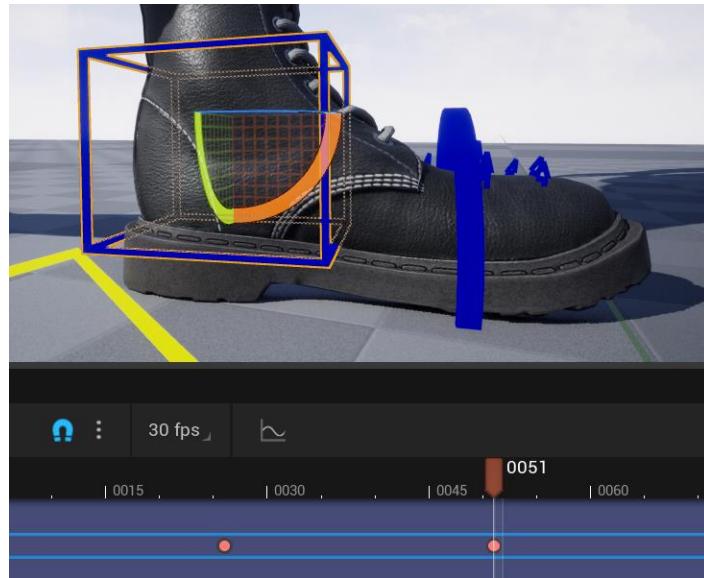


Figure 19b.42 Foot Correction Keyframe 0051

- Now scrub the timeline to frame 0085 when foot is fully planted again. Adjust the foot upwards a bit and rotate it also, so it is in full contact with the floor. Set a keyframe on the **additive** animation layer on frame 0085 as shown in *Figure 19b.43*.

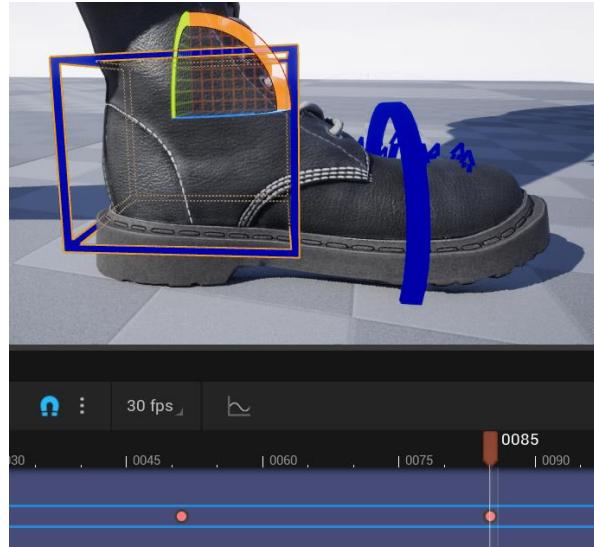


Figure 19b.43 Foot Correction Keyframe 0085

When you scrub the timeline, the toe clips badly at frame 0033 when the foot lifts as shown in *Figure 19b.44*.

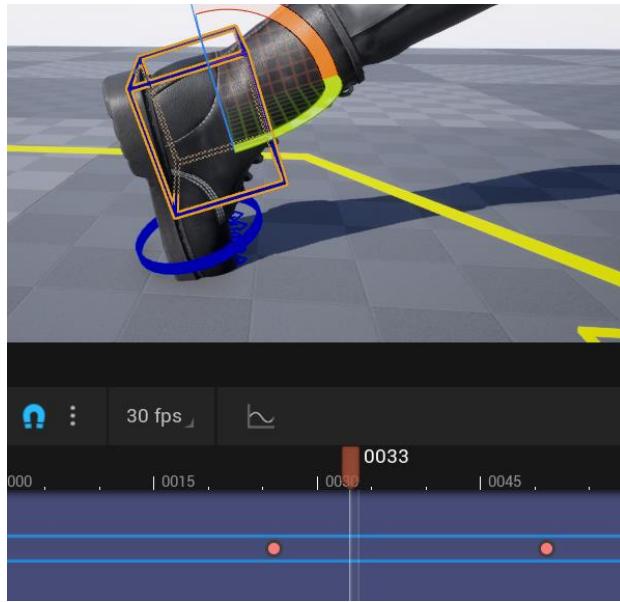


Figure 19b.44 Toe Clipping on Frame 0033

- Set a keyframe on the **additive** layer on frame **0033** to correct the left foot upwards as shown in *Figure 19b.45*.

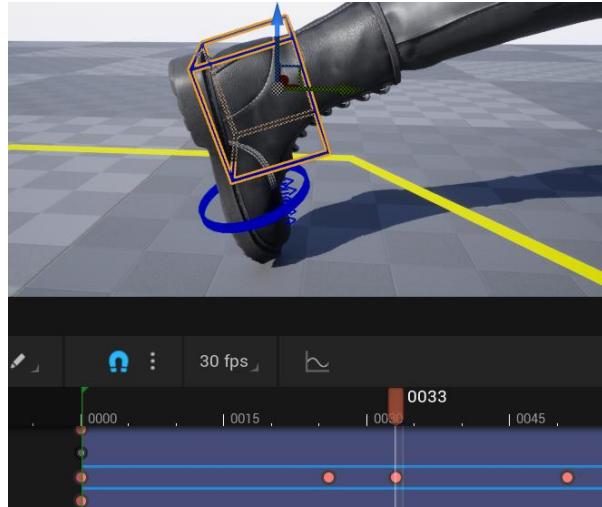


Figure 19b.45 Foot Correction on Frame 0033

If you scrub the timeline from frame **0051** onwards, we can see that we need to set an anchor keyframe to preserve the height of the foot before it lifts again

- Set a height **anchor** keyframe on the **additive** animation layer on frame **0062** as shown in *Figure 19b.46*.

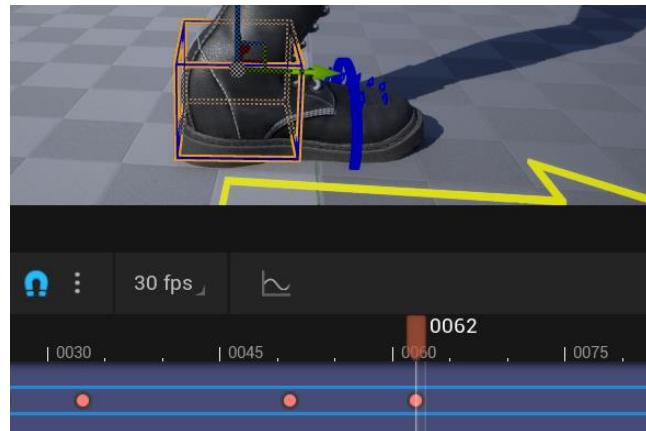
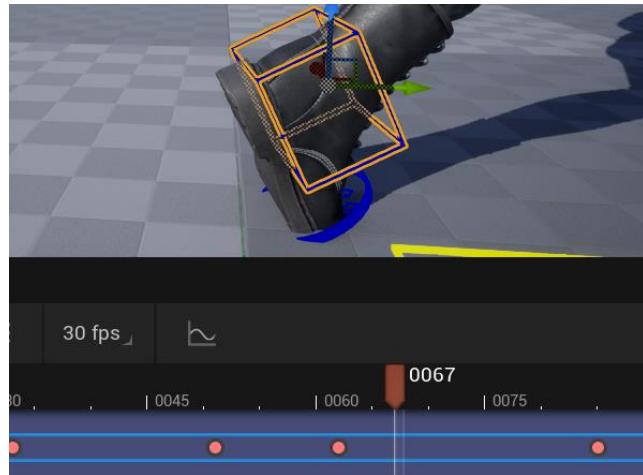


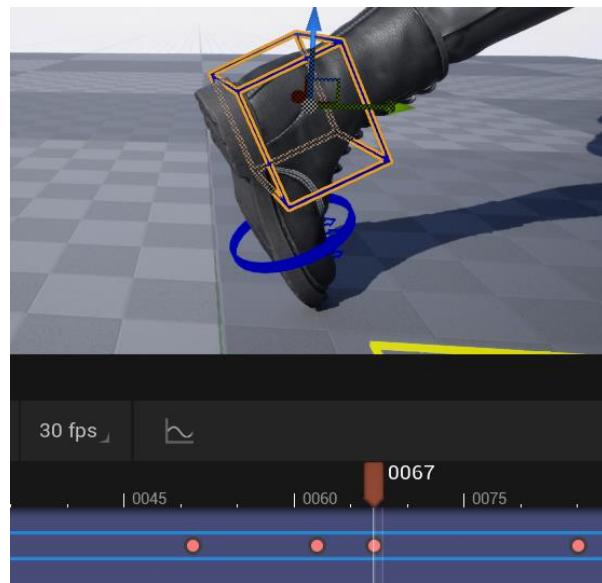
Figure 19b.46 Set Anchor Keyframe on Frame 0062

If you scrub the timeline, at frame 0067 you can see another clipping problem with the toe as shown in [Figure 19b.47](#). Let's fix that.



[Figure 19b.47 Clipping Problem on Frame 0067](#)

7. On the **additive** animation layer set a keyframe and lift the foot as shown in [Figure 19b.48](#).



[Figure 19b.48 Lift Foot and Set Keyframe on Frame 0067](#)

Now let's fix the sliding. Go to frame 0000, scrub the timeline and see how the foot slides between frames 0000 and 0026.

Let's use the **Snapper** tool again to fix this

8. In the **Snapper** tool, for **Children** select **foot_L_ik_ctrl**. Set the range from 0000 to 0026. Check **on**, Keep Offset, Snap Position and Snap Rotation. Keep the **Parent** to **World** as shown in *Figure 19b.49*.

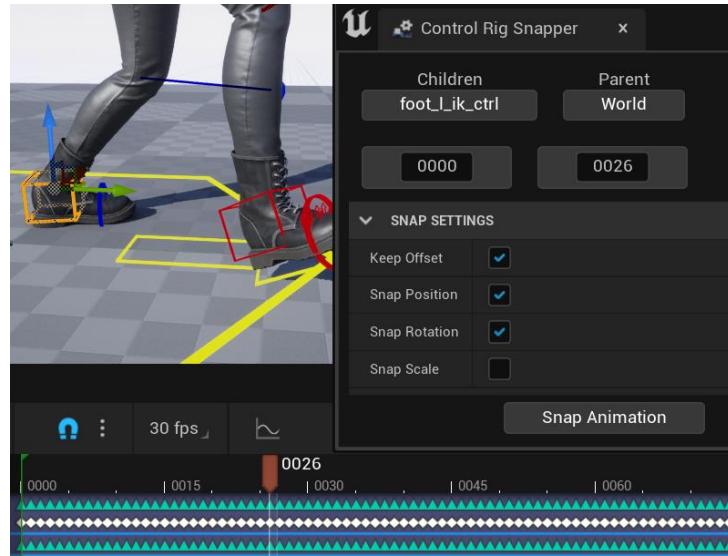


Figure 19b.49 Snap Left Foot for Frame 0000 to 0026

9. On the **base** layer of the animation, **delete** keyframe 0027 to 0031. Add inbetween keyframe on frame 0030 to stop the toe clipping as shown in *Figure 19b.50*.

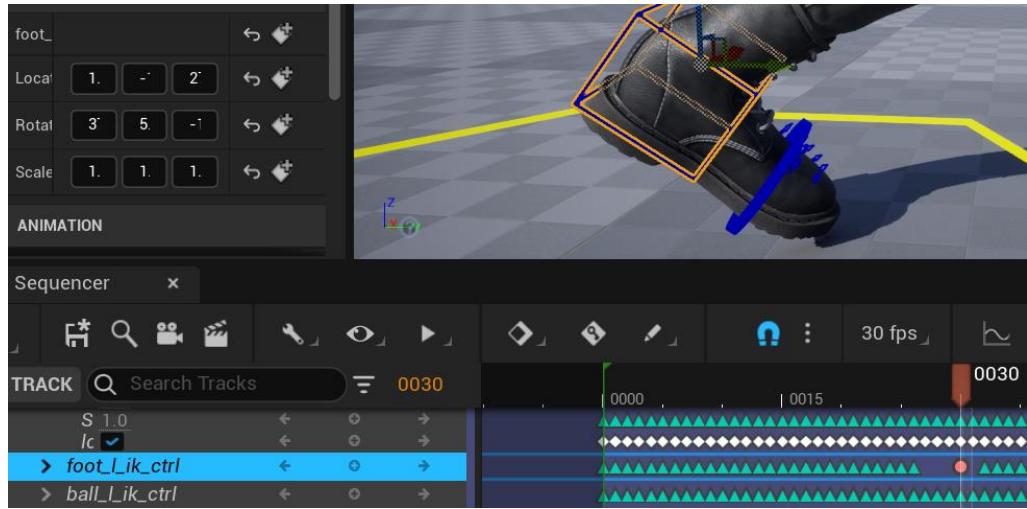


Figure 19b.50 Fix Clipping on the Base Layer

- In the **Snapper** tool, for **Children** select **foot_l_ik_ctrl**. Set the range from **0051** to **0062**. Check **on**, **Keep Offset**, **Snap Position** and **Snap Rotation**. Keep the **Parent** to **World** as shown in *Figure 19b.51*.

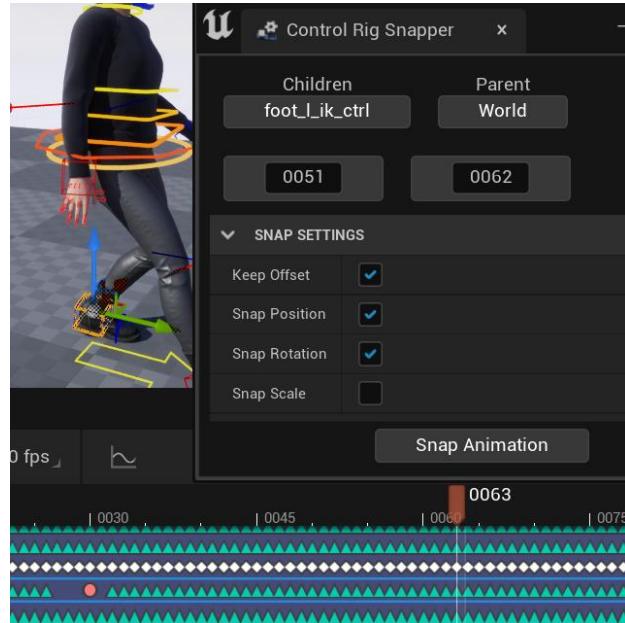


Figure 19b.51 Use Snapper Tool Between Frame 0051 to 0062

11. **Delete** keyframe 0063 to 0065 on the **base** layer of animation and add an inbetween keyframe at 0064 to stop the toe clipping as shown in *Figure 19b.52*.

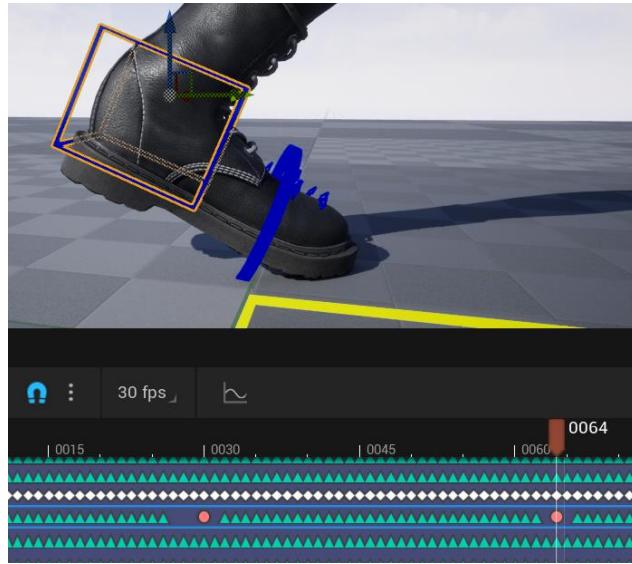


Figure 19b.52 Fix Clipping on the Base Layer

Now let us have a look at the left foot animation at end of the timeline when she stops after walking. The foot fully plants after the last step on frame 0085. However, the foot is swimming and sliding between frame 0085 and the last frame on 0102.

We want to get rid of this sliding by using the **Snapper** tool, but we have a problem. We want to preserve the exact pose of the foot on the last frame since this is the pose that links to all the other animations. If we use the **Snapper** tool from frame 0085 to 0102, it will over-ride the foot position of our current pose on frame 0102 since it will use the current frame 0085 as a reference of the position and rotation of the foot controller.

We need an **exact** marker of the position and rotation of the foot on the last frame 0102. We then use this a reference point for the **Snapper** tool **instead** of the **World** position.

Here's how we do that:

12. Scrub to frame 0102 on the timeline and then create a **cube** from the create menu on the top bar of the UE interface as shown in *Figure 19b.53*.

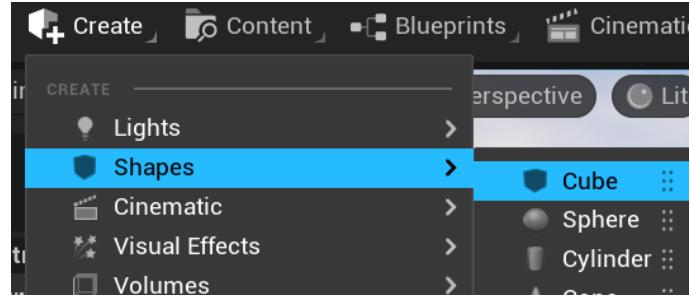


Figure 19b.53 Create Cube as Reference

13. **Scale** this new cube to roughly the size of the controller to be used as a marker as shown in *Figure 19b.54*.

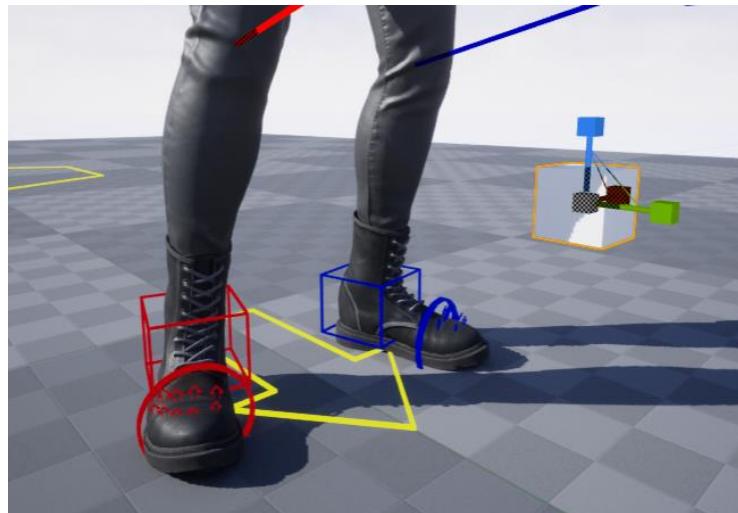


Figure 19b.54 Scale Reference Cube

14. In the **Snapper** tool, for **Children** select the **Cube** and for **Parent** select **foot_I_ik_ctrl**. Set the range from **0102** to **0102** (one frame is all we need). Check Keep Offset **off**. Check Snap Position and Snap Rotation **on**, as shown in *Figure 19b.55*.

