GEOSOFT

Oasis montaj How-To Guide

3D Gridding - Create Voxels using 3D Gridding Methods

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Create Voxels using 3D Gridding Methods

You can create a Voxel using the **3D Gridding** submenu, located on the *3D* menu. A "voxel" is short for "volume pixel", the smallest distinguishable box-shaped element of a three-dimensional image. A Voxel is the 3D conceptual counterpart of the 2D pixel.

The **3D Gridding** submenu offers 3 different gridding algorithms, each with a different focus:

- The *Kriging* method best suits clustered data occurring in a region with otherwise sparse data distribution, such as geochemistry data.

- The *Direct Gridding* method on the other hand should be used to grid data uniformly and densely sampled throughout the region, such as GPR or seismic data.

- Lastly, with gridding data collected along specific directions - such as borehole data - *Inverse Distance Weighted Gridding* will be most suitable.

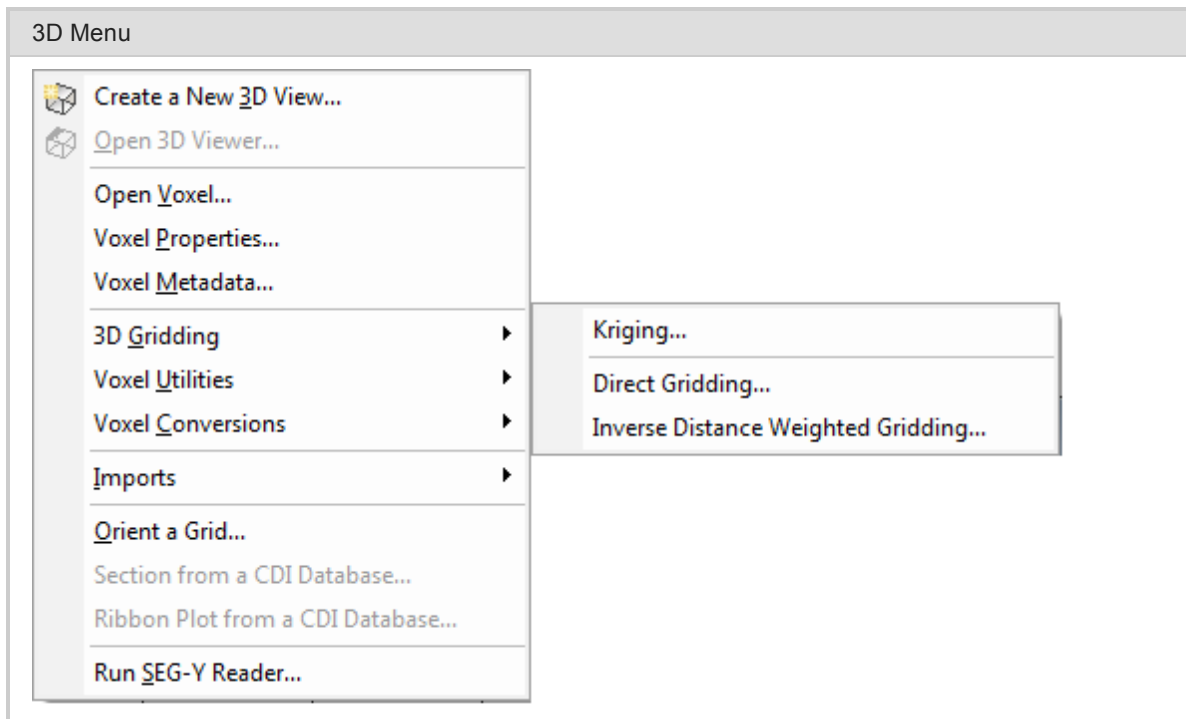

Figure 1: 3D Gridding menu system

The data to be gridded must have defined X, Y and Z coordinates. The 3 dimensional coordinate system will locate the data in space. The Z axis is interpreted as positive up. The **3D** workflow includes tools for creating, displaying and processing voxels. The *3D Viewer* allows for visual inspection of voxels and comes with a rich set of 3D viewing tools.

⚠ *When applying 3D gridding, halving the cell size reduces both the file size and processing time by a factor of 8 (2^3).*

Creating a Voxel Model using the Kriging method

From the *3D Gridding* menu, select the **Kriging** option to perform a statistical-based 3D gridding. The input data must be supplied in a Geosoft database (GDB file). The output will be a voxel model within the confines of the data extent.

