



Oasis montaj How-To Guide

3D Voxel Utilities - Filter a Voxel



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How to Filter a Voxel

Spatial convolution filters can be applied to an existing voxel. Three 3x3x3 convolution filters are supplied. You can also save a custom filter in a file and apply it to a voxel.

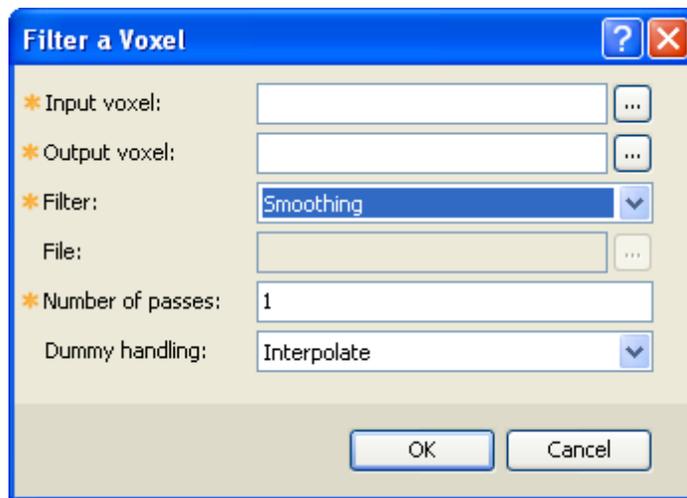
The supplied filters are:

- The **Smoothing** filter, useful for spatially smoothing 3D measured or calculated data.
- The **Laplace** filter, useful for emphasizing areas of rapid intensity changes.
- The **Total Gradient** filter, useful for delineating rock unit/contact boundaries.

To Smooth a Voxel

1. From the *3D* menu, select **Voxel Utilities | Filter a Voxel**.

The *Filter a Voxel* dialog opens.



2. Use the  button next to the *Input Voxel* field to select the voxel to filter.
3. Provide the name of the *Output Voxel*. If the selected file already exists, you will be prompted to either enter a different name or overwrite the existing file.
4. From the drop down list of filters, select the **Smoothing** filter.
5. Enter the desired number of passes of the smoothing filter.

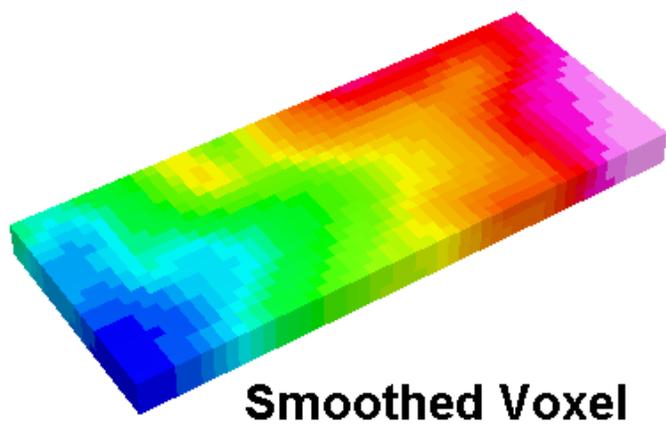
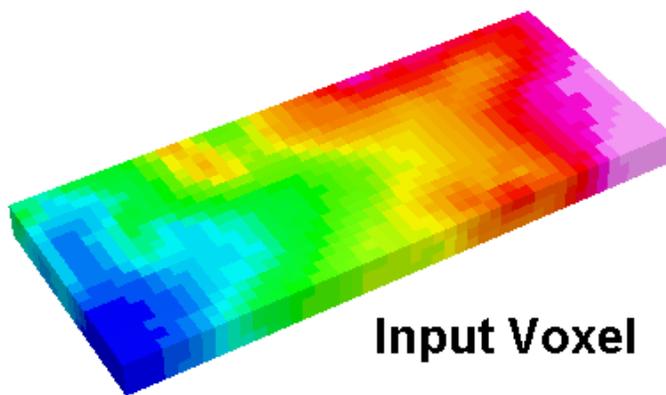


The larger the number of passes, the smoother the outcome.