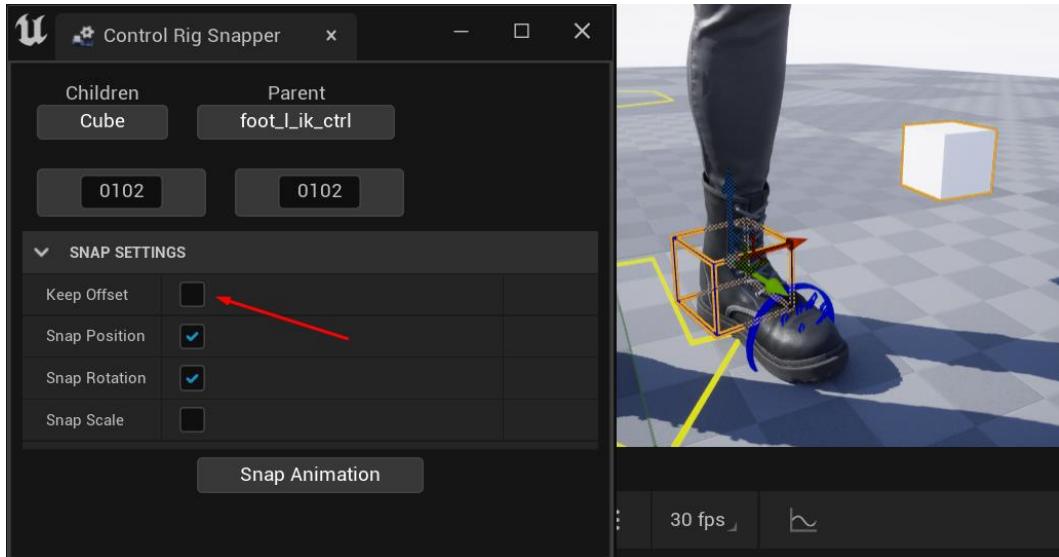


Figure 19b.55 Snap Cube to Foot Controller

The cube will now be snapped to the exact position of the foot controller on the last frame 0102 as shown in [Figure 19b.56](#). Now we have the final world position and rotation values of the foot controller on the **cube**. We can now use it as a **Parent** for the **Snapper** tool to snap the left foot controller to this final position that is exactly the same as the final pose.

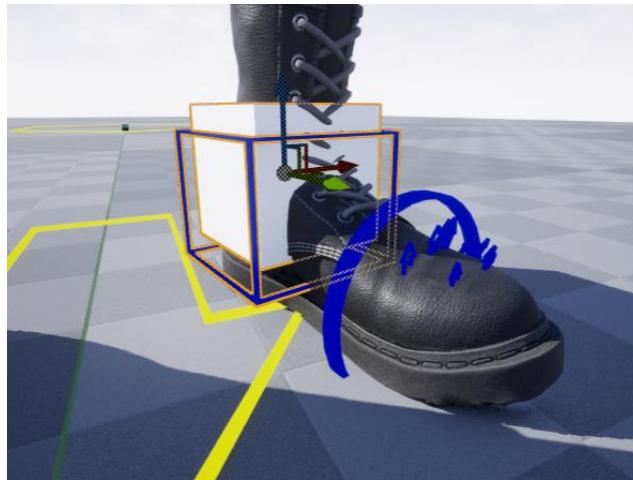


Figure 19b.56 Cube Snapped to Foot Position and Rotation

15. In the **Snapper** tool, for **Children** select the **foot_l_ik_ctrl** and for **Parent** select the **Cube**. Set the range from **0085** to **0102**. Check **Keep Offset off**. Check **Snap Position** and **Snap Rotation on**, as shown in *Figure 19b.57*.

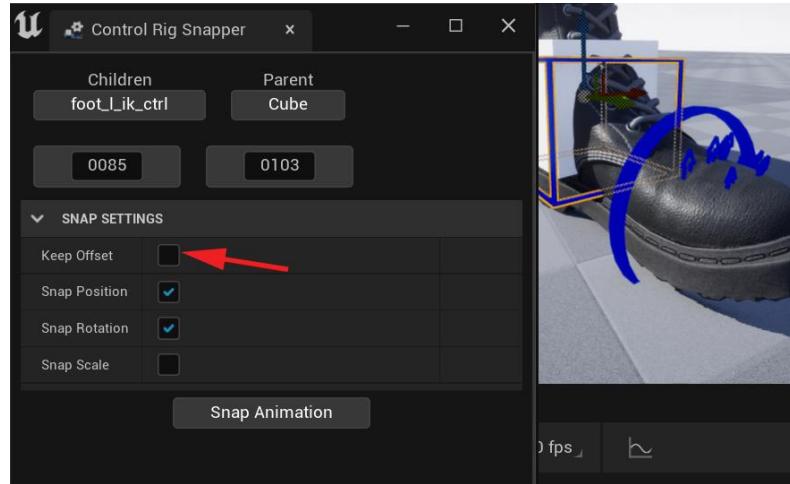


Figure 19b.57 Snap Foot to Cube

The foot should now be planted and then end up exactly in the pose position on the last frame **0102**. Scrub the timeline to look at the result.

16. **Delete** just frame **0084** to aid the transition into the snapped frames as shown in *Figure 19b.58*.

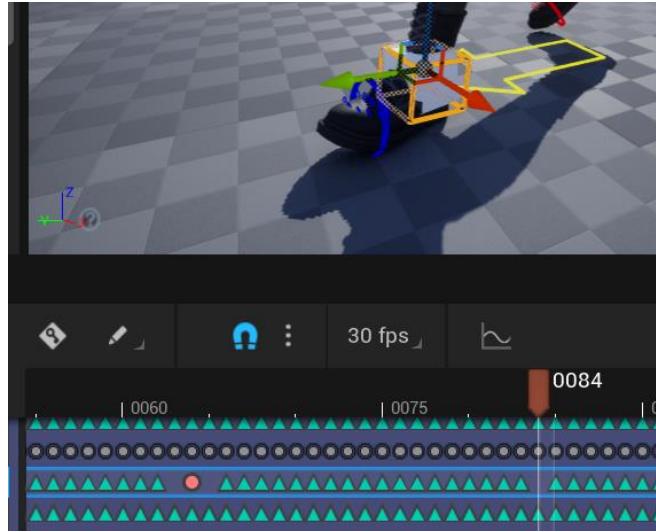


Figure 19b.58 Delete Frame 0084

We have now cleaned up both feet, but when you scrub the timeline, the right knee pole vector animation especially, is causing her to look like she is walking like a bit of a cowboy, and it looks unnatural.

Clean Up the Knee Pole Vectors

To fix the knees, we will do some corrections on the **additive** animation layer.

You start by setting **anchor** keyframes on the right knee pole vector controller, on the **first** and **last** frame of the animation. Then add corrective keyframes on the frames where you feel the knee is not in the optimal position.

You can study what I did in the following Figures ([Figure 19b.59](#), [Figure 19b.60](#), [Figure 19b.61](#), [Figure 19b.62](#), [Figure 19b.63](#))

The before is on the left of the Figure and the after is on the right. Frame number is in the Figure title.