To Create a 3D Voxel model using Kriging:

1. Open a Geosoft data database containing X, Y, Z and the data channel you would like to grid. If the coordinate system is not completely defined, a message will pop up and you will not be able to continue until the corrective action is taken.

2. On the *3D* menu, select **3D Gridding | Kriging**. The *3D Kriging* dialog appears.
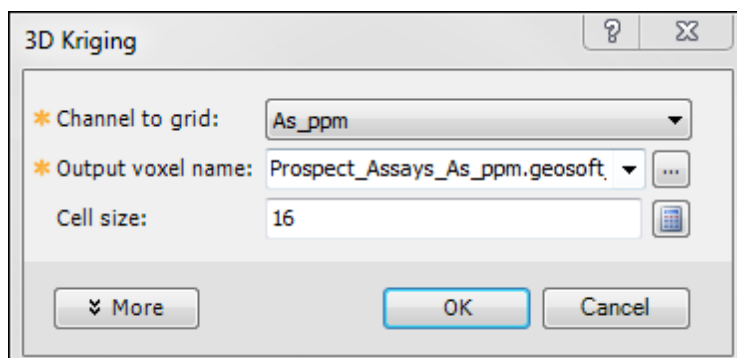

Figure 2: 3D Kriging Gridding dialog

⚠ *If a database is not already open you will be prompted to open one.*

3. From the drop-down list, select the *Channel to grid*. The first time through the process, the default *Output voxel file* name will the set to the provided channel name. The subsequent invocations of this tool will remember the user specified file name. You can rename the output voxel file or accept the default name.

4. Specify the *Cell size*. If you do not have a preset cell size, click the **Calculator** 🔲 button to obtain a reasonable cell size based on the extents of your data. The cell size is calculated for a single cube, assuming the volume is divided into 10000 individual cubes. The value is then rounded down to give a more satisfactory value.

   💡 *We recommend that your first attempt at gridding be using the remainder defaults. After inspecting the outcome however you may decide to modify defaults such as the Blanking Distance to fill in the gaps, modify the Z cell increment, or generate the output on a logarithmic scale.*

   💡 *Additionally you can customize the variogram to best suit your data.*

5. When you are satisfied with your selections click **OK**. The Voxel is created and displayed in the *Voxel Viewer*. An example is shown below:
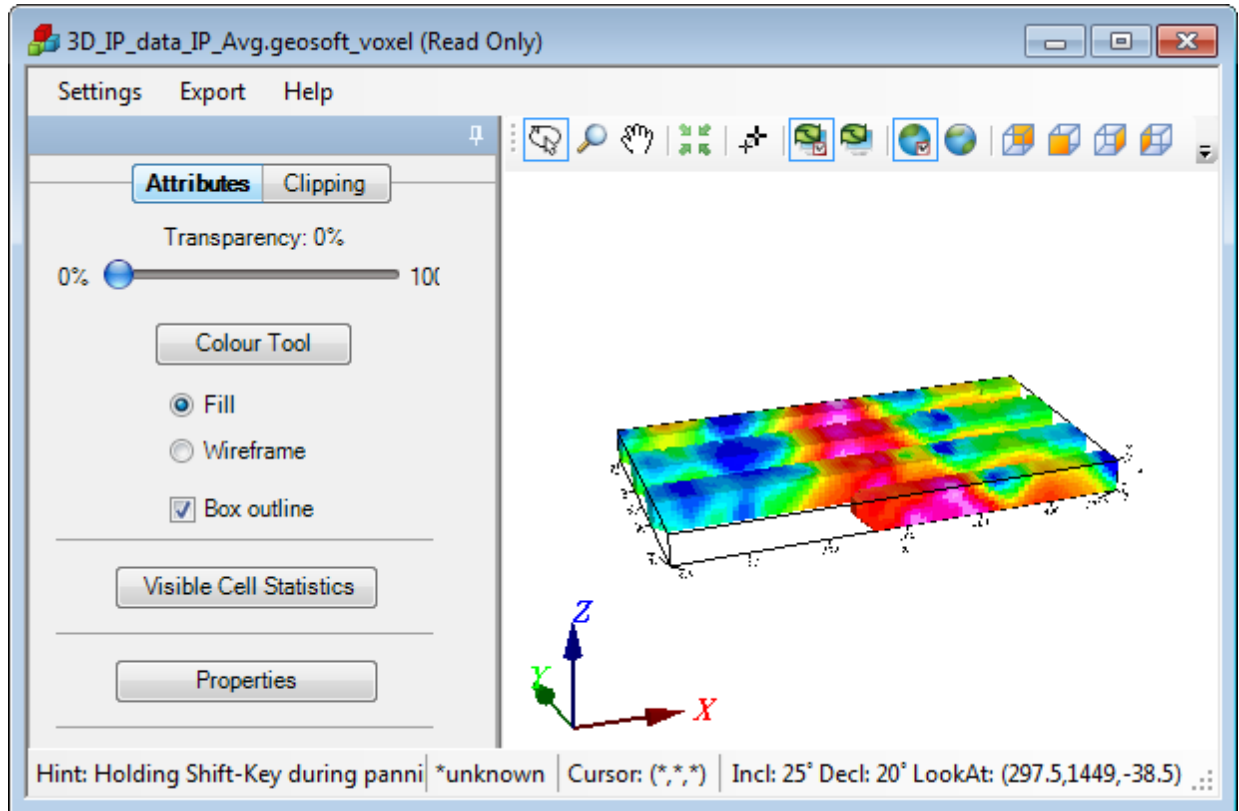
Figure 3: 3D Voxel produced with 3D Kriging Gridding method

