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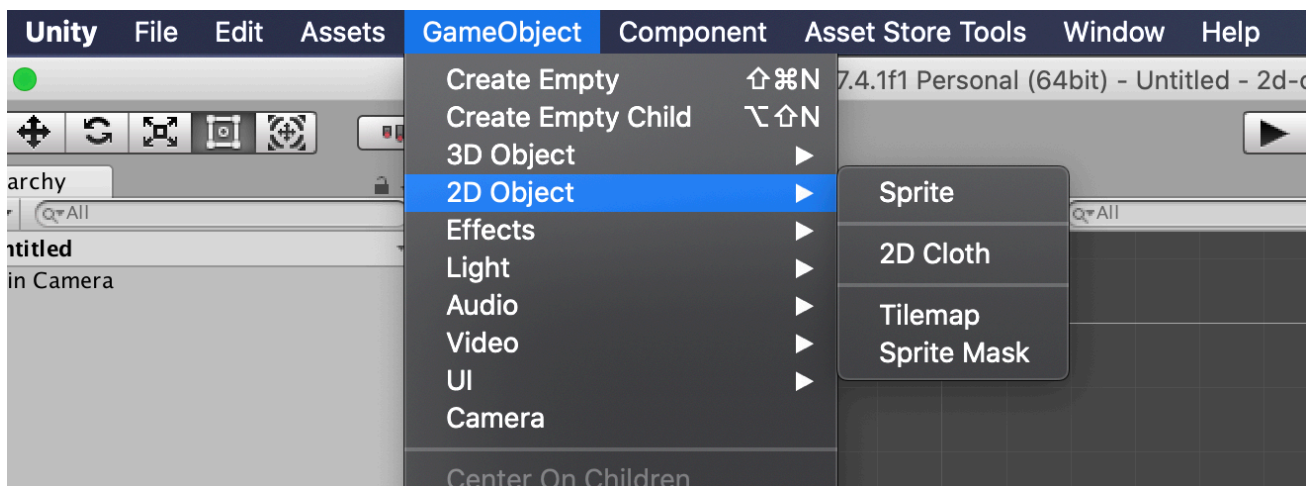
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What is 2D Cloth?

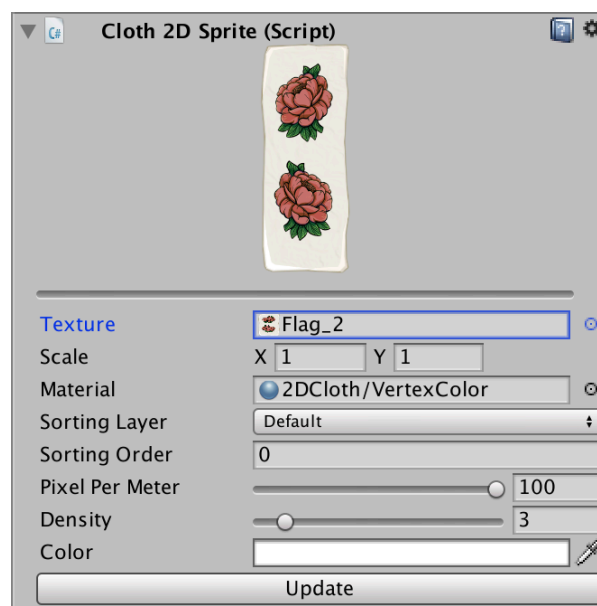
This is an asset for Unity that allows to create cloth physics in 2D. To create cloth physics add a GameObject, select a sprite, and configure parameters.

Quick Start

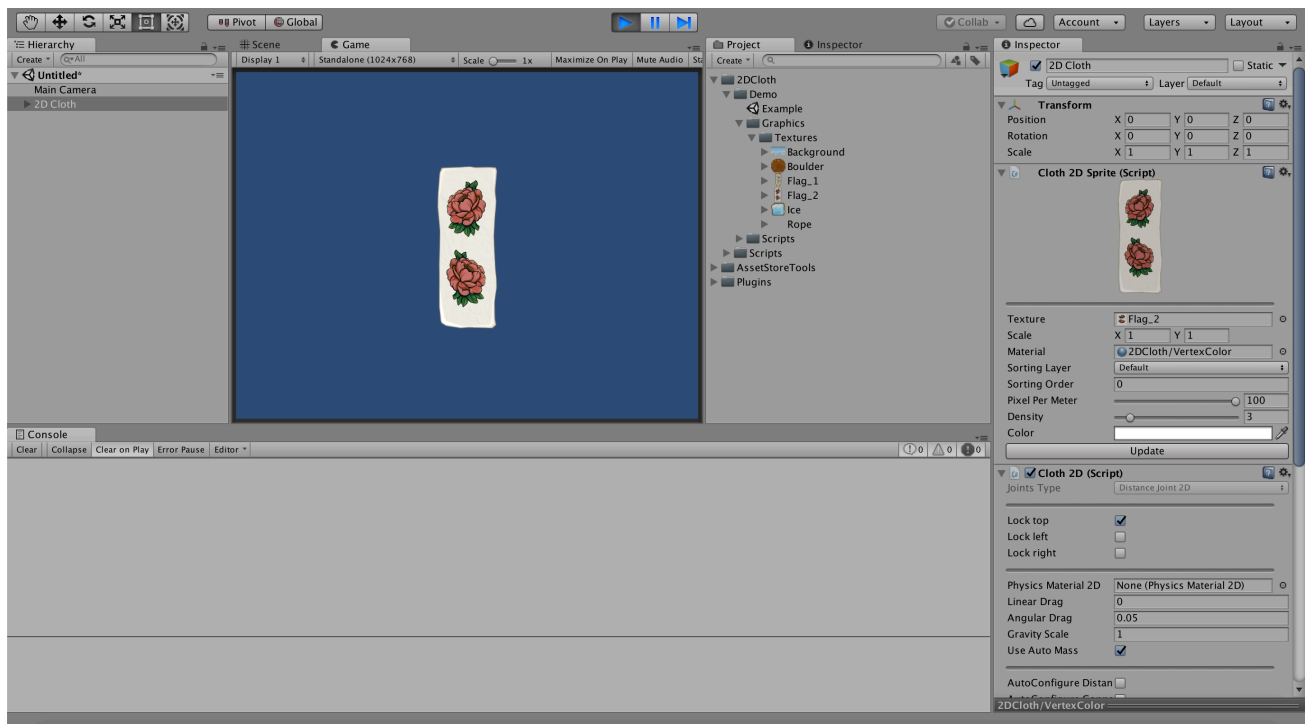
To create a 2D cloth: create new GameObject using the menu: GameObject -> 2D Objects -> 2D Cloth.



