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1 Introduction

With the release of Adobe Illustrator CS2 in late 2005 came a new feature that created a lot of hype and interest. The feature in question was Live Trace, which can be used to convert bitmaps and other raster images into vector shape compilations. Live Trace is very similar to the Bitmap Tracer that Xara has offered since 1995. Illustrator’s new Live Trace is particularly good for tracing line drawings, but the relatively old Xara Bitmap Tracer offers comparable line tracing output, and excels at full colour image tracing when the image has colour gradients. The Xara Bitmap Tracer is also considerably more efficient with memory usage, and is several times faster.

The Xara Bitmap Tracer works by building up a mosaic of overlaid shapes to form an approximation of the image being traced. Many people don’t appear to be aware of the range of results the Xara Tracer can produce. This tutorial will discuss the Tracer controls, and compare the output to that of Illustrator’s Live Trace.

Note 1: This .docx document has been written in MS Word 2007 in Print Layout View, and thus is printable. Furthermore, using the latest features of Xara, all images in the document were pasted from Xara, and thus are Xara objects; simply double clicking on them will load them directly back into Xara for easier, interactive inspection.

Note 2: A document tree is available in Word to see the structure of the document and make navigation easier:

- In Word 2003 and below: go to View > Document Map.
- In Word 2007: go to View tab > check Document Map checkbox in Show/Hide palette.
Note 3: This document also contains cross-references to key parts of the document. For example, Ctrl-clicking on text such as ‘Figure 2.1’ will cause the document to jump to the relevant location. Sections and figures references take advantage of this feature.

2 Bitmap Tracer Controls

This section will look at the Bitmap Tracer’s controls and what they do to the final traced image. Experience helps in knowing which settings are likely to have the biggest effects on the traced result. The skill in using the tracers is to be able to have the least number of control points and shapes and still have a good trace of the original bitmap.

In general, large bitmap images produce better traced results (because there is more information available for tracing), but also produce more shapes and result in more CPU power to manipulate afterwards.

2.1 Tracer control panel

The Bitmap Tracer control panel is shown in Figure 2.1, and can be accessed by selecting a bitmap, selecting the Utilities menu option, and selecting Bitmap Tracer. It’s also accessible by right-clicking on the bitmap and selecting the Bitmap Tracer option from the context menu. The top drop-down box on the left hand side allows the choice of bitmap in the Bitmap Gallery to be traced.
Figure 2.1. The Bitmap Tracer control panel.
2.2 Image type choice

The image type list allows you to select what general form of output the trace should produce. Figure 2.2 shows what output is produced for each setting.

Figure 2.2. Selecting the different image type outputs produces the results shown here. The choice of output would depend on your task and desired result.
2.3 Passes

The *Passes* setting determines how many parses of the image are made to complete the trace. Each successive parse produces more accurate shape layers. This option is only available for the photographic image type. Figure 2.3 shows the result when only the *Passes* setting is altered. It can be seen that typically at least 4 passes are required for the highest quality results.

![Figure 2.3. Increasing numbers of passes increases the quality of the trace, but also the number of objects constituting the image.](image)
2.4 Remove noise

The *Remove noise* setting is analogous to Illustrator’s *Blur* option, and determines how blurred the image is made in the background before the trace starts. This option, when used sparingly, can be useful for smoothing out artefacts, or giving blurred effects to the traced image as shown in Figure 2.4.

![Original bitmap image](image1.png) ![Low remove noise value](image2.png) ![High remove noise value](image3.png)

Figure 2.4. The *Remove noise* setting helps remove small noise artefacts from bitmaps that are not desired to be traced. It is analogous to a blur setting.

2.5 Minimum Area

The *Minimum Area* setting determines the threshold size of detail to be traced. The image below shows circles increasing in size from the centre of the image. Low values of this setting allow the smaller circles to be traced, whereas large values only allow the larger circles to be traced, as shown in Figure 2.5. More detailed and complex images are produced with the lowest value of this setting.
Figure 2.5. The Minimum Area setting determines the minimum size of detail to be traced. Larger values don’t include the smaller details.

2.6 Color tolerance

The Color tolerance settings determine how sensitive the trace is to the colour regions of an image. For a monochrome image type setting, these controls have no effect as there are only two colours: black and white. The greyscale and limited colour types allow control over the Final color tolerance only, whereas the photographic type allows control over both Initial and Final color tolerance for the successive passes that are available with this type. Large values of either Initial or Final color tolerance settings make the tracer more tolerant to colours, so fewer are displayed. Conversely, lower values make the tracer less tolerant to differences in colour regions in the image, and so more are traced making more detailed images.
For the photographic image type, multiple passes can be made, and each pass is less tolerant to colour than the last (i.e. more colours are successively built into the final traced image). The best image quality is produced if initially the tolerance is low, so general shapes are picked out, and the final tolerance is high, so in the latter parses, the finer coloured details are picked out. