Unity Cloth Physics

Introduction

This is quick worfkflow for Unity Cloth Physics in Illusion Games.

First, there will be 2 main parts:

1. *Setting the Mesh and Physics*
2. *Setting the Colliders and building the MOD.*

The first part will be covering the FBX importing to Unity and setting the cloth property.

In the second part I'll show you how to set colliders and build mod.

Requirements:

1. Unity Editor (hooh's modding tool)
2. 3D Modeling Software (Blender)
3. AI Cloth Colliders plugin by ManlyMarco
4. Fix Colliders script by RenderHeads

Also, this tutorial requires basic knowledge in modeling, rigging and modding in Unity. I won't be covering all basics here, sorry. Only the cloth physics workflow.

Setting the Mesh and Physics

Ok let's go straight to the 3d soft and make mesh. In this tutorial I will be using my DMG girl mod skirt as an example.

To make it work let's make a plain quad mesh. This is very important part, so I recommend making your cloth meshes as plain as possible. Thinking of cloth parts should be like a real life dress pattern designs.

Do not add any details or wrinkles to it at this point. As for the density – I don't recommend to go higher than that.
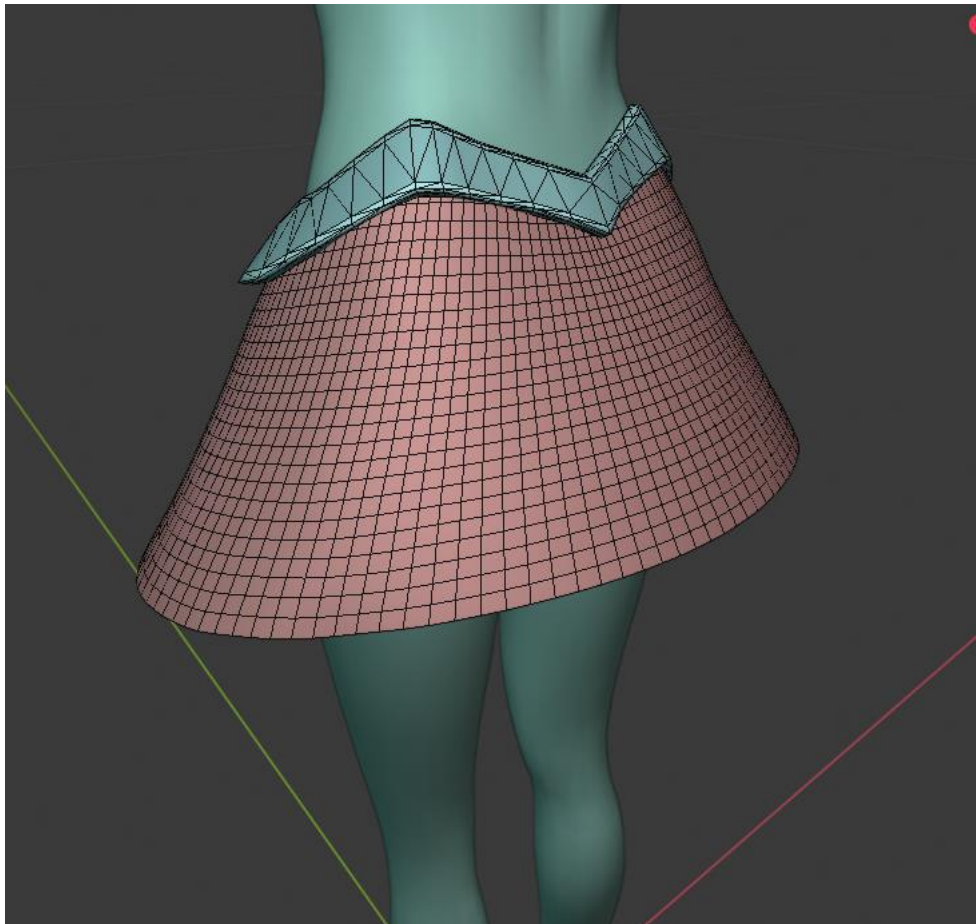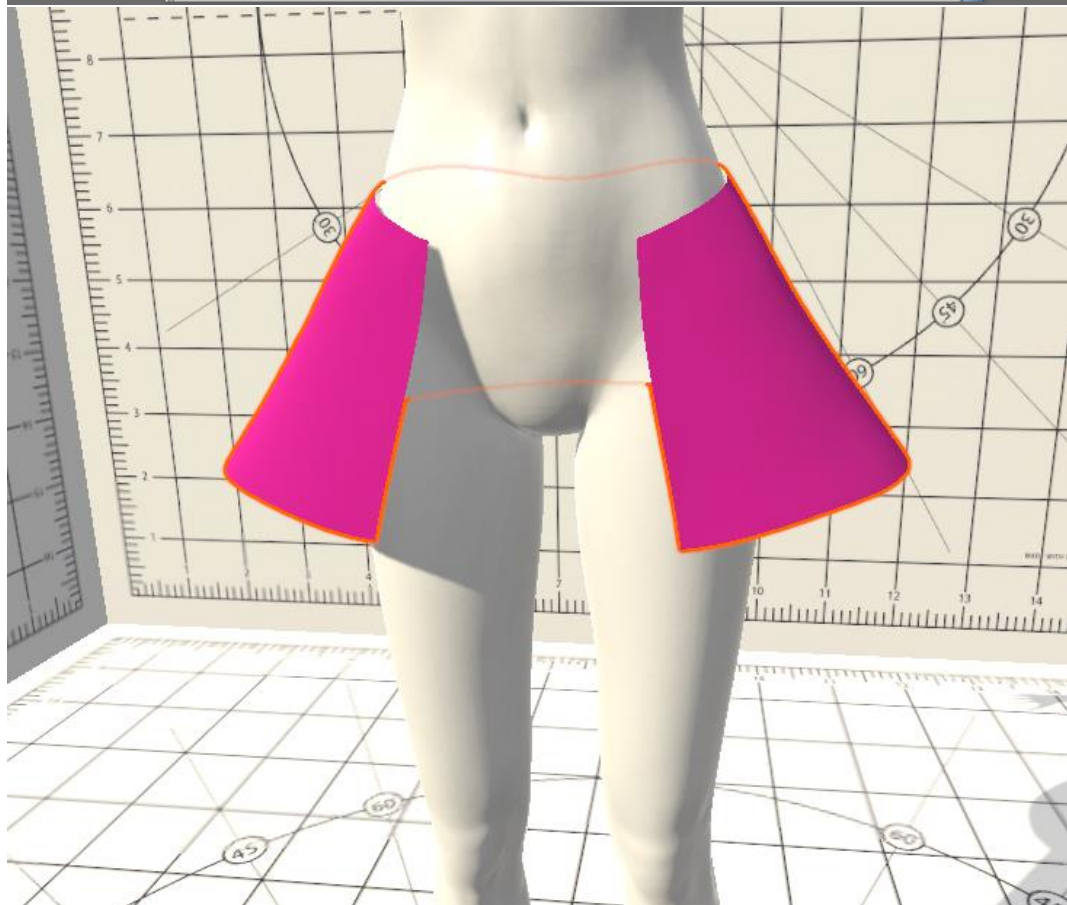
Rigging