New GameObject named "2D Cloth" will be created in the Hierarchy window. After that select the sprite that will be used as a 2D cloth graphic. To do this set the Texture field for the "Cloth 2D Sprite" component:



Afterwards the sprite will be created on the scene and to add the cloth physics, click on the "Update" button, then user can enter the game mode and test the cloth physics.



How does it works?

2D Cloth creates a rectangle of X:Y joints which are attached to each other (each joint is attached to the left and top joint) and with changing positions the data on the vertices of the MeshFilter component changes accordingly.

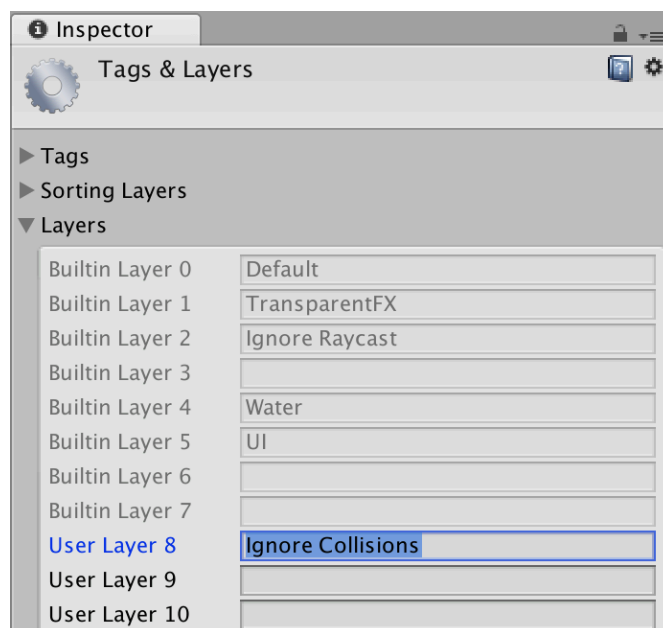
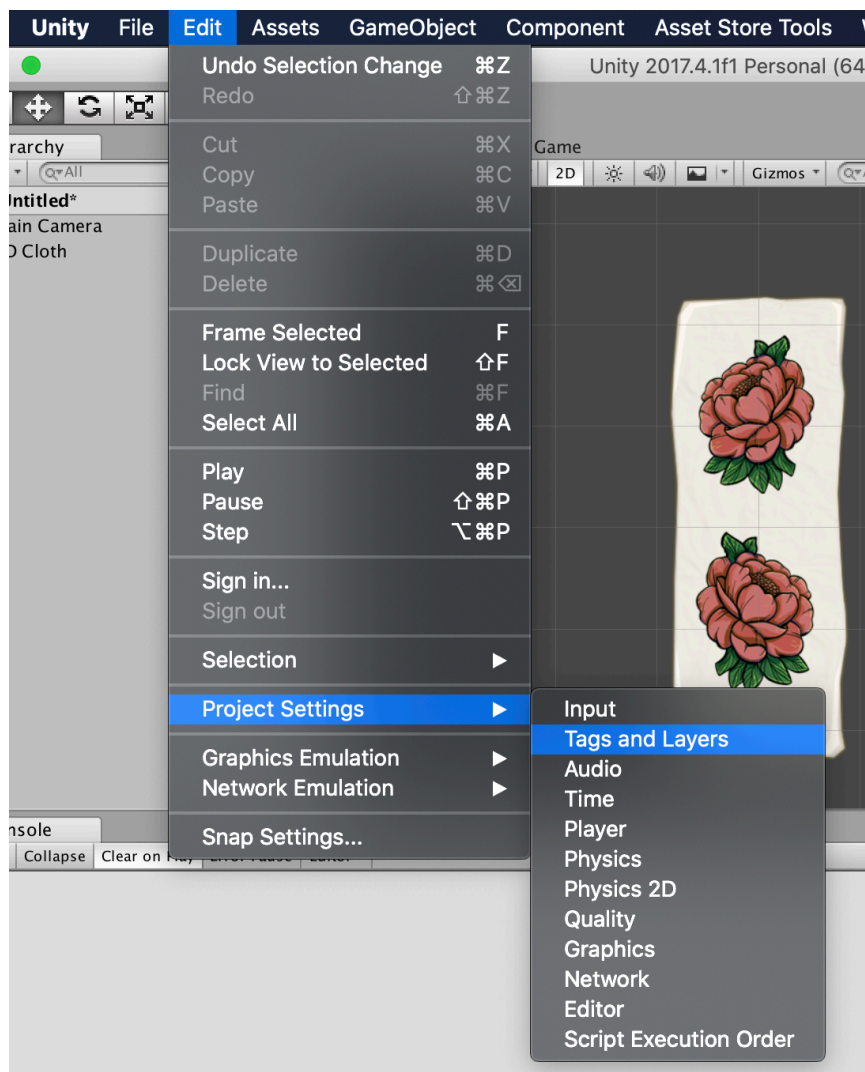
The Cloth2DSprite class creates a grid using the MeshFilter, MeshRenderer.

The Cloth2D class creates and configures joints, modifies the vertices of the MeshFilter created by the Cloth2DSprite component.

