EarthWorX
Terrain Elevation

APPLICATION NOTE

October 2015

Description: Guide to creating realistic-looking 3D terrains using GraphWorX64 3D and EarthWorX.
General Requirement: General knowledge of GraphWorX64 3D and EarthWorX.

Introduction

Having a realistic 3D terrain is a great way to provide advanced visualization that also helps your users understand the geography around your assets.

For example, a 3D wind farm model might help to visualize how the wind turbines are actually distributed on top of hills and how their performances might be affected by nearby assets or obstacles. A 3D terrain can help visualize pipelines, traffic and logistics, campuses, water plants and so on.

In this Application Note we will learn how to create 3D terrains in GraphWorX64 using EarthWorX.

> **NOTE:** For more information about the GraphWorX64 3D View, see the application note entitled, *GraphWorX64 - 3D Objects Quick Start*.

Creating a generic 3D terrain

The creation of a 3D terrain is fairly simple:

1. Create a new GraphWorX64 display.
2. Add a 3D View control to it.
3. With the focus on the 3D View, in the Ribbon bar, under Home tab, you'll find the "Primitives" section. There you'll find the button to create a 3D terrain, as shown in the below picture. Click it to add a terrain to your 3D world.

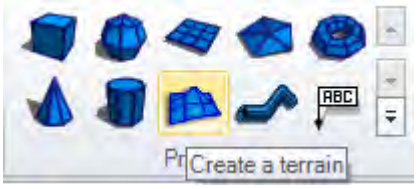

Figure 1 – Creating a 3D terrain

At this point, our 3D terrain has been created and is ready to be configured.

By default a 3D terrain is made up by 10 segments per side (11 points). This means we'll have only 121 vertices and 200 triangles to model to create our terrain, as shown in the next picture.

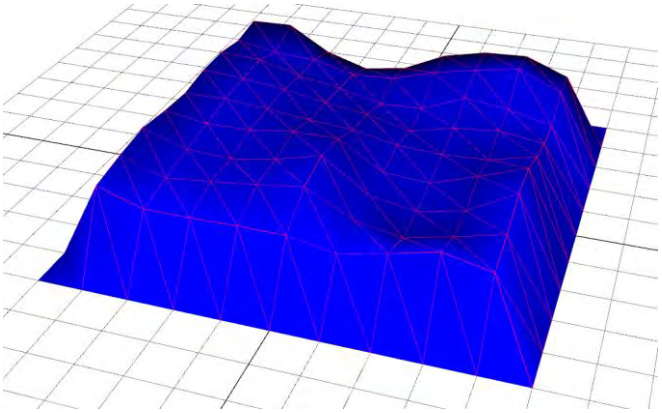

Figure 2 – A 3D terrain

There is not enough polygons to create a detailed terrain. For this reason, we will modify two properties: **WidthSegments** and **LengthSegments** by setting their value to 127 instead of 10. The resulting terrain will be much smoother than it was before, with 16,000 vertices and 32,000 polygons.

Using EarthWorX to model the terrain

At this point our model represents just a random terrain. We will use the power of EarthWorX to turn it into a realistic terrain.
With your terrain selected, look for the property **ElevationBitmap** in the Property Grid.

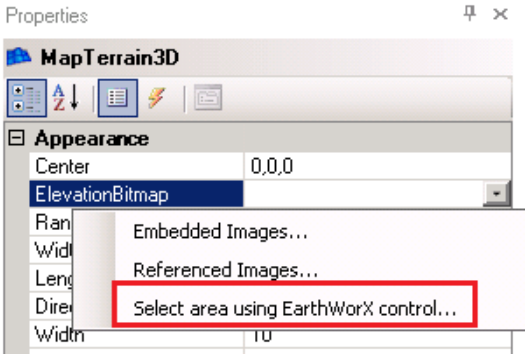

Figure 3 – ElevationBitmap property

This property allows you to select an elevation bitmap (a gray-tone image representing hills and valleys) to model your terrain. Instead of providing a pre-built image we can use EarthWorX to generate the elevation data. Click on that option.

This will bring up a dialog with an EarthWorX control embedded into it, which will allow us to select a geographical area.

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Hold down the Alt key on your keyboard and use the left mouse button to select an area to zoom in. To zoom out, hold down the Alt key and click once with the right mouse button. To return to the home view, right-click on the map and select Home.

We can also specify additional properties about the height map size and the texture size. The height map size will define how detailed your terrain will be. Because we have created a terrain with 127 segments, creating a height map with more than 128 points will be useless, as there won't be enough vertices to model a number of points larger than 128.

The texture image is a different story, because it is not used to model a vector object, it is applied as the material instead. A higher resolution will guarantee us that even if we zoom close to a certain area of the terrain, its details will still be sharp.