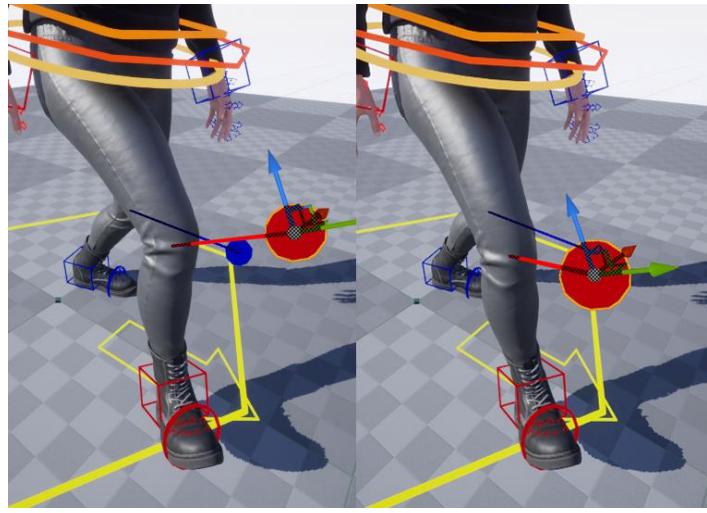


Figure 19b.59 Frame 0026 Correction

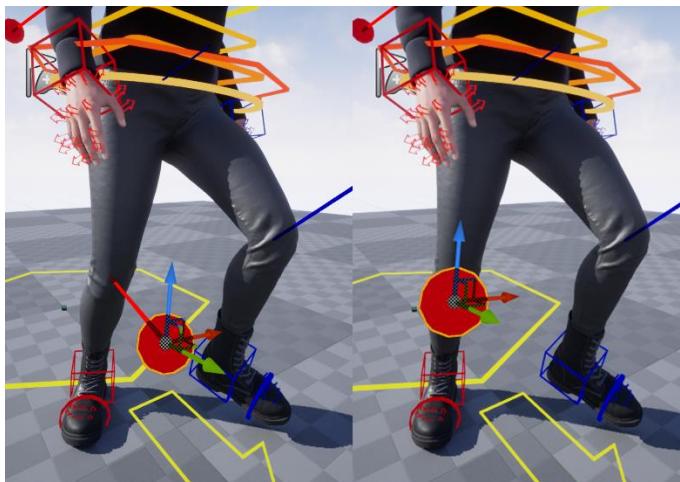


Figure 19b.60 Frame 0040 Correction

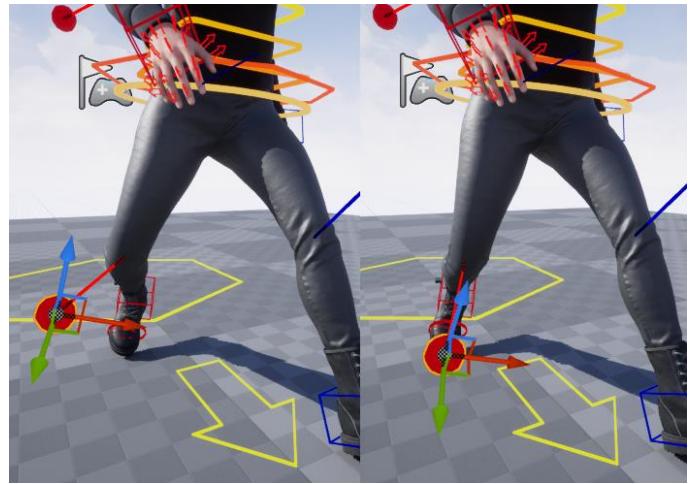


Figure 19b.61 Frame 0047 Correction

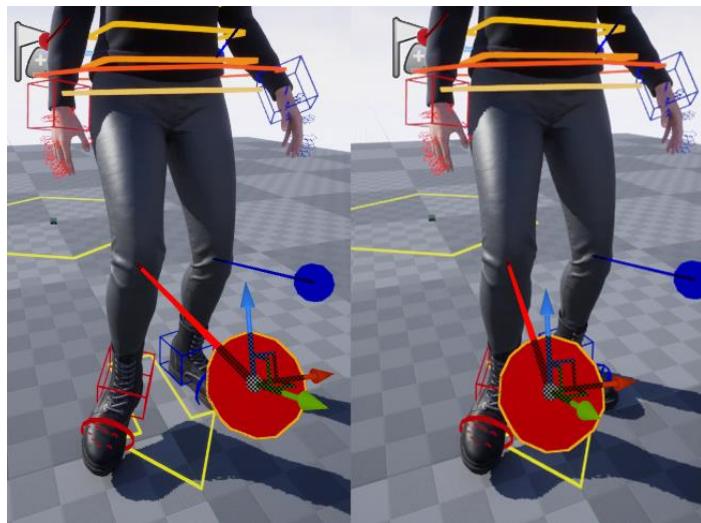


Figure 19b.62 Frame 0057 Correction

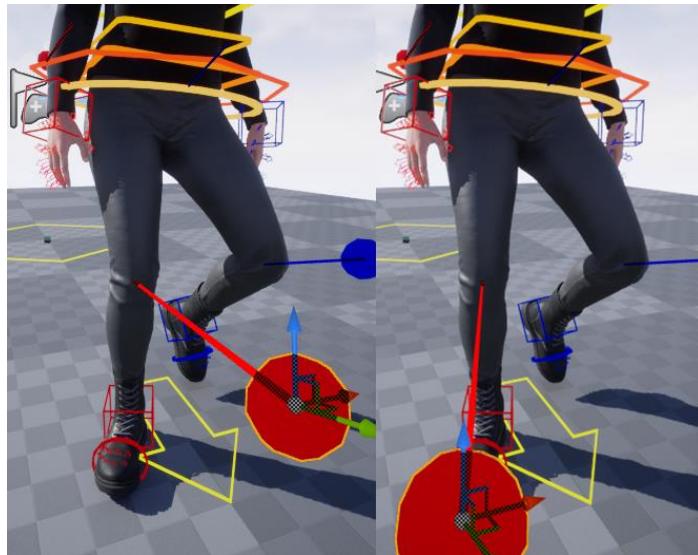


Figure 19b.63 Frame 0071 Correction

In this case the left knee seems better, so I didn't do corrections on it for now. Next, we will fix any '**Knee Pop**'.

Fix Knee Pop

Another element of cleaning up the knees is to get rid of what we call: "**Knee Pop**". Sometimes animators also refer to it as the knee or elbow being '**overextended**'. This has to do with the IK having some room to extend to reach its target on one frame, but then on the next frame the parent (hips) is too far away from the IK target (foot) and the IK overextends as it tries to reach it.

When the IK goes from **being able** to reach the target to **not being able** to reach the target, it tends to create a '**pop**' in the animation that is very distracting and not pleasant on the eye. So, in 3D animation we almost always try to prevent our IK to over-extend to avoid these unpleasant pops in the animation. It can be used in very specific, very cartoony animations, if they're done just right, but in general we avoid them.

Often you can tell an animator is not very experienced if you see this in their work.

If you scrub your timeline, you can now most probably see an example of this between frames **0044** and **0045** as shown in **Figure 19b.64**.

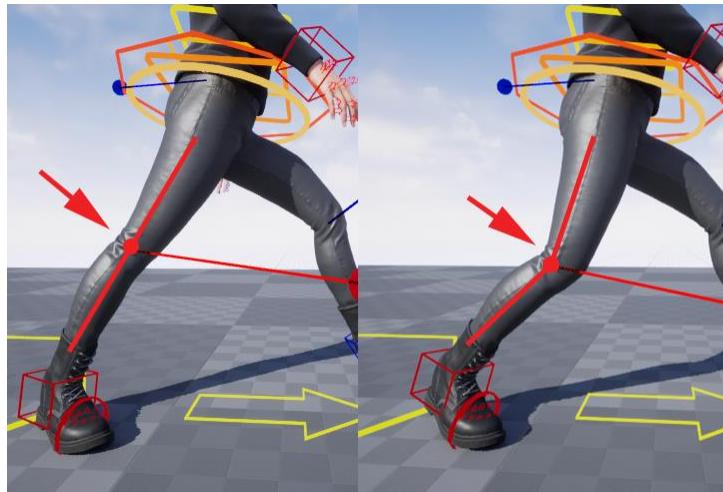


Figure 19b.64 Knee Pop Over-Extended

The right knee overextends now because we snapped the foot in place to be planted during those keyframes. It changed the distance between the foot controller and the hips ever so slightly, but it was enough to cause this issue.

There are several ways to fix this. Often, we can just make the ball of the foot rotate up slightly, so it doesn't overextend anymore. We could lower hips in general a bit across the animation or in that part. In this case we have the independently rotating hips with the **hips_ctrl**. During those frames we can just rotate the hips to get rid of the overextension.

Let's do that:

1. Set keyframe on **0044** on the **additive** animation layer where it overextends on the **hips_ctrl** controller as shown in *Figure 19b.65*. Do **not** rotate the hip controller yet.

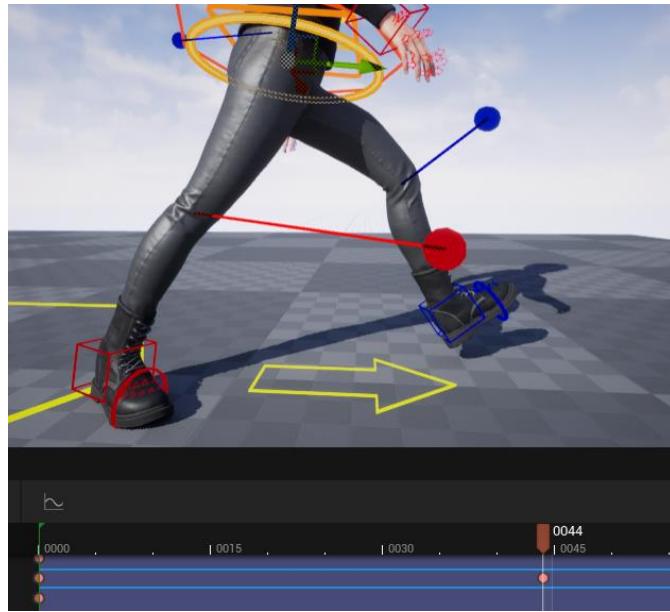


Figure 19b.65 Set Hip Keyframe on 0044

2. Place an **anchor** keyframe **4 frames** before frame **0044** at **0040** and **4 frames** after at **0048** as shown in *Figure 19b.66*.

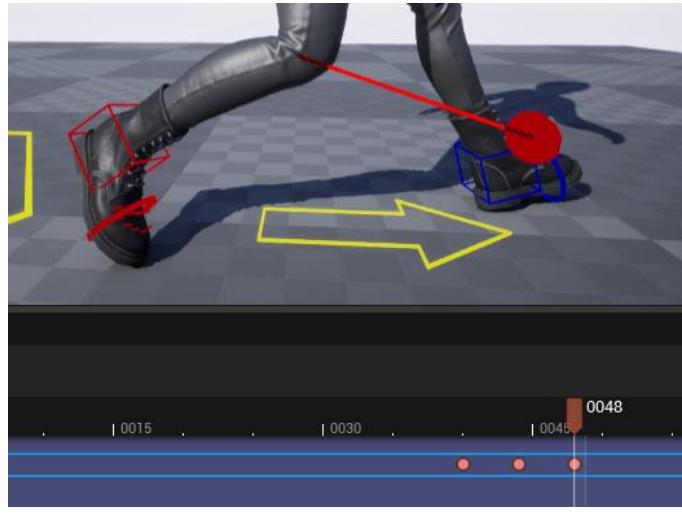


Figure 19b.66 Set Anchor keyframes at 0044 and 0048

We set **anchor** keyframes because we just want to change that part of the animation.

3. On frame 0044 rotate the **hips_ctrl** control down on right just enough so the knee is not overextended anymore and make sure the keyframe is set as shown in *Figure 19b.67*.

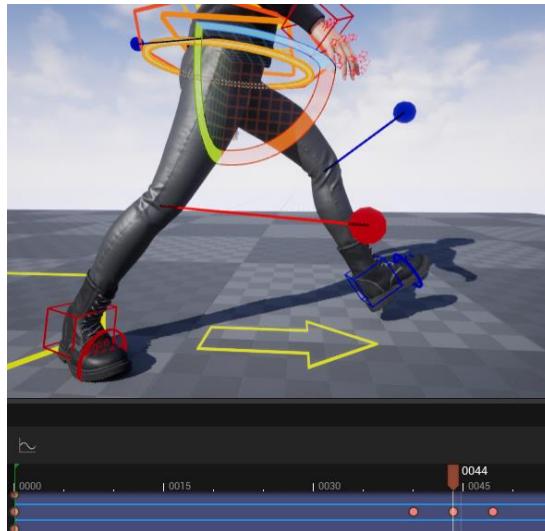


Figure 19b.67 Rotate Hips to Fix Pop

You now got rid of a knee pop in your animation. This happens a lot and you always need to check your character's knees after any foot controller edits.

4. **Check** the animation by playing it to make sure it looks good.
5. **Save** the sequence and **Bake Animation Sequence** by right clicking on **Body** in the sequencer **TRACK** window. Save it as the final cleaned up animation.

Congratulations! You have cleaned up your first walking animation. Next, we will clean up the **Button Push** animation.

