

TracTrix™ Software

Raster to Vector Conversion Tutorial

support@trixsystems.com

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Trix Systems | USA (978) 256-4445 | UK (020) 7193 7445 | Sweden (0) 10 451 0500
www.trixsystems.com | 1075 Westford St, Suite 301, Lowell, MA 01851

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TRACTRIX SOFTWARE

RASTER TO VECTOR CONVERSION TUTORIAL

What comes out of your scanner?

Imagine we've scanned this picture of a pair of boots and we're viewing it on our computer screen (the image shown is from the <tawademo.tif> file in the **Examples** folder). We see continuous lines.

But if we zoom-in on the tiny circled area on the trim at the top of the left-hand boot we'd see a grid of black squares. The scanner creates the 'lines' on a computer screen using square dots, known as 'pixels'. It's conventional to refer to them as dots only in the context of scanner resolutions (dots per inch or dpi). Scanner resolution is always referred to as dpi (dots per inch) whether you are in the metric (mm) or Imperial (inch) units of measure.

Where black dots are clustered together we see lines.

Where white dots are clustered together we see nothing (although the white dots are actually there).

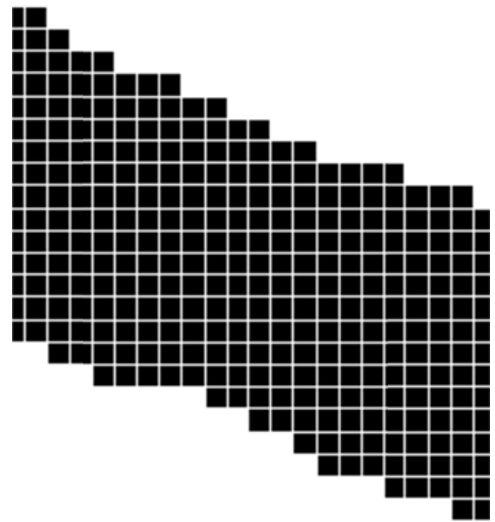
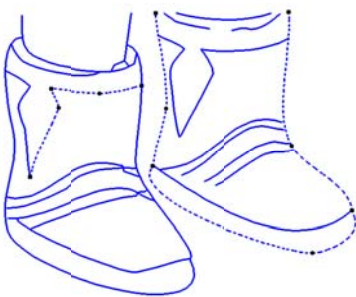
Any file in which pictures are saved as a sequence of black and white or different colored dots is called a raster file, and any picture presented this way is called a raster image. Scanners create raster images and nothing else. They cannot create vectors. The same is true for digital cameras and 'paint' software programs.




Raster images are wonderful for viewing or printing.

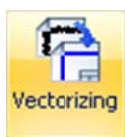
This is because our eyes and brain interpret what is a

line and what is not. Unfortunately, raster images are completely useless for any computer software which depends on vector descriptions of lines. CAD, CAM, numerical control and GIS

software can only do their job with vectors. So *TracTrix* traces the little dots that form the raster lines and automatically converts the lines into vectors which you can export as a standard vector file format. In the illustration to the left you can see how *TracTrix* converts the raster image of the boots to vector lines.



To duplicate this, **Zoom-in**   on the boots in <tawademo.tif>, and use **Select Area**  to select the area around the boots.



Vectorize the raster image with by clicking **Vectorize**.

Click on **Adjust** and select **Polylines**.

Click **OK**, then **Start**. The boots will be vectorized.





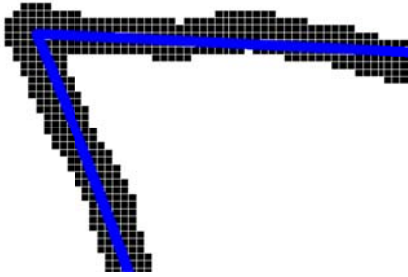
Use the **Select** tool to click lines that you can see.

Instead of being made up of hundreds of little dots each line is now described by control points and mathematical coordinates, the descriptions of curves and lines.

These are the vectors.

A single control point on a vector line now represents the corner on the trim that we previously zoomed-in on.

If we look at the vectors we've created on top of the original raster lines (as you can do in *TracTrix*) we see something like this:



The vector lines have been created along the dots that make up the original raster lines. This is at the core of how *TracTrix* works.

Why have we devoted so much time to explaining what a raster is and how it differs from a vector? Because to get the best out of *TracTrix* it pays to start with a good quality scan and use *TracTrix* raster editing tools to optimize the raster

before it is converted to vectors. Understanding that a raster is made up of masses of little dots is key to this process.

Creating vectors from rasters

What it takes for Vectorization

There are normally four distinct stages in raster to vector conversion:

- 1) Scanning the image to be vectorized;
- 2) Editing the raster image created by the scan, if necessary;
- 3) Conversion to vectors;
- 4) Cleaning up the new vectors.
- 5) Saving the vectors in a specific CAD vector format.

Successful Vectorization Rule #1:

Attention to the preparatory work saves on clean up later.

Scanning

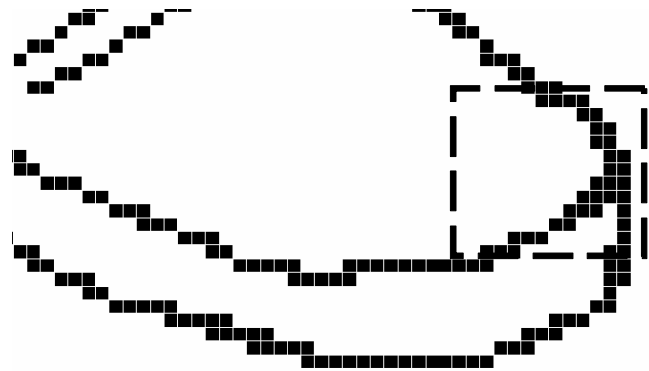
Your scanner provides you with a variety of options. While these settings are quite independent of *TracTrix*, your choices from these options can radically alter vectorizing performance. The two key scanning options to consider before using *TracTrix* are resolution and bit depth.

Resolution is usually set as a measure of dots per inch (or dpi). This is the number of raster dots your scanner will create for each inch of paper it scans. This is very important for accurate vector creation. In general, *TracTrix* prefers that the lines in the raster image are at least three pixels wide on screen. More pixels mean a smoother centerline.

By setting the scanner resolution high enough we ensure that lines in the raster contain enough pixels across their width. At the same time we don't want to set resolution any higher than necessary because this creates large files and slows down the conversion process.

To see the reason for the 3-pixel width requirement take a look at the picture of the front of a moccasin. It shows a raster image consisting of single pixel wide lines. Take a pencil and try to draw a centerline through the line of pixels.

It's quite difficult to draw smooth curves through these pixels. *TracTrix* experiences the same sort of difficulty.

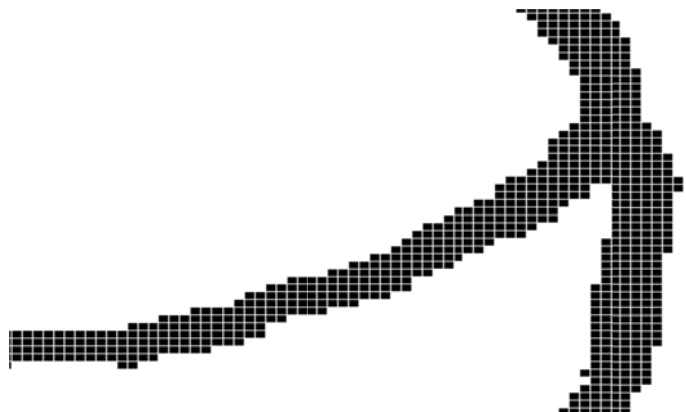


The illustration below and to the right is scanned at four times the previous resolution. Looking across any line you'll see at least three pixels. It's much easier to draw a continuous smooth line through the centerline of these dense pixel strings.

Scans with lines at least three pixels wide provide better information for *TracTrix* to calculate and create smoother vectors. You can ensure that your scans have 3-pixel wide lines by selecting a high enough resolution in your scanner's settings. Next we'll apply this rule to a real scan.

Scanning directly into *TracTrix*



Open the Examples folder and open the tawademo.tif file. Then print it. We will be using the print as an example for scanning into *TracTrix*.




If you don't have a scanner, a digital camera can also be used. If you have neither a scanner or a digital camera use the print for the subsequent vectorizing exercise.

The thinnest line on this print appears to be between 0.010" and 0.020" (0.25mm - 0.5mm) wide. To scan this to create at least 3 pixels width in the narrower raster lines we need to set a scanner resolution of 400 dots per inch (dpi).

Place the 'tawademo' print in your scanner. Align the edges of the print along the edge of the scanner bed. (*TracTrix* can de-skew vectors, but lining up the print now will save you editing work later.)

Establish a connection to your scanner by choosing   **Select Source**. If your scanner has a TWAIN interface, you will see its name listed; select it (most desktop scanners are supported).

Use  to access the scanning software where you can adjust scanning settings. Choose to use either the *TracTrix* interface or the scanner manufacturer's interface for scanning.

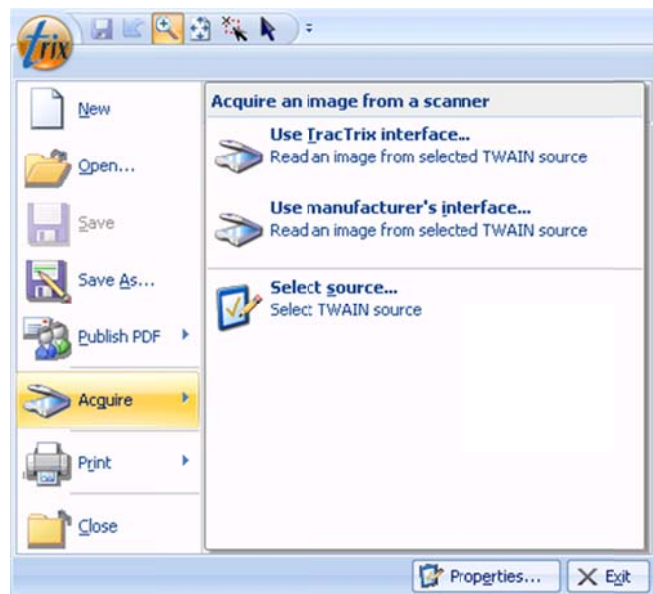
Set the resolution to the 400 dots per inch as suggested for the 'tawademo' print.

Next set your scanner to scan the image as a black & white, 1-bit, image. We do this because 'tawademo' is a black and white image--it contains no gray-scale tones or colors. Various terms are used to describe this setting control in different scanner software packages. Look for names that are synonymous with a 1-bit image such as 1 bit-depth, 1 bit color-depth, line art or monochrome.

Check also that the scanner is set to scan at 100% scaling.

If your scanner software supports a preview mode, click on this. The preview image will appear on your screen. Examine the preview image. You may need to adjust your scanner's brightness control to make the lines on the image as bold, crisp and clear as possible.

When you are satisfied with the appearance, click on the button that instructs your scanner to complete the scan (it may be labeled Final, Scan, or something of this sort.)



The scanner will run again and the 'tawademo' image will appear in the *TracTrix* window. By carefully choosing the scanner settings, you'll have the best possible raster image for Vectorization in *TracTrix*.

Successful Vectorization Rule #2:

Good quality vectors start with good quality scans.



tawademo
image
For use with
the TracTrix™
tutorial.

Just because we're using computers doesn't mean we have to ignore pens, erasers, or white-out. If you see blemishes on prints, it's often just as simple to make corrections on them before scanning.



Raster editing


TracTrix provides a variety of raster editing tools. In this tutorial we will use the **Eraser** tool and the **Pen** tool. The scan should be open in *TracTrix*, or open the <tawademo.tif> image instead.


Start by selecting the **Zoom** tool under the **Start** tab.



Look closely at the blob of dirt outside the text box, just to the left of the word 'image'. Let us use the eraser to remove it.



Again from the **Start** tab, select the **Eraser** icon  in the Raster Editing group. The eraser works like a 'freehand tool.' Move the cursor over the blob. Hold down the left mouse button and drag back and forth over the blob to erase it. **Zoom All**  (or roll your mouse wheel) to display the entire image.

Save  from the **Quick Access Toolbar**. The edited file will be saved as <tawademo.tif.TRX> in the Examples folder. TRX is the extension to *TracTrix* native files that store.

Zoom in  on the 'feathers' at the very top of the image. The tips of the top two feathers are missing. We'll use the **Raster Pen** tool to correct this error.

Select the **Pen** tool.  The cursor changes to a pen. Right-click/
 **Properties...**; set the pen width to 5 pixels. Click **OK**. Use the **Pen** tool to draw in the tips of the feathers.



If you make mistakes use the **Eraser** tool to correct them. Don't worry about being too exact. You should end up with something like this:



Select CALS Type 1 from the **File type** menu. Enter 'tawademo.cal' as the file name; click **Save**.

You'll be prompted for a size and resolution. Select **Letter** as the size and 400 dpi resolution; **Save**.



You've now saved a copy of the raster file that you opened or scanned in, complete with the edits you made to it.

In this exercise, you chose to save to the CALS format—any supported raster file format could have been chosen.

You've now used the **Eraser** to eliminate dirt and the pen to add missing detail. The image is now ready for Vectorization. Before we go on, take a moment to experiment with zooming in on the precision of the raster image. Zoom down until you can see the individual pixels (at high levels of zoom a grid will automatically appear so that you can see the individual pixels).

You should see that the edges of the raster lines are quite jaggy in many places when viewed as individual pixels. Junctions between lines are often irregular. *TracTrix* can deal with most of this. By dealing with the major raster irregularities and omissions you'll assist *TracTrix* in its automatic conversion in the next stage.

Successful Vectorization Rule #3:

It's quicker to clean up problems in a raster
before they become bigger problems as vectors.

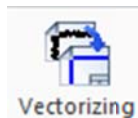
Converting the raster to vectors

TracTrix has some easy-to-use settings so that you can adjust to control exactly how *TracTrix* converts your images to vectors. In this exercise we are going to vary these settings to see how *TracTrix* creates different results

based on the settings you choose.

Outline Conversion

You should have *TracTrix* open and your 'tawademo' scan up on screen. (Open the <tawademo.cal> file if you are returning to the tutorial.)