Of course there are pros and cons with these settings. A very large texture image might slow down the whole display considerably, so we have to balance performance and details. For our example we will use 2048 x 2048 for texture size.

The last setting is about the Key to utilize to download maps. You can either insert a Security Server key, which lets you point to Bing credentials safely stored in the ICONICS Security Server, or you can enter your Bing Maps key here directly.

When browsing the map to set your desired location you can change the map mode by using the context menu shown when you right-click on the map. The map type you select will be used to generate your texture. We suggest using Road or Hybrid mode while browsing, and to finally set Aerial to create a realistic texture, without labels on it.

Next images shows how we configured EarthWorX to help us creating the 3D terrain. The area we selected is the San Francisco Bay area.

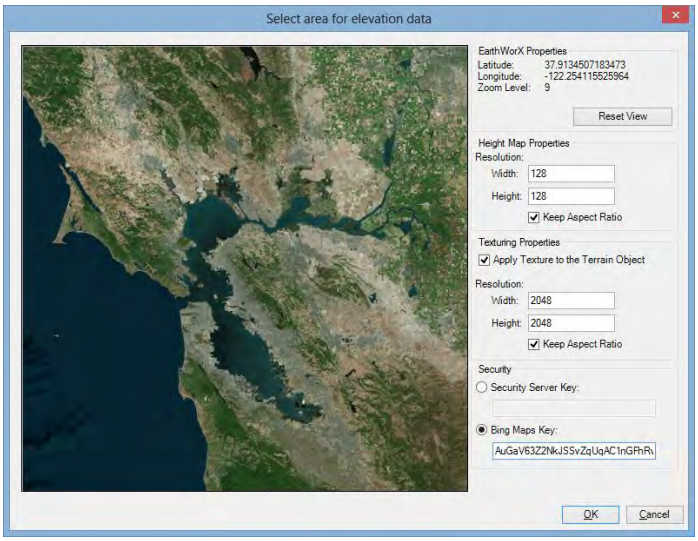

Figure 4 – Configuring EarthWorX

Once you press OK, the terrain creation process will start. This consists of two steps, one for creating the elevation bitmap and one for the texture. It might takes some time depending on your settings.

The resulting terrain might have unrealistically high hills and mountains, as shown in the next picture, representing the output of our terrain generation.

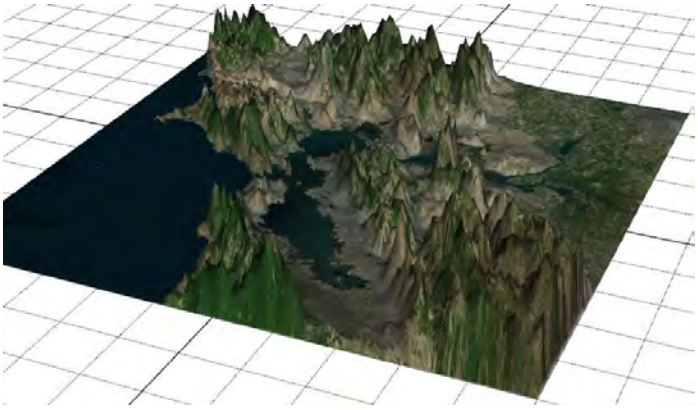

Figure 5 – The generated terrain

Sometimes exaggerating the elevation might be desirable, but in the above case it is way beyond the way we want it. To fix that, we can tweak the terrain property called **VerticalDisplacement**. The default value was 2, but we reduced it to 0.3 to get to the final result shown below where a sky from the Symbol Library was added to increase the overall realism.

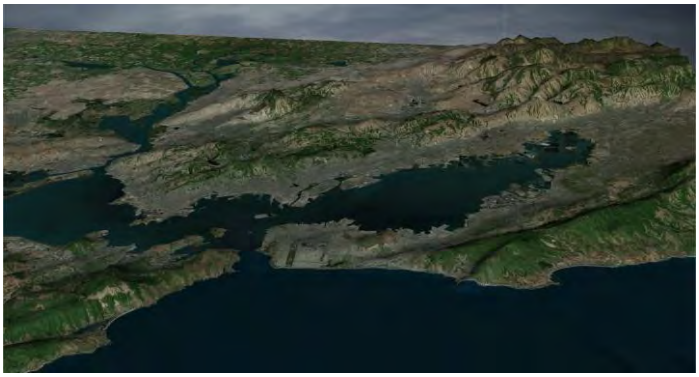

Figure 6 – Final result

This terrain is our starting point where we can add assets and other 3D models.

By choosing different areas, and tweaking properties, you can create the perfect terrain to be used in your project.