# 逻辑粒子

所有粒子系统组件都作用于*逻辑粒子*。每个粒子在粒子系统中都有一个逻辑表示，这就是组件所作用的。并非每个逻辑粒子都需要可视化，一些逻辑粒子可能导致在屏幕上绘制多个视觉粒子。

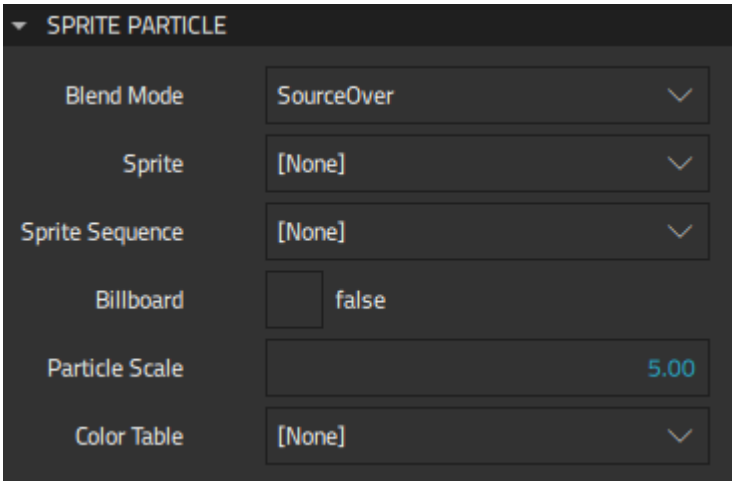
支持两种不同的逻辑粒子组件：用于 2D 纹理**粒子的精灵**粒子和用于 3D 模型粒子的模型粒子。模型粒子使用实例化渲染来启用数千个粒子的渲染，并具有完整的材质和光源支持。

以下组件可用于添加逻辑粒子以及修改其操作和外观：

- 精灵粒子
- 精灵序列
- 模型粒子
- 模型混合粒子

## 精灵粒子

在"**属性**"中指定子画面粒子的属性>**子画面粒子**。




**混合模式**确定粒子是使用源模式、屏幕模式还是乘法模式进行混合。如果选择"**源上方**"，则使用 Alpha 混合将前景源中的像素组件值写入源。如果选择"**屏幕**"，则值将相乘，再次被否定并写入。如果选择"**乘法**"，则它们将被乘法并写入。

**精灵**定义用于粒子的纹理组件。例如，要使用雪花的图像来模拟雪，请创建一个**纹理**组件的实例，并将图像作为**源**。

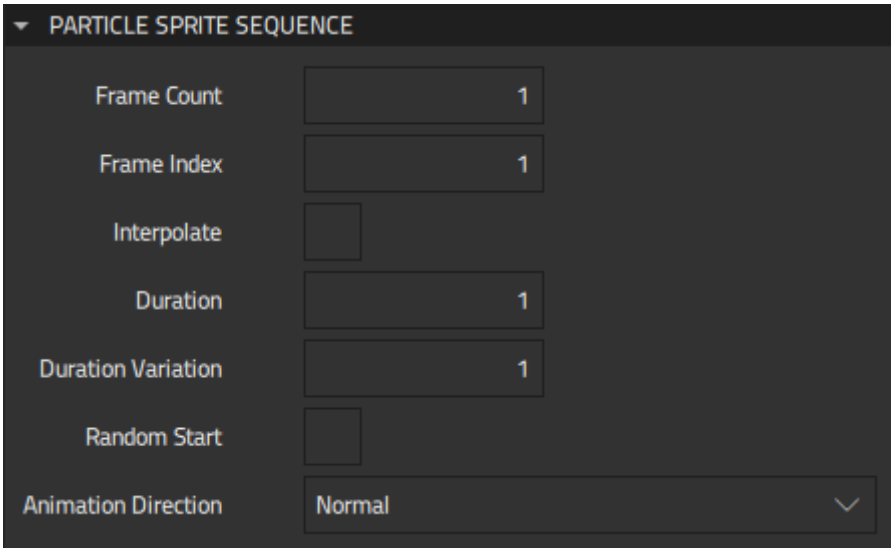
在"**精灵序列**"中，如果精灵纹理包含帧序列，则为粒子选择"精灵序列"组件实例。如果图像只有一个 sprite 帧，请不要设置此值。