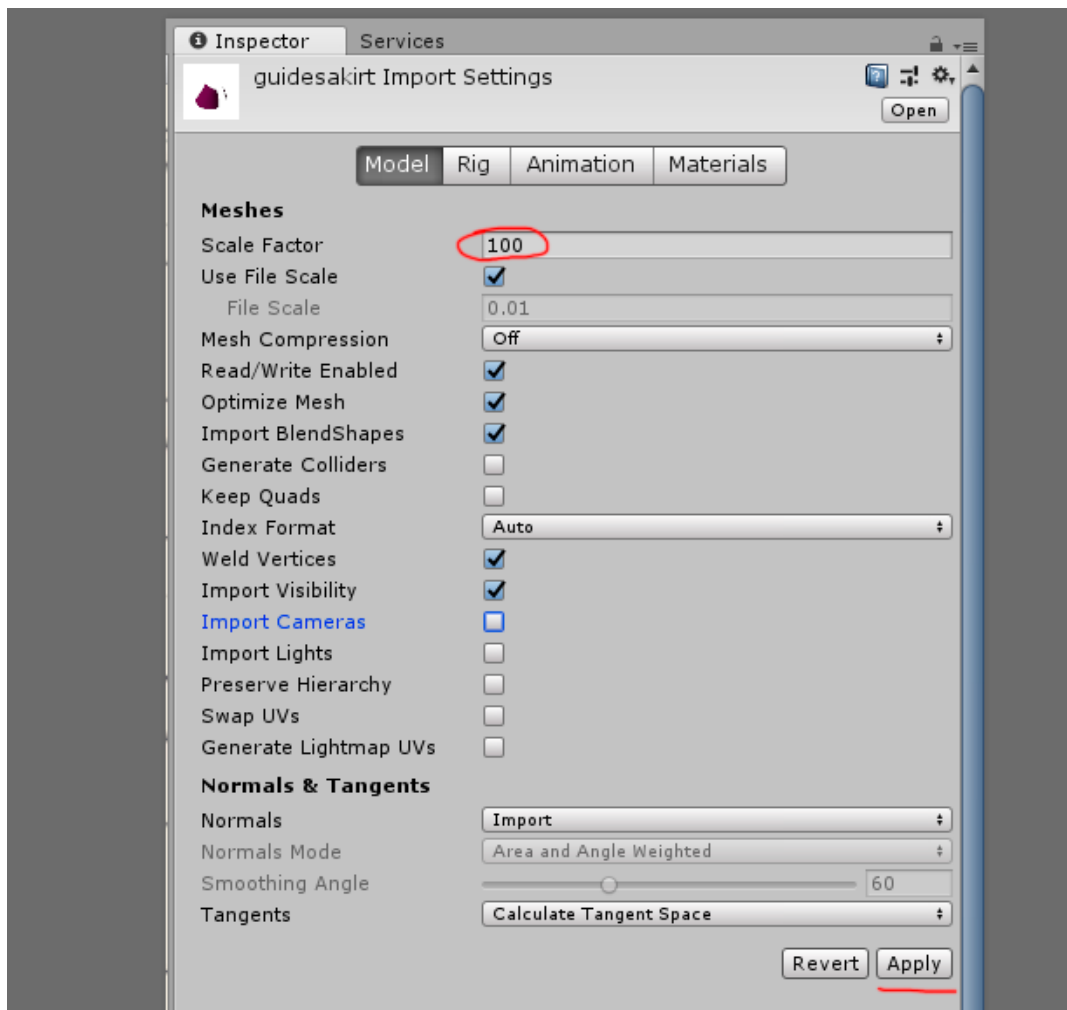As for the rig, you can keep it very simple - it's not matters so much, just make sure it sticks around the waist here. As for my example – I didn't use any skirt bones or so.

Importing to Unity

Now lets save FBX and import it into UnityEditor.

Right now I coverin the Ai*Girl model that has a small scale, so we need to do upscaling in Unity on mesh import. Create a new folder and drag the fbx to it.

guidesakirt Import Settings

Model	Rig	Animation	Materials

Meshes

Scale Factor	100
Use File Scale	✔
File Scale	0.01
Mesh Compression	Off
Read/Write Enabled	✔
Optimize Mesh	✔
Import BlendShapes	✔
Generate Colliders	☐
Keep Quads	☐
Index Format	Auto
Weld Vertices	✔
Import Visibility	✔
Import Cameras	☐
Import Lights	☐
Preserve Hierarchy	☐
Swap UVs	☐
Generate Lightmap UVs	☐

Normals & Tangents

|	
Normals	Import
Normals Mode	Area and Angle Weighted
Smoothing Angle	60
Tangents	Calculate Tangent Space

Revert   Apply

Add a cloth Prop

Now you need to navigate the actual SkinnedMeshRenderer and add a new component to it.
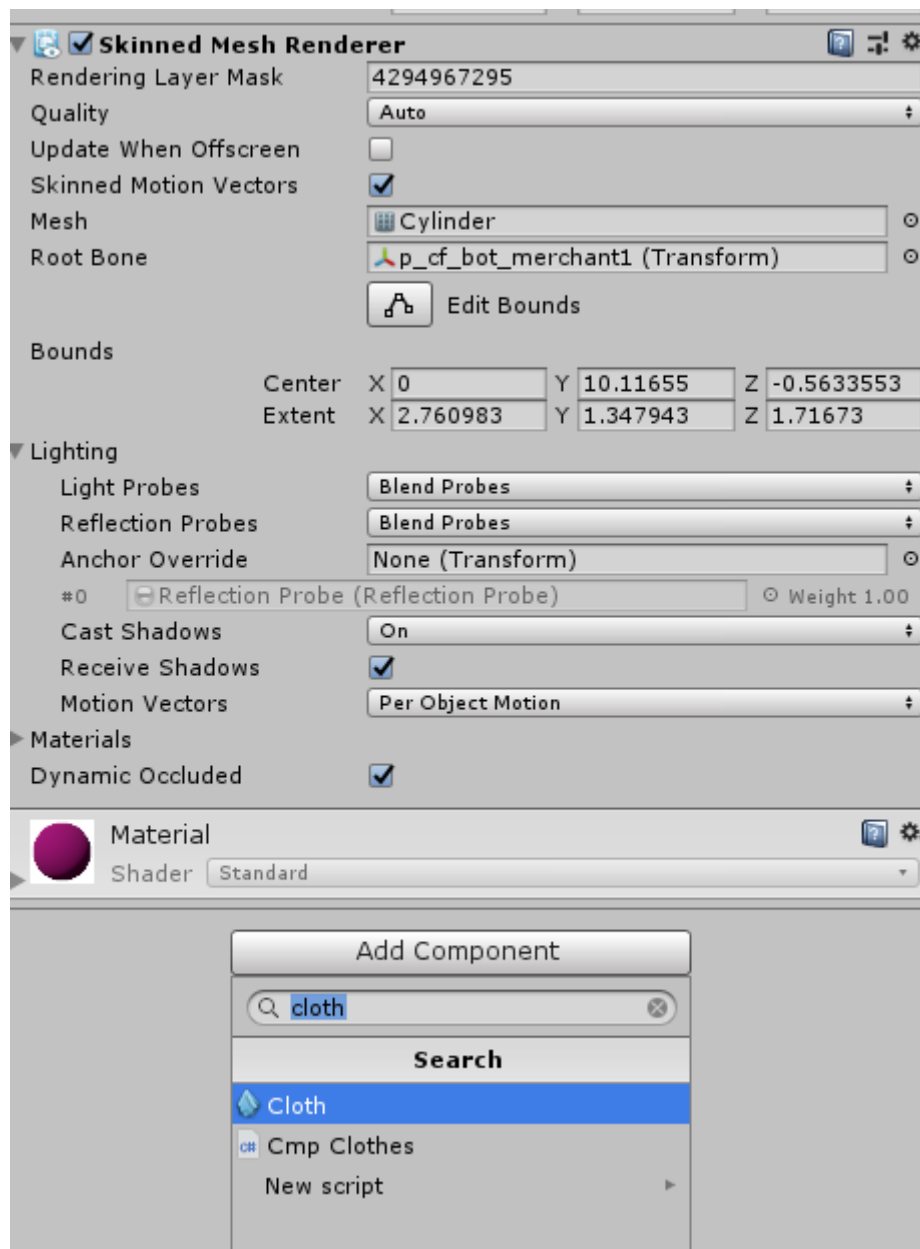
Setting the Cloth Constraints.

