

How to Vectorize for Raster Data

How to make vectorization

Firstly know some questions before the vectorization:

1. What's vectorization?

It is to convert the raster data to vector data.

2. Why do we need to make vectorization?

Compared with the raster data, the vector data is with compact data structure, low redundancy, is conducive to the network and search analysis, and has good display quality with high precision, so we need to make vectorization in some application analysis.

3. What method do we use for vectorization? What conditions are they suitable for?

There are two methods: semiautomatically tracing vectorization and automatically tracing vectorization.

- Semiautomatically tracing vectorization is the interactive vectorization mode; trace each lines of the raster data manually, but if the line object has better display effect, the system will automatically trace the line until it can't trace, then you need to trace manually continuously, in this way you can interactively digitize each line. That applies to the contour map, the drainage map, the road network map and other maps with more line objects.
- Automatically tracing vectorization is completed by the system fully automatically, which is suitable the condition that the line quality is high and the features are clear.

4. What's the process of vectorization?

Currently, SuperMap iDesktop 9D in Object Operations>Vectorization, it provides several operation tools for vectorizing lines/regions, which can help completing vectorization work better.

After knowing above four questions, you will know more about vectorization. In this topic, it will use the contour vectorization example to introduce how to use the vectorization tools in iDesktop.

It mainly includes two parts:

Automatically tracing vectorization

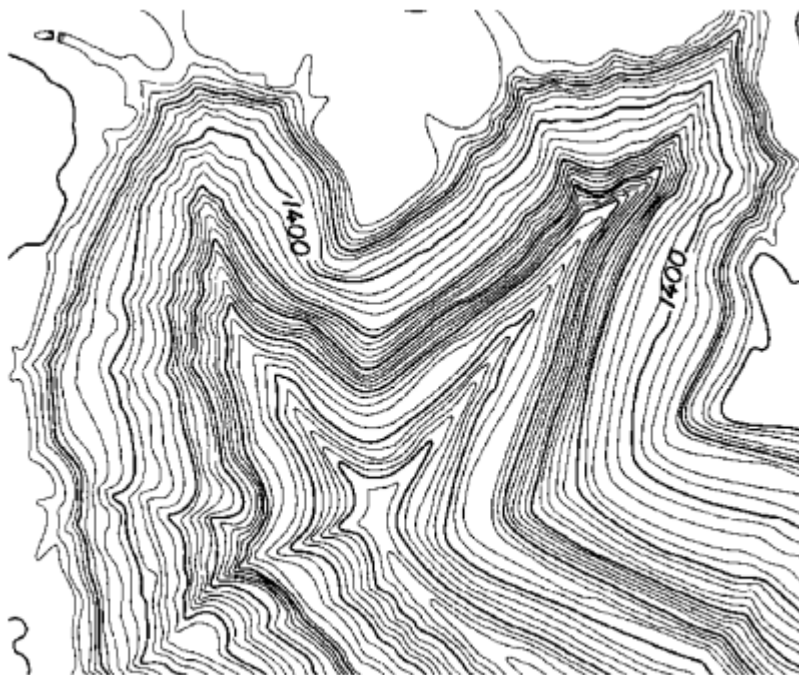
Semiautomatically tracing vectorization

Automatically Tracing Vectorization

The function can greatly improve the vectorization efficiency, which is suitable for the data with clear line features. The main steps are:

1. Import

Import the raster data to be vectorized. The result data can be grid or image dataset.



Import raster file

2. Register

If the imported raster data doesn't have spatial position information, it's needed to register it to assign the actual spatial positions. In addition, registration can also correct the raster data on some shape distortion. For the function of registration, please refer to the registration theme.

3. Raster Binaryzation

If the lines are very clear in the data, there is no need for binaryzation processing, otherwise, it is needed to make raster binaryzation: first check the difference between the lines and the background values, second set the threshold, e.g., if the line value is bigger than 10000, the background value is smaller than 10000, then use the algebraic expression $\text{Con}(\text{dem} > 10000, 1, 0)$ to assign the background and the lines to 0 and 1.

4. Automatically Tracing Vectorization

1. In Analyze>Raster Analysis, click Vector Converter, select Raster to Vector to open the dialog as shown below:
2. Select the raster dataset in Source Data, if the raster data goes binaryzation processing, it's needed to select the processed result dataset.

