

Interactive World Documentation

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Create interactive snow,mud,water and foliage area in large world.

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Features

World Drawing Board

- Snow trails
- Water waves simulation
- Foliage(grass) interact
- Foot steps on mud
- Designate areas with physics volume(World Interact Volume)
- Large world support(World Drawing Board will follow player pawn,and only simulate area around player)
- Auto active and shut off simulating if no brushes draw on

Brush

- Wheel trail brush
- Multi-Draw mode:Draw trail according to moving distance.Allow high-speed moving objects to leave continuous trails
- Auto culling brushes faraway,outside the drawing board,outside the interact volume

Features of Snow Simulation

- Self-Shadow
- Keep trails from afar with lower resolution
- Fluffy freshly piled snow

Special Note

Limitations

- Currently it only supports 2D simulation on world XY plane.
- You can set Render Target size or “Canvas World Size” as a

rectangle, whose X not equals Y, but Brush will draw incorrectly when there are rotation in Brush or Drawing Board. You'd better set Render Target size And "Canvas World Size" as a **square**.

- Although you can find "Canvas World Yaw" in "BP_DrawingBoard". This system dose not support setting "Canvas World Yaw" in some of the Drawing Boards. Currently, it works well only when "Canvas World Yaw"=0.
- In current version, you can't resize RT or "Canvas World Size" in runtime, or the simulation will be incorrect. But you can set Canvas Location (That's enough).

Noteworthy points

- The snow trail simulation is not an efficient way. It need 3 RGBA16f Render Targets to record snow self-shadow, age, and keeps trails from afar with lower resolution. I wanted to add some special and useful features. In future version I will add an simple snow drawing board. **(Added in Version 1.1)**
- Wheel trail brush would draw incorrectly if turning radius is less than wheel width in some time.
- World Interact Volume sometimes doesn't work after compiling the code. You should use Brush Editing Mode in editor and edit the Brush (just move an vertex or something) to refresh it's collision.
- I want to find a job. So, this plugin is for job hunting in a sense.

Quick Start

Step0: Before Start

Download Demo Project(Optional)

All assets of this project is from "Starter Content" and "Third Person Template"

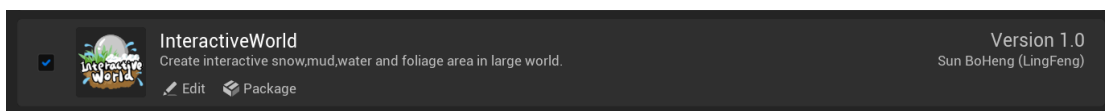
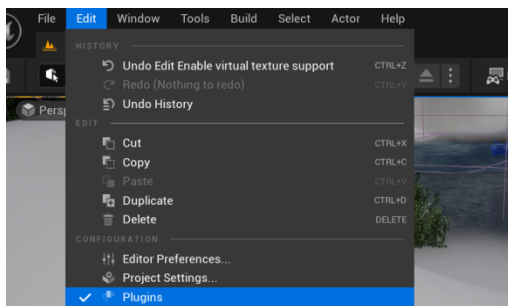
You can download this project (Please install this plugin at first), to see how to create a interactive world with this plugin.

[LingFengSBH/InteractiveWorldDemo: Demo project of Unreal Engine plugin "InteractiveWorld" \(github.com\)](https://github.com/LingFengSBH/InteractiveWorldDemo)

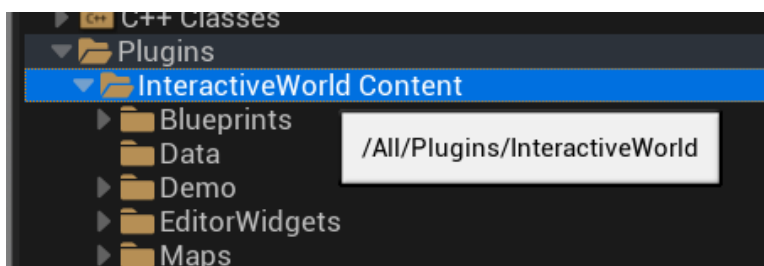
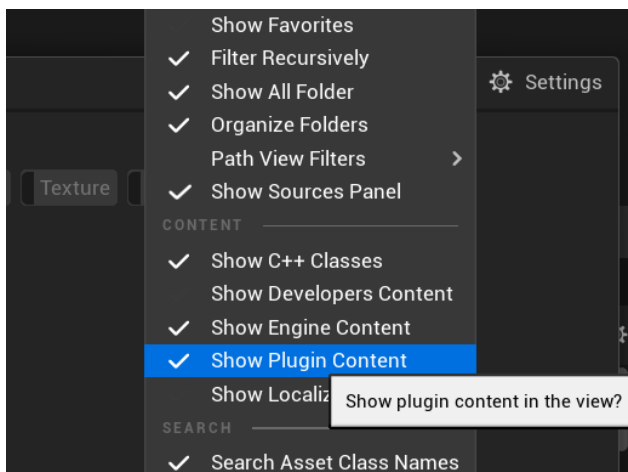
This project mainly shows using RVT and VHF to create snow deformation in world.

And there are a snow interact particle in this project.

