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Complex Games Assessment Task 2:

Integration

**Document Overview:**

This document aims to guide the end user through the integration of the Procedural Planet Generator into their project, as well as the features and functionality of the complex system.

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**Initial Setup:**

Make sure when creating a project within Unity it utilizes the Universal Render Pipeline as there are certain hardcoded features that require this.

Once you’re in a new or existing URP compatible project simply drag and drop the “proceduralplanetgeneration.unitypackage” file into your **Assets** window, then click **Import**.



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That’s it… the system has now been added to your Unity project! The rest of this document describes features and how to use the system to generate planets.

**Setting Up Your First Planet:**

1. To start seeing anything you’ll have to create an empty game object within your scene **Hierarchy** (You can call “GameObject” whatever you like).

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1. Add the “Planet” script component to the empty game object.

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*Upon adding the “Planet” script you’ll notice some errors in the console. This will be fixed in step* ***3****.*

1. Create two “settings” files anywhere in your **Assets** window, one “Colour Settings” and one “Shape Settings”. You can call these whatever you like.

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*These files are used to store a planets shape a colour data. Each different planet you create will require its own shape and colour settings.*

Once you have your settings files, connect them to the “Planet” component.

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*The console errors from connecting the Shape Settings will be resolved in step* ***4****.*

1. After step **3** you should have 2 drop down fields under the “Planet” component.

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Start by added a layer of noise to the “Noise Layers” under Shape Settings 🡪 Noise Layers.

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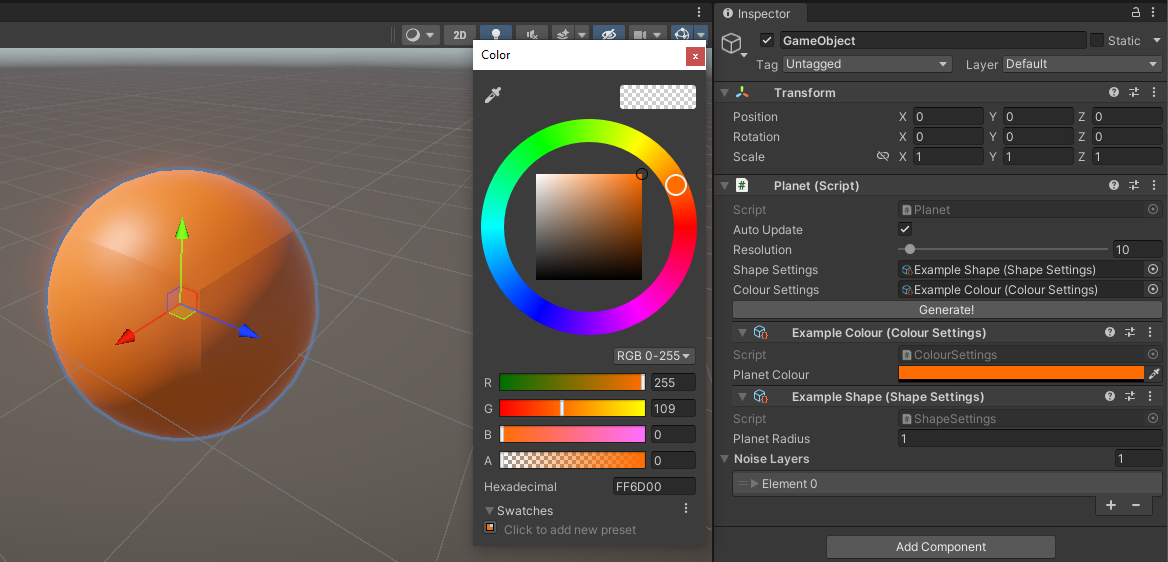
Description automatically generated

You should now see your planet in the scene!

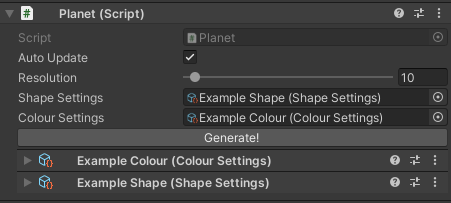
A screenshot of a computer

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1. You can change the colour of this planet by editing the “Colour Settings” scriptable object, either directly in the “Planet” component or from wherever you saved it under **Assets**.



**Things to Know About the Planet Component:**



**3**

**2**

**1**

1. **“Auto Update”**

Auto Update usually only needs to be disabled when editing a planet with immense detail, as the higher a planets quality is, the more lag is induced with every change.