**粒子尺度**指定粒子的尺度乘数。要调整发射器中的粒子大小，请设置**粒子发射器**属性。

在"**颜色**"**表中**，选择用于为粒子着色的**"纹理"**组件。图像可以是 1D 或 2D 纹理。水平像素根据您在"粒子发射器">**寿命**"中设置的值确定**粒子**颜色。例如，当粒子的寿命过半时，它将在图像的中间部分指定颜色。如果图像是 2D 的，则会为每个粒子随机选择一个垂直行。例如，一个图像包含 4 个不同的粒子着色选项。256 x 4

## 精灵序列

在"粒子精灵序列"**>"属性"**中指定包含帧序列的**子画面粒子序列的属性。**




**帧计数**指定子画面中图像帧的数量。粒子在其持续时间内通过这些帧进行动画处理。帧应在同一图像文件中水平布局。例如，子画面可以是 512x64 的图像，帧计数为 8。这将使每个粒子帧大小为 64x64 像素。

**帧索引** 指定帧的初始索引。这是开始动画的帧之间的位置。例如，当帧索引为 5 且**"动画方向"**设置为**"正常"**时，第一个渲染的帧为 5。如果动画方向设置为**"反转"**，则第一个渲染帧为 4。

**帧索引**的值必须介于 0 和**帧计数**值减去 1 之间。当**"动画方向"**设置为**"单帧"**且"**随机开始**"被禁用时，所有粒子都将呈现具有帧索引的子画面。

Enable **Random start** to start the animation from a random frame between 0 and **Frame count** minus 1. This allows animations to not look like they all just started when the animation begins.

**Interpolate** determines whether sprites are blended between frames to make the animation appear smoother.

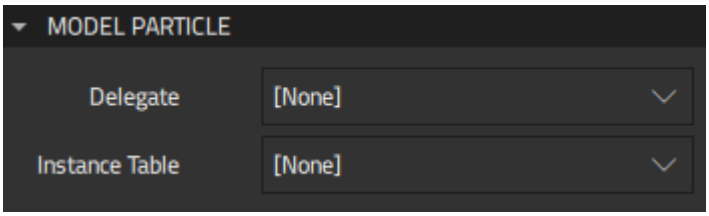
**Duration** specifies the time in milliseconds that it takes for the sprite sequence to animate. For example, if the duration is 400 and the **Frame count** is 8, each frame will be shown for 50 milliseconds. When the value is -1, **Particle** > **Life span** is used as the duration.

**Duration variation** defines the duration variation in milliseconds. The actual duration of the animation is between duration minus duration variation and duration plus duration variation.

**Animation direction** defines the animation playback direction of the sequence. Select **Normal** to play the animation from the first frame to the last frame and to jump back to the first frame from the last one. Select **Reverse** to reverse the normal order. Select **Alternate** or **AlternateReverse** to alternate between normal and reversed orders.

If you don't want to animate the frame, select **SingleFrame**. When **Random start** is disabled, the frame set in **Frame index** is rendered. When it is enabled, each particle renders a random frame.