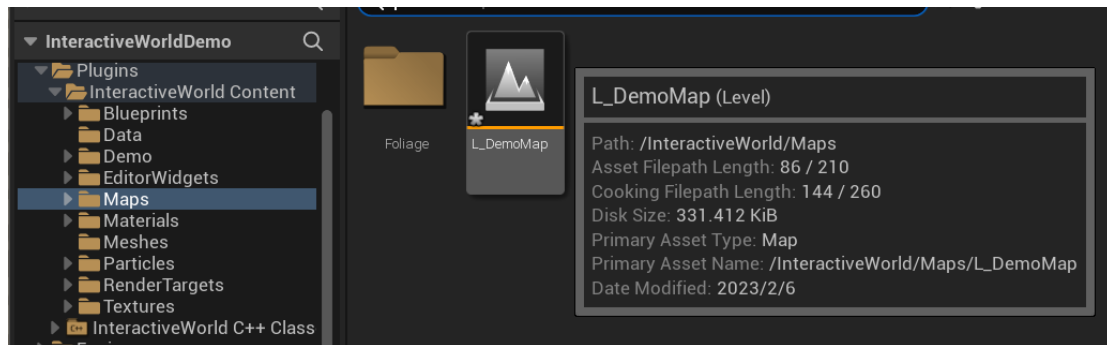
Enable InteractiveWorld plugin



Find Plugin in Folder



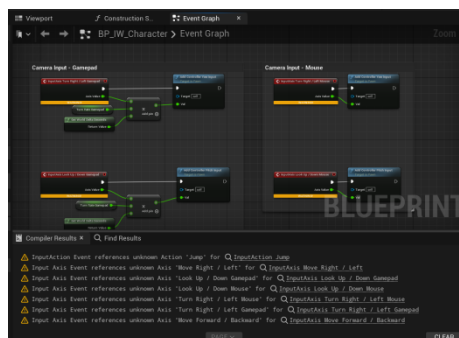
Example Map



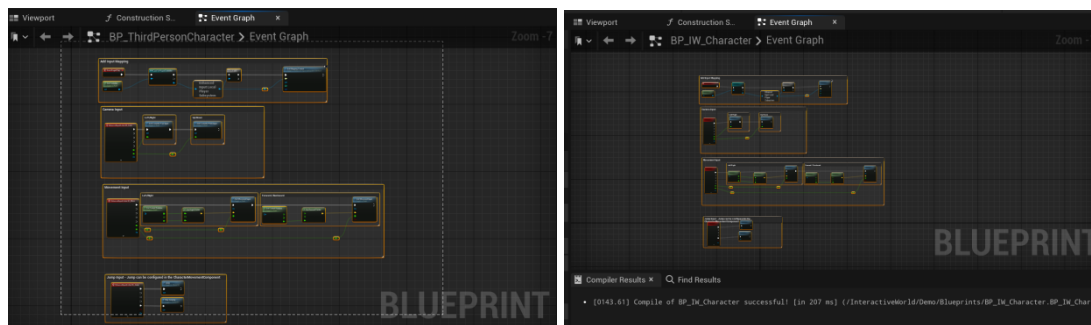
Fix up input

If you find that you can't move when you start play in L_DemoMap, that means the input is not completely suitable for your project. This plugin uses input of Third Person Template in UE5.0.

You may find that when you open blueprint "BP_IW_Character" in "Plugins/InteractiveWorld/Content/Demo/Blueprints/BP_IW_Character.uasset"

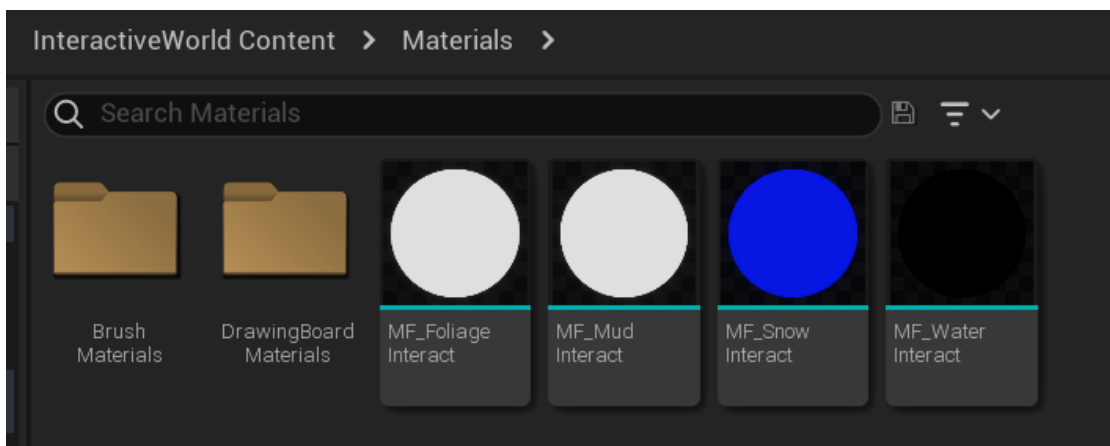
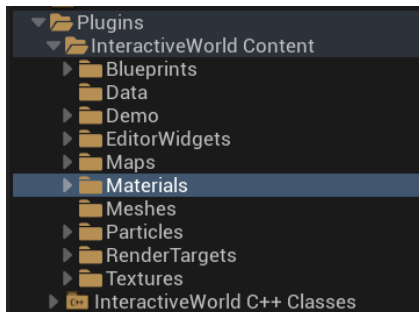


You can copy input blueprints in your character to this blueprint and delete old ones.



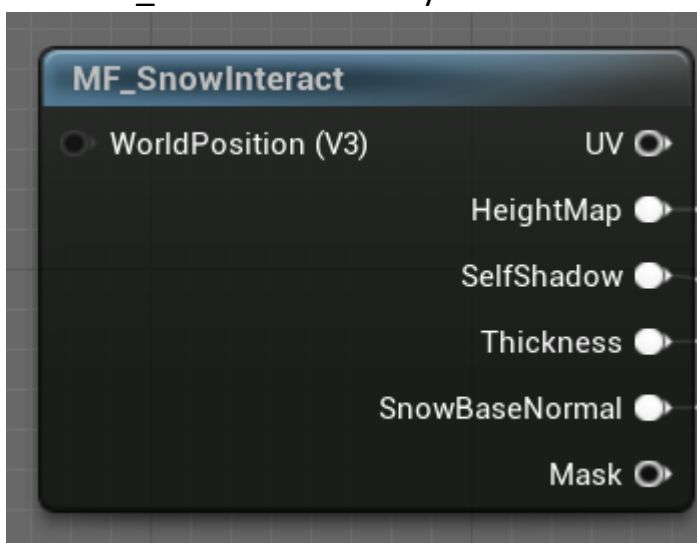
Step1:Add Function to Your Materials

Find Material Functions



Snow

Add “MF_SnowInteract” to your snow material



- UV:UV of Render Target,if you want to sample Output RT of Drawing

Board,you should use this UV,so that it will be mapped on the ground.

- HeightMap:Height map of snow deform.1 means no deform,0 to 1 is area stepped on.Above is where piled up.
- SelfShadow:Ray-Marching self shadow by HeightMap.Less than 1 means shadow area.
- Thickness:Thickness of snow.It is $\text{HeightMap} * \text{SnowThickness}$
- SnowBaseNormal:Normal after deformed from height map.
- Mask:It is where Drawing Board simulate.