Basically this is the cloth component main settings, it can be edited to imitate the different types of cloth. But first of all we need to pin it to the body or it will fall down immediately.
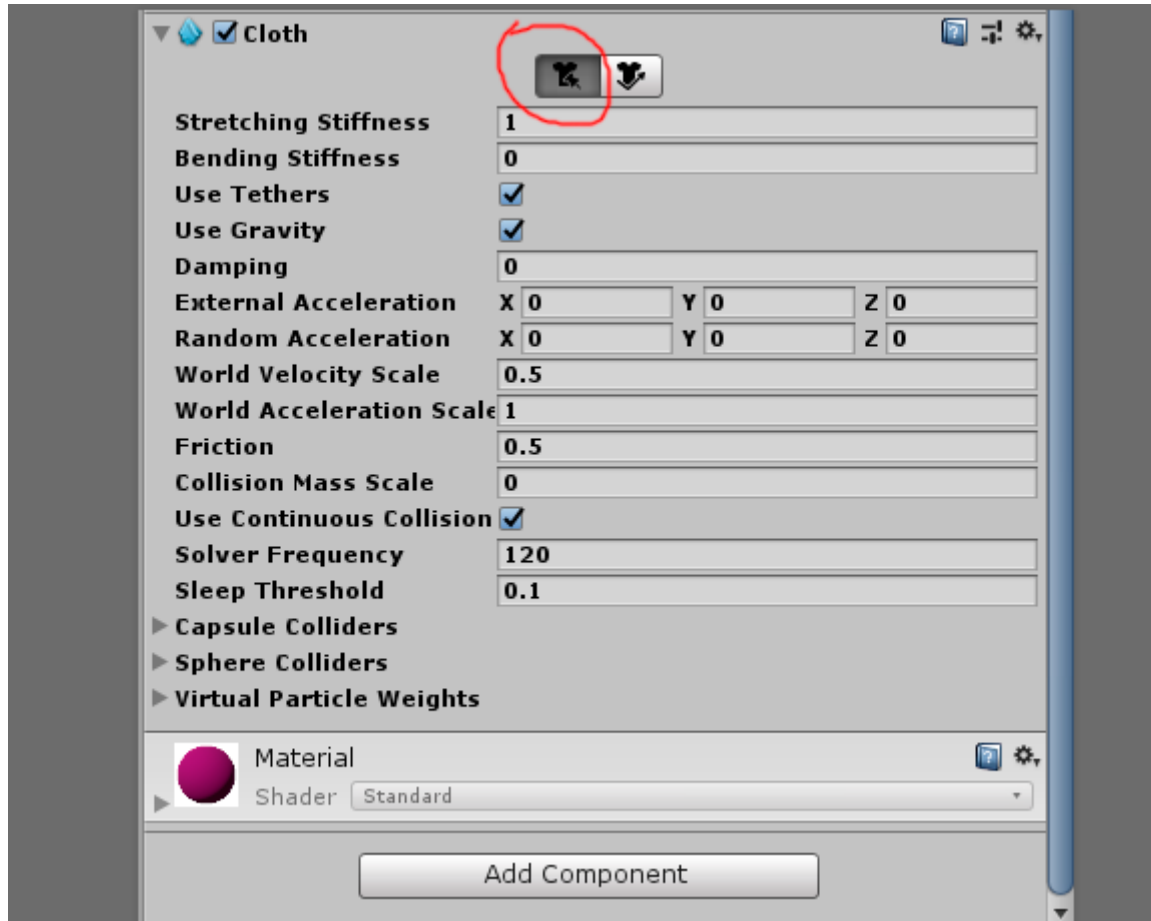
Note: often there is a bug with the Unity, when you open the cloth constraints tool the vertex positions are wrong. So in this case we will use RenderHeads Unity script.
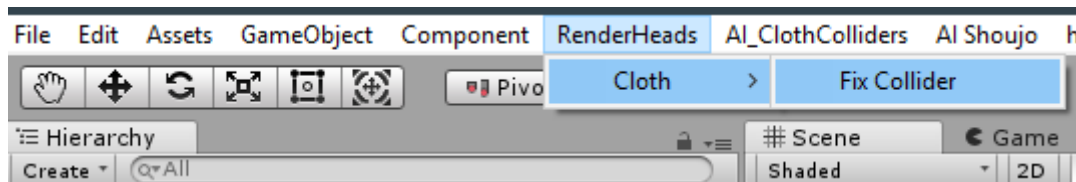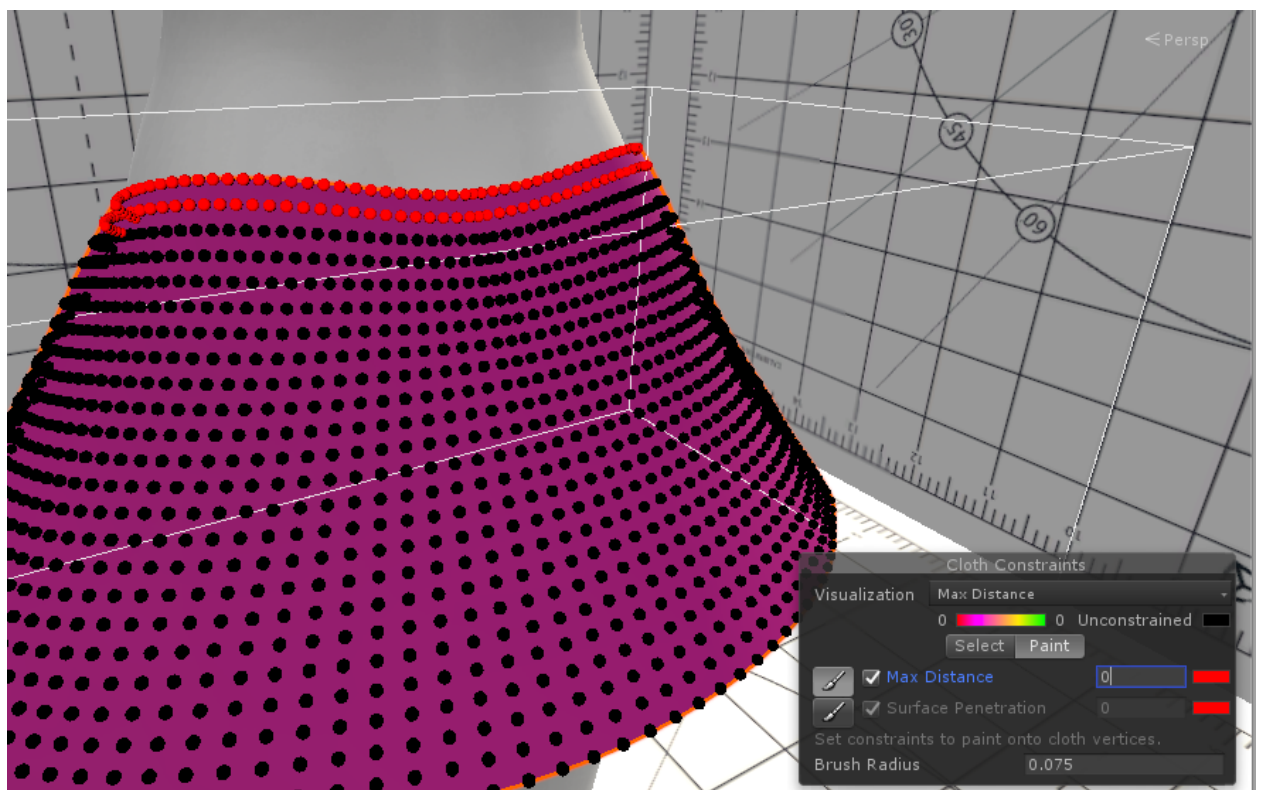

This should fix the constraints positions.

So, the constraits should looks like this:
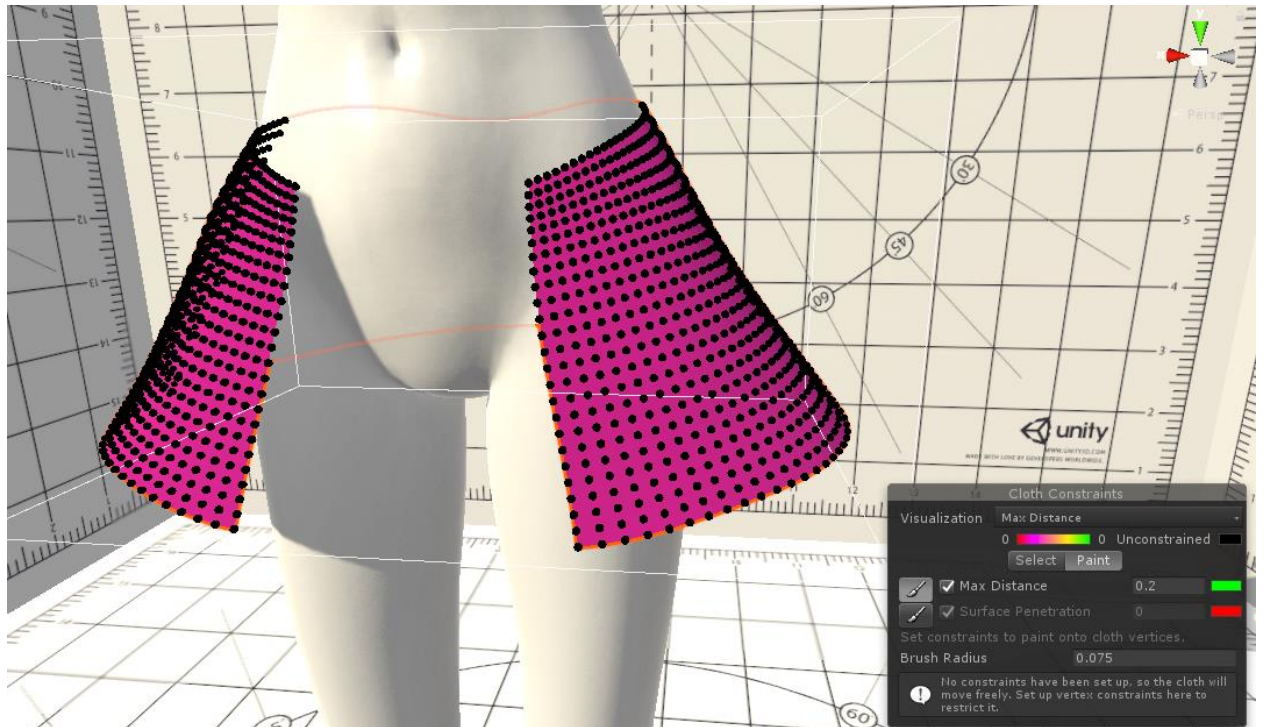
Now, we need to paint the parts that will be excluded from the cloth simulations. For this case, set Max Distance to 0 and paint the parts. To erase, uncheck the Max Distance and paint.

Basically you can set any other numbers to imitate different stiffness, but if you want the most realistic simulation I recommend you to use only 0 and null. (red, black). So red vertexes will be restricted in simulations, while black vertexes won't be restricted in moving at all.

