UE4 C++ CODE PLUGIN – PASSIVE RAGDOLL

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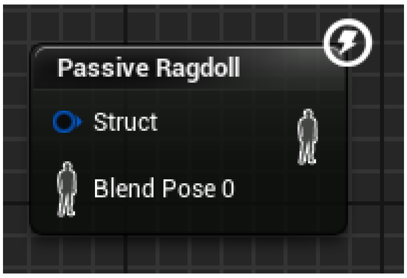
Introduction

This plugin contains an Actor Component and an Animation Node (inherited from Blend List Base) for a Passive Ragdoll System.

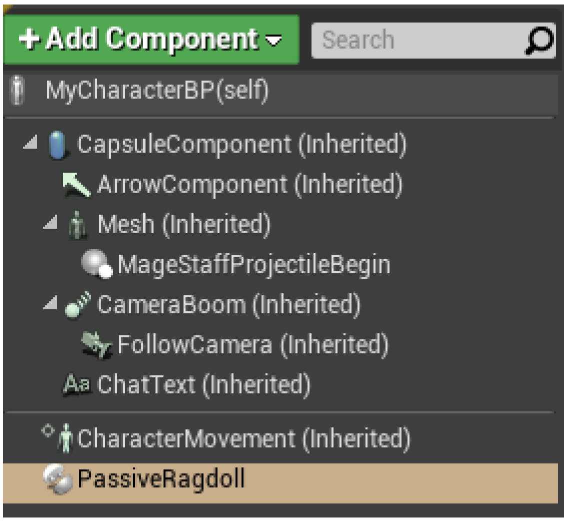


All calculations are made with the results of line traces. There are two different kind of line trace calculations. First one is during "Walking" movement mode. Two line traces aligned with feet give us the information about Hit Normal, therefore slope of the terrain, where we are staying. If both feet are staying on a terrain that has higher slope than a user-defined threshold, Character will enter Ragdoll state.

The second application of line trace is from the Actor location (therefore Capsule). When Character is "in air" or "in Ragdoll State" this line trace tells us if our Character is close to the ground. If it is and if it is faster than a certain user-defined speed threshold, it will enter Ragdoll State. This line trace also helps us to adjust Alpha values for position interpolations, because during Ragdoll State, if character is in air, there should be less interpolation, otherwise Actor won`t be able to catch up with Mesh.