The *Voxel Viewer* provides additional viewing tools.

Creating a Voxel Model using the Direct Gridding method

To Create a 3D Voxel model using Direct gridding:

1. Open a Geosoft data database containing X, Y, Z and the array data channel to grid. If the coordinate system is not completely defined, a message will pop up and you will not be able to continue.

2. On the *3D* menu, select **3D Gridding | Direct Gridding**. The *3D Direct Gridding* dialog appears.
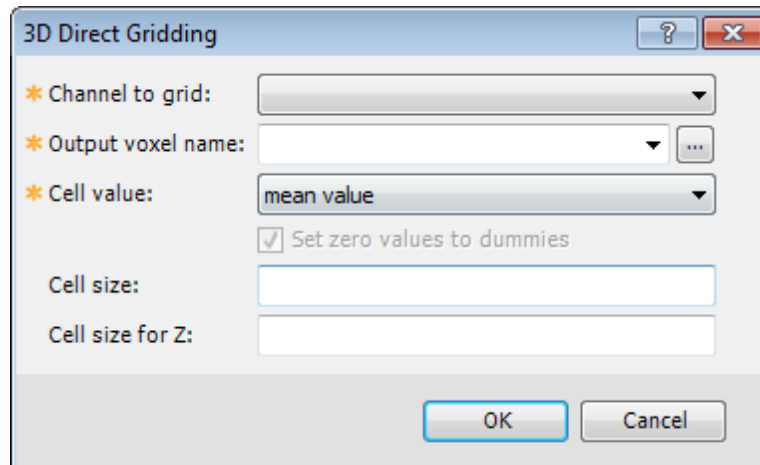
Figure 4: 3D Direct Gridding dialog

⚠️ *If a database is not already open you will be prompted to open one.*

3. From the drop-down list, select the array *Channel to grid*. Only array channels are eligible to be gridded. The first time through the process, the default *Output voxel file* name will the set to a combination of the current database and provided channel name. The subsequent invocations of this tool will remember the user specified file name. You can rename the output voxel file or accept the default name.

4. Specify the *Cell size*. If you do not have a preset cell size, click the **Calculator** 🔳 button, to obtain a reasonable cell size based on the extents of your data. The cell size is calculated for a single cube, assuming the volume is divided into 10000 individual cubes. The value is then rounded down to give a more satisfactory value.

5. The default vertical Z cell size is set to the same value as the horizontal cell. If this value is not reflecting the desired resolution, modify it accordingly.

