Spacetime Curvature

This tutorial shows you how to make a basic spacetime effect, allowing you to visualize the spacetime curvature of gravitational bodies.

Step 1 - Make a Spacetime

Right click in your **Hierarchy** window, and select **Space Graphics Toolkit → Spacetime**, and you should see a new Spacetime GameObject in your scene with the SgtSpacetime and SgtSharedMaterial components attached.

You can now set the **Main Tex** setting in the **SgtSpacetime** component to the **Grid** texture that comes with SGT,.

Step 2 - Make a Grid

For the spacetime effect to render, you need to make a grid that it will be displayed on. You can use Unity's built-in Plane for this by right clicking in the Hierarchy window, and selecting **3D Object → Plane**, and your scene will have a new Plane GameObject. If you want a higher detail plane with a more sensible size (+- 1 unit), then you can use the Plane100 mesh that comes with SGT.

You can use as many GameObjects as you like to render the effect. Also keep in mind they don't have to be flat planes, you can use a sphere or box or anything you like, as long as it has enough vertices to deform correctly.

Step 3 - Remove Grid Renderers

The spacetime effect works by adding a new material to your grid renderers, so unless you really want a second material, I recommend you remove any materials used by your grid. To do this, find the **MeshRenderer** component on each of your grid GameObjects, expand the **Materials** array, and set the **Size** setting to 0 and press **Enter** on your keyboard.

Step 4 - Link Grid Renderers

Now that you have removed all grid renderer materials, it's time to add the spacetime one. To do this, find the **SgtSharedMaterial** component on your Spacetime GameObject, find the **Renderers** setting, and drag and drop each of your grid GameObjects from the **Hierarchy** window to this list. If you do it correctly, it should display an add [+] icon, and automatically add them to the list. Do this for all your grid GameObjects.

Step 5 - Add Wells

To make the spacetime effect display curvature, you need to add gravitational wells. To do this, right click in your **Hierarchy** window, and select **Space Graphics Toolkit → Spacetime Well**, and you should see a new Spacetime Well GameObject in your scene with the SgtSpacetimeWell component attached.

You should now see your spacetime deform. If not, adjust the position to ensure it's on or near the grid, or try adjust the **Radius** setting so it's large enough.

Step 6 - Done!

You now have a basic spacetime set up. To show the spacetime curvature of planets and such, just add the Spacetime Well as a child to your planet, and watch it deform the grid as it moves.