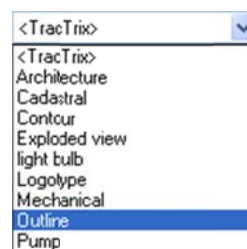
Click **Vectorizing** in the **Tools** tab.

When you first launch *TracTrix* the default setting is the basic <*TracTrix*> setting.

Additional pre-defined settings are provided in the menu.

Start by choosing the **Outline** setting in the menu, then click **Adjust**. The **Trace Settings** window appears—notice that the **Trace** method is set to **Outline** vectorization. This means *TracTrix* will create lines along the outside edges of the raster lines.

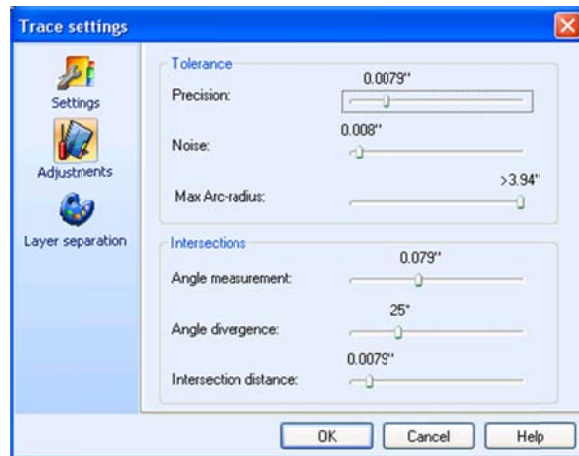
When would you want outline vectorization rather than centerline? Typically you'd use this when you have a large filled raster area in silhouette, such as a logo, where you want to have vector definitions of the edges. See ornament.tif in the Examples folder.



Now click on **Adjustments**. The new window contains settings for the tracing parameters.

The **Precision** tolerance parameter is set to 0.20 mm (0.0079"). Why we wouldn't want absolute precision?

There are two primary reasons: The closer you follow your original jaggy raster, the more vector entities you will create, and this can create unmanageably large CAD files. Also, the raster lines are imperfect in the first place because of cumulative discrepancies from original drafting, paper stretch, and scanner wobble. There is no point in absolutely replicating an already somewhat imperfect original.




Precision tolerance tells *TracTrix* to follow the raster lines so that the vectors created are never more than 0.20 mm away from the original raster. You may want to think of this as the setting for the level of detail you want from *TracTrix*. If you prefer to work in inches go to **Program Settings** in the **Settings** tab and change 'units' from mm to inches.


The **Noise** tolerance parameter tells *TracTrix* what size of speckle is to be ignored. Many raster images have very small areas of dirt on them where lines may have been erased or dust particles appear as black specks. As we do not want these to appear as vectors we tell *TracTrix* to ignore them. The current setting is 0.20 mm. This means *TracTrix* will ignore any group of pixels less than 0.20 mm across.


The other settings enable even finer tuning of *TracTrix* conversion. To keep this tutorial simple we'll skip these for now.

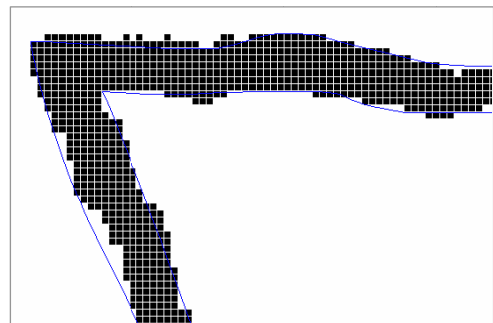
Now let's see what happens when you convert the 'tawademo' image using these settings. Click **OK**. Check that the **Outline** setting is still showing, then click **Start**. The cursor changes to an hourglass.




The progress of the vectorization is shown in the foot of the *TracTrix* window.

Within a few seconds vectorization is complete and blue vector lines appear overlaying the black of the 'tawademo' raster scan. Note that the outline is filled with blue. Turn off the 'fill' to show only the outline by clicking the **Filled objects** button .

Zoom in closely  anywhere on the image. Notice how the blue vector lines smoothly flow around the jaggy edges of the underlying raster image, always keeping within the 0.20 mm limit set in the **Precision** setting. You'll also see how *TracTrix* has handled intersections.

Right-click/**HOLD**  + **Drag** to activate and use the **Pan** tool (also in the **Start** tab).

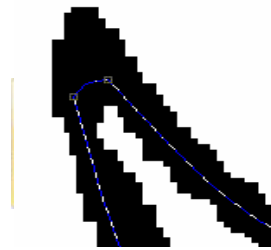


Turn the raster layer off by using the **Drawing** button  icon. You can now see the vector lines without the black raster lines underneath. To see the underlying raster again click on the  button again. Then click the  to toggle the display of the vector layer.

Centerline Conversion

When you want to go back and see the entire image, click on the  **Zoom all** icon.