3. Select the datasource to store the result dataset in Result Data, select the result dataset type, which can be point, line, or region dataset, and set the result dataset name.
4. If the result dataset type is line, you can set the following parameters:
 - Smooth Method: Valid only when the raster is converted to line dataset. SuperMap provides two smooth methods-"B spline method" and "grinding angle method". For details please refer to the smooth methods document.
 - Smoothness: Valid only when the raster is converted to line dataset and the smooth method is not "None". When the smooth method is "B spline method", if the smoothness value is smaller than 2, it will not smooth the data; when the smooth method is "grinding angle method", it is valid when the smoothness value is larger than or equal to 1, and bigger the value, smoother the result data.
 - Refine Raster before Conversion: The thin raster operation can reduce the number of cells used to identify the linear features in raster data so as to improving the velocity and precision of the vectorization. It is generally used as a pretreatment before transforming the raster data into vector data so as to improving the transformed results. For example, a scanned contour map may use 5 or 6 cells to show the width of a contour line, but after the thin raster operation, the width of the contour just needs a cell for its display.
5. The parameters in Grid Settings part are only valid for grid dataset vectorization. Novalue: the pixels with this value will be regarded as no value and not be processed. Novalue Tolerance: the pixels with the value within the tolerance range of the Novalue value will not be processed. Grid Field: save the pixel value to this field of the result dataset. Convert Specified Only: only the pixels with the specified value are processed. Grid Value: set the specified pixel value. Grid Tolerance: the pixels with the value within the tolerance range of the "Grid Value" value will be processed.

Pop up the Raster to Vector dialog.

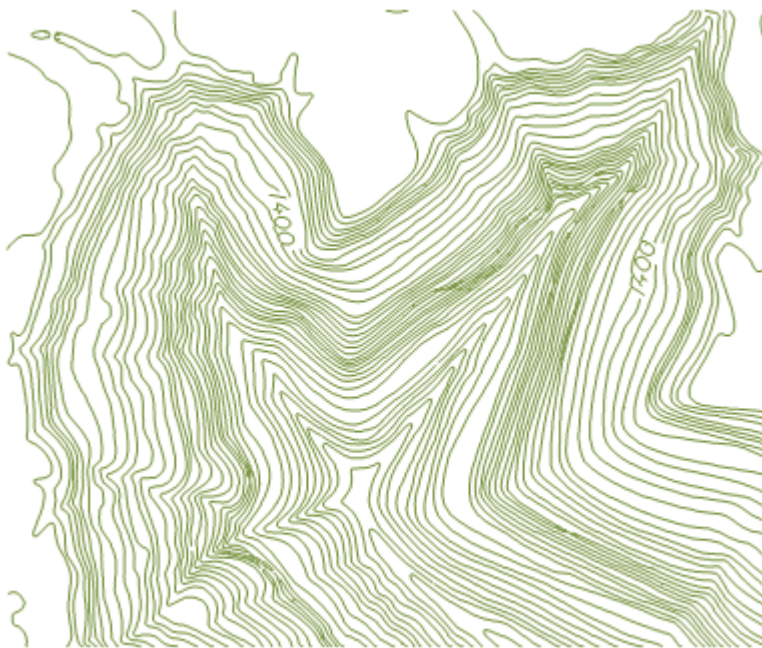


Fig: The Raster to Vector Dialog

5. Select the dataset to be processed in Source Data.
 - Datasource: select the datasource the processed dataset is in.
 - Dataset: select the processed dataset.
6. Set the result datasource and dataset name in Result Data.
 - Datasource: Set the result datasource.
 - Type: set the result dataset type, which can be point, line or region.
 - Dataset: set the result dataset name.
7. Vector Line Settings: it is only valid when the result dataset type is line.
 - Smooth Method: Valid only when the raster is converted to line dataset. SuperMap provides two smooth methods-"B spline method" and "grinding angle method". For details please refer to the smooth methods document.