## Model Particle



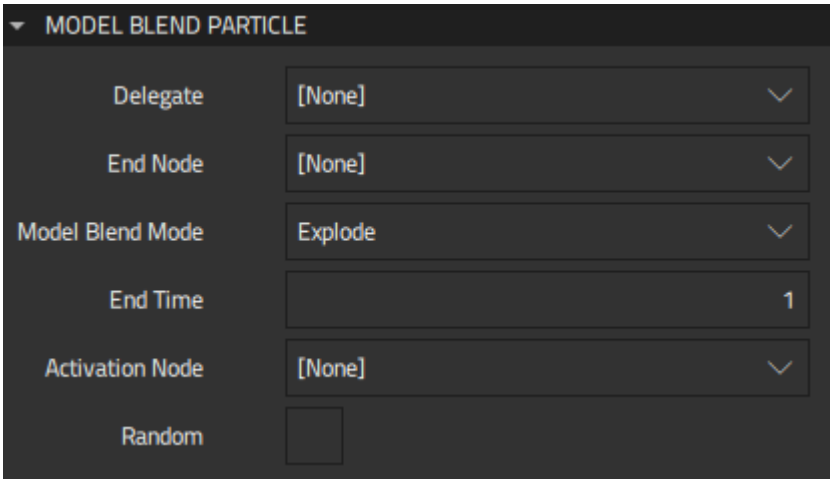

In **Delegate**, select the **3D Model** component that defines each object instantiated by the particle.

**Instance table** provides you with access to the internal instancing table of the model particle that is used to implement efficient rendering. This table can be applied to the instancing property of models that are not part of the particle system.

You can use this feature also to provide an instancing table without showing any particles. This is done by omitting the delegate.

## Model Blend Particle

Specify properties for model blend particles in **Properties** > **Model Blend Particle**.




The **Model Blend Particle** component blends a particle effect with a **3D Model** component. The provided model needs to be triangle-based. Each triangle in the model is converted into a particle, which are then used by the emitter. Instead of particle shader, the model is shaded using the material specified in the model. The way the effect is blended is determined by **Model blend mode**.

The possible blend modes are:

- **Construct**, where the model is constructed from the particles.
- **Explode**, where the model is converted into particles.
- **Transfer**, where **Construct** and **Explode** are combined to create an effect where the model is transferred from one place to another.

The particles are emitted in the order they are specified in the model unless **Activation node** is set or **Random** is enabled.

In **Delegate**, select the **3D Model** component that defines each object instantiated by the particle.

**End node** specifies the transformation for the model at the end of a particle effect. It defines the size, position, and rotation where the model is constructed when you set **Model blend mode** to **Construct** or **Explode**.

**End time** specifies the end time of the particle in milliseconds. The end time is used during construction and defines

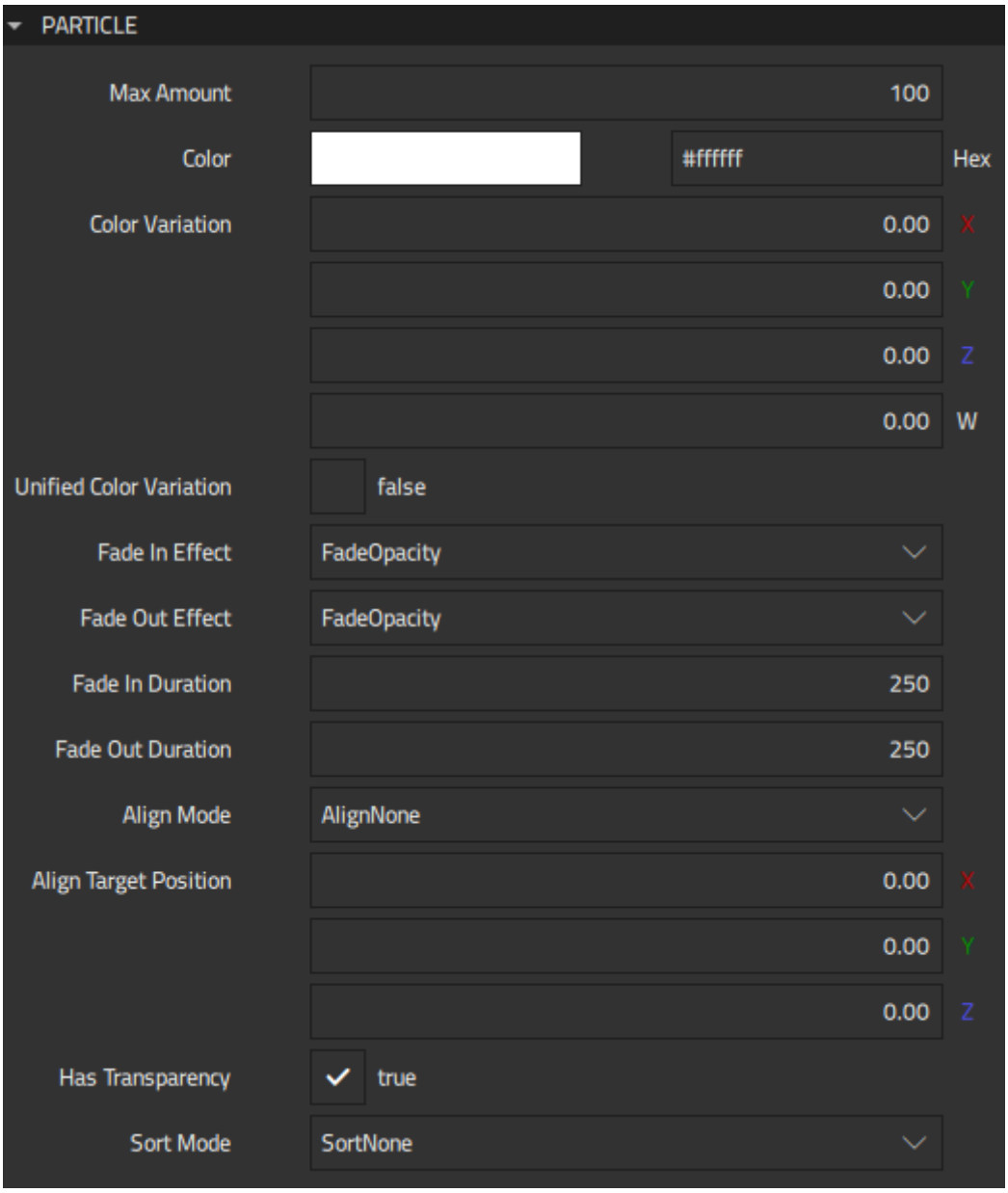
blended linearly with the model end position.