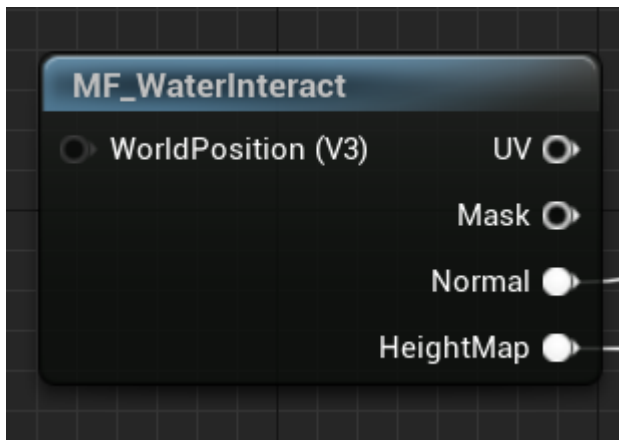
Mud

Add “MF_MudInteract” to your mud material



- UV:UV of Render Target,if you want to sample Output RT of Drawing Board,you should use this UV,so that it will be mapped on the ground.
- Mask:It is where Drawing Board simulate.
- Normal:Normal form height map,you can blend it with your mud normal as normal output
- Height:Mud height,1,less than 1 means it is stepped on.

Water



- UV:UV of Render Target,if you want to sample Output RT of Drawing Board,you should use this UV,so that it will be mapped on the ground.
- Mask:It is where Drawing Board simulate.
- Normal:Normal of water wave.
- HeightMap:Water deform height map

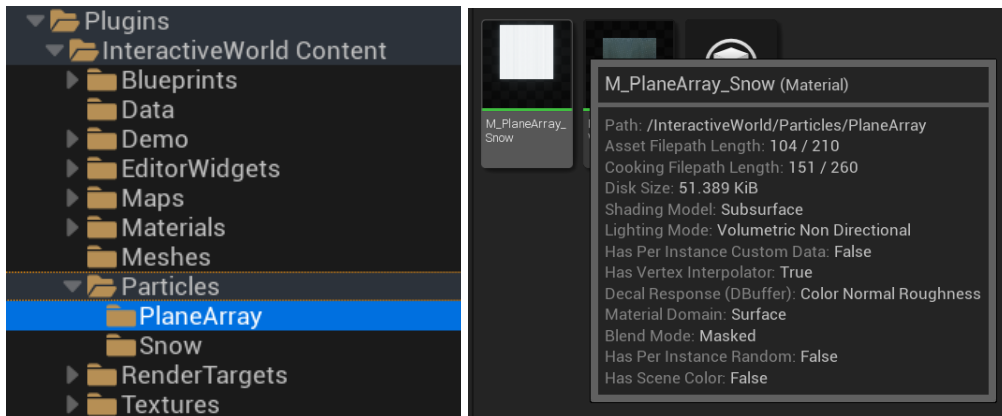
Foliage



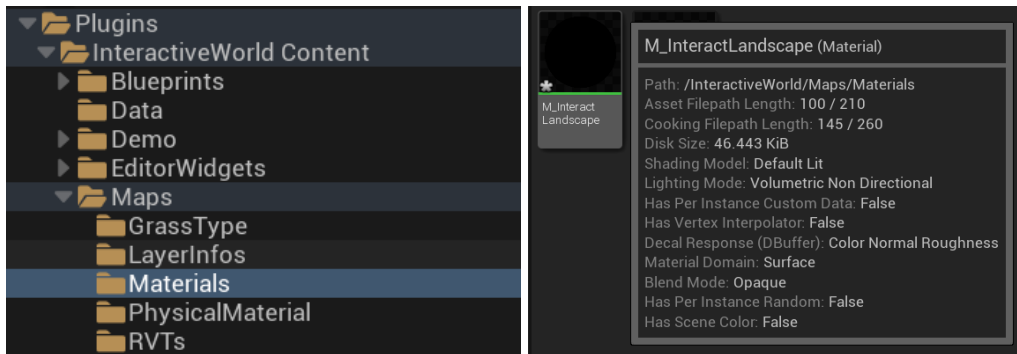
- UV:UV of Render Target,if you want to sample Output RT of Drawing Board,you should use this UV,so that it will be mapped on the ground.
- Mask:It is where Drawing Board simulate.
- TurbulenceStrength:Intensity of turbulent. You can use it as WindIntensity of "SimpleGrassWind".

Examples:

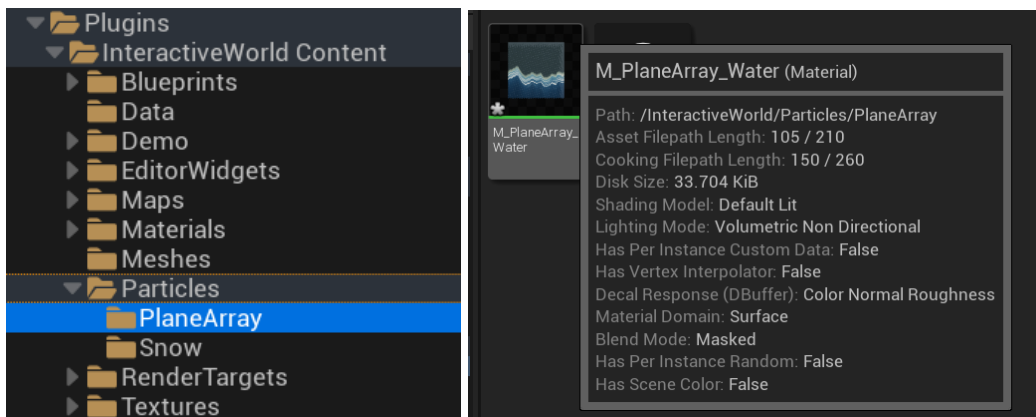
- Snow:



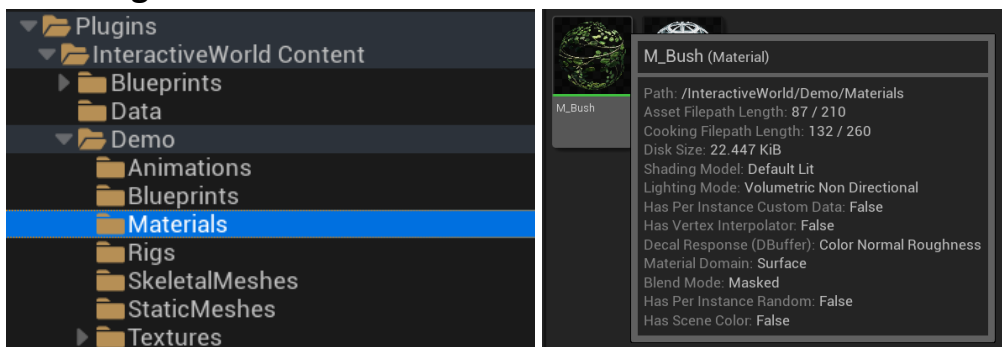
● **Mud:**



● **Water:**

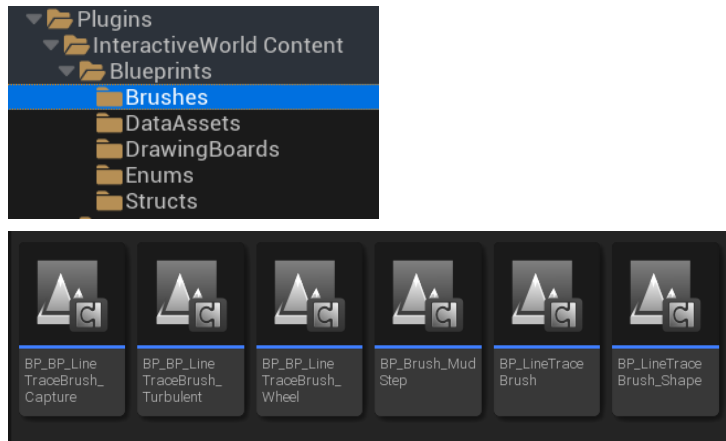


● **Foliage:**



Step2:Attach Interact Brush to Your Character

Find Interact Brushes



Brush Types Introduce

BP_BP_LineTraceBrush_Turbulent

- Designed for Foliage&Water
- Draw a sphere falloff,the strength is depending on movement velocity.

BP_BP_LineTraceBrush_Wheel

- Designed for Mud&Snow
- Draw a continuous tire tracks
- X Axis should point to the wheel rotation axis

BP_Brush_MudStep

- Designed for Mud
- It draws only when you call function “Draw Brush”.
- You’d better use animation notification to call it’s “Draw Brush” function.
- Find “BP_ThirdPersonCharacter” to see how blueprints runs
- Find “ABP_Manny” and related animations to see how animation are set.

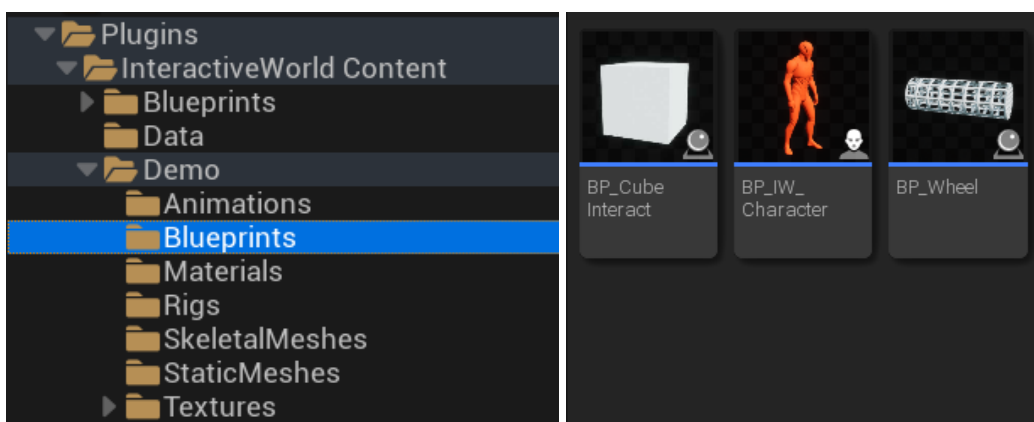
BP_LineTraceBrush_Shape

- Designed for Snow
- Draw a shape on snow. Like box, sphere.

BP_BP_LineTraceBrush_Capture

- Capture from ground to up vector with SceneCapture2D

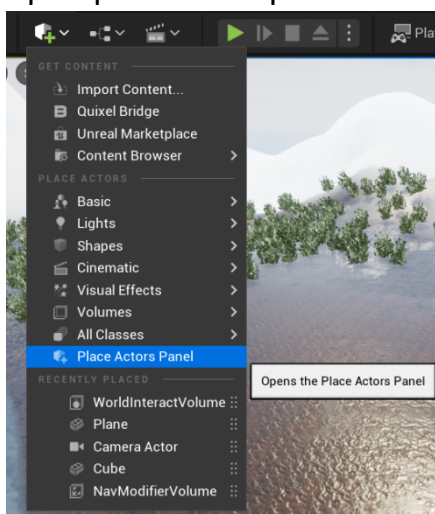
Examples:

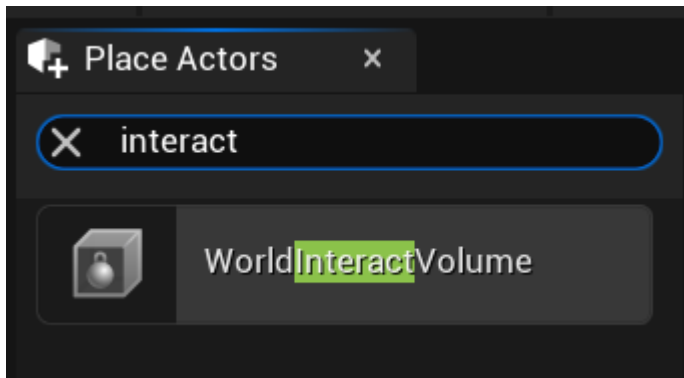


Step3:Set Interact Area with Interact Volume

Place Interact Volume

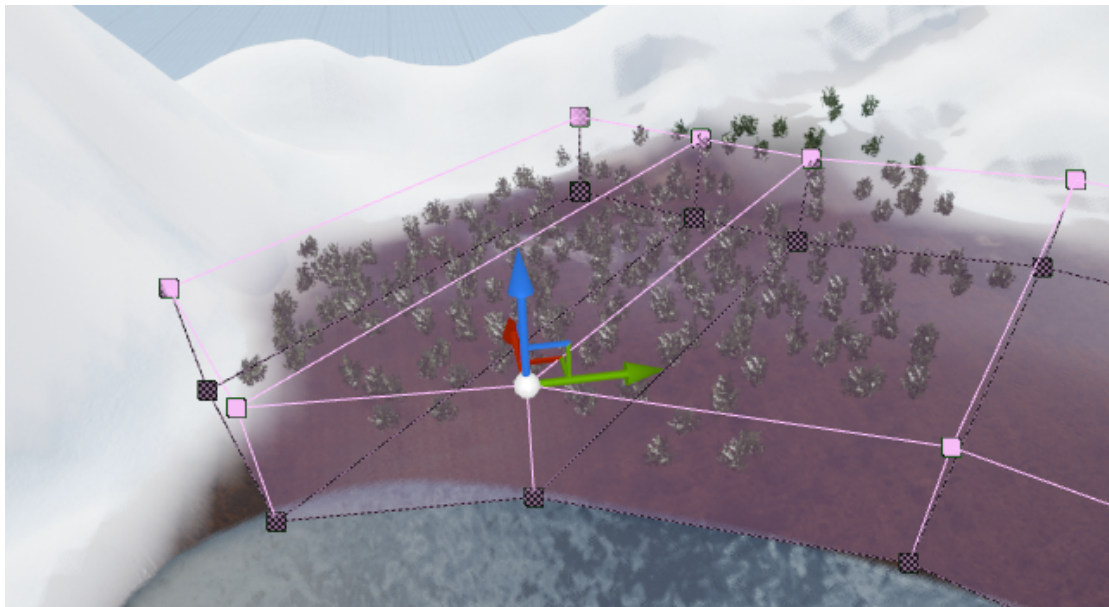
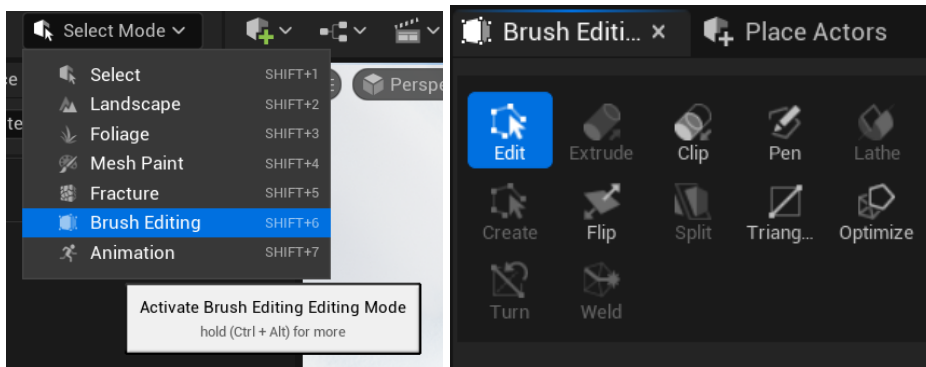
Open place actor panel and find WorldInteractVolume





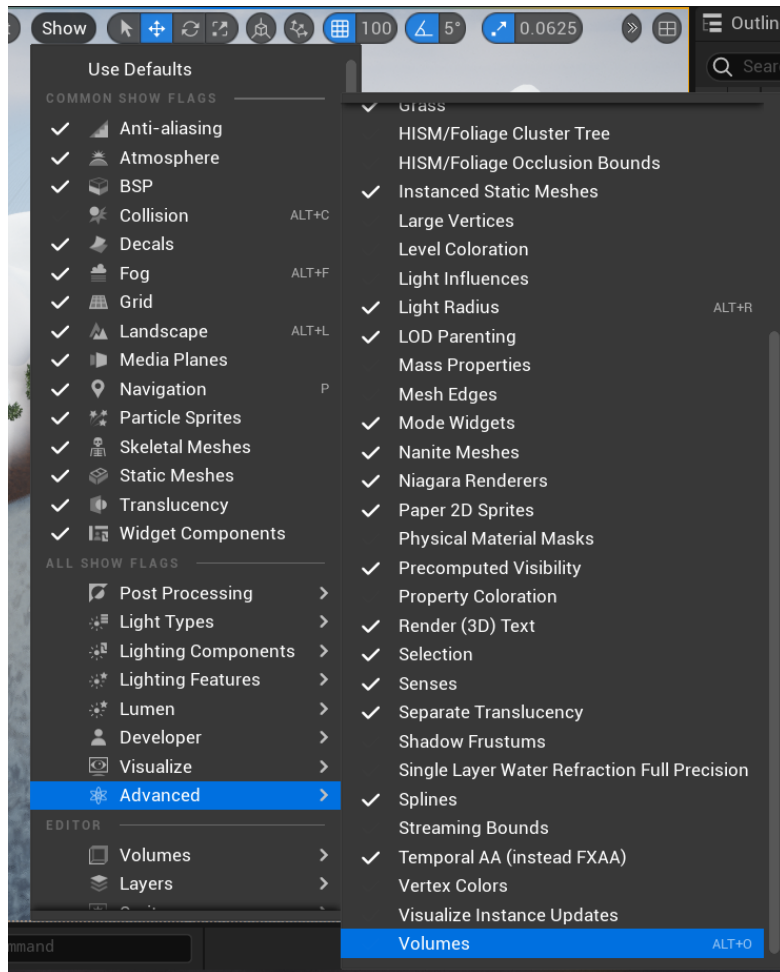
Set Interact Area

Switch to Brush Editing Mode and edit volume brush

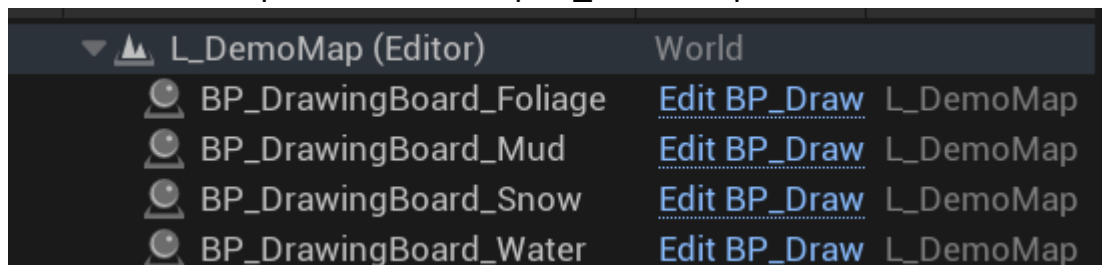


Examples:

Alt+O or open volumes visualization on panel



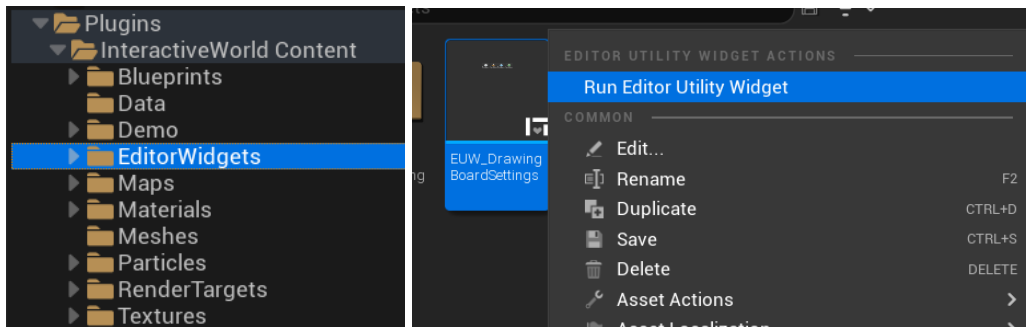
See these actors placed in the Map “L_DemoMap”