Settings Adjustments
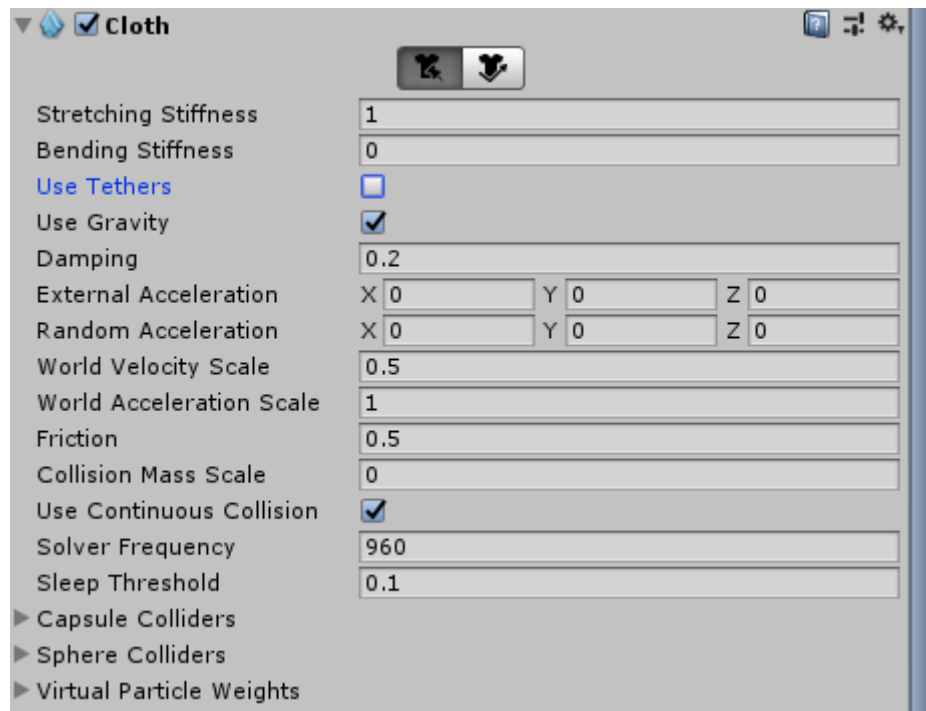
You can use this screen as a reference or play with the different settings here.

Stretching Stiffness – this should be left 1 in most cases.

Bending Stiffness – you can play with the settings to increase or decrease the wrinkles.

Use Tethers – if you using default **Solver Frequency** (120) better leave it ON, but if you want better simulations fidelity and speed you can increase Solver Frequency to 960 and uncheck the Tethers.

Use Gravity – basically the gravity of the scene, you can uncheck it and use **External Acceleration** instead. For example, to imitate some force or wind applied to simulation.

Random Acceleration – this basically used to imitate wind effect.

Friction – this controls the sticking functions. If it set to 1 the cloth will be sticking to the colliders, while 0 will be sliding from it. Setting it to 1 can cause glitches and bugs, so use with caution.

Damping – also very important setting. 0 is moving freely, 1 is maintain the original shape. So, I recommend to keep it low for the cloth, like 0.2 or 0.5.

This basically all. Just don't touch other settings here. You can also play with the setting in the actual game in real-time by Runtime Editor (F12).

Setting the colliders

Now we need to set the colliders to the body. Unity allows to add 2 types of colliders, its capsule collider and a sphere collider, and the cone collider which basically a pair of spheres with different size.

Please note, that colliders not working perfectly in all situations, so expect to have clippings and so. The problem is that Illusion games are very customizable by the users, and the cloth physics system is not quite suitable for this and working best with the solid characters.

So, if you example make a perfect collider setup, some users might want to change the sizes and the shape and the collider rig is most likely be ruined. This probably caused by disproportional scaling in bones and colliders.

At this point, the collider rig working best with it's own original card. Also note that there is no any good tools to work with the colliders. So most time you will have to work blind and trial and error way.

