

Conversion of Raster Images into Shapefiles using ArcScan

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ArcScan extension is primarily used to convert raster images into vector-based feature layers. Since a large amount of geographic information still exists in the form of hard copy maps, it is important to have a tool that can facilitate the use of these documents in a GIS format. Unfortunately ArcScan itself cannot be used to get a final shapefile; it has to be combined with manual digitizing tools.

In order to use ArcScan you need to perform the following steps:

Step 1. Scanning

The map hardcopy must be scanned at an appropriate resolution. Usually 150dpi is sufficient, but sometimes a higher resolution is preferred, especially if the map contains small features. The image file (jpg or other format) must be created.

Step 2. Georeferencing

The created image must then be georeferenced (i.e. assigned with spatial reference) using some kind of base map; this could be another image or shapefile that has a spatial reference (projection). The base map has to have number of distinct points that can be used to associate with the new image. All necessary functions can be found in ArcMap 'georeferencing' toolbar.

Step 3. Create a blank shapefile.

Open ArcCatalog, choose directory, and create blank shapefile. It must have the same spatial reference as the image and its geometry type must be associated with the desired feature (line for roads, polygon for parcels etc.)

Step 4. Open ArcMap.

Add both image and blank shapefile into ArcMap document.

Don't miss the next step - ArcScan will not work properly!

Step 5. Change image properties.

Go to image properties -> Symbology.

Change 'show' from Stretched to Classified.

Change number of classes from 5 to 2.

Click Classify button.

Set first breakpoint value as 254. Leave the second one as 255. Click OK twice. The image will have more contrast.

Step 6. Enable ArcScan.

Go to Tools->Extensions and check ArcScan extension. Add ArcScan toolbar to ArcMap document.

Step 7. Start Editing

Go to Editor->Start Editing. This must activate the ArcScan toolbar. If this option is still grayed out, close ArcMap and repeat steps 4-6.

Step 8. Set Vectorization Settings.

Go to Vectorization->Vectorization Settings. The options are:

- *Intersection Solution.* Use 'Geometrical' for engineering drawings or street maps; 'Natural' for natural resources maps (vegetation, soil etc.); 'None' for contour maps.
- *Maximum line width.* Sets line width which is eligible for raster tracing (in pixels). ArcScan will not create a vector line feature if the raster line width is thicker than a set value.
- *Smoothing Weight.* This setting is used to smooth line features that are generated during vectorization process. Using larger smoothing weight will cause the creation of smoother line features.
- *The Gap Closure Tolerance.* This is a distance in pixels that is used to jump over breaks in a raster line.
- *Fan angle.* This setting is useful when the original line is curved and contains gaps. It allows ArcScan to "search around" for gaps.
- *Hole Size.* This setting will help ArcScan to ignore holes in raster lines during vectorization.

Step 9. Generate Features.

Go to Vectorization->Generate Features. Choose the blank layer name from the list. There are options to save an average width of each line feature or select new features by checking an appropriate checkboxes. Click OK.

It will take some time for ArcScan to generate vector features. The amount of time will depend on computer capabilities, amount of generated features and quality of raster image.

Step 10. Clean up.

It is very likely that generated shapefile will have a lot of unnecessary features (so-called 'noise'). Sometimes it is possible to get rid of it using automatic methods, for example, delete all lines that are shorter than some specific number. More likely, that clean up has to be done manually by merging line segments and deleting unnecessary ones. This work can take a long time. *Therefore, in some cases it is more efficient to use manual digitizing tools instead of ArcScan.*