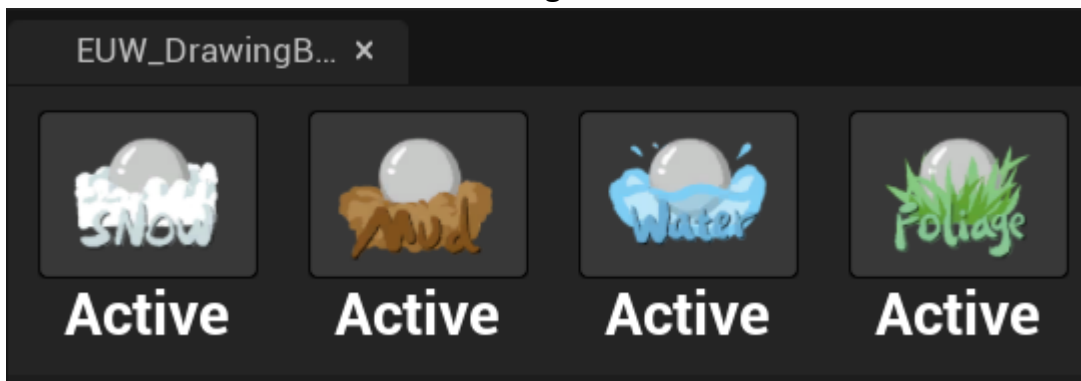
Step4:Active Drawing Board

Run Editor Utility Widget

Right click “EUW_DrawingBoardSettings” and run it



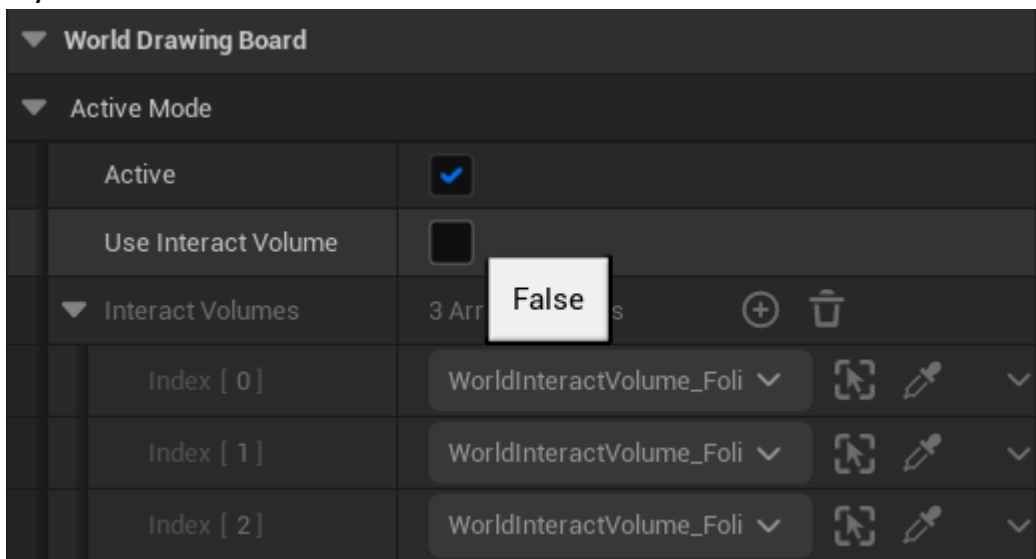
Click these buttons to active Drawing Boards



Then you'll find corresponding Drawing Board placed in front of camera.

Bind Interact Volume

If you want to use Interact Volume.Enable "Use Interact Volume"



Then add Interact Volumes into Array

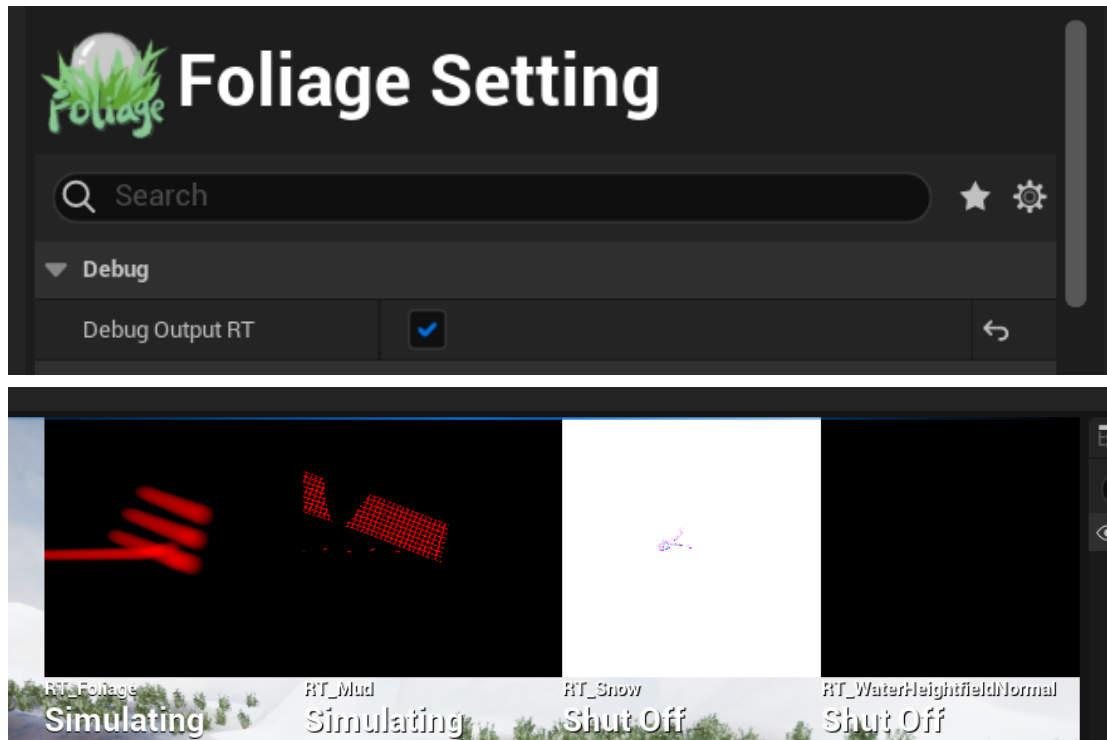


Settings

World Drawing Board

Debug output RT on screen

Enable “Debug Output RT” and the debug UI will be added on screen in runtime



Common Settings

- Simulate World Size:Unit:cm.The world size that the Drawing Board will simulate.For example,when you set it as 1024,the Drawing Board canvas size will be 1204cm*1024cm in world.
- Edge Falloff:A falloff in the edge of Drawing Board.For example,snow trails will falloff at the edge of simulation.
- RT Size:Size of Render Targets.1024 means all of the RTs of this drawing board will be set as 1024*1024.
- Output RT:The Render Target that the Drawing Board render as output.It is used for materials to sample.