I would recommend to open the body mesh in Blender and set armature visible
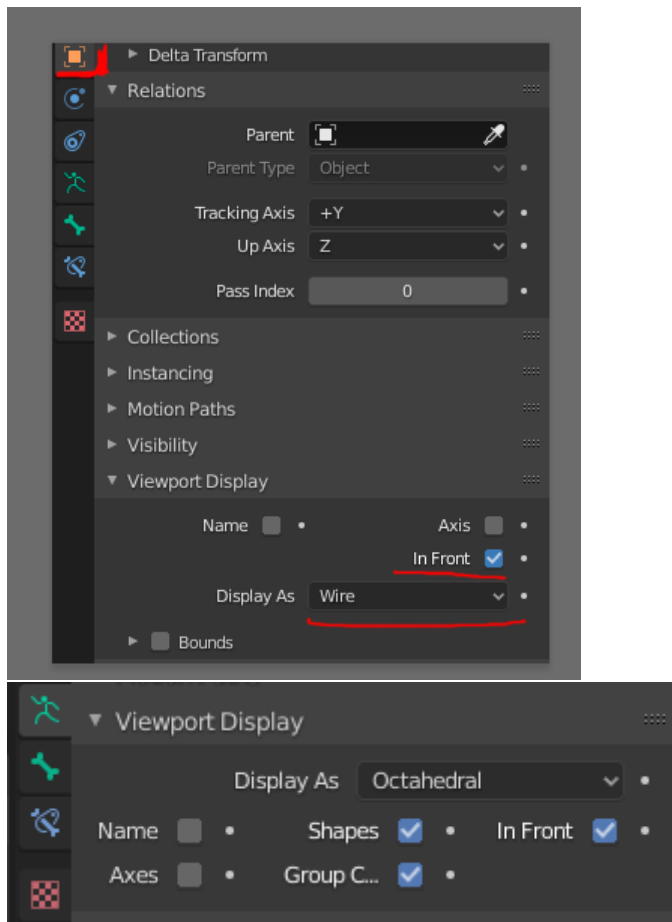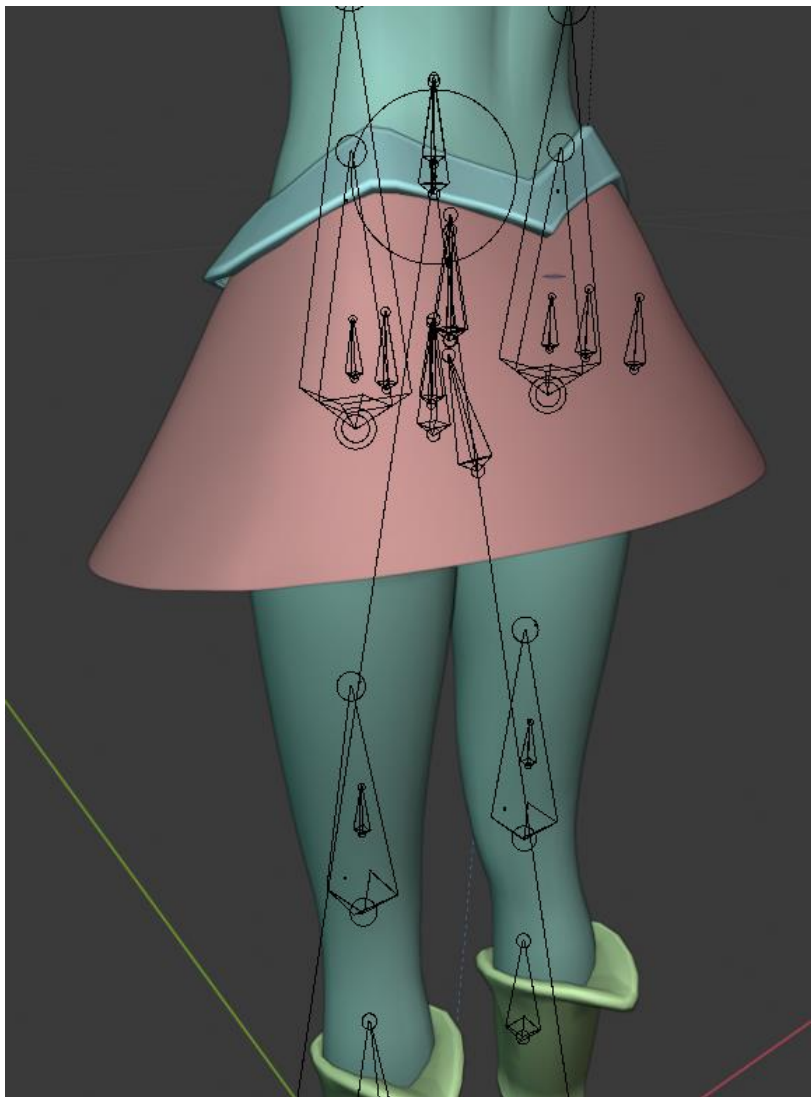
The workflow: you navigate the bone on which you add want to add a collider and then go to Unity Editor and navigate the same bone there and set the collider.
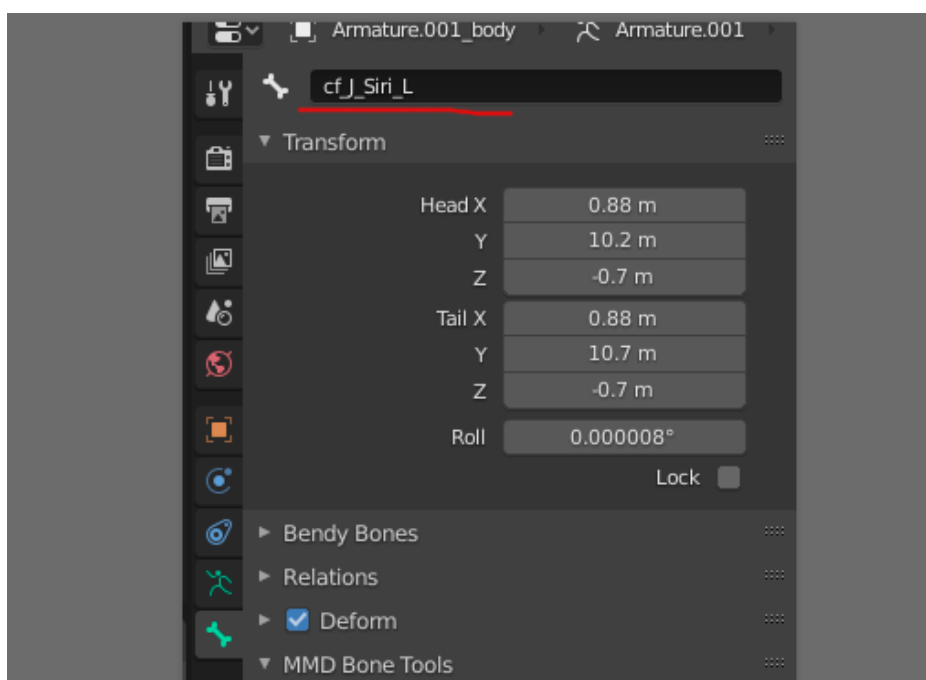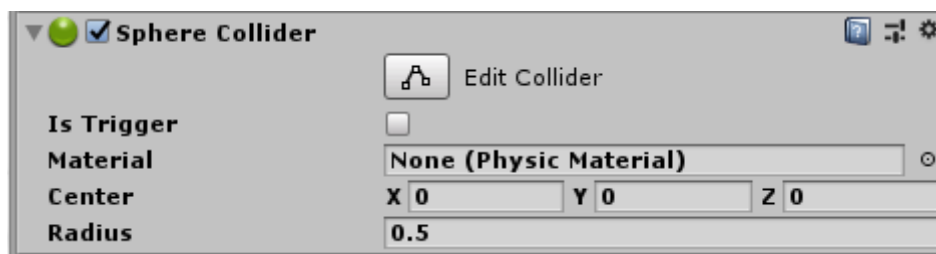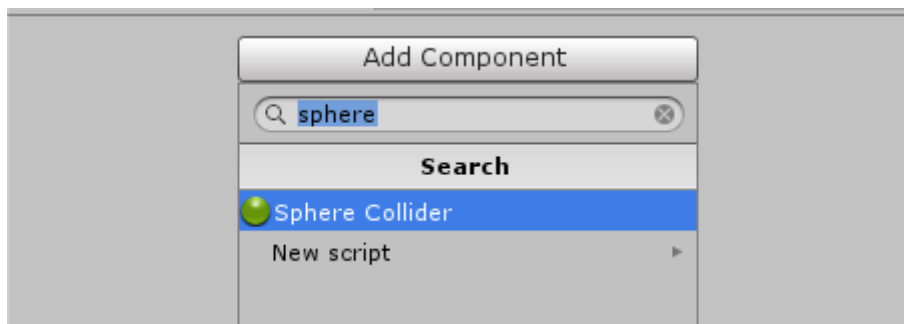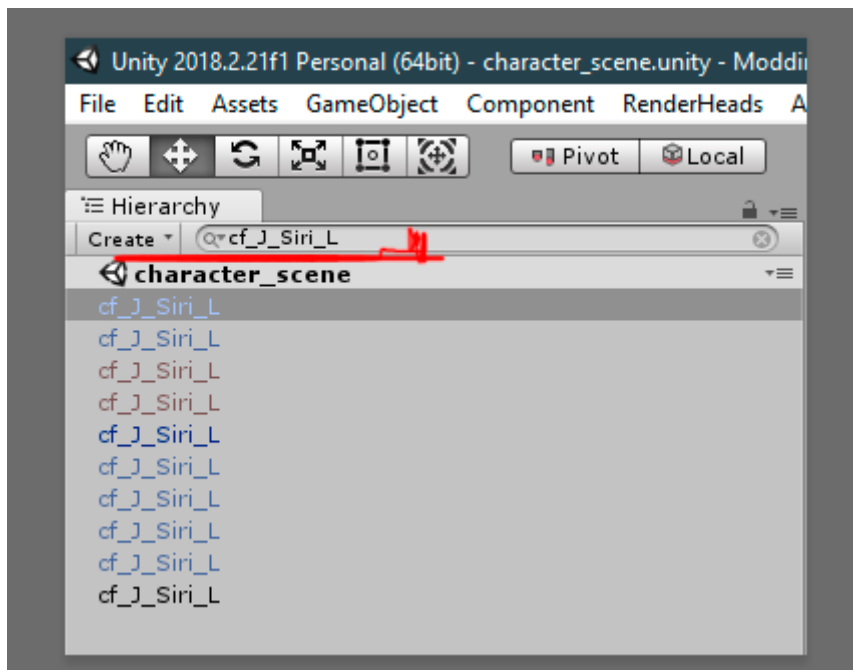
Actually most of the time you'll need a **Radius** of the collider, but you can also set the **Center** offset. But offsets tend to cause bugs when the parent bone is scaled, so use with caution.

You can have only **ONE COLLIDER PER BONE.**
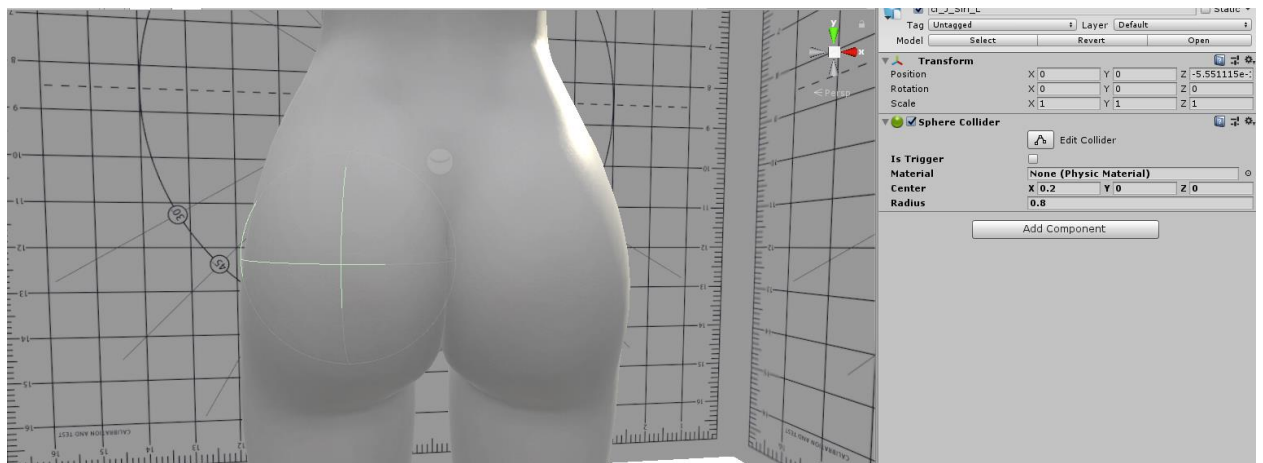
After you add it it should show in the viewport, the main goal here is to cover the part of the body that should collide with the skirt with colliders. The plugin can mirror colliders, so I recommend to set only Left side of the colliders and then mirror it