Now we'll do the conversion again, but this time we'll create centerline vectors. We first have to delete the outline vectors we just created (**Ctrl+A** to Select all). Every blue vector line on the screen will be highlighted with gray control points. Press the Delete key on your keyboard. All the vectors will disappear, leaving the original raster on screen.



To create centerline vectors press the **Vectorizing** button again. Select the 'Mechanical' setting from the pull-down Settings menu.

The maximum line width setting enables you to have both centerline and outline vectorization performed simultaneously, depending upon the line widths. We want centerlines only for this demonstration.

Click on **Adjust**. The setting for Maximum line thickness, which was previously grayed out, is now available. Increase this setting to its maximum, 3.0mm.

In **Drawing Entities** select 'Beziers and lines'. This will create Bezier vector line segments and straight line vector line segments and connect individual vector line segments together.

Now click on **Adjustments** to take a look at the other settings. Adjust the Precision to 0.14 mm. Leave Noise set to 0.20 mm.

Go back to the **Settings** screen. Click to highlight **Mechanical** in the setting field, key in 'Tawa demo', then click **Save**. This creates a permanent record of the setting with our adjustments. Click **OK** to close the **Trace** settings. Since you saved your setting, the **Mechanical Setting** will be stored for future use.

The words 'Tawa demo' will appear in the box.

This shows that the settings you just saved will be used for the vectorization. Click **Start**. *TracTrix* will convert the raster image to vectors. This time it will create vectors which follow the centerlines of the original lines within the +/- 0.14mm tolerance set for **Precision** in the **Trace** parameters box.

When the vectorization is complete the blue vector lines are displayed on screen.

Industry-specific techniques

Sign-making/NC

Vinyl cutters, laser-cutting machines, engravers and routers have 2D motion systems that require smooth and continuous vector lines.

To reduce points and for smoother lines, set Precision (in Trace Settings) to 1mm. This tells *TracTrix* to follow the original line but allows it to deviate within +/- 1mm for optimum smoothing and minimum vector points. This effectively adheres to the line but reduces vector points by ignoring the small jaggies that are present in all raster files. Each vector point is a signal for the machine either to stop, start, or change direction. Fewer vector points allow the machine to cut longer and smoother continuous lines.



Save your work. It will be named 'tawademo.cal.TRX'. This .TRX file contains a copy of your original raster image and the vectors created from it.

The .TRX format is used only by *Trix DrawingCenter* and *TracTrix* to save and store work. It can contain raster only images or hybrid raster with vector images.

Exercise

In your own time we suggest you experiment with the effect of changing the **Precision** setting in the **Trace parameters** box. Start by zooming in on the vectors we've just created. Note how closely they follow the original center lines. Then delete all the vectors (see the instructions earlier on how to do this). Change the **Precision** settings and vectorize again. Zoom in and examine the new vectors. You'll see how this change in setting affects how closely *TracTrix* follows the original. See the examples opposite. Although *TracTrix* settings are simple, it pays to think about them before each vectorization. Once you have experimented a little with the effects of changing the settings you'll find it easy to establish the optimum settings.


Successful Vectorization Rule #4:


Careful selection of trace settings will optimize the type and quantity of vector entities you create.

Editing the vectors that you created

TracTrix provides tools to edit the newly created vectors. Open the <tawademo.cal.TRX> file in your **Examples** folder. Use the **Zoom** tool to zoom in on the text in the lower right-hand corner of the image. You should see something like this:



We will use the vector editing tools to tidy up the vectors that represent the text. Click on the **Vector editing** tool  icon. Start by clicking once on any blue vector. The entire vector 'entity' is selected and appears as a dashed line.

Position the point of the cursor arrow over any part of the dashed line. Hold down the left mouse button and drag. The entire vector entity moves. Release the mouse button. To return the vector to its original state select,  **Undo** from the top menu bar or type **Alt-backspace**.

Click on the vector line again to select it. Position the cursor exactly on the center of one of the small circles or squares on the dashed line. These small squares or circles are called corners. Again hold down the left mouse button and drag. This time the dashed line on either side of the corner moves while the remainder of the line remains in its original position.



You will also see that when you select a corner it 'sprouts' gray lines. These gray lines and squares are called handles. They control the shape of a line on either side of a corner (corners at the end of a vector line sprout only one handle).

Position the cursor over a solid gray square at the end of a handle and hold down the left mouse button. Slowly drag the mouse. Watch how the shape of the line changes.

Some corners are represented as circles, others as squares. Try manipulating the handles on each type. When you select and move a handle on a square corner the vector line adjacent to the handle changes shape but the vector line on the far side of the square corner does not move.

When you select and move a handle on a circular corner it changes the shape of the lines on both sides of the corner. Circular corners are called locked corners because the shape of the line on one side of the corner is 'locked' to the shape on the other side. The square corners are called unlocked corners.

You can also snap two lines together to form a single connected line using the **Polygon** and **Snap**.