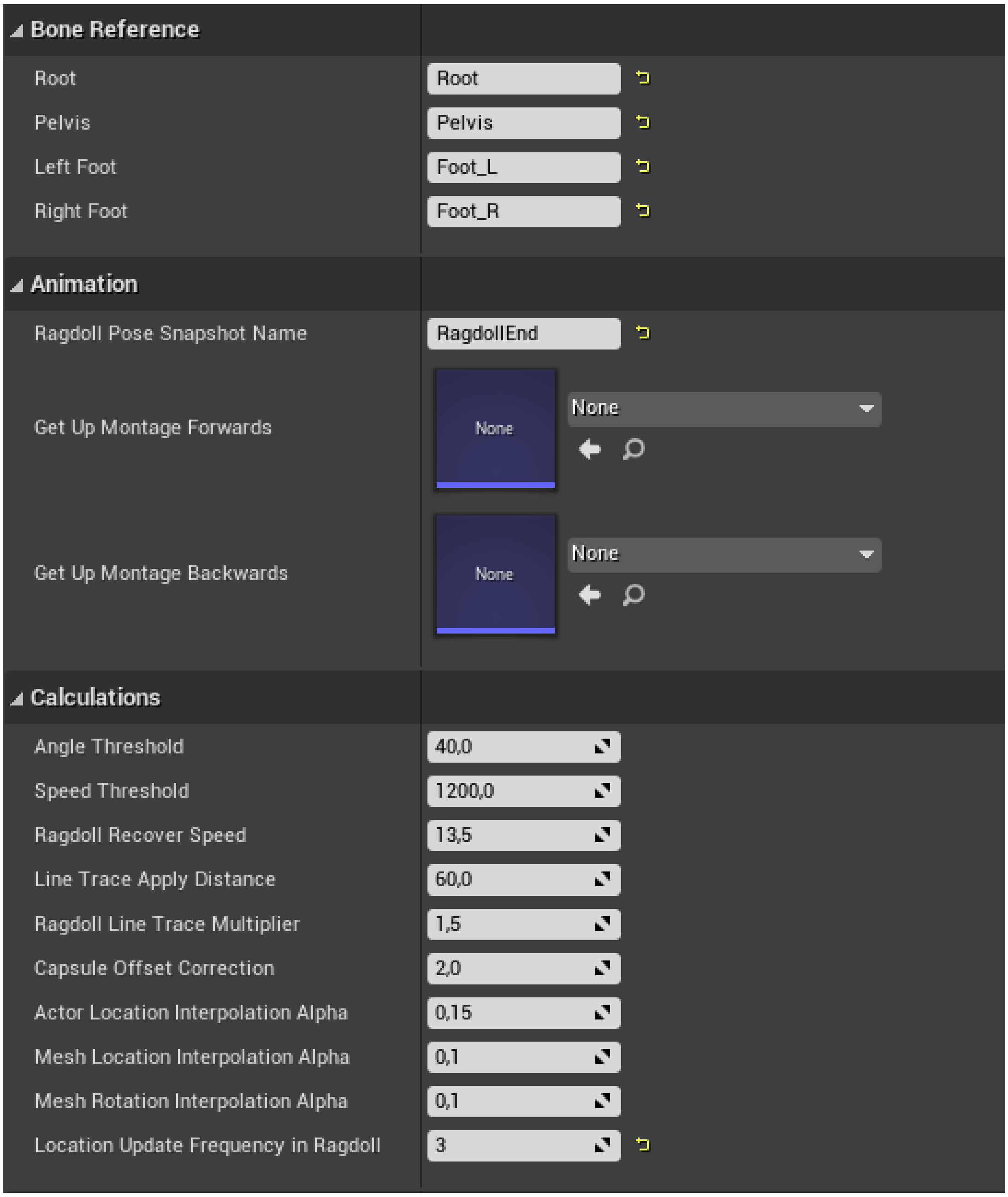
After entering Ragdoll State, character will stay in this state until user recovers it with a previously assigned Key. Ragdoll State can only end if Mesh has a lower speed than a certain user-defined speed threshold. During the recover process, Character will first save a Pose Snapshot of its Ragdoll State. Then, with the help of a Blend Node, it will go from lying position to Get Up Animation.

Installation



Add the Passive Ragdoll Component in the Character Blueprint.

You will have to enter Bone Names in the component. These can be found in the skeleton. Then you should choose a Pose Snapshot name for the use with Anim Node. It can be anything. After that you can add Get Up Animations, forward and backwards. This is the setup of the component. Now let`s take a look at it.



Bone Reference

Root	Root
Pelvis	Pelvis
Left Foot	Foot_L
Right Foot	Foot_R

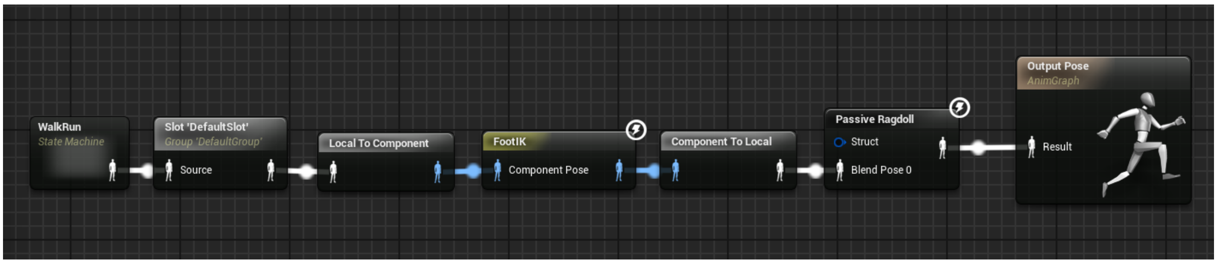
Animation

Ragdoll Pose Snapshot Name	RagdollEnd
Get Up Montage Forwards	None
Get Up Montage Backwards	None