Snow

- Snow Thickness:Snow thickness.
- Shadow Softness:0 to 1,0 means hard self-shadow,1means soft self-shadow.
- Self Shadow Intensity:Intensity of self-shadow.
- Bank Intensity:Intensity of pile up area.Higher will make pile up more obvious.
- Bank Width:Width of pile up area.

- Bank Base Noise: This noise will be used to shape pile up area of snow
- Bank Base Noise Range: "Bank Base Noise" will be remapped into this range.
- Bank Base Noise Size: World size of "Bank Base Noise" texture.
- Bank Detail Noise: This noise will be used to shape pile up detail.
- Bank Detail Noise Size: World size of "Bank Detail Noise"
- Bank Detail Noise Intensity: Intensity of "Bank Detail Noise"
- Snow Sub Surface Color: Subsurface color of snow material.
- Simulate RT: A Render Target used to pile up snow and save some details.
- Save RT: A Render Target used to save state in last frame.

Mud

- Save RT: A Render Target used to save state in last frame.

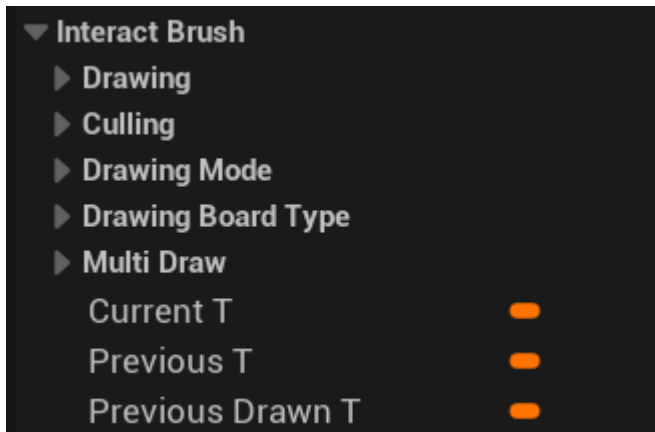
Water

- Travel Speed: Travel speed of water wave.
- Normal Intensity: Intensity of water normal.
- Update Rate: Water simulate rate.
- Wave Fade Time: How long time will water waves fade in.
- Water Displacement Strength: Strength of water world position offset.
- Height0RT, Height1RT, Height, RT: RTs to simulate water height.

Foliage

- Fade Time: How long time that the turbulent fade in.
- Save RT: A Render Target used to save state in last frame.

Interact Brush



Drawing

- Size:World size that the brush will draw

Culling

- Override Cull Radius:If this brush is outside the Drawing Board range,it will be culled,Cull Radius will be calculated be size.Enable if you want to override that value.
- Cull Radius Override:If this brush is outside the DrawingBoard range,it will be culled.This will override that value if enabled "Override Cull Radius"

Drawing Mode

- Draw Every Frame:Whether to draw every frame.
- Draw On Movement:Whether to draw on movement. Disable if you are going to draw manually from blueprint.
- Movement Tolerance:Tolerance of movement. X:Position tolerance, Y:Rotation tolerance,Z:Scale tolerance. If greater than that will be considered as movement.

Drawing Board Type

- Use Draw Only Drawing Boards Class List:Enable if you'd like this

brush can only draw in specific Drawing Boards.

- Draw Only Drawing Boards Class List:You'd like this brush can only draw in specific Drawing Boards class, "Use Draw Only Drawing Boards Class List" should be true if you want to use it.

Multi Draw

- Use Multi Draw:If you want to draw more than once every frame.If true,the drawing times will be depending on distance moved,but more than once each update.
- Max Draw Distance:If "Use Multi Draw" enabled,drawing times will be depending on distance moved,then how far do you want each draw between.

Line Trace(Only for Child Classes of "BP_LineTraceBrush")

- Max Trace:Max line trace height.If height of component greater than that,will not draw.
- Trace Offset:Offset of height.For example,a sphere ball whose radius is 20,and InteractBrush Component is in it's center,when trace height = 20 means is grounded.So "Trace Offset" should be 20.

Turbulent(Only for "BP_BP_LineTraceBrush_Turbulent")

- Strength:Strength of turbulent,which would be multiplied with distance moved this frame.

Shape Settings(Only for "BP_LineTraceBrush_Shape")

- Shape:Select shape of this brush.Currently only support sphere and box.
- Bounds:Bounds of shape.

Pattern(Only for "BP_Brush_MudStep")

- Render Texture:Texture2D Object.should be a musk or gray-scale
- Mirror Flip:Enable if you want to mirror flip this texture.This is useful when you draw steps.

Wheel Setting(Only for Wheel Brush)

Wheel Radius:Radius of wheel.

Wheel Pattern:Pattern of wheel tire.

Use Guide

Version 1.0.0

Use Low-Quality Snow Simulation

Under the default snow simulation, snow DrawingBoard additionally saves the time of snow piling up, self-shadow, and storing a larger range of trails at low resolution, which are not always required. If you don't need these features, consider using a low-quality snow simulation.

Way to use

Enable “Use Low Quality”



When enabled, your snow will :

- Stop save Piling up time,the fluffy effect of newly piled up snow is turned off.
- No longer calculate self-shadow.
- No longer add detail Noise.
- No longer store trails far away.
- Only use R channel in RT.

Further optimization:

If you are sure you only need Low Quality snow simulation, you can:

- Change the format of snow's RTs Format as R16f to reduce video memory usage.
- Remove unnecessary nodes in "MF_SnowInteract". No longer sample self shadow and calculate "Normal from Height Map" far away.

