VistaPro DEM Geometry Import Converter
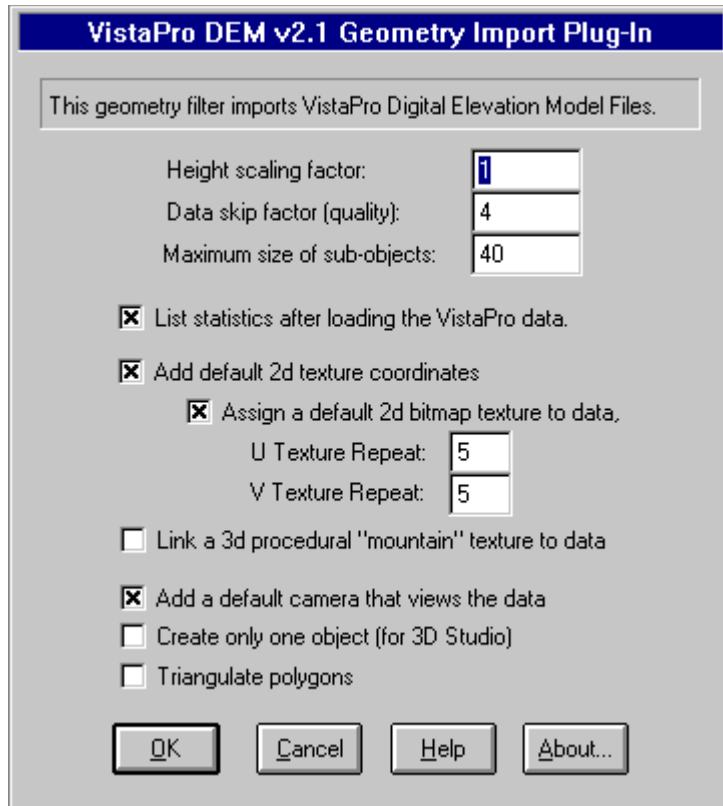
The **VistaPro DEM** geometry import converter imports, manipulates and converts digital elevation model (DEM) data in the VistaPro format.

PLEASE NOTE: the **Create only one object'** checkbox should be enabled (check-marked) if the DEM data is destined for **3D Studio** (see explanation in the dialog box descriptions section below).

Features of this converter

1. VistaPro DEM datasets typically contain 60000 or more quadrilateral polygons, or 1200000 triangles (for a 258x258 resolution sample). This is an enormous number of polygons for most 3d rendering programs so this DEM converter incorporates two unique options to overcome this problem:.

    A. The converter can skip over samples in the dataset so that only every n-th sample is used. Rather than importing 258x258 samples, the converter imports 51x51 samples (for a skip factor of 5) which results in only 2601 quadrilateral polygons.

    B. Rather than store the entire DEM dataset in single object, the DEM converter breaks up the data into multiple smaller objects with a common parent. This   has shown to be an effective method to speeding up the wireframe redraws of the DEM data (by a factor of 2 or 3), and makes interactive user movement of a 3d camera much faster since each sub-object is only a few hundred polygons. In addition, certain rendering programs (such as Okino's NuGraf renderer) use much less memory when many smaller objects are used rather than one large object with many polygons. By default each sub-object stores a maximum of 900 polygons; contrast this with other converters which lump all 120,000 polygons into a single object - few renderers will be able to render such a large object.

1. A default 3d camera is added to the scene which views the DEM data from a pleasing angle.

2. u/v texture coordinates are added to the imported data so that a bitmap image can be easily draped over the DEM data.

3. The converter creates smoothed vertex normals so that the DEM data appears to be smooth when rendered.

Dialog Box Options

VistaPro DEM v2.1 Geometry Import Plug-In

This geometry filter imports VistaPro Digital Elevation Model Files.

Height scaling factor: `1`
Data skip factor (quality): `4`
Maximum size of sub-objects: `40`

☒ List statistics after loading the VistaPro data.

☒ Add default 2d texture coordinates
    ☒ Assign a default 2d bitmap texture to data.
    U Texture Repeat: `5`
    V Texture Repeat: `5`

☐ Link a 3d procedural "mountain" texture to data

☒ Add a default camera that views the data
☐ Create only one object (for 3D Studio)
☐ Triangulate polygons

[OK] [Cancel] [Help] [About...]

DEM Height scaling factor

This option scales the height of the DEM data. It default to 1.0. Values greater than 1.0 will make the DEM data higher while values between 0.0 and 1.0 will make the DEM data shorter.