Select the endpoint of a line. The cursor changes to show a box with a key icon. Continue dragging until the points snap to one another—the connection is indicated when both vectors become one dashed entity.

Experiment with adjusting the shape and positions of the lines using the corners. You can also delete entire lines once they have been selected. Use the Delete key for this.

You'll probably have noticed by now that each line segment in the vector lines created by *TracTrix* is joined to its neighbor. This is because the 'Beziers and lines' box in the Trace settings was selected prior to vectorization. To disconnect two lines use the left mouse button to select a corner point where you want a disconnect to occur (you'll see the handles appear when the corner has been correctly selected). Right-click/**Break**. Deselect the vector line by clicking outside it. The dashed appearance changes to a solid blue line. Then reselect it. Hold the left mouse button down and drag the line. The line segment on the other side of the break remains in position. You can also insert a break in the middle of a selected vector line segment by putting the cursor where you want the break to occur and hold down the right mouse button and proceed as above where you separated lines at a corner. Entirely new vectors can be added by using the vector line, arc, circle or Bezier tools available under the **Start** tab.


Experiment with vector editing until you are comfortable with manipulating the vectors.


Successful Vectorization Rule #5:

Edit vectors in *TracTrix* (where you have access to specifically-designed tools)
before you save in a specific CAD format.


Saving your vectors to CAD

Before saving the vectors in a specific vector file format refer to your CAD, CAM, NC or Design software manual to check which vector file format or formats it will import or open.

Click the **Drawing**  toggle to switch the raster layer off. For this exercise we will export the vectors representing the Tawa figure but omit the text box and base line.

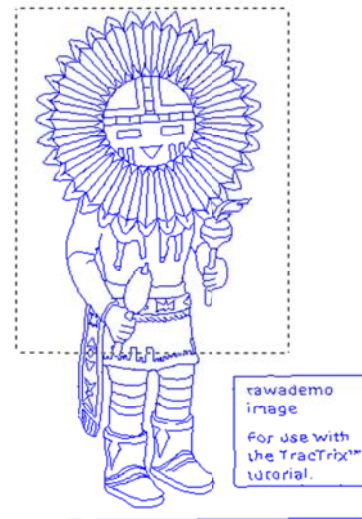
 **Select** an area of vectors in the top half of the image.

Now hold down the **Shift** key and select the lower-right box of text—the remaining vectors in the Tawa figure are added to the selection. The text box and footer line should be outside this rectangle.

File  Save As... Enter *tawavect* as the file name and select the output vector format you require, then click on **Save**.

TracTrix gives you the option to save the vector lines as any one of several CAD formats and automatically appends the three-character extension to the *tawavect* name. For example, if you selected DXF output *TracTrix* has saved the file as <tawavect.dxf>.

Open your CAD, NC or Design software and follow its instructions for importing the vector file that you have just created. *TracTrix* does not need to be open while you do this.



Using OCR to convert raster text to ASCII

In this section of the tutorial we convert raster text to vector text. In [Exercise 1](#) we demonstrate text recognition by converting an example file using our supplied text recognition library. In the next exercise we create a new text recognition library.

Using an existing text recognition library


In *TracTrix*, navigate to the Examples folder in the *TracTrix* folder and open <Plan1.tif>.


The image shows an architectural drawing. We want to create vectors from the centerlines of the drawing and we want to create ASCII text from the characters and digits in the raster image. The text is processed first—this enables us to delete the raster text before vectorizing the linework.

Click on the **Character Recognition** icon on the **Tools** tab.



In the **Text Recognition** window select **Settings**, and check that the **Active network** field at the foot of the window shows a file path to 'DefNet.ndb.'


If it does not, click , navigate to the **Program Files/TracTrix** folder and select it.


Click on **Start**, then on .

TracTrix 'looks' through the drawing to locate text regions and presents them one at a time in the window.

The large field shows the raster text being processed; the text field underneath shows *TracTrix*' interpretation of this text (also shown in red behind the raster text window).


Use the slider for zooming the raster text. Also, as you can see at the bottom of the window, there is a font specified. Change the TrueType font by clicking on the Font buttons and making the necessary adjustments.

If *TracTrix* converted the text correctly, use  to move on to the next text string. All the text should be correctly identified until you get to the drawing number **44901_01**.

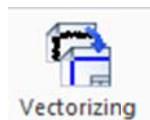
Edit the incorrectly converted text in the text field and confirm the change by clicking on the  button.


You have now reviewed and edited each text row. Click **OK**.

TracTrix asks 'erase the raster under the converted text'. Click **Yes** and the raster text in the drawing is replaced with ASCII text (in the same color as the vector layer in which you are working).