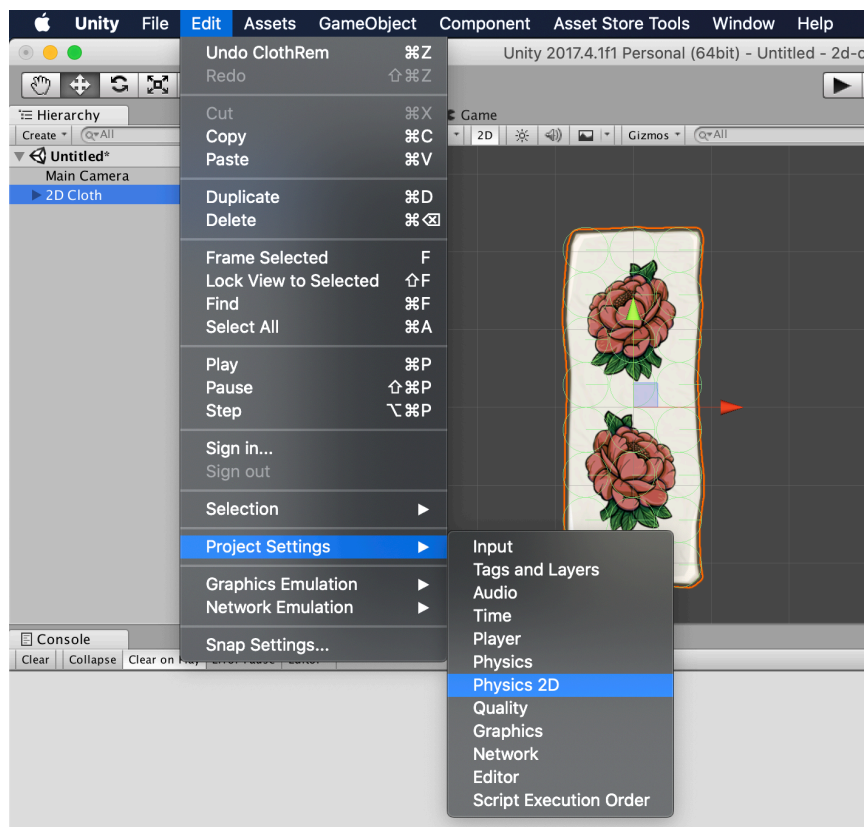
Project setup

To create the effect of silk fabric add a layer whose colliders will not interact with each other (menu item "Edit->Project Settings->Tags and Layers"). This reduces the load on the processor. How to create this layer read below.

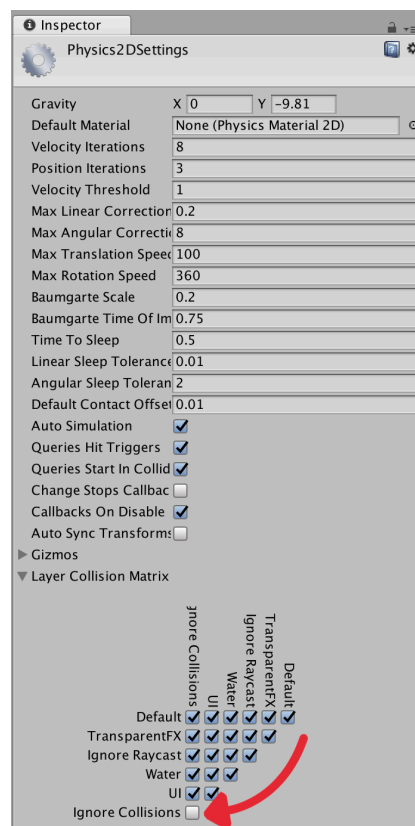
Add a new layer with an arbitrary name in the Inspector window, this layer will be used to ignore the contact:



After that indicate that all colliders with this layer will not interact with each other ("Edit->Project Settings->Physics 2D"):



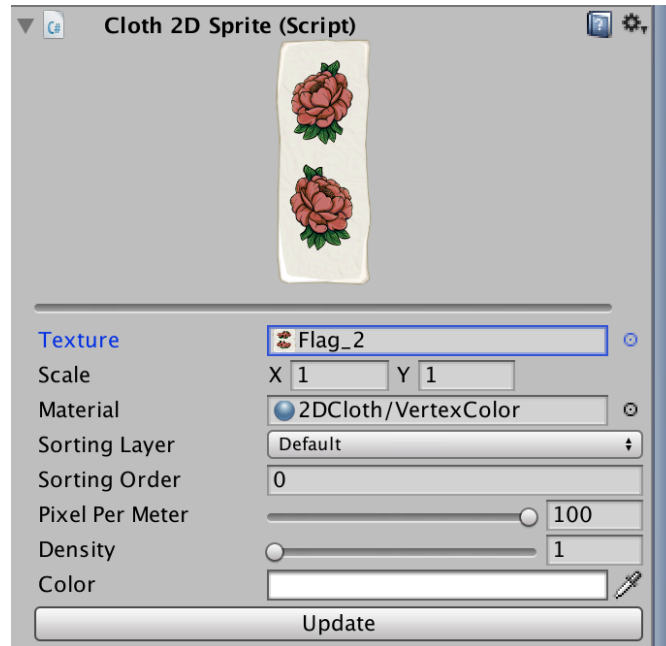
Uncheck from the cross field of the previously created layer in the Inspector window:



Select this layer in the Joints Layer parameter of the Cloth2D component.

Cloth2DSprite parameters

Consider the following parameters of the Cloth2DSprite component:



- Texture - the source sprite used to create physics of 2D cloth;
- Scale - the scale of the sprite. Use this parameter, instead Transform scale;
- Material - material of the object;
- Sorting layer и Sorting order - sort by layer and depth;
- Pixel Per Meter - analogue Sprite's pixelPerUnit;
- Density - vertex density, affects the number of colliders that will be generated;
- Color - sprite color.