As for the limps, I recommend to use a pair with two spheres:
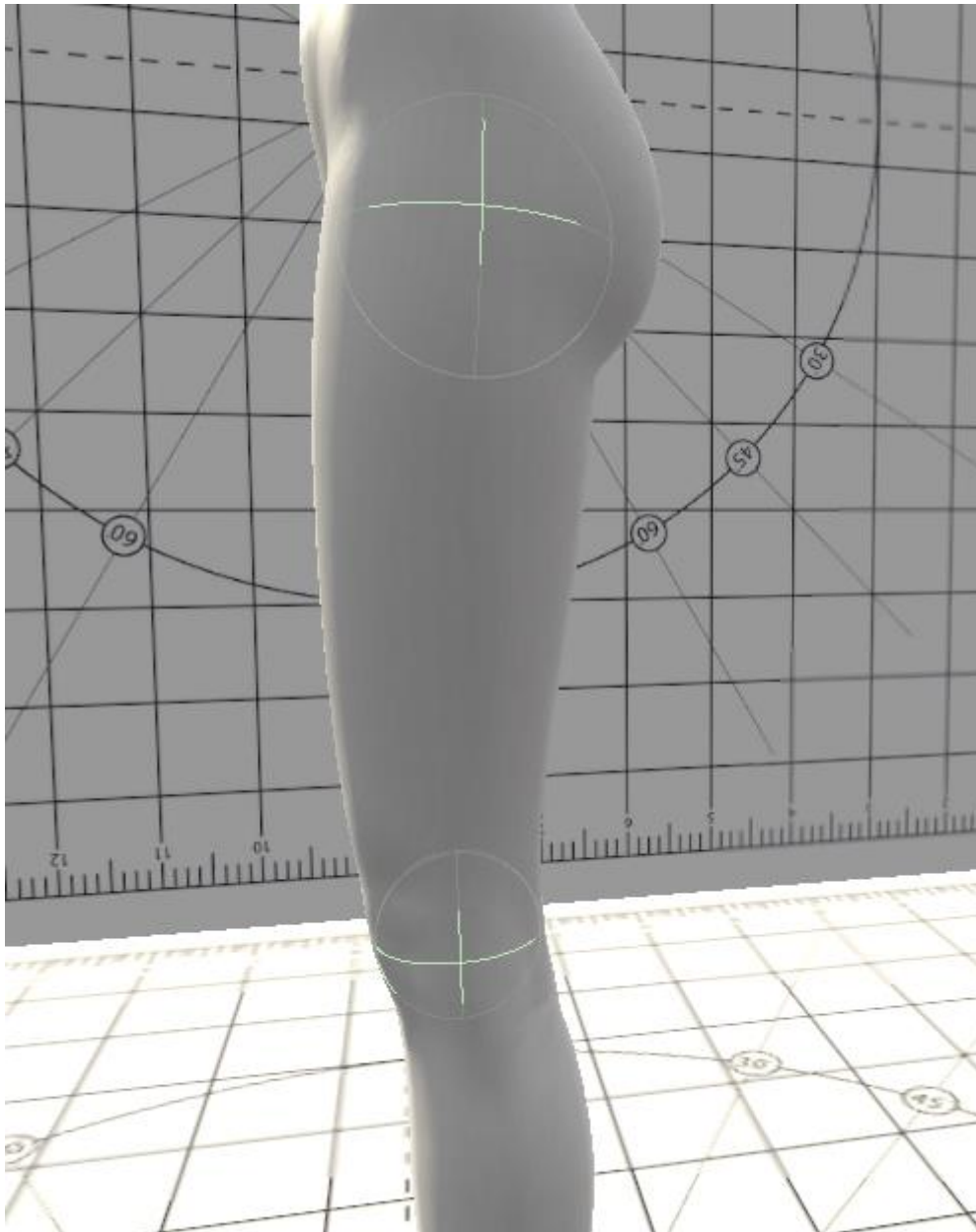
And then connect them to the single cone collider. To do this go to our skirt mesh, navigate cloth component and search for scroll Sphere Colliders.

First, type a number of elements, for example 5, so it will have 5 pair of sphere colliders.

Now, we need to add our colliders to this arrays.

If you need only a single Sphere, then you navigate the single sphere in First row and leave the Second empty.

If you need a cone, then you add two sphere colliders in the First and Second rows.

Cloth

Stretching Stiffness	1
Bending Stiffness	0
Use Tethers	☐
Use Gravity	☑
Damping	0.2
External Acceleration	X 0 Y 0 Z 0
Random Acceleration	X 0 Y 0 Z 0
World Velocity Scale	0.5
World Acceleration Scale	1
Friction	0.5
Collision Mass Scale	0
Use Continuous Collision	☑
Solver Frequency	960
Sleep Threshold	0.1

▶ Capsule Colliders
▼ Sphere Colliders

Size	5

▼ Element 0
  First — ● cf_J_Siri_R (Sphere Collider)   ⊙
  a pair
  Second — None (Sphere Collider)   ⊙
▶ Element 1
▶ Element 2
▶ Element 3
▶ Element 4
▶ Virtual Particle Weights

Cast Shad
Receive St
Motion Vec
Materials
Dynamic Occ

Cloth

Stretching St
Bending Stiff
Use Tethers
Use Gravity
Damping
External Acce   Z 0
Random Acce   Z 0
World Velocit
World Accele
Friction
Collision Mas
Use Continuo
Solver Freque
Sleep Thresh
Capsule Colli
Sphere Collic
  Size
▼ Element 0
  First   ere Collider)   ⊙
  Second   der)   ⊙
▶ Element 1
▶ Element 2

Select SphereCollider ✕

🔍 |

Assets   Scene

None
🔲 cf_J_LegLow01_L
🔲 cf_J_LegUp00_L
🔲 cf_J_Siri_L
🔷 cf_J_Siri_R

this is the list of all collider that was added to the scene.

So yo need to add all needed colliders to Left part of the body, then mirror it, then you go to the Cloth component and add it to the arrays there.
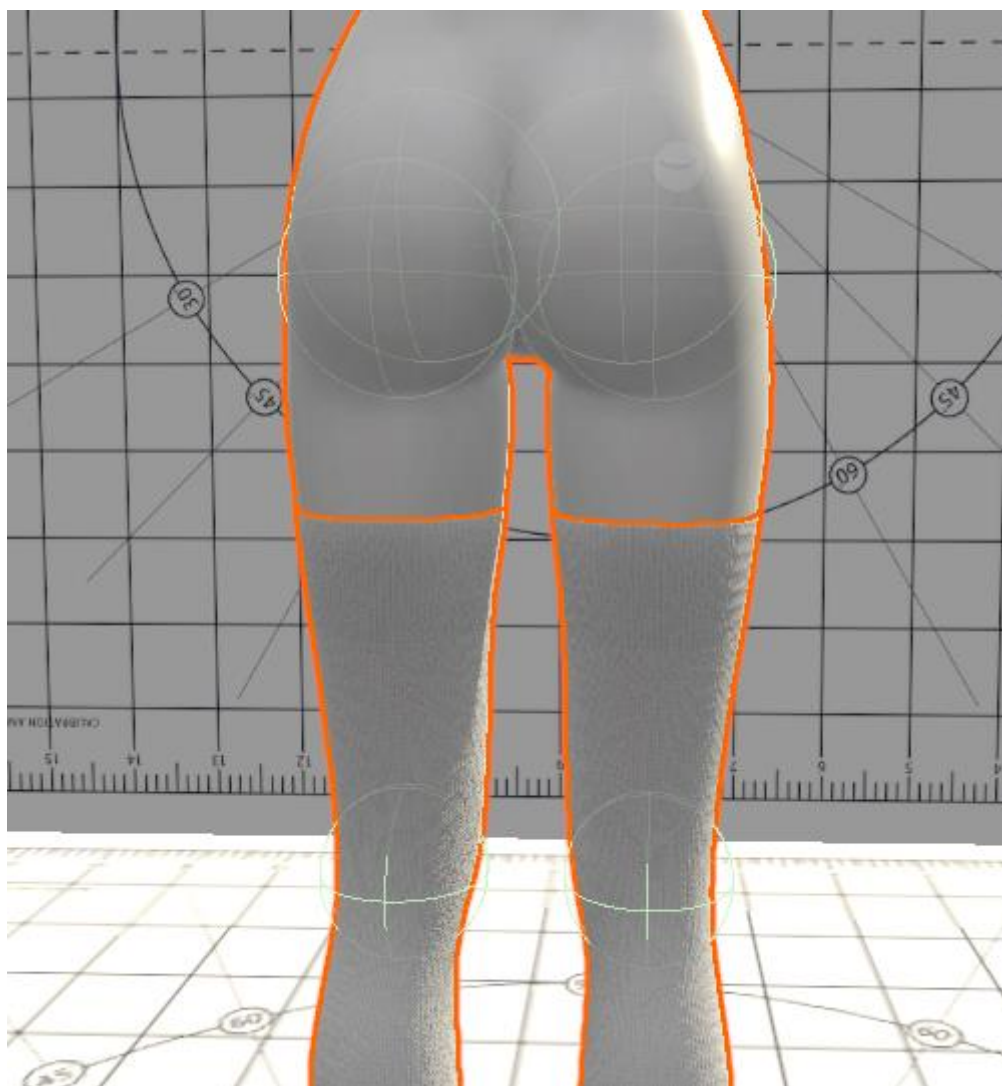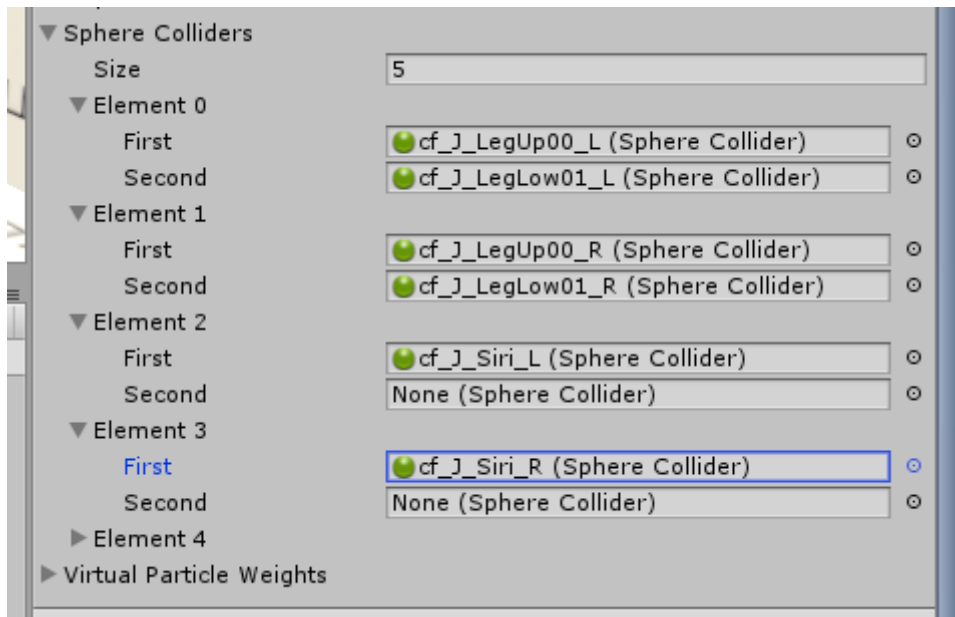
This is the example of simple collider setup for the skirt, of course you can add more colliders to your needs.