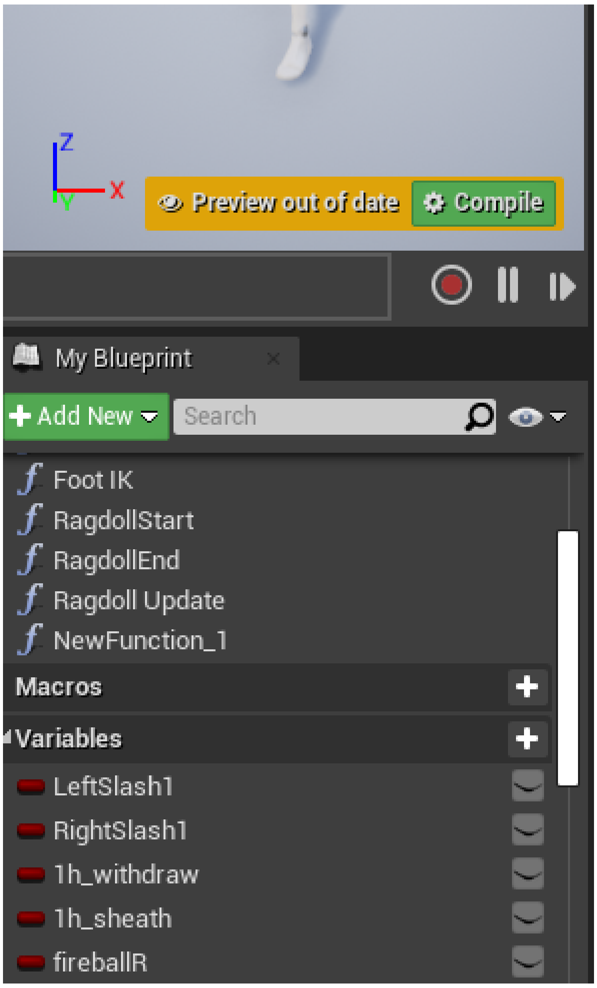
Calculations

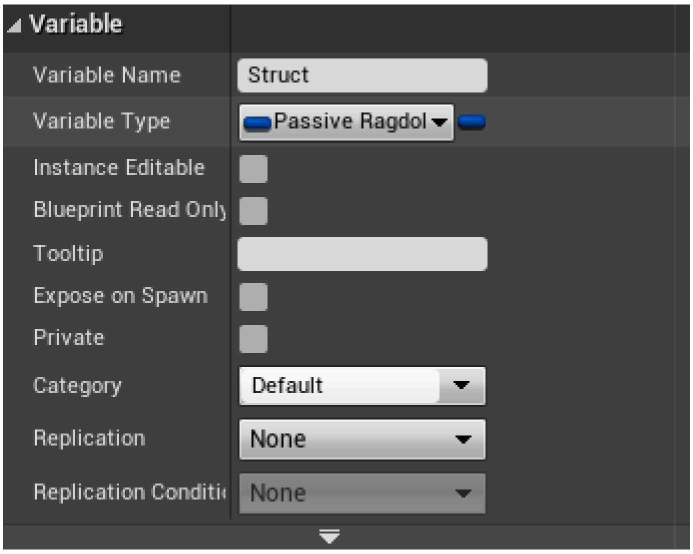
Angle Threshold	40,0
Speed Threshold	1200,0
Ragdoll Recover Speed	13,5
Line Trace Apply Distance	60,0
Ragdoll Line Trace Multiplier	1,5
Capsule Offset Correction	2,0
Actor Location Interpolation Alpha	0,15
Mesh Location Interpolation Alpha	0,1
Mesh Rotation Interpolation Alpha	0,1
Location Update Frequency in Ragdoll	3

Next Step is to put the Blend Node "Passive Ragdoll", that I have created. It will be at the very end of your Animation Nodes in the Animation Graph of your Character`s Animation Blueprint, just before Output Pose Node.



After this step, you should create a new variable in your Animation Blueprint. in the type of “Passive Ragdoll Struct”.