Clean Button Push

For the **Button Push** animation we will first of all need to attach the piece of arm armor as a reference to make sure we press the button on the armor, while the finger is in the correct position when it presses the button.

For this exercise, in order to get the armor pieces, it might be easier to download the example final project file that can be downloaded from here along with installation instructions: [Link](#)

The animations are under: **Content/Mocap_From_Mixamo/Mocap**

The armor pieces are under:

Content/MetaHumans/SciFiGirl/Armor/Armor_Models

Attach Armor Plate for Reference

Attaching the armor is unfortunately not that straight forward as a result of a long standing UE bug. In *Chapter 20, Using Sequencer to Construct Your Final Scene*, under the section *Attaching the body armor to Metahuman Rig*, I give a full explanation on this, but for this tutorial I'll just go through the steps.

Now let's attach the armor plate to the arm

1. Open **New Level Sequence** in UE to edit this animation and name it **ButtonPush_Cleanup**.
2. In the **Content Drawer** under **Content/MetaHumans/SciFiGirl/Armor/Armor_Models** locate **ARMOR_Arm_Plate_L_with_Buttons** asset and drag it into Sequencer as shown in *Figure 19b.68*.

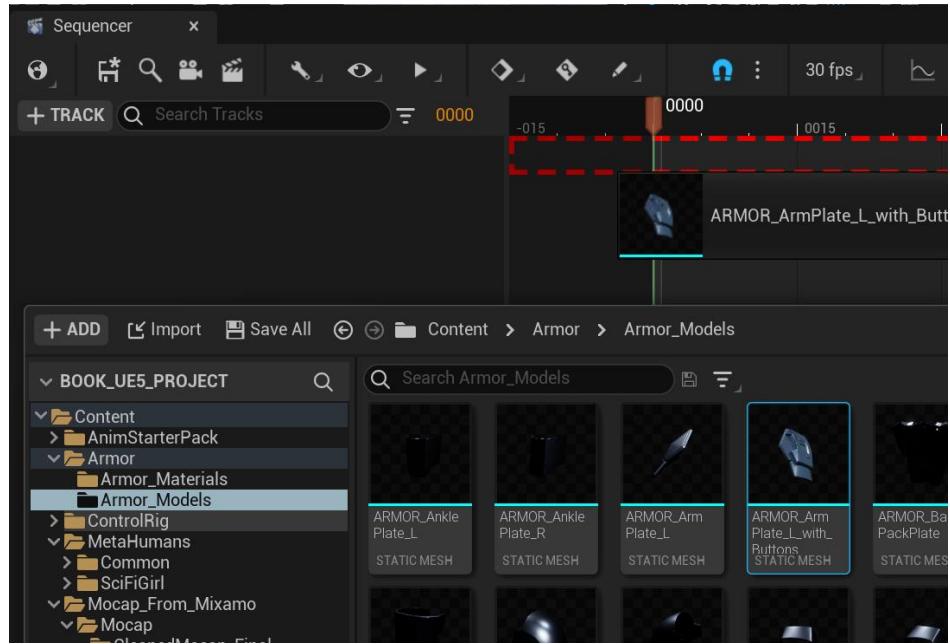


Figure 19b.68 Drag Armor into New Sequence

3. Drag **MetaHuman** blueprint into the level as shown in [Figure 19b.69](#).

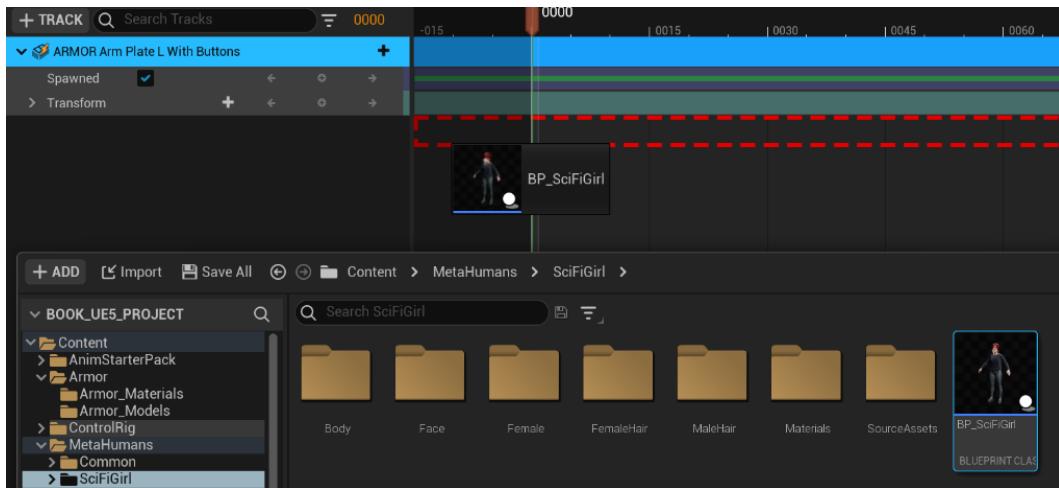


Figure 19b.69 Drag Armor into New Sequence

4. Delete the **Control Rig** in **Sequencer**.
5. In **Sequencer**, on the ARMOR_Arm_Plate_L_with_Buttons track, select **+Track** > **Attach** > **BP Sci Fi Girl** as shown in *Figure 19b.70*.

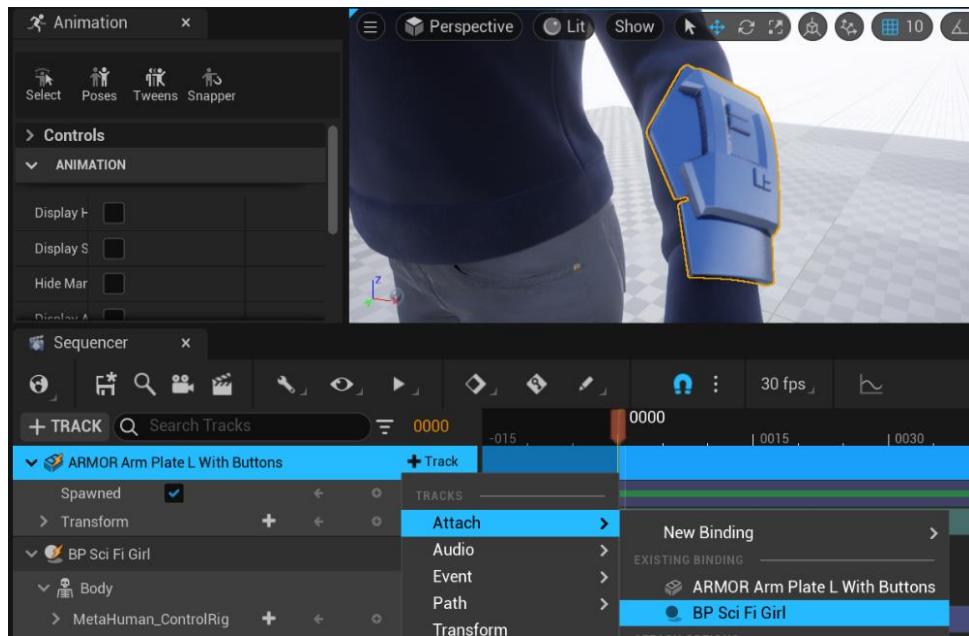


Figure 19b.70 Attach Armor to The MetaHuman

6. Select **Torso** from the next menu as shown in *Figure 19b.71*.

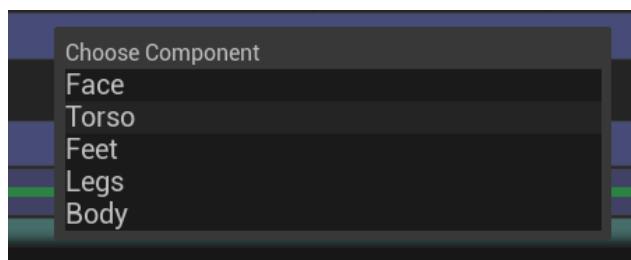


Figure 19b.71 Attach to Torso

7. Then select **lowerarm_l** as shown in *Figure 19b.72*.

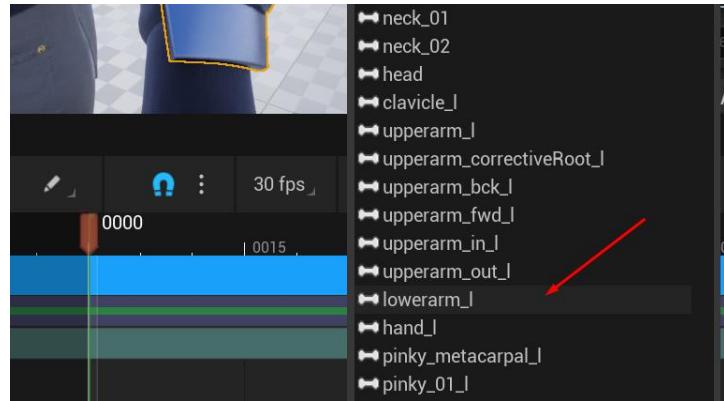


Figure 19b.72 Attach to Lowerarm

The armor will appear in the wrong place as shown in [Figure 19b.73](#).

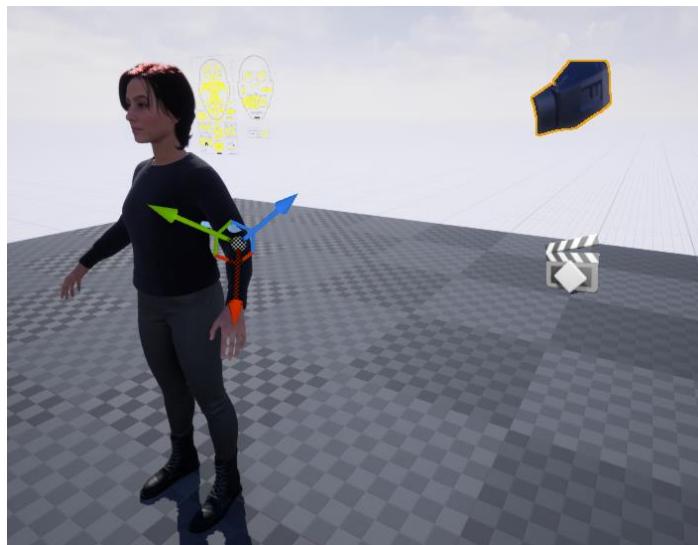


Figure 19b.73 Armor in Wrong Position

3. If the **Animation Mode** window for Control Rig on the top left is open, you can switch to **Select Mode** since it seems to interfere with the regular right click menus, we'll need to align the armor later. You can open the Animation Mode again after by clicking on the dropdown menu at the top of the main UE interface.