1. **“Resolution”**

Resolution describes how many vertices are along a given “face” of the planet. This is because the planet made up of 6 separate faces like a cube.

|  |  |
| --- | --- |
| Planet with resolution of 5: | Planet with resolution of 50: |

1. **“Generate!”**

The generate button only serves a purpose when “Auto Update” is unchecked. This is used to see results of editing when rendering changes live is causing too much lag.

**Using the Shape Settings Scriptable Object:**

The rest of this document will go into detail about the “Shape Settings” portion of the editor as this is what creates natural looking planets.

**Planet Radius:** describes the distance (in Unity units) from the centre of the planet to its surface.

**Noise Filters:** used to store multiple layers of noise with differing values to create desired results.

A screenshot of a computer

Description automatically generatedExpanding a “Noise Filter” element will show a few more options:

**Enabled:** dictates whether this noise layer is rendered to planet.

**First Filter Should Mask:** dictates whether the first filter of “Noise Filters” (Element 0) should mask this layer.

**Noise Settings:**

Within each layer of noise is a “Noise Settings” dropdown. This field contains all the variables and types of noise to use when generating the planet.

**Noise Type:**

There are currently two types of noise, but the system is setup for new types of noise to be seamlessly integrated. These noise types are:

|  |  |
| --- | --- |
| * **Simple**   Raw 3D Simplex Noise values. | * **Inverse**   Inversed 3D Simplex Noise values. |

The following examples are all using the “Simple” noise type.

**Strength:** multiplies the final noise value with this float.

*Below is the same noise configuration with different strength values:*

|  |  |
| --- | --- |
| Strength: 0.1 | Strength: 0.5 |

**Roughness:** multiplies the frequency of noise within subsequent “Noise Layer” layers with this float.

*This is only visible when there are multiple “Noise Layers” in a single “Noise Filter” element.*

*Below is the same noise configuration with different roughness values:*

|  |  |
| --- | --- |
| Roughness: 1 | Roughness: 5 |

**Base Roughness:** the frequency of all noise layers is this value.

*Below is the same noise configuration with different base roughness values:*

|  |  |
| --- | --- |
| Base Roughness: 1 | Base Roughness: 5 |

**Persistence:** represents the amount the previous “Noise Layer” should affect this noise layer.

*The hardcoded value this effects is 1 meaning a persistence value of 0.5 would result in 50% of the previous noise layer affecting this layer.*

*Below is the same noise configuration with different persistence values:*

|  |  |
| --- | --- |
| Persistence: 0.25 | Persistence: 1 |

**Min Value:** represents the minimum value of noise displacement before beginning to render noise.

*Below is the same noise configuration with different min values:*

|  |  |
| --- | --- |
| Min Value: 0  A brown ball with a grid  Description automatically generated with medium confidence | Min Value: 1.25 |

**Noise Layers:** the number of layers of noise that should affect this instance of the filter.

*Below is the same noise configuration with different numbers of noise layers:*

|  |  |
| --- | --- |
| Noise Layers: 2  A brown ball with a grid  Description automatically generated with medium confidence | Noise Layers: 8 |

**Origin:** a vector 3 that represents displacement of noise. This will not affect how the noise looks just how it appears on the sphere.

*The best way to visualize this is to have “Auto Update” checked and to drag the “x, y or z” components.*

*Below is the same noise configuration with different origin points:*

|  |  |
| --- | --- |
| Origin: 0, 0, 0  A brown ball with a grid  Description automatically generated with medium confidence | Origin: 0, 0, 5 |

**Inverse Noise Type:** this is an example of the same noise configuration with different noise types.

|  |  |
| --- | --- |
| Noise Type: Simple | Noise Type: Inverse |

**Conclusion:**

With these variables you can create wide variety of planets, however due to the nature of this system it is hard to predict what tweaking a given variable will achieve. The easiest way to make what you imagine is to just play around with settings until you have a better understanding of how these change the result!

**Known Errors and Fixes:**

|  |  |
| --- | --- |
| **Error:** | **Solution:** |
| Even with the layer enabled, no noise renders to the sphere. | **Cause:** This occurs because there are currently no “Noise Layers” in the noise layer array within “Element 0” of the “Noise Filters” array. When a new “Noise Filter” element is created I couldn’t find a way to initialize the Noise Layers array with an existing element.  **Fix:** Drag the “Noise Layers” slider to any value or input any number into the int field. |
| Large seams between faces visible | **Cause:** This happens due to the way I create vertex data for each face, there are duplicate vertices along each edge and at the moment they have no way of know about each other.  **Fix:** If you look through my scripts you’ll find a lot of comments regarding a “Mesh Welder”. This was my attempt to fix this however because of time constraints I was unable to implement this. |