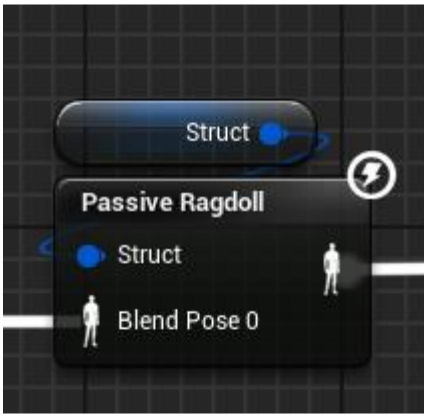


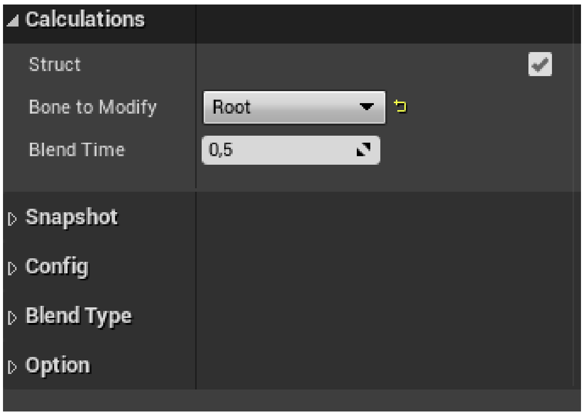


Variable

Variable Name	Struct
Variable Type	Passive Ragdol
Instance Editable	□
Blueprint Read Only	□
Tooltip	
Expose on Spawn	□
Private	□
Category	Default
Replication	None
Replication Conditi	None

Connect the struct that you have created to our Blend Node. Bone To Modify is Root.