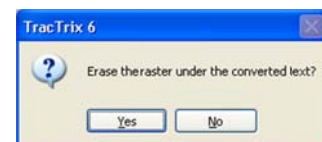
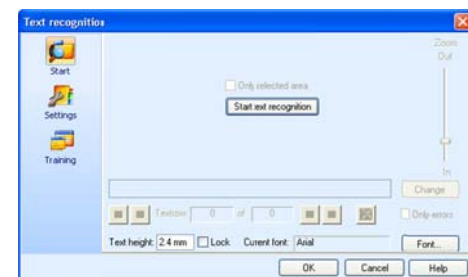
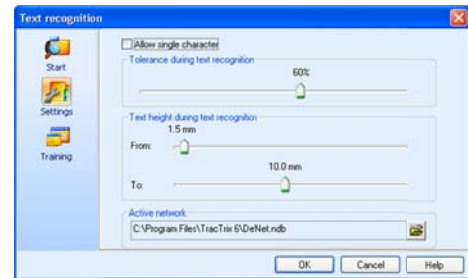
TracTrix may have ignored solitary raster 'T' and 'G' shapes where they are boxed-in by lines. This occurred because **Allow single characters** was left unchecked in the OCR settings. In instances such as this, use the **Text** tool  to add the characters.

Now that you've completed the text conversion you can move on to vectorizing the lines.



Click on **Vectorizing**; a dialogue box appears. Choose **Architecture** from the drop-down menu of predefined settings and click .

All the raster elements remaining in the drawing are vectorized as line work that



can be edited as needed. Finally use File  to export the CAD format you require.

Creating a character recognition library

There are an almost infinite number of text styles in drawings. In addition to the many typefaces produced as output from CAD programs there are characters manually created using stencils and, particularly on older drawings, hand-drawn text.

TracTrix provides the user with the ability to create and save custom libraries (or databases) of raster image text and the equivalent ASCII text. For example, you might create a specific library to be used when converting drawings hand-drawn by one or more individuals. This library would be trained to recognize the characters created by each of them. For another set of drawings where the draftsman employed a unique set of stencils, a separate text recognition library would be created.


TracTrix creates text recognition libraries in two stages. In this first stage you create a raw database which contains 'pictures' of the raster text characters and the actual text which you choose to associate with them. When you have completed this database of pictures and text, *TracTrix* will take care of the second stage by processing it using neural network technology to create the text recognition library. These text recognition libraries are called *net databases*.

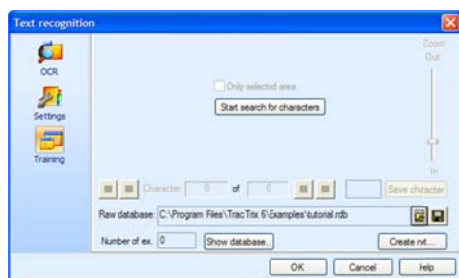
The initial creation of a library requires a semi-manual conversion process. This can be quite time-consuming compared with the subsequent automatic conversions. This time is the investment necessary to enable later automatic conversions of drawings from the same type or font 'family'.

For this exercise we'll recreate a text recognition library suitable for use with Plan1.tif. (If you have just completed the exercise above, close the file, do not save changes, and reopen it so that no vectors are showing.)


Click on the **Character Recognition** icon on the **Tools** tab and select **Training**.





Click on  to create a new raw database. Name it *tutorial.rdb* and save it in the **TracTrix/Examples** folder.




Open the database--click  and select <tutorial.rdb>.

Click . *TracTrix* searches the raster image identifying the raster elements which it sees as characters. The first raster character is presented in the large window.

Use your keyboard to enter the actual character in the smaller window below. Use **Enter** to save the character and move on to the next one. You should find that, although there are quite a large number of characters, rapid progress can be made.

When all the characters have been manually identified click , and then click  to save a new net database—save it as *tutorial.ndb*. Wait patiently as *TracTrix* saves this net database which contains the text recognition information created from the unique text in the <Plan1.tif> image.

In order to use the <tutorial.ndb> that you have just created select it in the **Text Recognition Settings Active** network box at the foot of the window.

Begin the OCR process by selecting . This repeats the first exercise in this tutorial using your new net database. You may need to change the font to one that closely resembles the one on the drawing. As you've just used <Plan1.tif> to train and create the <tutorial.ndb> net database, the results of this conversion will be satisfactory, as you expect.

A fairer test and illustration is to take a set of your own drawings created by one individual draftsman or employing the same fonts, open a typical drawing from the set in *TracTrix* and use the training function to develop an .rdb database. Once you have identified all the characters, create an .ndb file from the .rdb as you did above. Then select and use this .ndb file on the remainder of the drawings from your set. If the characters used in the training file were reasonably representative of those in the entire set you should find that text is correctly recognized most of the time.

Additional characters can be added to the raster database (rdb) files at any time from new drawings. When the rdb database is then recompiled into the neural net database (ndb), file recognition will be improved across the entire set.

Converting color images to vectors

The ideal color original contains only spot colors, as opposed to blended colors or colors that fade into one another. We have included an example of such a file in the **Examples** folder. The file name is <spotclr.png>. Open the file and zoom in on the colors and color boundaries in this image to see examples of pure spot colors.