6. Select **Dummy** for the handling of the edges of the voxel.



7. Click **OK** and the filtered voxel will appear.





In each direction, the convolution operation requires 3 consecutive data points to apply the filter. The outcome of the operation will be located on the central point. Thus, the filtering of the edge points can be approached in 2 different ways:

- on output, the edge points are truncated because in at least one direction, they are missing a valid data point,
- the next point adjacent to each end point is first extrapolated using valid data, after which the filter is applied, and the output voxel will be of the same size as the input voxel. A linear interpolation is performed for the inside dummy points and the nearest valid point is assigned for exterior extrapolation.



The supplied Geosoft filters have the extension `flt3d` and are installed in the `Geosoft\Oasis montaj\etc` directory. The convolution filter coefficients are supplied in the increasing order of X, then Y, and finally Z.



In analogy to the supplied filter format, you can create your own custom filter. This filter can reside in any directory, however if you intend to use it in other projects, we recommend to save it in the directory `Geosoft\Oasis montaj\user\etc`.

To Emphasize the Areas of Rapid Change

1. Follow steps 1,2,3 from the *smooth a voxel* procedure.
2. From the drop down list of filters, select the **Laplace** filter.

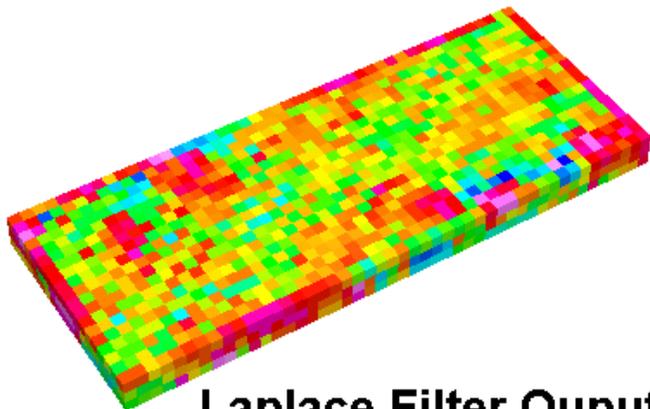


Although you can enter up to 3 passes of the Laplace filter - since this filter accentuates the local variations - it is recommended not to go above 1 pass unless you have a compelling reason to do so.



3. Select **Interpolate** for the handling of the edges of the voxel.

- Click **OK** and the filtered voxel will appear.



Laplace Filter Output



The visible edge effect of the Laplace Voxel is due to the fact that on the outside, the nearest neighbour value is assigned to extend the voxel.



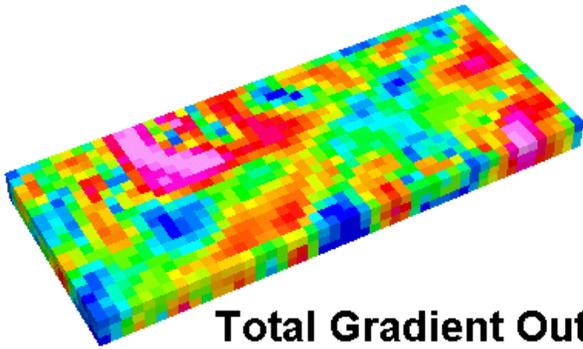
If you find excessive noise in the Laplace voxel, you can apply a smoothing filter to the Laplace Voxel to smooth out the noise .

To Apply a Gradient Filter

- Follow steps 1,2,3 from the *smooth a voxel* procedure.
- From the drop down list of filters, select the **Total Gradient** filter.
- You will notice that only one pass of the Total Gradient convolution filter can be applied.
- Select **Interpolate** for the handling of the edges of the voxel.



5. Click **OK** and the filtered voxel will appear.



Total Gradient Output