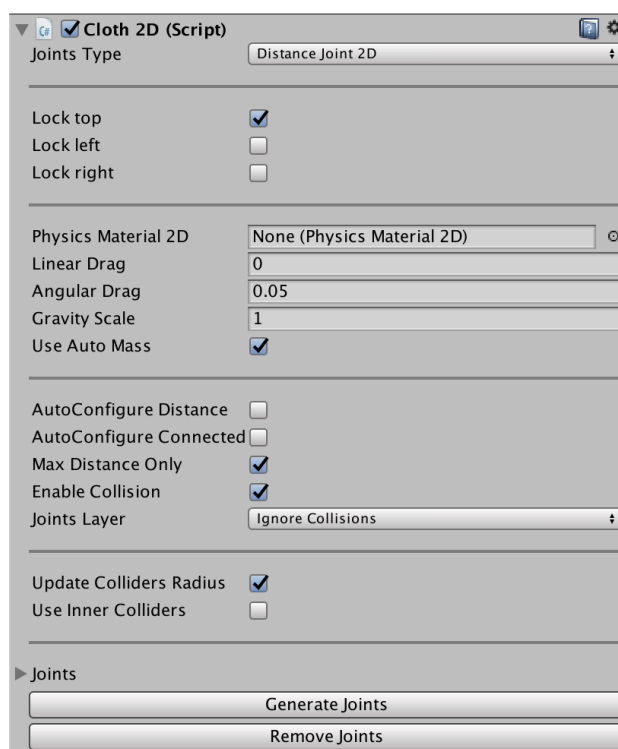
The "Update" button updates the sprite parameters and reconfigures the joints.

Cloth2D parameters

Consider the parameters of the Cloth2D component:

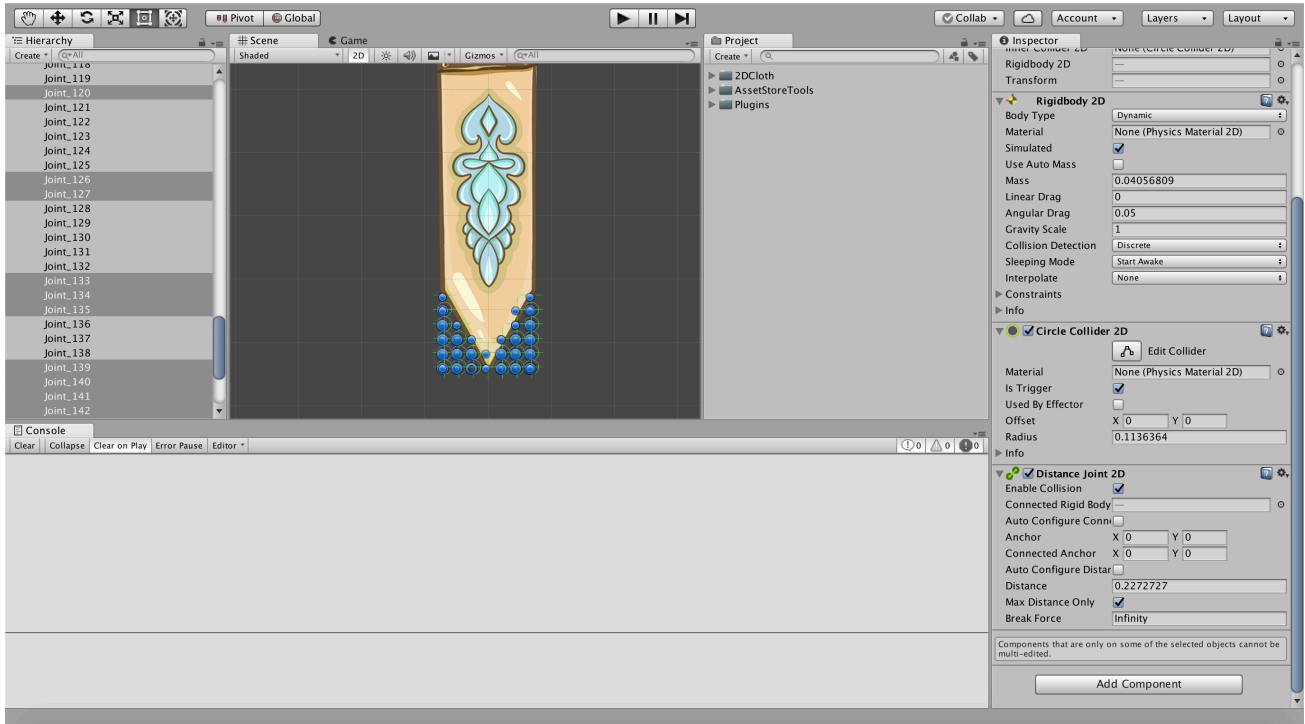
- Joints Type - type of joints. It can be set as Distance Joint 2D or Spring Joint 2D, the type of joints affects the physical behaviour of the generated cloth;
- Lock top - blocks the positions of the upper joints;
- Lock left - blocks the positions of the left joints;
- Lock right - blocks the positions of the right joints;
- Physics Material 2D - joints material, the field may be empty;
- Linear drag - Linear drag parameter of Rigidbody2D;
- Angular drag - Angular drag parameter of Rigidbody2D;
- Gravity scale - Gravity scale parameter of Rigidbody2D;

- Use Auto Mass - Use Auto Mass parameter of Rigidbody2D;
- AutoConfigure Distance - Auto Configure Distance parameter of DistanceJoint2D;
- AutoConfigure Connected Anchor - AutoConfigure Connected Anchor parameter of DistanceJoint2D;
- Max Distance Only - Max Distance Only parameter of DistanceJoint2D;
- Enable Collision - Enable Collision parameter of DistanceJoint2D;
- Damping Ratio - Damping Ratio parameter of SpringJoint2D;
- Frequency - Frequency parameter of SpringJoint2D;
- Joints Layer - a layer of joints GameObjects;
- Update Colliders Radius - whether to update joints radius colliders;
- Use Inner Colliders - whether to create additional collider as child GameObject for each joint. Using for creating cloth with different density to create different physics effects. Note, that inner colliders layer should ignore with joint layer;
- InnerRadiusRatio - ratio of the inner collider and joint collider size;
- InnerPhysicsMaterial - inner colliders material, the field may be empty;
- InnerCollidersLayer - a layer of inner colliders GameObjects;
- The "Generate Joints" button recreates all joints;
- The "Remove Joints" button removes the created joints. The created joints can be seen as child objects of GameObject with the Cloth2D component.