8. In viewport right click on the armor and select **Transform > Snap/Align > Align to Floor** as shown in *Figure 19b.74*.

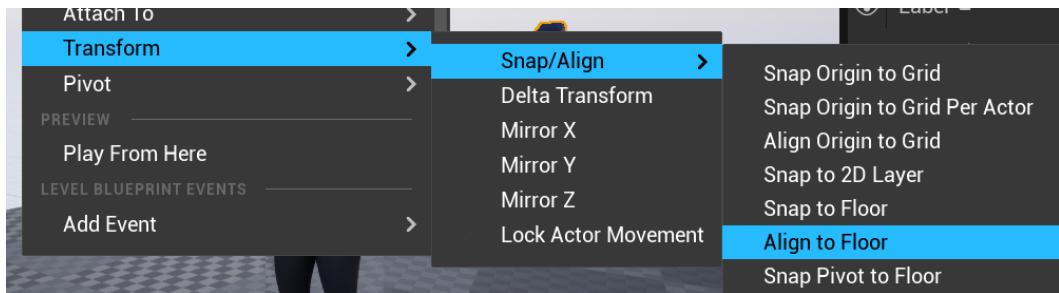


Figure 19b.74 Align to Floor

The **pivot** of the armor piece is now on the floor but in the wrong position as shown in *Figure 19b.75*.

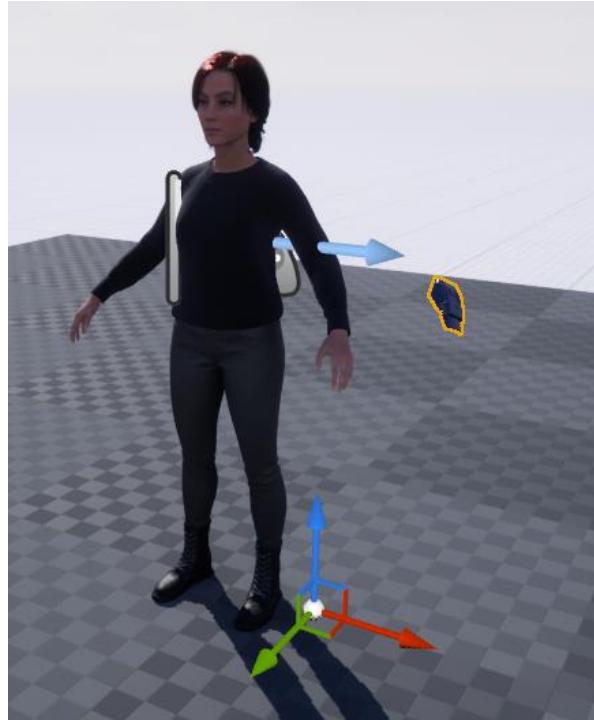


Figure 19b.75 Armor Pivot Aligned to Floor

9. In the main **World Outliner** on the right switch **Location** to **World** by clicking the dropdown on the left as shown in *Figure 19b.76*.



Figure 19b.76 Change to World Transform

10. Make all the Location values **0** to get it back to the origin of the scene as shown in *Figure 19b.77*.

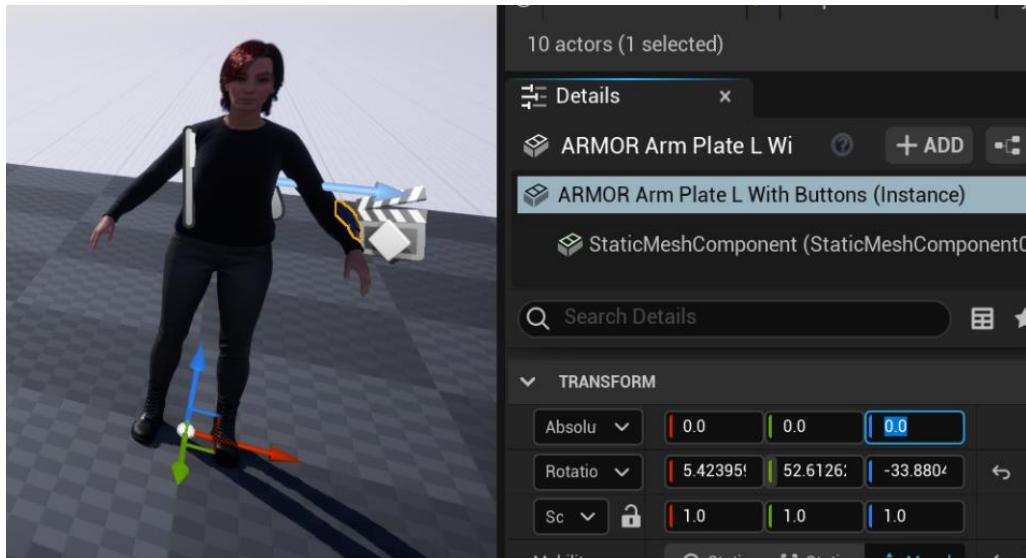


Figure 19b.77 Make Absolute Location Transform 0,0,0

The armor is now aligning to arm perfectly again, just like when we first loaded it into the Sequence.

11. Switch **Location** back to **Relative** as shown in *Figure 19b.78*. This **Important** or it would **not** work in Sequencer.

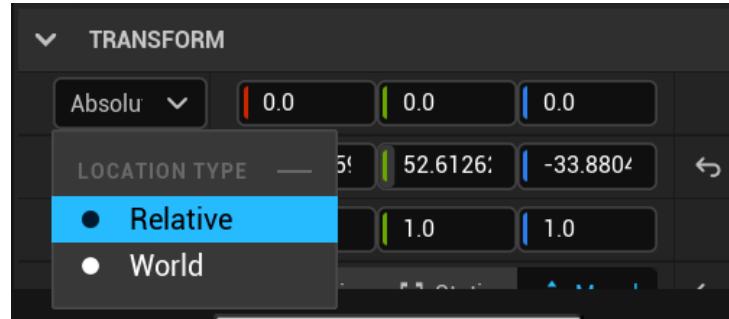


Figure 19b.78 Change Back to Relative Translation

The relative numbers will change in the location fields, but the armor will stay in the same place, while still being attached to the lower arm of the MetaHuman.

12. In **TRACK** window set a keyframe on **Transform** to reserve these relative location values on the arm armor as shown in *Figure 19b.79*.

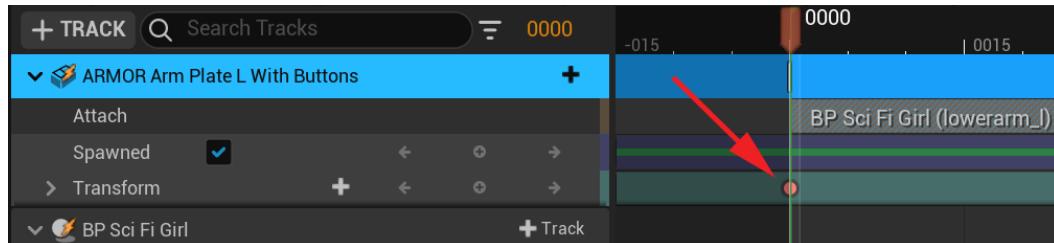


Figure 19b.79 Set Relative Position Keyframe

The armor piece should now be attached to the lower arm of the MetaHuman in the correct relative position and the keyframe will make sure this location is saved. Make sure the **Attach** track spans the whole animation for the armor to stay attached.

Next, we can start editing the animation itself.

Bring Animation into Sequencer

1. Add an **Animation Track** to Sequencer and choose the **Button_Pushing_meta** animation.

2. Set **Active Range** 0000–0096.

3. **Bake** this animation to the **Control Rig** so you can edit it in **Sequencer**.
4. Add **Additive Layer** to the Control Rig in **Sequencer**.
5. Turn **Autokey Off**.
6. Make sure **IK/FK keys** are checked to enable **IK** on the **arms** and **legs** as shown in *Figure 19b.80*.

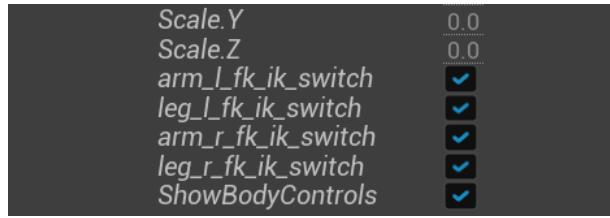


Figure 19b.80 Set IK Controls

7. With the Poses Tool, on the first frame of the additive layer **Paste Pose** your own Standing Idle Pose you created in *Chapter 19, Motion Capture Editing and Cleaning Using Control Rig and Sequencer* as shown in *Figure 19b.81*. Otherwise, use the **PoseB_Stand_Idle_tutor** Pose I provide in the final **example project**.

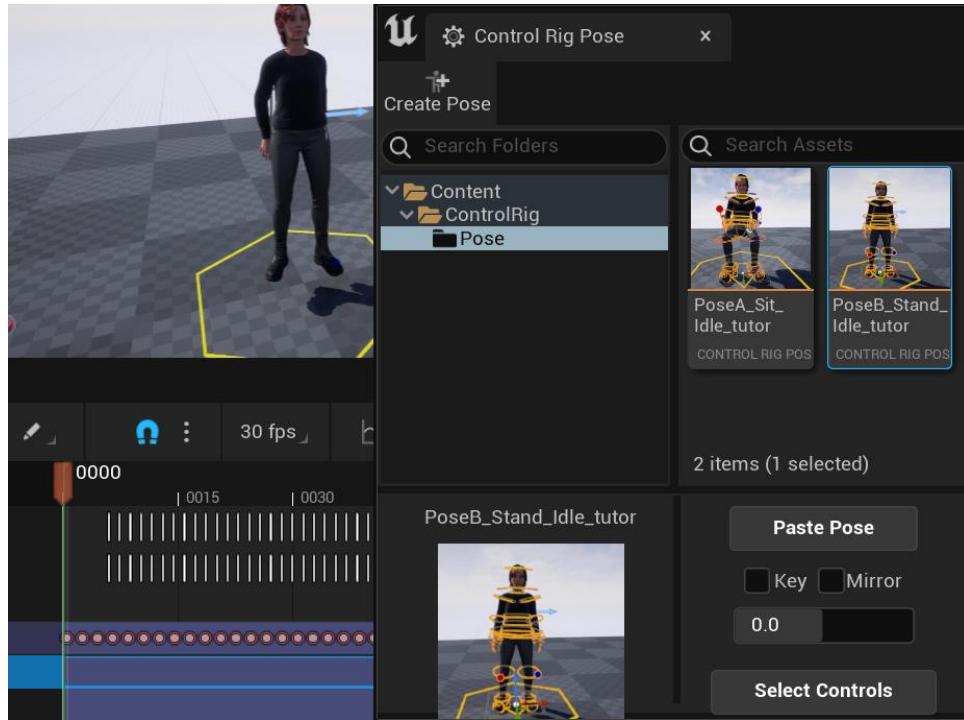


Figure 19b.81 Paste Pose

8. Set a **keyframe** on all the Controllers on the **Additive Layer**.
9. If the head looks wrong, sometimes you have to set this to **local** on the **head_ctrl**.
10. On the **base** animation layer (**not** the additive layer) **delete** all keyframes apart from the one on frame **0000** on the **foot_r_ik_ctrl** and **foot_l_ik_ctrl** controllers to keep feet in place without drifting.
11. On frame **0042** on the **additive** animation layer set an anchor keyframe at the moment she pushes the button on all the controllers, and then also on the last frame **0096** as shown in **Figure 19b.82**.

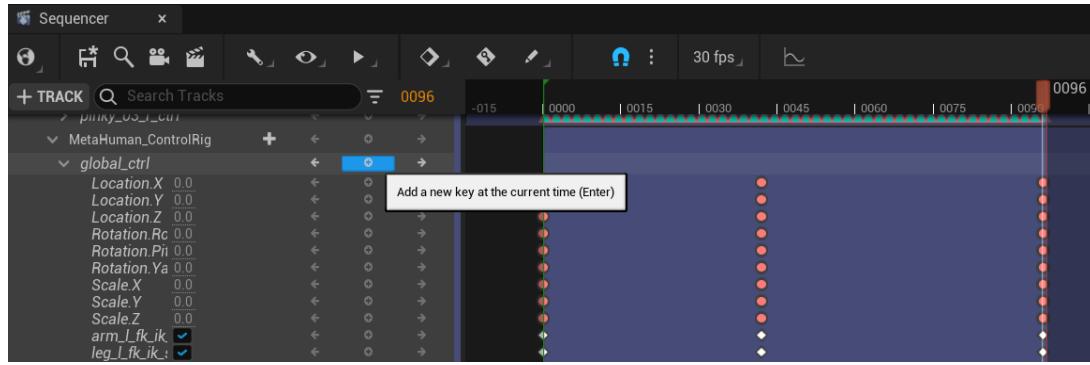


Figure 19b.82 Ste Anchor Keyframes

We have now done the setup and we're ready to repurpose and edit this MoCap animation.

Edit the Button Push

First, we'll work on the right hand and right fingers.

1. **Scrub** the animation timeline to have a look at the animation.

At Frame 0021 the right hand passes too close to the hips.

2. On frame 0021, move the right hand away from the hips a bit and set a keyframe on the **additive** animation layer as shown in *Figure 19b.83*.

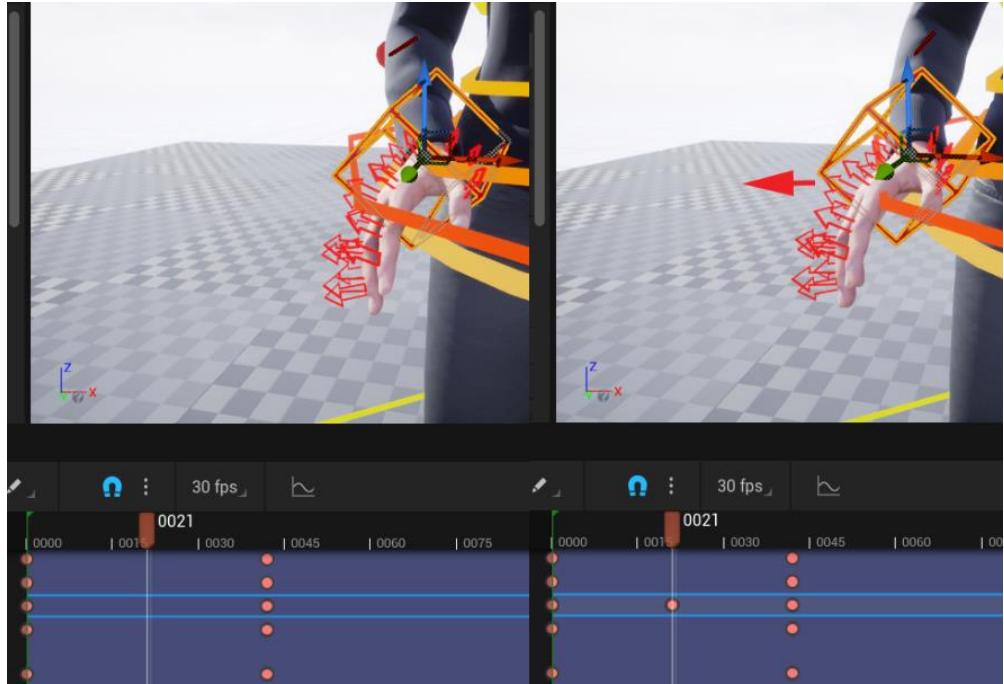


Figure 19b.83 Correct Right Hand Away from the Hips

3. Do the same at frame 0073 where the right hand clips again with hip going back after button press.
4. On frame 0083, set another inbetween keyframe on the **additive** animation layer to stop it swinging out too much after frame 0073.
5. On frame 0021 and 0073, set anchor keyframes on the right hand finger controllers where the hand is open as shown in *Figure 19b.84*.

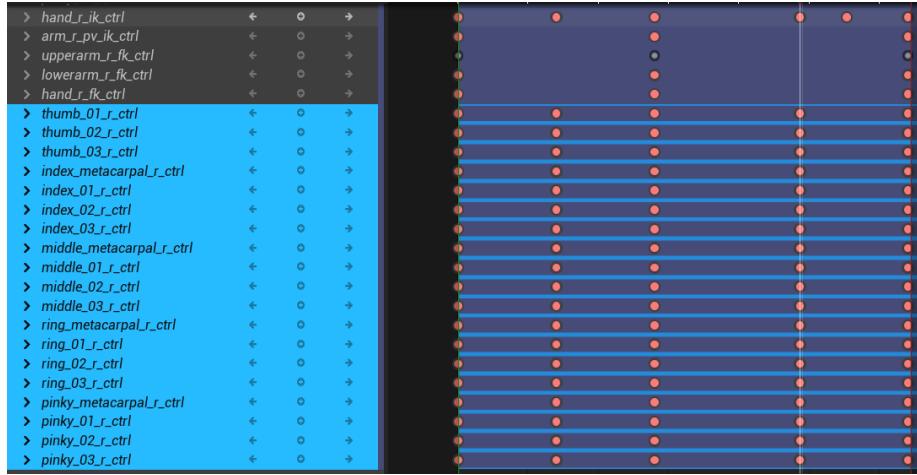


Figure 19b.84 Anchor Keyframes for the Fingers

We do this so when we change it next on frame **0042** to where she is pushing the button with a pointed index finger the anchor keyframes will ensure it returns to an open hand pose before and after.

6. On frame **0042** rotate the fingers on the right hand to make a pointed fingers pose as shown in **Figure 19b.85** and set a keyframe on the **additive** animation layer.

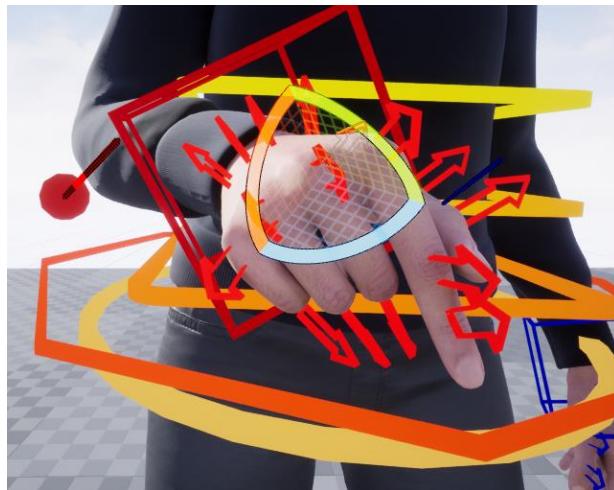


Figure 19b.85 Pointed Finger

7. Select **all** the right hand finger controller keyframes on frame **0042**, press **CTRL + C** on the keyboard to **copy** the keyframes, and then scrub to frame **0054** and press **CTRL + V** on the keyboard to **paste** them on frame **0054** (see *Figure 19b.86*).