In **Activation node**, select the component instance that activates particles and overrides the regular emit routine. The activation node can be used to control how the particles are emitted spatially when the model is exploded or constructed from the particles. The activation node emits a particle if the center of that particle is on the positive half of the z-axis of the activation node. Animating the activation node to move trough the model will cause the particles to be emitted sequentially along the path the activation node moves.

To emit particles in random order instead of in the order in which they are specified in the model, select **Random**.

## Common Particle Properties

The properties that you specify for logical particles in **Properties** > **Particle** determine the common appearance of all particles.




**Max amount** allocates data for particles. Setting this value instead of just growing the data based on **Particle Emitter** > **Emit rate**, **Life span**, and **Emit Bursts** enables you to optimize memory usage and to modify the emit rate and life span without reallocation.

**Color** determines the base color for particles. You can use the Color Picker to select colors. For color variation, set

To apply color variation uniformly for all the color channels, enable **Unified color variation**. This applies all variations with the same random amount.

**Fade in effect** and **Fade out effect** define the fading effect used when the particles appear. Fading is implemented by changing the value of opacity or scale between 0 and 1 over the time specified in milliseconds in **Fade in duration** and **Fade out duration**. Fading duration is calculated into the particle lifespan. For example, if **Particle Emitter** > **Life span** is 3000, **Fade in duration** is 500, and **Fade out duration** is 500, the particle will be fully visible for 2000 ms.

**Align mode** determines the direction that particles face:

- Select **AlignNone** to use the value set for the emitter component in **Particle Rotation** > **Rotation**.
- Select **AlignTowardsTarget** to align the particles towards the direction set in **Align target position**.
- Select **AlignTowardsStartVelocity** to align the particles towards their starting velocity direction.

This value takes no effect if **Sprite Particle** > **Billboard** is enabled.

Unlike the materials used with the models, particles default to being rendered with assuming semi-transparency, and so with blending enabled. This is the desired behavior most of the time due to particle textures, color (alpha) variations, fadings, and so on. If you don't need the blending, disable **Has transparency** for possible performance gain.

**Sort mode** determines the order in which the particles are drawn. You can sort particles based on their distance from the camera, farthest first, or lifetime, newest or oldest first.

The particles are emitted from the location of the Emitter or Trail Emitter component instance.

‹ Particle System

Particle Emitters ›