Now, lets build our mod.

I won't be covering the mod building here, you can see the hooh's documentation at:

https://github.com/hooh-hooah/AI_Tips/blob/master/mods/How%20to%20make%20Top%20Clothes.md

So, after you build the mod, you need to set manifest.xml to initialize it in the actual game.
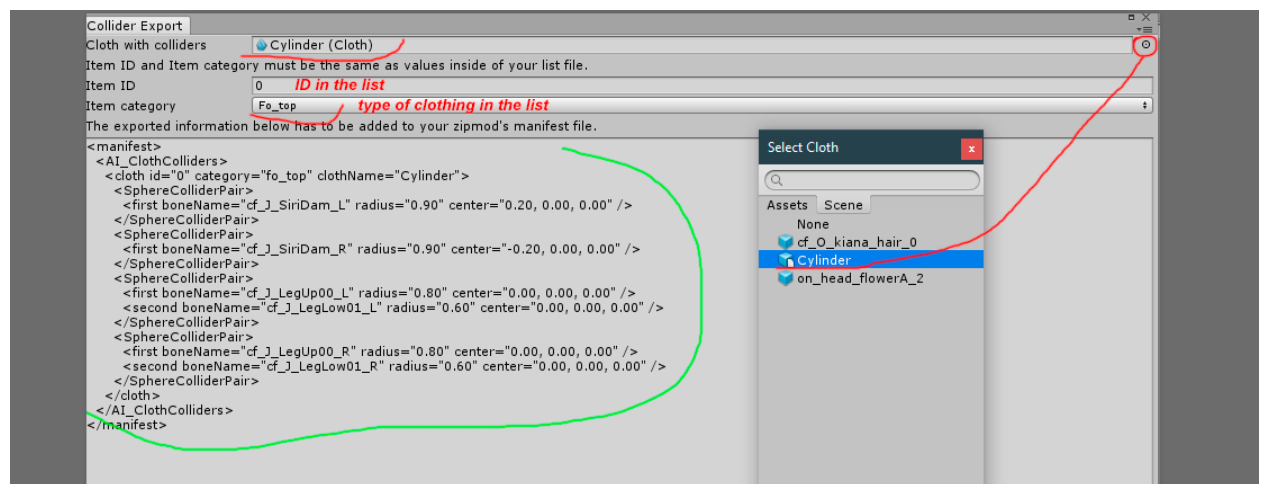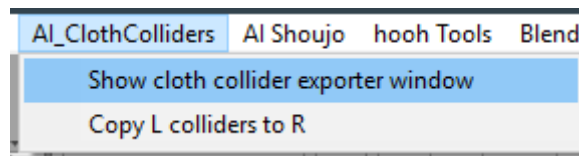
You will be provided with the code, now copy it and paste in the manifest.xml in your zipmod.

```xml
1  <manifest schema-ver="1">
2      <guid>test.mod</guid>
3      <name>Collider Tutorial</name>
4      <version>1.0.0</version>
5      <author>Hanmen</author>
6      <description>Testing example</description>
7
8
9    <AI_ClothColliders>
10     <cloth id="777" category="fo_bot" clothName="Cylinder">
11       <SphereColliderPair>
12         <first boneName="cf_J_SiriDam_L" radius="0.90" center="0.20, 0.00, 0.00" />
13       </SphereColliderPair>
14       <SphereColliderPair>
15         <first boneName="cf_J_SiriDam_R" radius="0.90" center="-0.20, 0.00, 0.00" />
16       </SphereColliderPair>
17       <SphereColliderPair>
18         <first boneName="cf_J_LegUp00_L" radius="0.80" center="0.00, 0.00, 0.00" />
19         <second boneName="cf_J_LegLow01_L" radius="0.60" center="0.00, 0.00, 0.00" />
20       </SphereColliderPair>
21       <SphereColliderPair>
22         <first boneName="cf_J_LegUp00_R" radius="0.80" center="0.00, 0.00, 0.00" />
23         <second boneName="cf_J_LegLow01_R" radius="0.60" center="0.00, 0.00, 0.00" />
24       </SphereColliderPair>
25     </cloth>
26   </AI_ClothColliders>
27
28 </manifest>
```
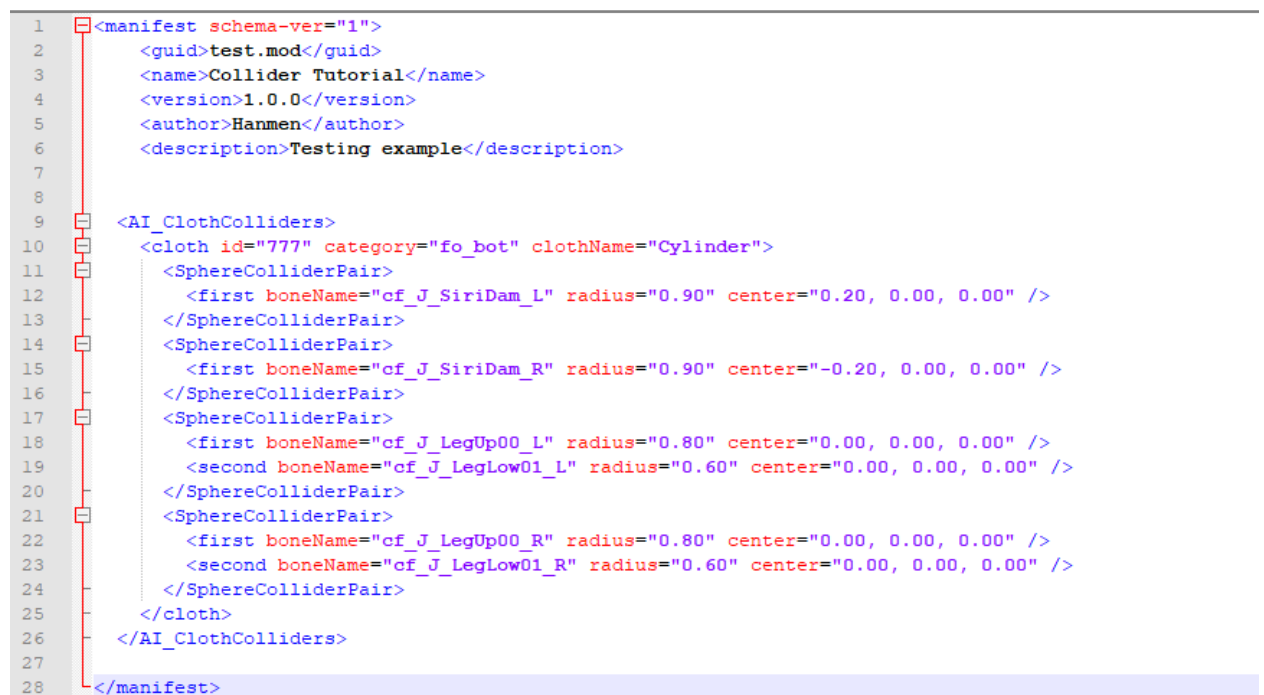
This will initialize the colliders in runtime so it should work in the game.