◢ Calculations

Struct	☑
Bone to Modify	Root
Blend Time	0,5

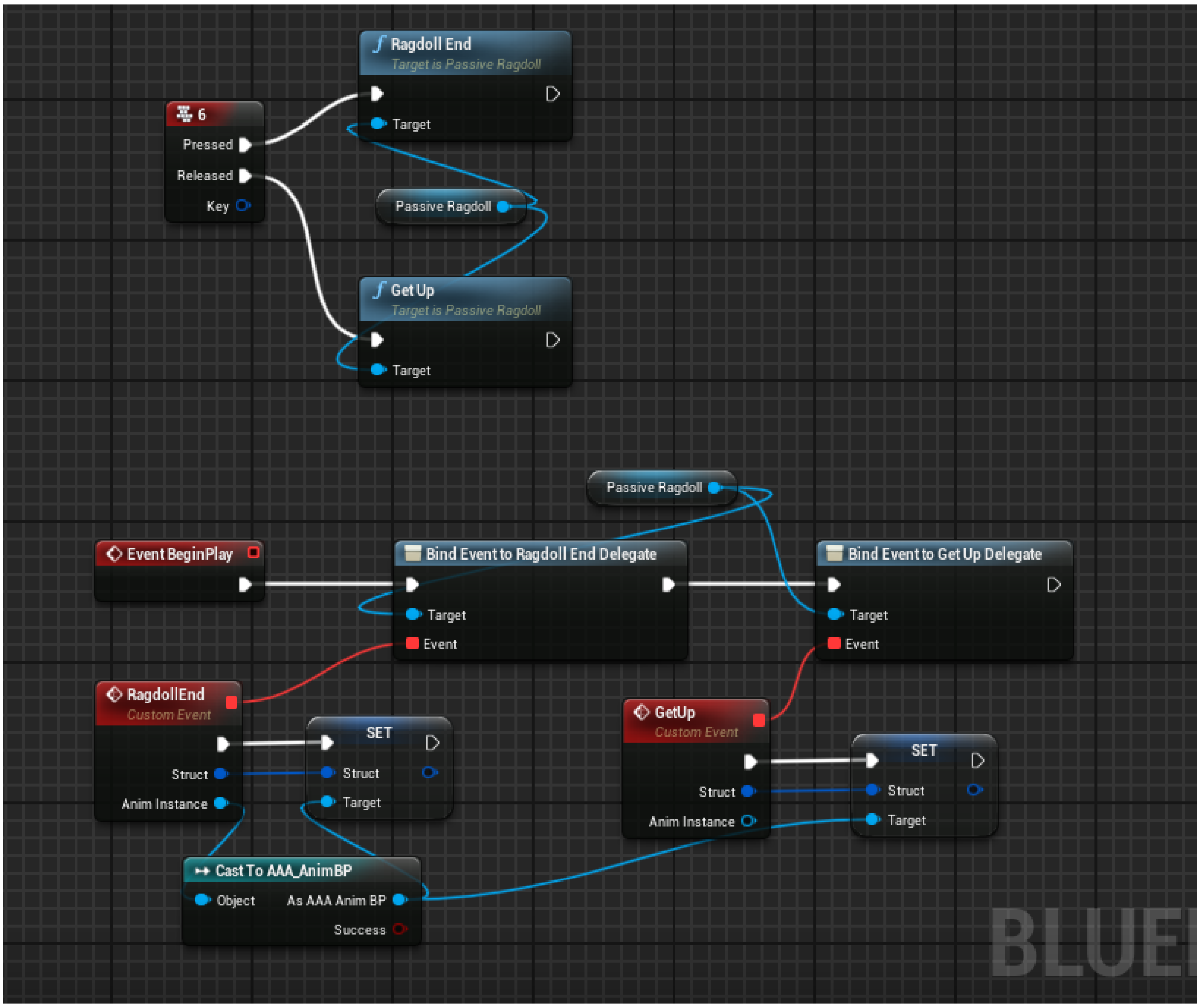
▷ Snapshot

▷ Config

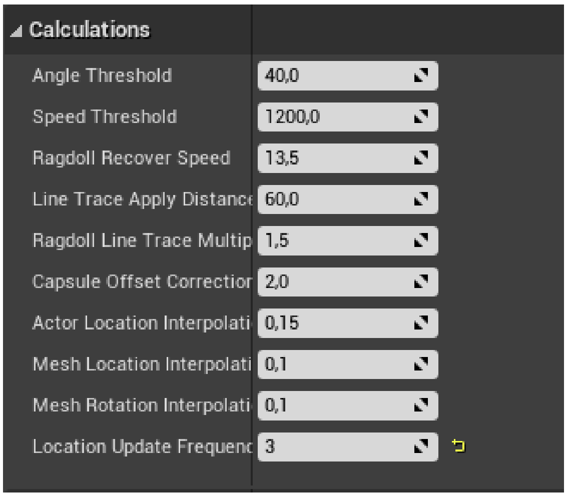
▷ Blend Type

▷ Option

Final step is to look for "Ragdoll End" and "Get Up" functions of Passive Ragdoll Component in the Character Blueprint Event Graph and assign a key. Character will be recovered from Ragdoll with this key. There are also RagdollEnd and GetUp delegates. Set up them as seen to make them set Passive Ragdoll Struct that we have created, that will be used in our Blend Node.



Calculations



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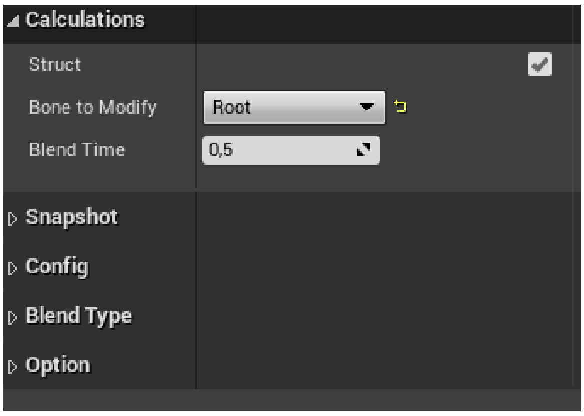

◢ Calculations

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Bone to Modify	Root
Blend Time	0,5