Real life rarely provides such simple images. Now go to **File – Open** and choose the file <Blume.jpg> from the **Examples** folder.




The <blume.jpg> flower image is far more typical of a color image. It has thousands of different color hues. Converting this image in its original state, *TracTrix* would convert the colors into 256 individual vector layers. This is unlikely to be of practical use. Instead we change the raster <blume.jpg> so that it contains a

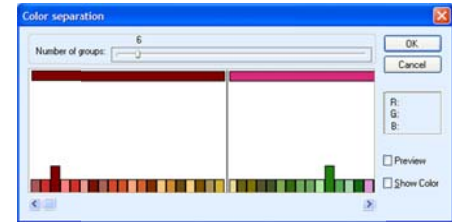
TracTrix places a limit of 256 colors on its separation tool. 8-bit images can contain up to 256 colors. All images of more than 8-bit depth must therefore be converted to 8-bit before they can be processed by the color separation tool.

manageable, relatively small set of colors for *TracTrix* to vectorize. These colors have to be ordered in such a way that the resulting vectors reasonably depict the petals and leaves in the original image. This is no small task, given the multitude of colors and tones, which run together in the original image.

The process used to achieve this is known as *color separation*. This separates all the colors in the image into a few groups, each containing similar colors. Once this is done each group is replaced with a single spot color that represents the colors in the group.

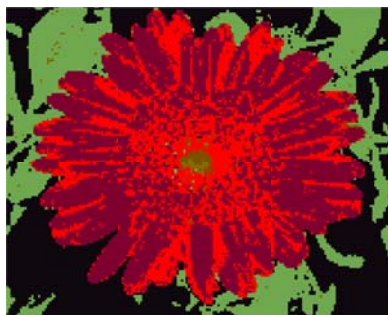
To demonstrate this, click  **Color Separation** under the **Draw** tab. A window appears stating: *This file contains more than 256 colors and must be converted.* Click **OK**.

TracTrix then analyses the image and reduces the number of colors to a selection of 6, which it calculates as representative of the original thousands of colors. The colors in the <blume.jpg> image will change to reflect this.



Each group of colors is separated in the color separation window by a vertical line known as a *delimiter*. Use the scroll bar at the foot of the window to examine how *TracTrix* has separated the original colors. The height of each colored bar represents the relative quantity of pixels of that color. In effect we are graphing the distribution of the colors. This graph is known as a color *histogram*.

It is possible to edit the position of each color. However, for the purposes of this example, accept *TracTrix* selection of 6 groups and click on **OK**.



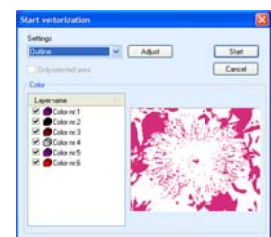
The *blume* image changes to reflect the reduction in colors from 256 to six colors. Although not as attractive as the original, the shapes of the petals and leaves can be seen clearly as spot colors in the new image.

Beauty is in the eye of the beholder. Our human eyes liked the original with its thousands of colors. *TracTrix* would have hated it. If you are a vectorizing machine a few spot colors are your ideal.

Go to the vectorizing tool under the Tools tab.  Click **Adjust**.

The trace settings box is displayed.


Select **Outline** as the trace setting (this will give us outline vectors around the petals). Now vectorize it by clicking on **Start**.

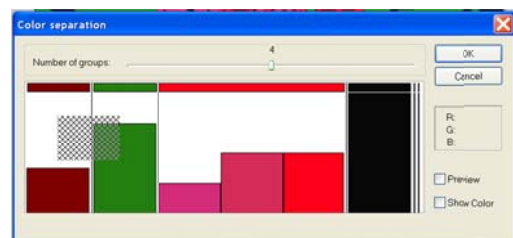


The resulting vectors can then be edited in the normal way using the *TracTrix* vector editing tools before they are exported to the required CAD or NC format. Each color is saved to a separate vector layer for vector editing.

Merging color groups

Sometimes *TracTrix* interprets more colors than there really should be for effective vectorization. You can prevent this by intervening during Color Separation and merging groups into single colors.

Re-open the original <blume.jpg> image and choose  **Color Separation**. The window appears stating: *This file*



contains more than 256 colors and must be converted. Click on **OK**. Again, six color groups are created. You can manually merge two groups together as follows.

Place the cursor in one of the two columns to be merged. Click and hold down the mouse button and drag. A cross-dashed representation of the group appears. Drag it to the target group's column. Release the mouse and the two groups will be merged into one new group. This will reduce the number of groups and therefore the number of vector colors eventually produced.

TracTrix starts its automatic color separation by estimating the number of individual color groups to create. If you would prefer a greater or smaller number of color groups, use the slider bar beside the **Number of groups**. *TracTrix* will recalculate and display a new set of groups.