DEM Data skip factor (mesh quality)

This option determines the quality of the imported DEM data (it directly controls how many polygons will be used to approximate the input DEM data). **THIS IS AN IMPORTANT CONTROL PARAMETER**!! A value of 1 results in the highest quality mesh while higher values (2, 3, 4, etc) result in lower quality, but at the benefit of reducing the number of polygons in the input data. This number will cause the converter to 'skip' over every n-th input sample. For example, if the input dataset size is 258x258 samples, and the skip factor is set to 4, then the converter will actually read in the data as if it were of size 65x65 (258/4 = 65). This will produce 4225 polygons (65x65) instead of 66565 polygons. A **value of 2 or 3** (16641 polygons to 7396 polygons) will produce good results for a final rendering, while **values of 5 to 8** will produce small datasets ideal for fast previews (2704 polygons to 1024 polygons).

Maximum size of sub-objects

By default the DEM data will be cut up into several smaller sub-objects rather than having all of the DEM data clumped together into one huge object. This option controls how many polygons will be put into each sub-object. The default is 30 which will cause 900 polygons (30x30) to be stored in each sub-object.

List statistics after loading the DEM data

If the checkbox is enabled (check-marked) then the converter will print out the number of objects and polygons created.

Add default 2d texture coordinates

If the checkbox is enabled (check-marked) then u/v texture coordinates will be added to the imported dataset. These texture coordinates will allow a 2d bitmap image to be easily mapped to the surface of the data. Please note that the texture coordinates are aligned with the mathematical bounding quadrilateral   of the dataset, not the actual physical edges of the data (this is because the physical edges of the data are not square or precise).

Assign a default 2d bitmap texture

This option is only valid if the converter is running within the **NuGraf Rendering System** software. If this checcbox is enabled (check-marked) then a default 2d bitmap texture filt (default.tif) will be linked to the DEM data. This option is useful is you intend to apply a 2d bitmap image to the DEM data. The **Add default 2d texture coordinates** option must also be enabled.

Once the DEM data has been imported, you can change the default bitmap image assigned to the data by pressing the **Textures** tab on the **Selector Window** (within the **NuGraf Rendering System** software) then clicking and holding the left mouse down over the **default dem texture** entry. A small pop-up menu will appear - choose the **Edit Texture** menu item. The **2D Image Texture Parameters** dialog box will appear; press the **Select** button to choose the new texture bitmap. When done, press the **Update and Exit** button on the dialog box.

U/V Texture Repeat

These two values determine how many times the 2d bitmap texture is to repeat across the DEM data surface (see the   **Assign a default 2d bitmap texture** option above). The default values are 5 which will make the texture repeat 5 times in the horizontal and vertical directions.

Once the DEM data has been imported you can change the u/v repeat values by pressing the **Surfaces** tab on the **Selector Window** (within the **NuGraf Rendering System** software) then clicking and holding the left mouse down over the **default dem surface** entry. A small pop-up menu will appear - choose the **Edit Surface** menu item. The **Surface Attribute Editor** dialog box will appear; press the **Texture Layers** button so that the Texture Layer Editor dialog box appears. Now modify the values shown beside **U/V Repeat**.

Add a default camera that views the data

If the checkbox is enabled (check-marked) then the converter will add a default camera to the scene which views the DEM data at a pleasing angle.

Link a 3d procedural mountain texture to data

If the checkbox is enabled (check-marked) then a NuGraf "**mountain**" procedural texture definition will be added to the scene and assigned to the current shader (useful for rendering the DEM data with the NuGraf renderer). This texture varies the color of the DEM data according to the elevation and slope of a polygon (the

color varies from greens, to browns to whites at the highest altitudes).

Create only one object (for 3D Studio)
If the checkbox is enabled (check-marked) then one single object is created for all of the imported data rather than having the data broken up into multiple smaller sub-objects (the default). **THIS OPTION SHOULD BE USED FOR DATA DESTINED FOR 3D STUDIO** because 3D Studio requires all polygons to be inside a single object so that its smoothing algorithm will work properly; if multiple objects are used then the vertex normals will not be the same where the sub-objects meet and hence "cracks" may appear at the junctions.

Triangulate Polygons
If the checkbox is enabled (check-marked) then the DEM data will be imported as triangles instead of 4 sided polygons. This is sometimes useful to enable since 4-sided DEM data polygons are not planar.

Limitations of the Converter

1. If exporting to 3D Studio then all of the DEM data must be exported as one object so that proper smoothing occurs between the sub-chunks. 3D Studio has a limit of 64k vertices and 64k polygons, therefore the chunk size must be set appropriately to limit the number of polygons and vertices output (the number of polygons created can be verified by enabling the ' **List statistics after loading**' and checking that the number of polygons created is less than 65536).