▷ Snapshot

▷ Config

▷ Blend Type

▷ Option

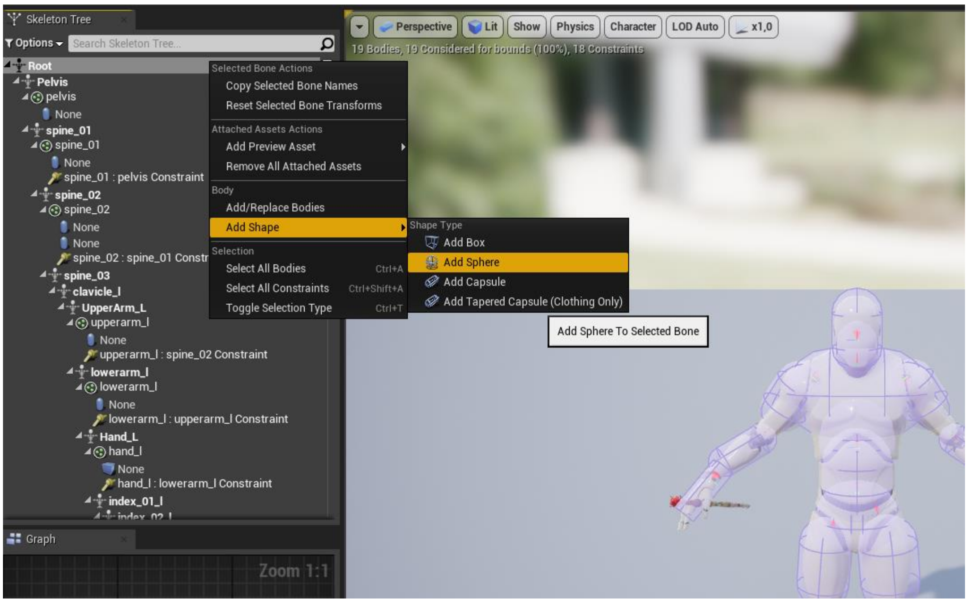
Left is Passive Ragdoll Component and right is Blend Node. For Blend Node you can change Blend Time. This is the blend time between lying position and Get Up Animation after key is pressed to Get Up at the end of the Ragdoll State.

For Component, there are several variables you can change for calculations.

- Angle Threshold: The maximum angle of the terrain Character can walk on without entering Ragdoll State. Use this parameter according to the Character Movement Component parameter regarding maximum walkable floor angle.
- Speed Threshold: If the Character is close to the ground with a speed higher than this threshold, it will enter Ragdoll State, i.e. hitting to the ground.
- Ragdoll Recover Speed: The Character can only be recovered from Ragdoll State with the assigned key press, if its Mesh Speed during Ragdoll State is lower than this threshold.
- Line Trace Apply Distance: Line Trace Distance beginning from the bottom of each foot. It will be applicable in the Walking Movement Mode and will used to determine terrain angle.
- Ragdoll Line Trace Multiplier: For the second Line Trace, which is there in “in air” or “Ragdoll” states. Distance is beginning from the bottom of the Actor Location (and Capsule). It is Capsule Half Height multiplied with this Multiplier.

- Capsule Offset Correction: This is only for more precise calculation and does not have any significant effect. It is the default offset between bottom of the Capsule and the ground.
- Actor Location Interpolation: Actor Location will follow Mesh during Ragdoll. And if you are not using any Camera Manager, camera will follow Actor. This parameter is to interpolate between Location updates to avoid stutter. Similar to Lerp function.
- Mesh Location Interpolation: This is only for Multiplayer Replication. Our Mesh position will be passed to other clients. And they will update the mesh of their copies accordingly. Interpolation is to make Location updates without stutter.
- Mesh Rotation Interpolation: Same as Location.
- Location Update Frequency: This value is not exactly a frequency but what it does is to control how often Locations will be updated. This is the most important parameter for Multiplayer Replication. Location updates will be done every frame with a multicast in an event tick. But multicast every fame does not work as expected. There will be some replication issues. So, You can change this variable to something like 5 to avoid any replication problems. This means, locations will be updated only every 5th frame. Therefore, this will also mean that there will be more stutter during each update. So, you should keep this value as 1 in a singleplayer setting. The stutters in the multiplayer can be overcome with a Camera Manager (not included with this plugin) and/or tweaking Interpolation parameters that I have given.

One last remark about Calculations. If you want to use this system only in singleplayer, you can consider adding a shape to your Physics Asset, to keep Root in the position during Ragdoll. This will help with more accurate transition from lying position to the Get Up Animation. Sadly, this can`t be done for Multiplayer Replication because to update Mesh Location and Rotation, Root should move freely with Mesh, otherwise I have no way to tell other Clients about the position of my Character`s Mesh during the Ragdoll State. I could do that with Pelvis or any other bone, but they are not as reliable as root and giving extremely poor results during Transform updates in the other Clients.



19 Bodies, 19 Considered for bounds (100%), 18 Constraints

Summary

For further information please also refer to my Explanation Video. If you encounter any unexpected behaviour when using this plugin please let me know through my given communication channels in my marketplace profile.