Now you need to debug it in the game, lets launch the studio.
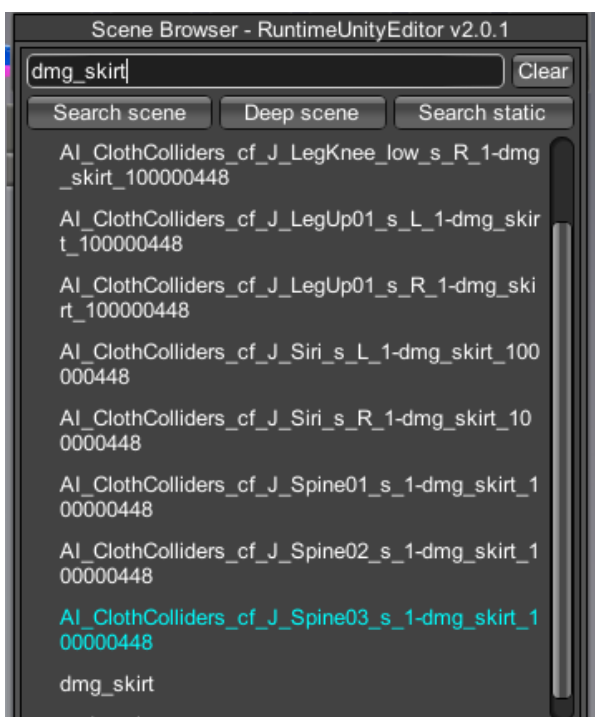
This is the working example obviously, your cloth might look not good, so you can try to debug it with Runtime Editor (F12).

Best way to navigate is to use search, by the name of the mesh, then you can see all the colliders that associated with it, and then you can change its Radius and Center ofsset in the real time and see.

Value/return type	Member name	Value
System.Void	Open in Scene Object Browser	Navigate to GameObject this Component is attached to
UnityEngine.Vector3	center	{"x":0.30000001192092898,"y":0.0,"z":0.699999988079071}
System.Single	radius	0.97
System.Boolean	enabled	True
UnityEngine.Rigidbody	attachedRigidbody	NULL
System.Boolean	isTrigger	False
System.Single	contactOffset	0.01
UnityEngine.Bounds	bounds	Center: (-0.5, 8.9, -0.3), Extents: (1.1, 1.1, 1.1)
UnityEngine.PhysicMaterial	sharedMaterial	(UnityEngine.PhysicMaterial)
UnityEngine.PhysicMaterial	material	(UnityEngine.PhysicMaterial)
UnityEngine.Transform	transform	AI_ClothColliders_cf_J_Siri_s_L_1-dmg_skirt_100000448
UnityEngine.GameObject	gameObject	AI_ClothColliders_cf_J_Siri_s_L_1-dmg_skirt_100000448
System.String	tag	Untagged
System.String	name	AI_ClothColliders_cf_J_Siri_s_L_1-dmg_skirt_100000448
UnityEngine.HideFlags	hideFlags	None
UnityEngine.SphereCollider	GetComponent<SphereCollider>	Method call - enter to evaluate
UnityEngine.SphereCollider	GetComponentInChildren<SphereCollider>	Method call - enter to evaluate
UnityEngine.SphereCollider[]	GetComponentsInChildren<SphereCollider>	Method call - enter to evaluate
UnityEngine.SphereCollider	GetComponentInParent<SphereCollider>	Method call - enter to evaluate
UnityEngine.SphereCollider[]	GetComponentsInParent<SphereCollider>	Method call - enter to evaluate
UnityEngine.SphereCollider[]	GetComponents<SphereCollider>	Method call - enter to evaluate

C# REPL Console

AI_ClothColliders_cf_J_LegUp01_s_L_1-dmg_skirt_100000448
AI_ClothColliders_cf_J_LegUp01_s_R_1-dmg_skirt_100000448
AI_ClothColliders_cf_J_Siri_s_L_1-dmg_skirt_100000448
AI_ClothColliders_cf_J_Siri_s_R_1-dmg_skirt_100000448
AI_ClothColliders_cf_J_Spine01_s_1-dmg_skirt_100000448
AI_ClothColliders_cf_J_Spine02_s_1-dmg_skirt_100000448
AI_ClothColliders_cf_J_Spine03_s_1-dmg_skirt_100000448
dmg_skirt
o_dmg_hat

Time > ‖ 1.00   Dump Log ◉REPL ☐Wireframe
Clear AssetBundle Cache

CommonSpace/chaF_001/BodyTop/p_cf_anim/cf_J_Root/cf_N_height/cf_J_Hips/cf_J_Kosi01/cf_J_Kosi02/cf_J_SiriDam_L/cf_J_SiriDam01_L/cf_J_Siri_L/cf_J_Siri_s_L/AI_ClothColliders_cf_J_Siri_s_L_1-dmg_skirt_100000448

Layer 0 (Default) ☐isStatic ◉Active   Inspect X
position   -0.77   8.86   -1.08
localPosition   0.00   0.00   0.00
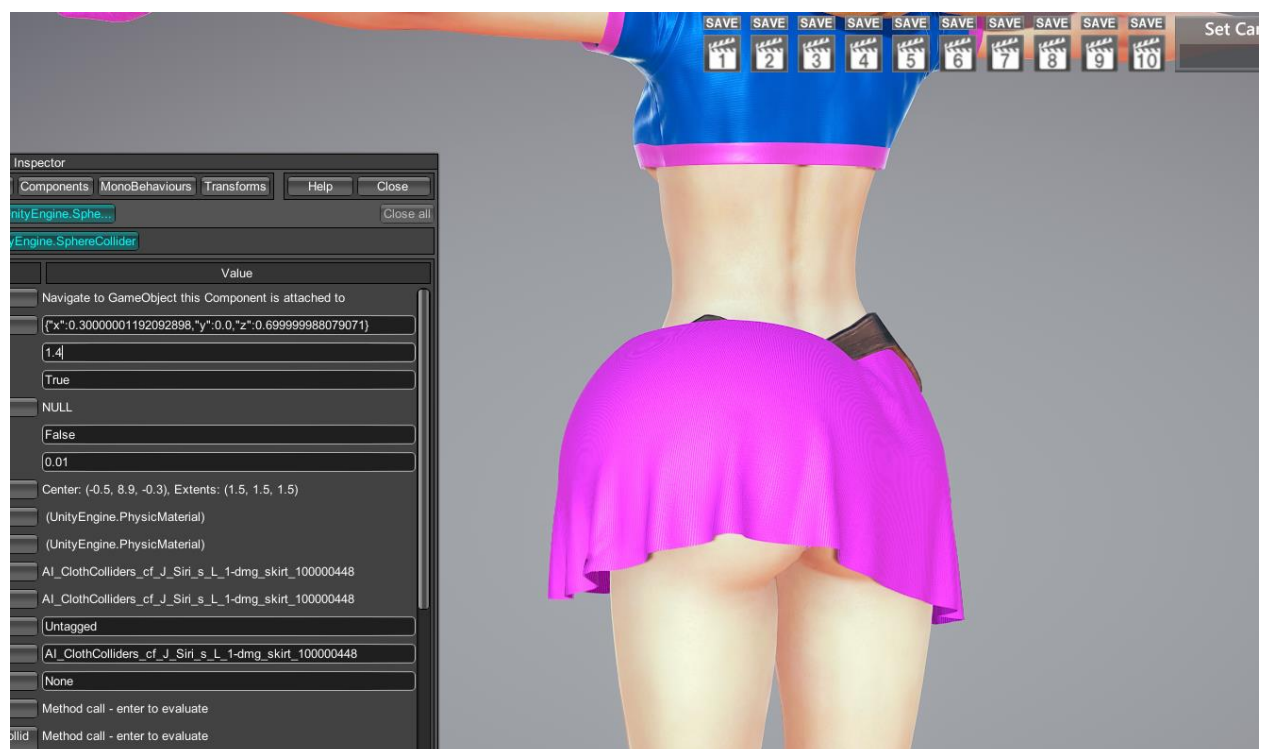localScale   1.00   1.00   1.00
eulerAngles   357.6   0.00   0.00
localEuler   0.00   0.00   0.00
Search components   _____   Clear
Transform
SphereCollider   X

press here

Just make sure to hit Enter to apply the changes in Radius and Offsets. After you adjust it copy the changes to your manifest.xml

See how it changes the size in real time as I increase the radius.

SAVE SAVE SAVE SAVE SAVE SAVE SAVE SAVE SAVE SAVE
1 2 3 4 5 6 7 8 9 10   Set Ca

Inspector
Components | MonoBehaviours | Transforms   Help   Close
UnityEngine.Sphe...   Close all
yEngine.SphereCollider

	Value
	Navigate to GameObject this Component is attached to
	{"x":0.30000001192092898,"y":0.0,"z":0.699999988079071}
	1.4
	True
	NULL
	False
	0.01
	Center: (-0.5, 8.9, -0.3), Extents: (1.5, 1.5, 1.5)
	(UnityEngine.PhysicMaterial)
	(UnityEngine.PhysicMaterial)
	AI_ClothColliders_cf_J_Siri_s_L_1-dmg_skirt_100000448
	AI_ClothColliders_cf_J_Siri_s_L_1-dmg_skirt_100000448
	Untagged
	AI_ClothColliders_cf_J_Siri_s_L_1-dmg_skirt_100000448
	None
	Method call - enter to evaluate
	Method call - enter to evaluate

You can use my free mod as example:

https://gum.co/dmgfree