- Smoothness: Valid only when the raster is converted to line dataset and the smooth method is not "None". When the smooth method is "B spline method", if the smoothness value is smaller than 2, it will not smooth the data; when the smooth method is "grinding angle method", it is valid when the smoothness value is larger than or equal to 1, and bigger the value, smoother the result data.
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8. The parameters in Grid Settings part are only valid for grid dataset vectorization.
- Novalue: the pixels with this value will be regarded as no value and not be processed.
 - Novalue Tolerance: the pixels with the value within the tolerance range of the Novalue value will not be processed.
 - Grid Field: save the pixel value to this field of the result dataset.
 - Convert Specified Only: only the pixels with the specified value are processed.
 - Grid Value: set the specified pixel value.
 - Grid Tolerance: the pixels with the value within the tolerance range of the "Grid Value" value will be processed.
9. The parameters in Image Settings part are only valid for image dataset vectorization.
- Background: the pixels with this background will be regarded as background and not be processed.
 - Back Tolerance: The tolerance of the background color. The tolerance value corresponds to three values for R, G, B, e.g., if the tolerance is 10, then the pixels with RGB(R \diamond 10, B \diamond 10, G \diamond 10) are background. The tolerance range is (0~255).
10. Click OK to start, click Cancel to cancel the operation.

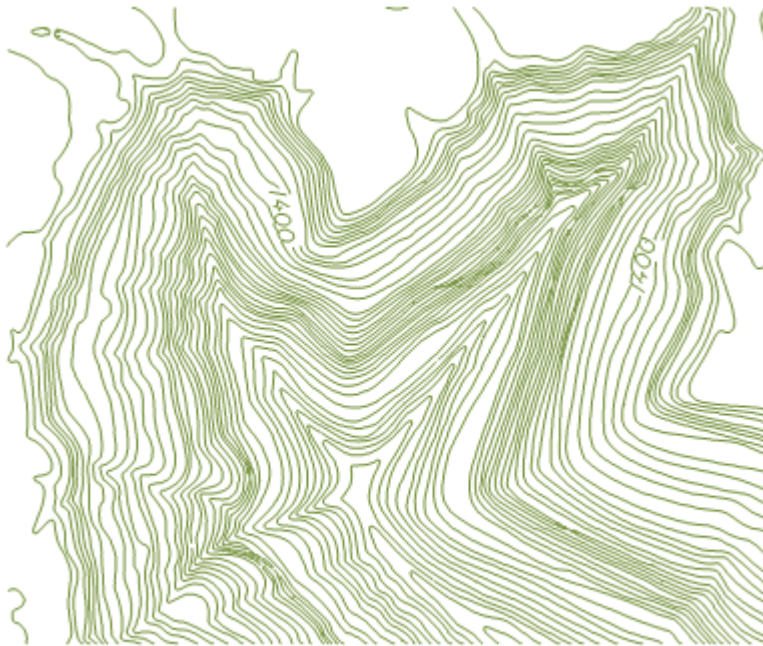


Fig: The Raster to Vector Dialog

11. The result of the automatically tracing vectorization is generally needed to be adjusted, which can be realized by the tools in Object Editing. For details please see [Object Editing](#).

Semiautomatically tracing vectorization

Vectorize Lines

Semi-auto vectorization refers to vectorizing lines by human-computer interaction according to the raster base map. The main steps include track settings, auto tracking lines, undo lines and auto tracking regions. Here we will take an example of how to semi-auto vectorize contour lines.

1. Data Preparation

Import the image file you want to vectorize and georeference the image. Create a new line dataset or CAD dataset which is used to store vector contour lines. Place the raster dataset and the new line (CAD) dataset to the same map window.

2. Raster to Vector Settings

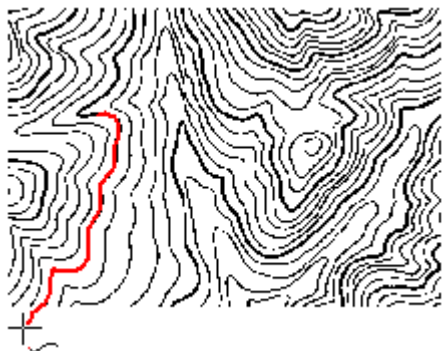
Set the line (CAD) dataset editable in Layer Manager. Click the Object Operations tab, find the Vectorization group and click the Set button. A Raster to Vector dialog box pops up. You can set parameters in this dialog box.