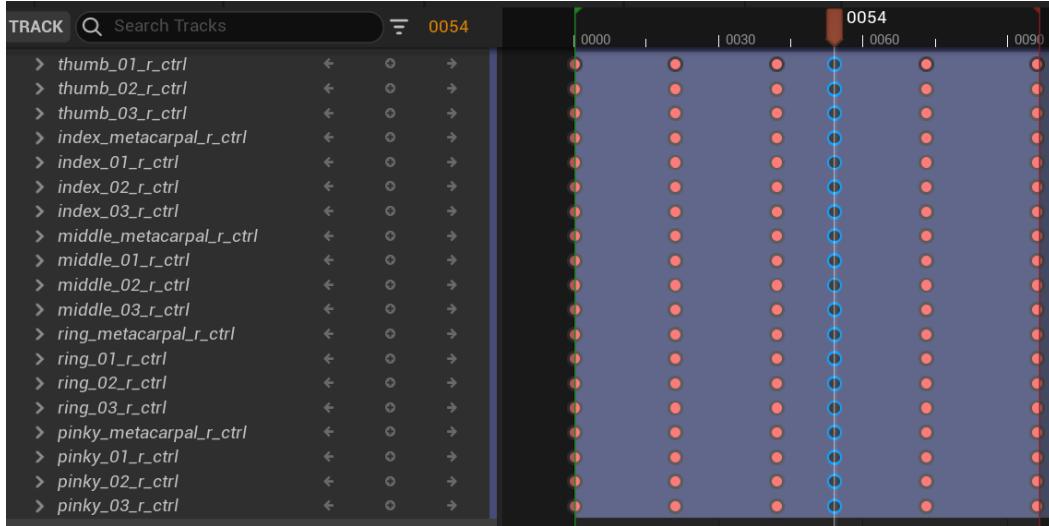


Figure 19b.86 Copy and Paste Keyframes

This is to hold that pointed finger pose during those frames.

8. On frame **0042** move and pose the left arm and right arm controllers so the left forearm is under pointed finger for the button push as shown in *Figure 19b.87*.

Note

For this I had to move and rotate the hand IK controllers, clavicles controllers, elbow pole vectors controllers and also the head controllers to look in the direction of the button push.

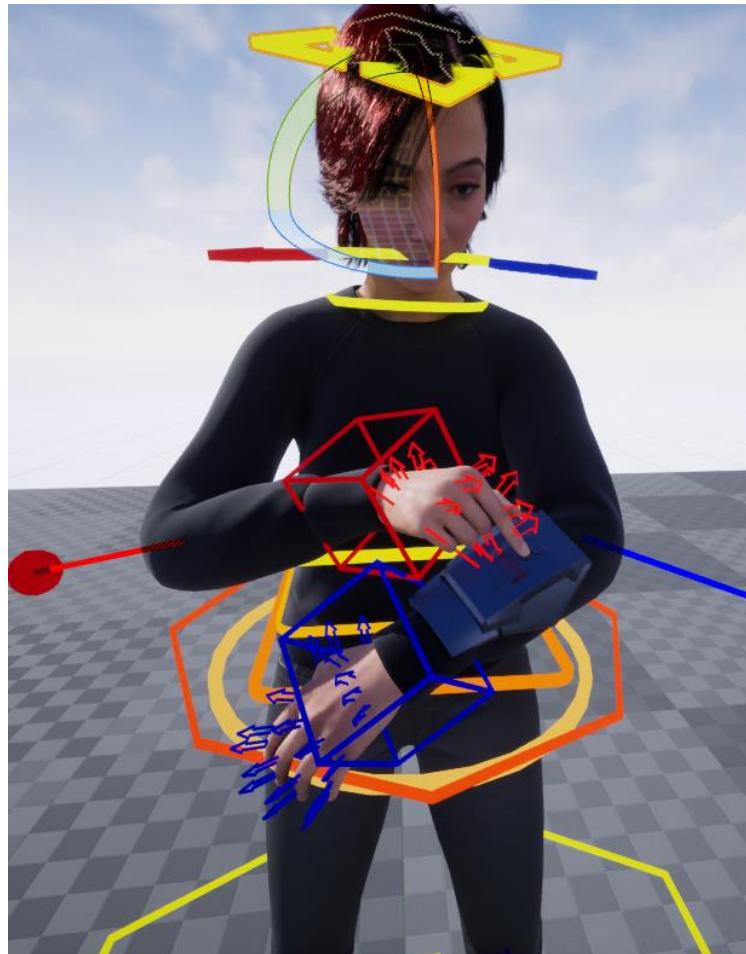


Figure 19b.87 Button Push Pose

9. Then **select** the IK hands controllers, pole vectors controllers, clavicles controllers, and head controller **keyframes** on frame **0042**, **CTRL + C** to **copy** them and then **CTRL + V** to **paste** them on frame **0054**.

This is to hold the pose of the button press for these frames. You can also do the keyframe copy and paste process, one-by-one, on these controllers if needed.

Since this is on an **additive** animation layer, the underlying animation can still shift the final result. On frame **0054** the pointy finger and the button on the armor might be mis-

aligned as shown in [Figure 19b.88](#). Yours might be different, depending on your own poses used.



[Figure 19b.88 Mis-aligned Finger and Button](#)

10. If needed, fix it on frame [0054](#) by moving the left arm, hand IK, pole vector, plus the right hand controllers until they're more or less aligned again and setting an **additive** keyframe.

It doesn't need to be exact. It just needs to be close enough, so it looks good as shown in [Figure 19b.89](#). You might need some inbetween keyframes between frame [0042](#) and [0054](#).

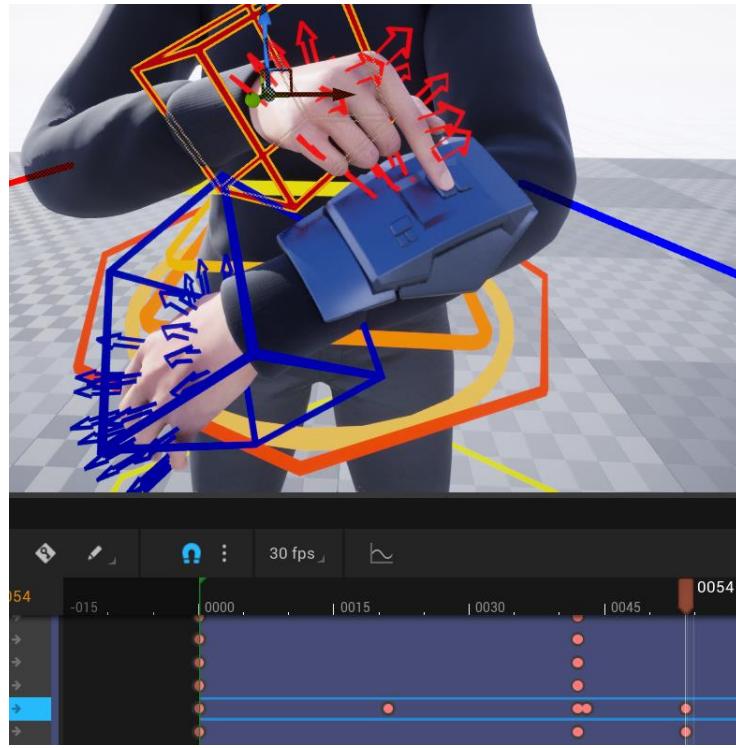


Figure 19b.89 Finger and Button Aligned

11. After this, **reevaluated** the whole animation.
12. If needed, adjust the angle of the right hand on frame **0021** as shown in **Figure 19b.90** again, since it might not flow very well to the button press position anymore.

You need to use your judgement and don't be afraid to try different things.

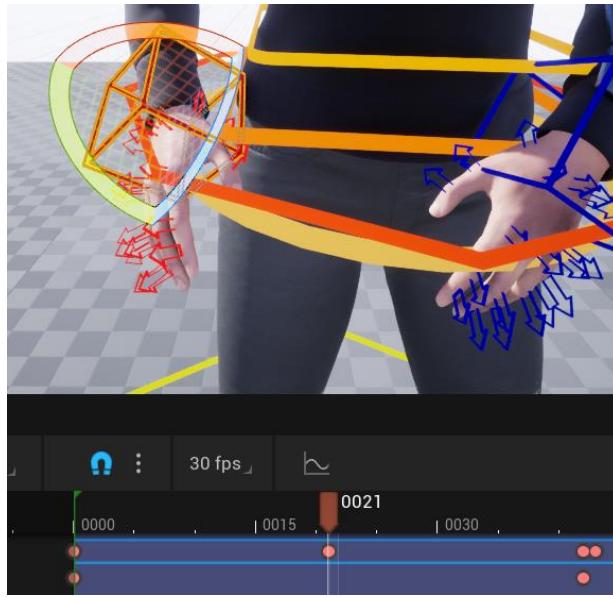


Figure 19b.90 Readjusting Frame 0021 for Better Flow

I did feel the left arm raised to slowly to the point where she pushes the button and goes back down to her side too slowly after the button press. To make it faster, we need to do it over less frames.

13. Select and **CTRL + C copied** the **keyframes** on frame **0000** on the left arm hand IK, Pole Vector and Clavicle controller and **CTRL + V pasted** them to frame **0015** (see *Figure 19b91*).

Now the left arm lifts from frame **0015** to frame **0042**, instead of **0000** to **0042**, so it lifts faster.

14. **Do the same** at the end of the animation for the same controllers. **Copy** the keyframes on the last frame at **0096** and pasted them to **0080** (see *Figure 19b91*).

So now the arm is back down by her side by frame **0080** instead of **0096**, making this movement faster too.



Figure 19b91 Faster Movement Keyframes

15. Clean the **direction** the head is facing at frame **0015**. Characters tend to first start look in the direction they're going to do an action, so you want her to look to her arm earlier.
16. **Check** the animation by playing it to make sure it looks good.
17. **Save** the sequence and **Bake Animation Sequence** by right clicking on **Body** in the sequencer **TRACK** window. Save it as the final cleaned up animation.

If this was an animation for a AAA game title, I would have introduced more finger animation and many other subtleties, but for the purposes of this exercise, this is enough.

Congratulations! You have cleaned up your all your animation.

I hope this bonus material gave you some good insights and introduced you to some tricks to clean up, repurpose and edit MoCap animations in a non-destructive way.