6. When you are satisfied with your selections click **OK**. The Voxel is created and displayed in the *Voxel Viewer*. An example is shown below.
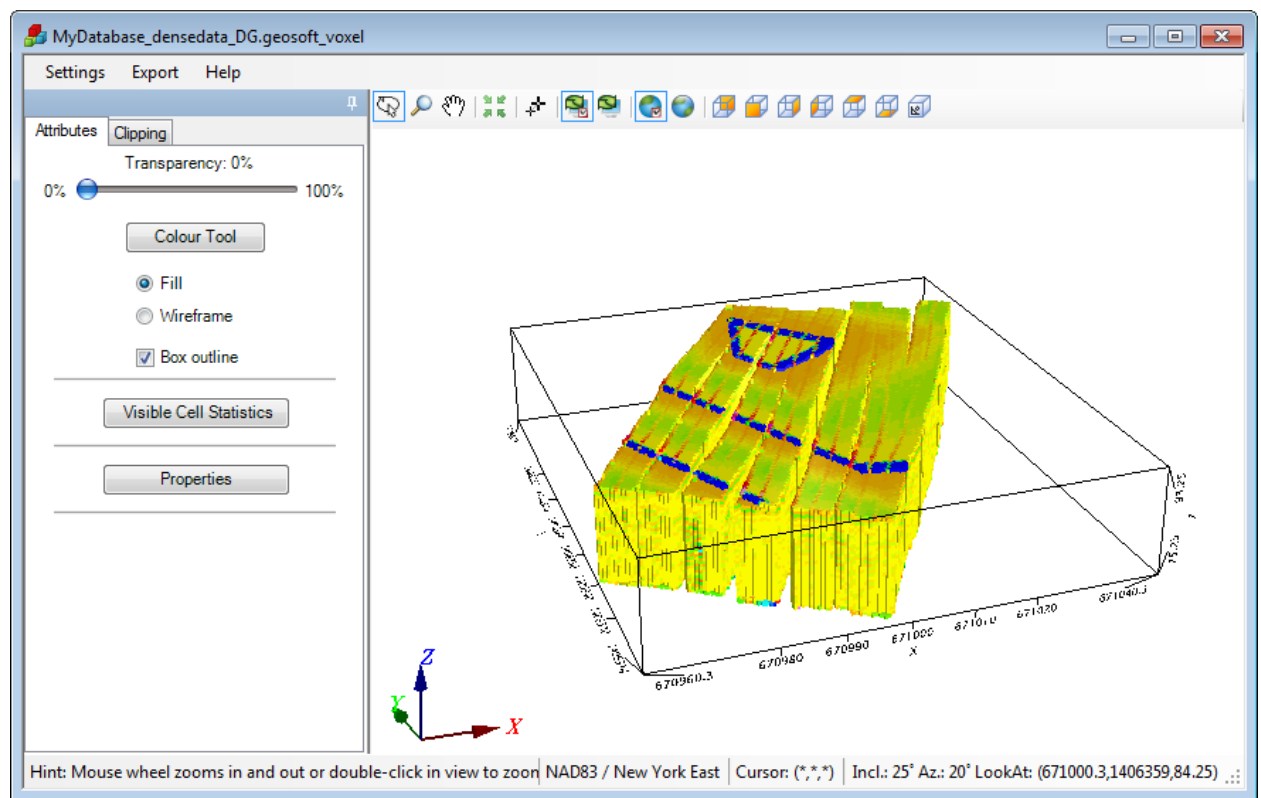

Figure 5: Direct Gridding of GPR data. Data courtesy of UIT

Creating a Voxel Model using the Inverse Distance Weighted (IDW) Gridding method

To Create a 3D Voxel model using Inverse Distance Weighted Gridding:

1. Open a Geosoft data database containing X, Y, Z and the array data channel to grid. If the coordinate system is not completely defined, a message will pop up and you will not be able to continue.

2. On the *3D* menu, select **3D Gridding | Inverse Distance Weighted Gridding**. The *3D Inverse Distance Weighted Gridding* dialog appears.
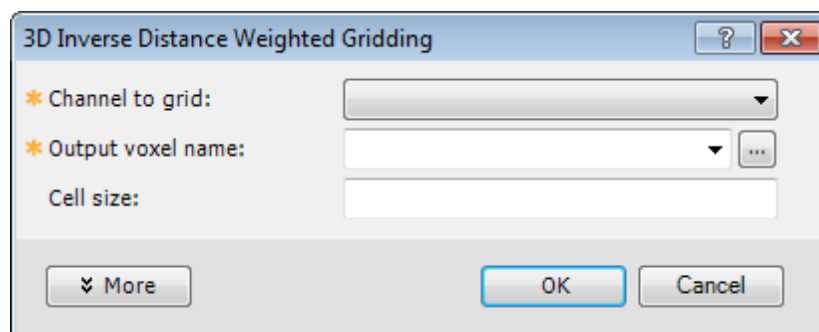
Figure 6: 3D Inverse Distance Weighted Gridding dialog

⚠️   *If a database is not already open you will be prompted to open one.*

3. From the drop-down list, select the array *Channel to grid*. The first time through the process, the default *Output voxel file* name will the set to a combination of the current database and provided channel name. The subsequent invocations of this tool will remember the user specified file name. You can rename the output voxel file or accept the default name.

4. Specify the *Cell size*. If you do not have a preset cell size, click the **Calculator** 🖩 button, to obtain a reasonable cell size based on the extents of your data.

5. When you are satisfied with your selections click **OK**. The Voxel is created and displayed in the *Voxel Viewer*. An example is shown below.
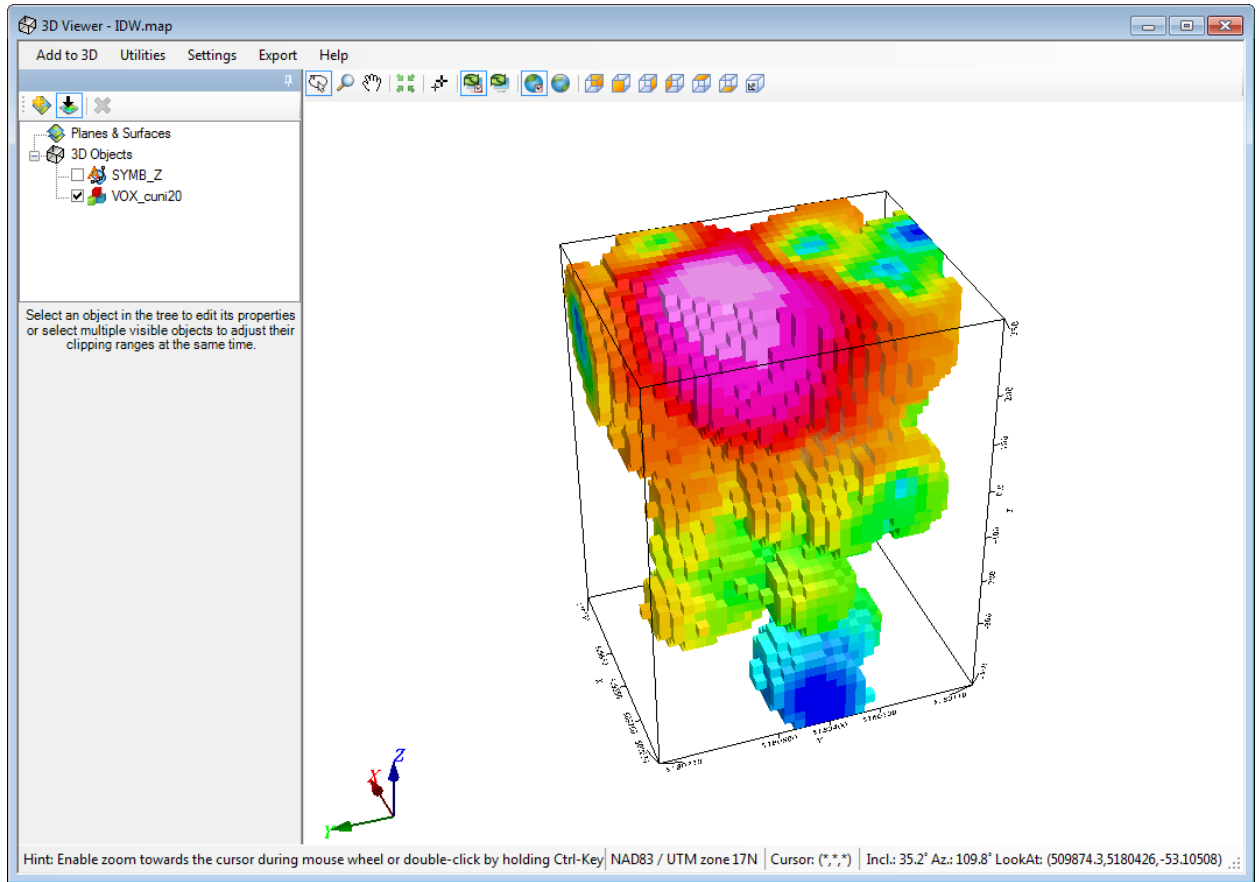
> **Creating a Voxel Model using the Inverse Distance Weighted (IDW) Gridding method**

Figure 7: Inverse Distance Weighted Gridding of Borehole data

💡 *We recommend that your first attempt at gridding be using the remainder defaults. After inspecting the outcome however you may decide to modify defaults such as the Weighting power & slope to alter the degree of influence of contributing data points relative to their distance , or the Blanking Distance to fill in the gaps, or generate the output on logarithmic scale.*