Configuring Cloth2D with arbitrary shape

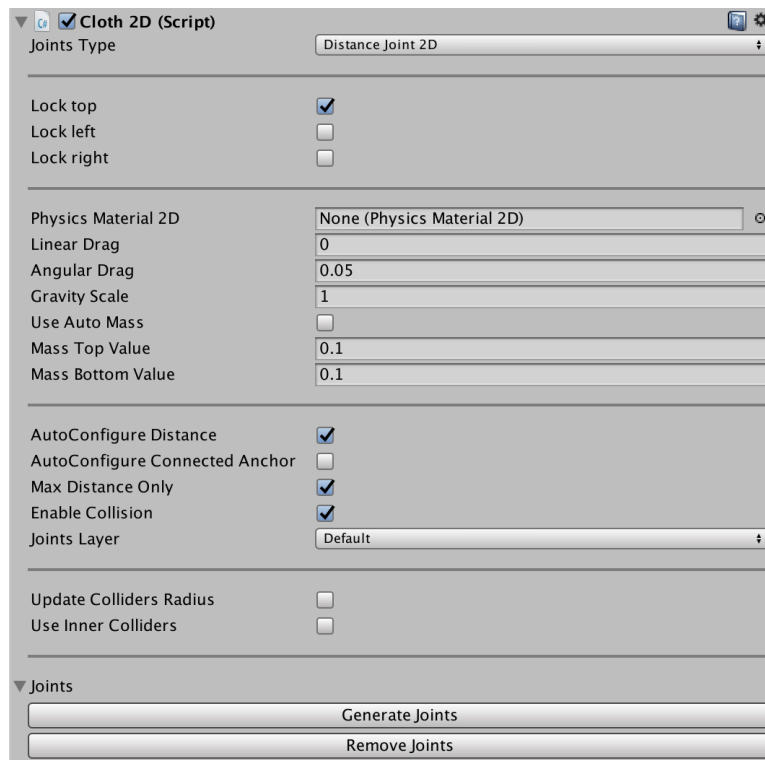
Asset supports working with a rectangular and arbitrary shape of the cloth. In the case of arbitrary shape of the cloth, set manually the `IsTrigger` flag for each collider that goes beyond the visible part of the sprite. Also, uncheck `AutoMass` and set the necessary mass for objects, because with `IsTrigger` active, the mass of the object is automatically set to 1.0, which can change the behaviour of objects:



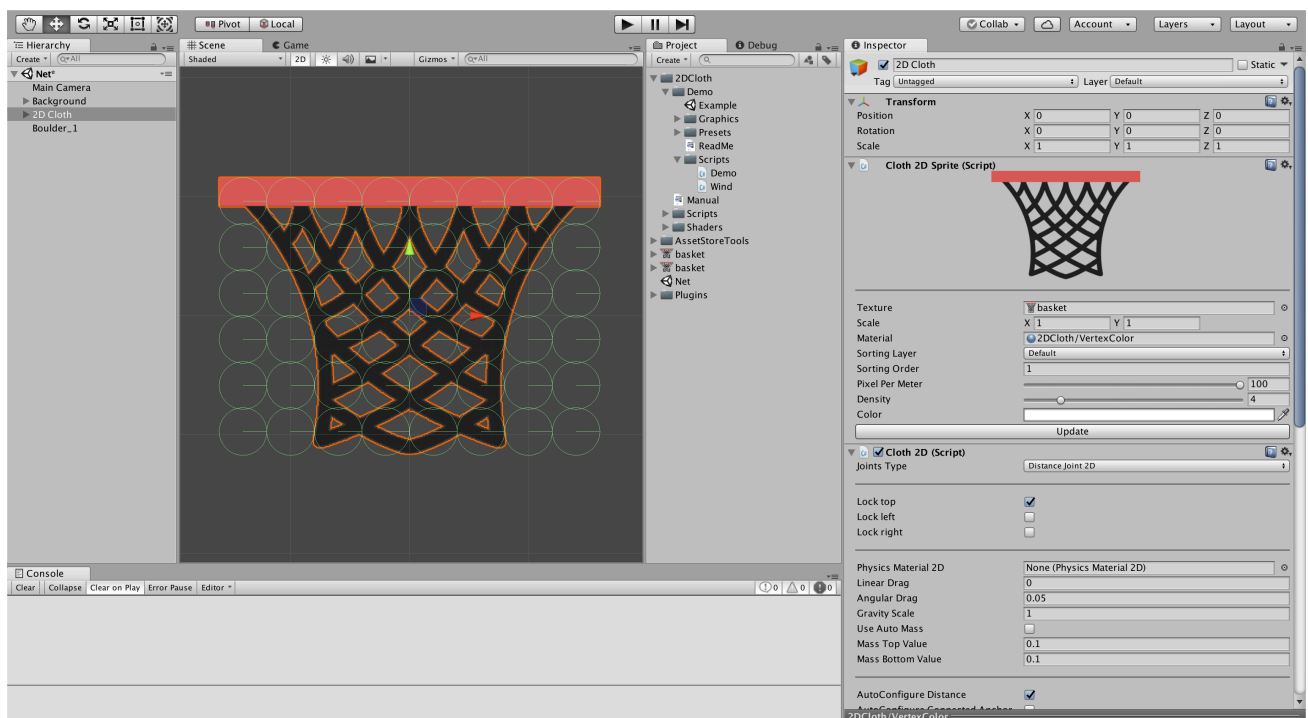
Please note that when you click on the “Update” button in `Cloth2DSprite` or the “Generate Joints” button in `Cloth2D`, the colliders will be recreated.

Basketball net example

For creating basketball net lets add a new `GameObject` with menu «`GameObject` -> `2D Object` -> `2D Cloth`», select created `GameObject` in Hierarchy window and set basketball net texture in `Cloth2DSprite` component, uncheck «`Use Auto Mass`», «`Update Colliders Radius`», check «`AutoConfigure Distance`» and generate joints by clicking «`Generate Joints`» button in `Cloth2D` component. After that joints for cloth will be generated.