Use with Sequencer

In order to adapt to the interaction of large scenes, the DrawingBoard always follows the player Pawn. When using Sequencer, the simulation position obtained by default may be incorrect, and most of the time Sequencer's camera is not Pawn's location. To work with Sequencer, it can be solved by following the following scenarios:

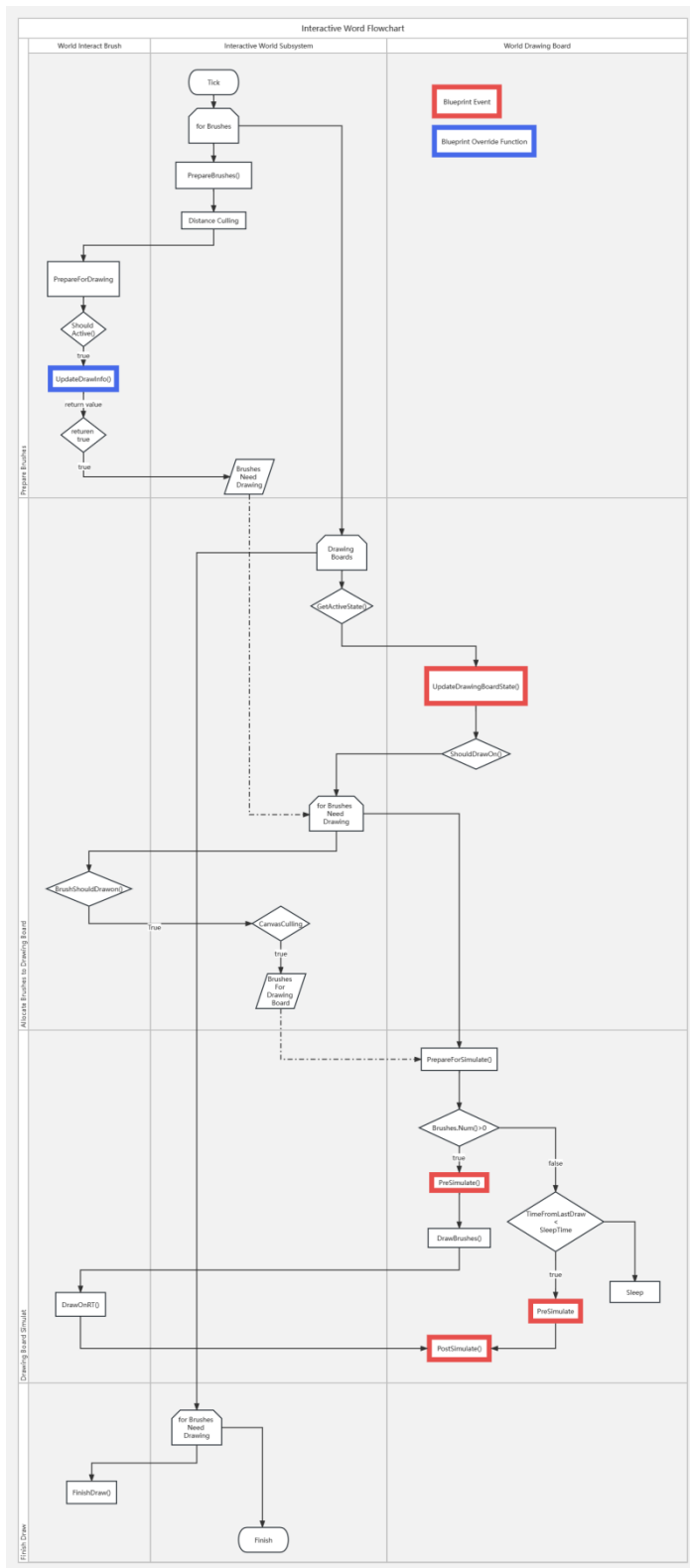
Click Drawing Board Actor in scene. Find Simulate Following category in detail panel.

Enable Follow Target Actor. And select a Target Actor which you want DrawingBoard follows. This Actor can be an empty Actor with a location set within the Sequencer track, so that the DrawingBoard will follow the Actor.



Details

Flow map



Update Log

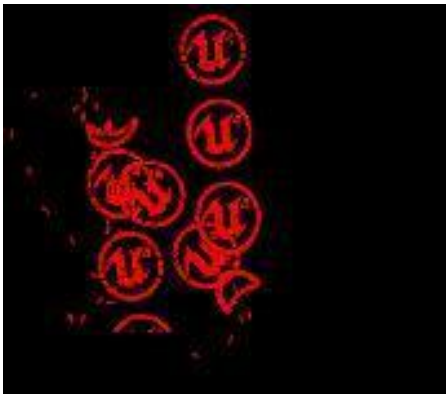
2023.02.13 Version 1.0.1

- Support Low Quality snow simulation.
- Adding custom following Actor to support using with sequencer.
- Allow you to edit fresh snow fall time in DrawingBoard settings.
- Fixed a BUG that wheel pattern mirror-flipped when moving backward.

Before



After



My Videos about This Plugin

These videos are not about how to use this plugin.

They are some videos teaches you how to create interactive snow and some technology sharing.

[\[UOD2022\]大地画板:大世界的可交互雪地](#) | [孙博恒\(聆枫LingFeng\)](#)

https://www.bilibili.com/video/BV1gW4y1x7Sz/?share_source=copy_web&vd_source=26cb85417ffe3140f31edb42c19b67ab

Land Drawing Board:Interactive snow field in large world

This is my speech video about interactive snow in Unreal Open Day 2022.It is a technical presentation about how to use Render Target to simulate interactive snow in large world,and expand this system for water,mud and foliage interaction.

This is the opportunity for me to delve into this and finally made this plugin.Thank for Epic Games中国's recognition

[\[UE5\] 交互雪入门合集](#)

https://www.bilibili.com/video/BV1PR4y1Z74e/?share_source=copy_web&vd_source=26cb85417ffe3140f31edb42c19b67ab

Interactive snow for starter

This is a collection of 5 videos I made for starters to learn how to create your own interactive snow with pure blueprint.

[\[UE5\] 为交互雪设计的Niagara粒子](#)

https://www.bilibili.com/video/BV16Y41197t5/?share_source=copy_web&vd_source=26cb85417ffe3140f31edb42c19b67ab

Niagara for Interactive snow

A simple particle,mainly about how to let particle fall onto deformed snow surface.

[\[UE5\] 无限交互水面教程](#)

https://www.bilibili.com/video/BV1YY41197mK/?share_source=copy_web&vd_source=26cb85417ffe3140f31edb42c19b67ab

Infinity interactive water tutorial video

A tutorial video to teach you how to make "WaterSurface_BP" in "Example Content" simulate in infinity world,so that you can use it in your huge water surface.

[\[UE5\] 让交互雪更加生动的三个建议](#)

https://www.bilibili.com/video/BV14R4y1a7zx/?share_source=copy_web&vd_source=26cb85417ffe3140f31edb42c19b67ab

Three pieces of advice to make interactive snow more vivid