Select a raster layer. Set the background color and color tolerance, so that any color value (RGB) falls in this color tolerance will be treated as the raster base color. The default color tolerance value is 32. Then set the smooth factor (after filtering sawtooth, how many interpolation points can be inserted between the two points along a line) and the filter pixels (de-aliasing parameter). You can also use the default values. Finally, Set the base color white, in this case, iDesktop will not track the base color of the raster layer during vectorization.

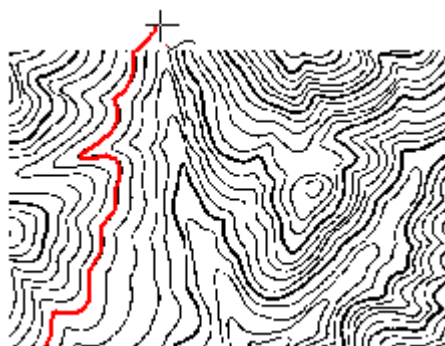
1. **Raster Layer:** Select the image layer which you want to vectorize as the base layer.
2. **Background Color:** Set the base color white, in this case, iDesktop will not track the base color of the raster layer during vectorization.
3. **Color Tolerance:** The degree of similarity of the raster base map. It will continue tracing when any component value of RGB is less than the tolerance. Its value range is from 0 to 255, and the default value is 32.
4. **Filter Pixels:** Set the filter parameter, i.e., eliminates the vertical offset distance that the serration of the line object flutters with the grating method. The default value is 0.7. The greater the parameter, the more points it filters.
5. **Smooth Factor:** The vectorization needs the smooth operation. The greater the smooth factor you set, the smoother the boundary of the vector line/region is.
6. **Auto Pan:** If the **Auto Pan** check box is checked, the application will move the map automatically, i.e., the window will automatically move when the mouse clicks the border of the window during vectorization. If the **Auto Pan** check box is unchecked, the window has to be moved manually.
- 7.

3. Semi-auto Tracking Lines

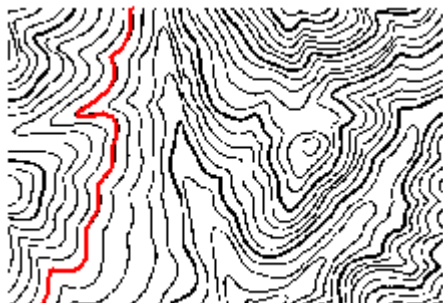
1. Click **Object Operations > Vectorize Raster > Undo Line**.
2. Move the mouse to a line object and left-click on it to start drawing the line object. When the mouse meets a breakpoint or a crossing during vectorization, the operation will stop and you need to double-click the next point on the forward direction line of the breakpoint or crossing. Then the tracing will go on until it meets another breakpoint or crossing.



3. Right-click when you meet an endpoint of a line segment to trace in a reverse direction from the start point. The vectorization stops when it reaches the other endpoint of the raster line.



4. Right-click to end vectorizing. If the raster line is closed, it will be closed automatically during vectorization.



4. Undo Lines

The quality of the raster base map influences the result of vectorization. You can use the **Undo Line** command to undo the drawing of partial line segments, and then left-click to do this, or right-click to return to the current vectorizing state. If you finish vectorizing, the Undo Line button will turn gray and be unavailable.

If you undo on the U line, maybe you cannot go back to the status you want. In this case, we suggest you click at the corner and then undo line. Move the mouse pointer can undo your operations.

Vectorize Region

For semi-auto vectorization, some raster needs to be vectorized to regions, such as rivers, lakes, etc. The operations of vectorizing regions are similar to vectoring lines. Set the region layer editable, and set related vectorization parameters. Click the Object Operations tab, find the Vectorization group, and click the Vectorize Region button. Move your mouse to the map, click and draw the region on the layer. The cell within the tolerance can be vectorized. Right click to finish the vectorizing. The region can be adjusted by Object Edit.

Note

- During vectorization, you can use Zoom In (Zoom Out, etc.) to adjust the scale of the raster base map. Right-click to continue vectorizing.
- Click **Esc** or click the **Vectorize Line** button on the **Vectorize Raster** group to cancel the current drawing.
- With Alt + Q shortcut keys, you can quickly and easily use the Vectorize Line function.