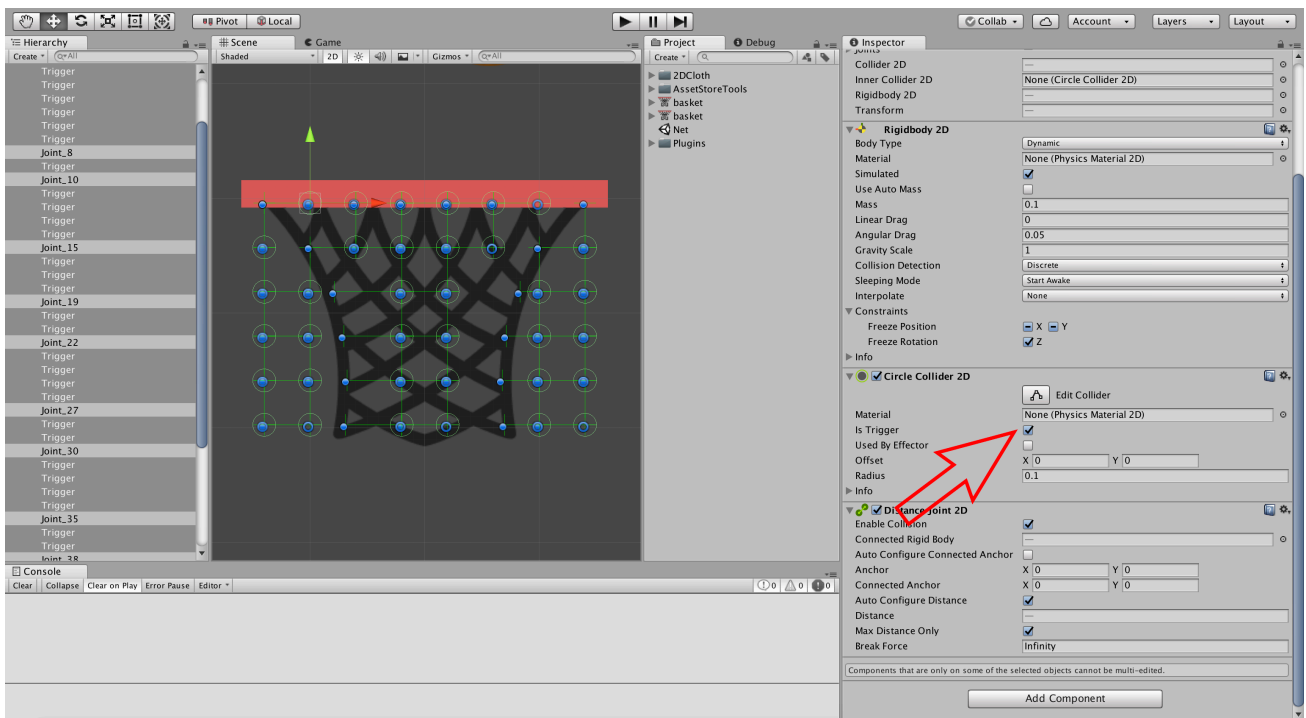


(Cloth2D component parameters)



(Cloth with generated joints)

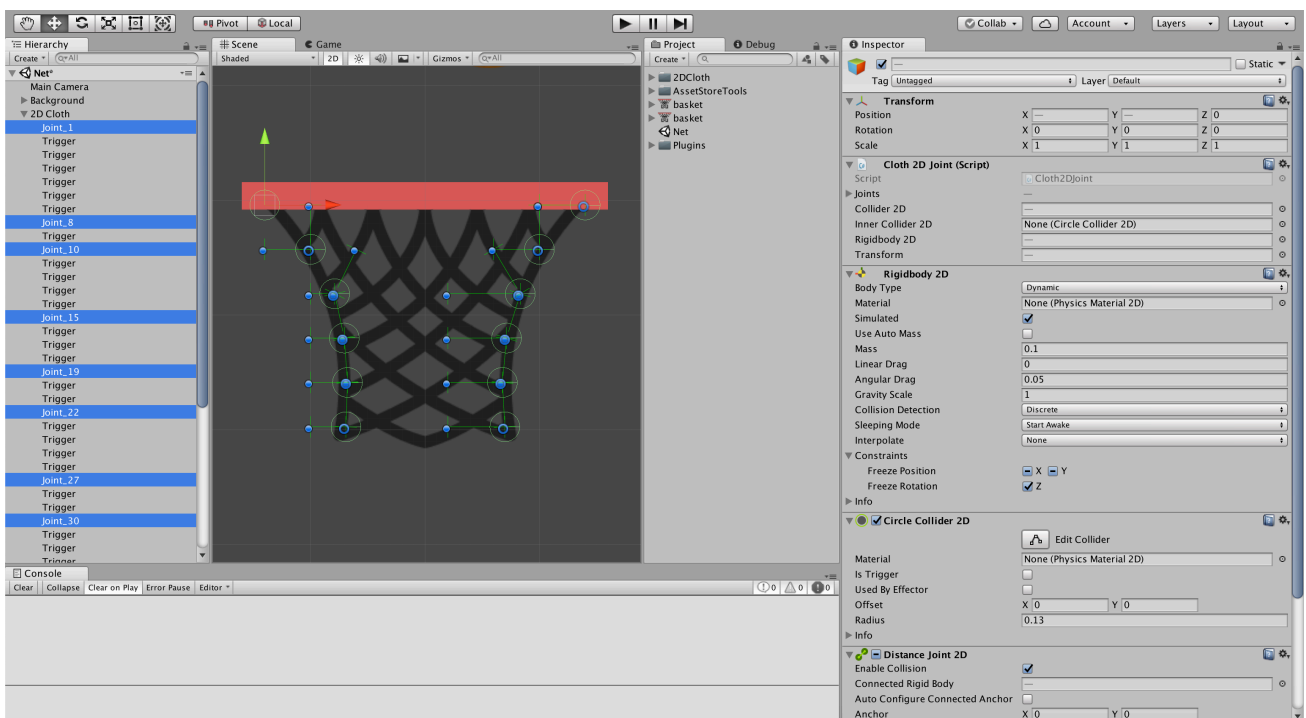
Next, joints that shouldn't collide with ball should be checked as «IsTrigger» in CircleCollider2D component:



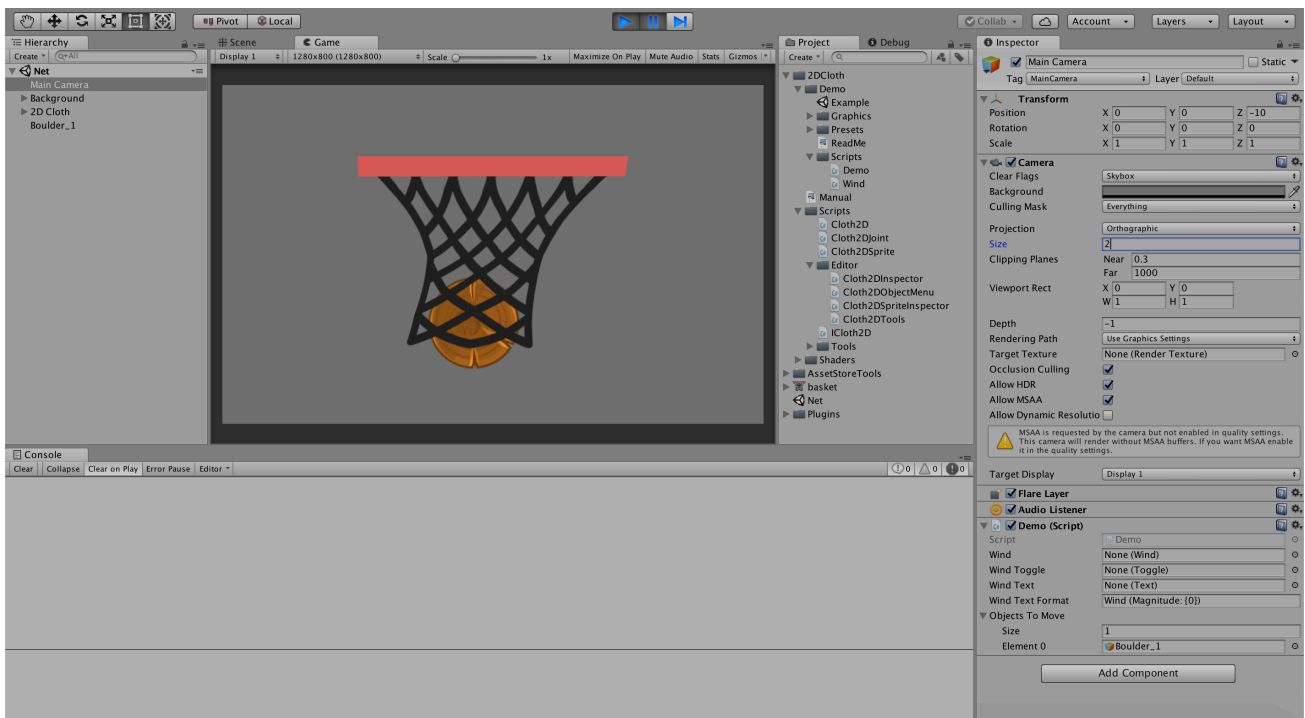
(selected joint with «IsTrigger» flag)

For more convenient editing, joints with IsTrigger colliders can be renamed, in screenshot they renamed to «Trigger».

Next, colliders that should lie on net edges can be moved closer to edges for better collider accuracy:



The basketball net is ready! Enter play mode and check by throwing the ball into the basketball net.



(basketball net example)

Cloth2D script

Cloth2D creates and configures joints, modifies the vertices of the MeshFilter created by the Cloth2DSprite component.

Cloth2D script has methods:

`public void SetJointsCount(int width, int height)` - setting the number of joints used by the Cloth2DSprite class;

`public Cloth2DJoint[] GetAllJoints()` - returns all joints;

`public Cloth2DJoint[] GetTopJoints()` - returns all joints on top;

`public Cloth2DJoint[] GetLeftJoints()` - returns all joints on the left;

`public Cloth2DJoint[] GetRightJoints()` - returns all joints to the right;

`public Cloth2DJoint[] GenerateJoints()` - creates joints, returns all created joints;

`public void DestroyJoints()` - deletes all created joints;

`public void UpdateValues()` - updates joints parameters without recreating them.

Cloth2DSprite script

Cloth2DSprite creates a mesh using MeshFilter, MeshRenderer.

Cloth2DSprite script has methods:

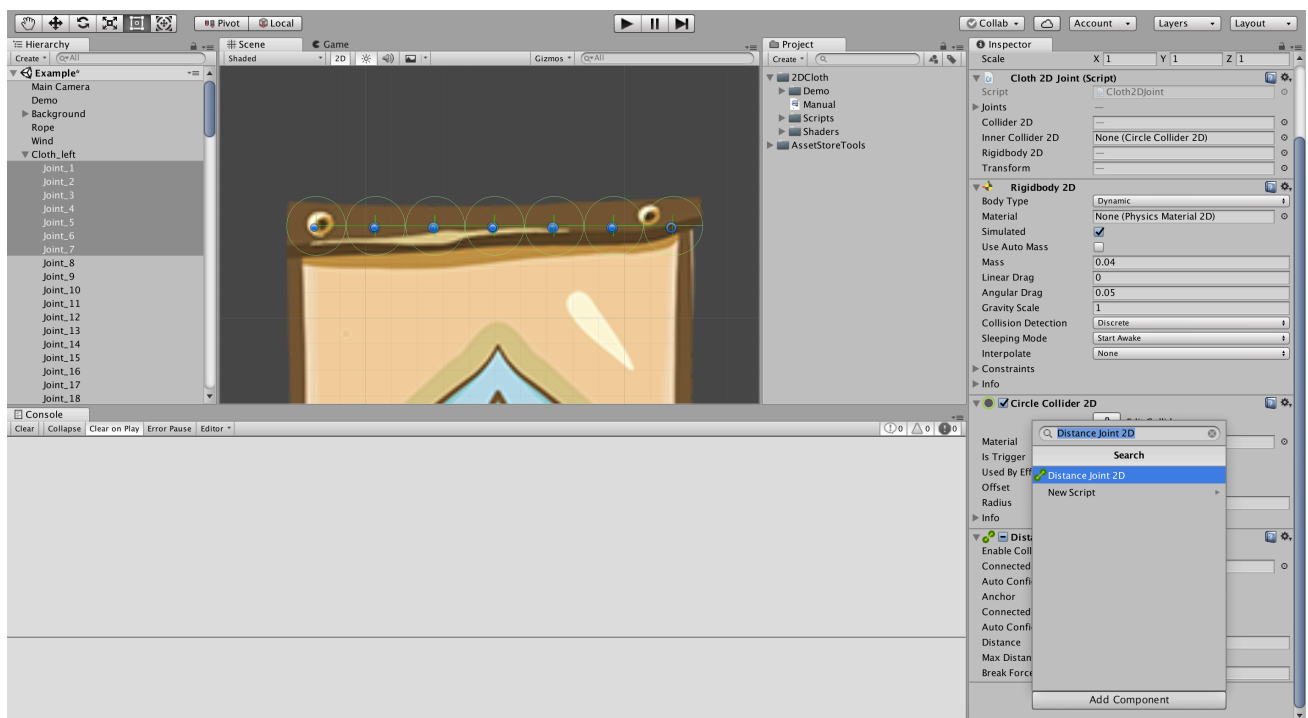
`public Cloth2D GetCloth2D()` - returns Cloth2D component;
`public void ForceUpdate()` - updates the created mesh for MeshFilter, material parameters and MeshRenderer.

Tips

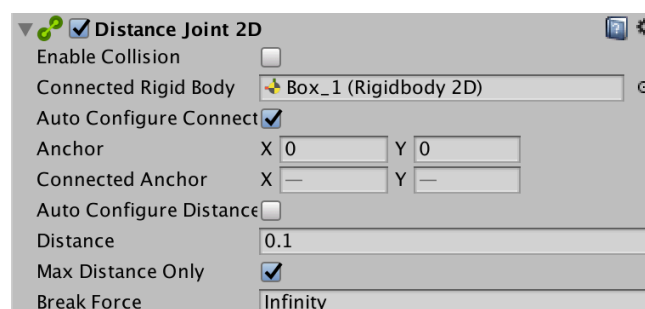
Here are tips which helps in configuration and using «2D Cloth».

1. Attaching Cloth2D to the object (character)

Cloth2D can be attached to the character/player and moved with it. As an example attached cloth can be used as cape/cloak. For attaching it uncheck Locks (Lock Top, Lock left and Lock right) in Cloth2D component, add Distance Joint or Spring Joint component to all top joints (or any other to connect object with cloth):



Set «Connected Rigid Body» as rigidbody2D of attached object for added components, also it is recommended to set parameters as in screenshot:



After that cloth will be attached to «Box_1» Rigidbody2D, moving «Box_1» using Rigidbody2D.AddForce / Rigidbody2D.MovePosition will move cloth too.

2. Moving Cloth2D

Cloth can be moved using unity physics. For moving add force to its joints or into main object (that contains attached cloth). Moving player with attached cloth using keyboard arrows - example code:

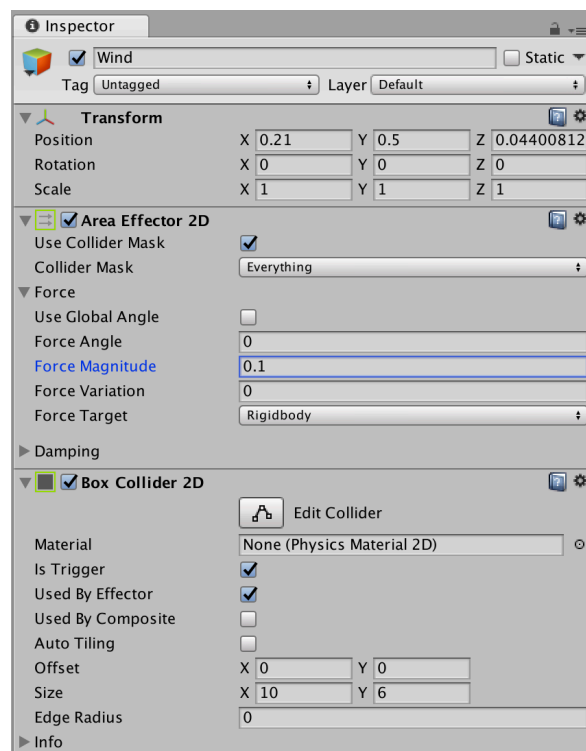
```
Rigidbody2D player = ... //players Rigidbody2D
var ratio = 10000f; //moving speed
if (Input.GetKey(KeyCode.LeftArrow))
{
    playerBody.AddForce(Vector3.left * Time.deltaTime * ratio);
}
if (Input.GetKey(KeyCode.RightArrow))
{
    playerBody.AddForce(Vector3.right * Time.deltaTime * ratio);
}
if (Input.GetKey(KeyCode.UpArrow))
{
    playerBody.AddForce(Vector3.up * Time.deltaTime * ratio);
}
if (Input.GetKey(KeyCode.DownArrow))
{
    playerBody.AddForce(Vector3.down * Time.deltaTime * ratio);
}
```

Cloth can be moved by adding forces to joints:

```
Cloth2D cloth = ... //cloth
var joints = cloth.GetAllJoints();
foreach (var joint in joints)
{
    joint.Rigidbody2D.AddForce(Vector3.right * Time.deltaTime *
ratio); //moving cloth to the right
}
```

3. Wind Effect

Wind effect can be achieved using Effectors. For example: create a new GameObject, add an AreaEffector2D component, BoxCollider2D (or any other Collider2D component) and configure them: check BoxCollider2D IsTrigger as True, User By Effector as True, set BoxCollider2D size, set AreaEffector2D parameters to create wind effect. Demo scene contains Wind effect and corresponding script for configuration it:



Please let me know if you have any questions.
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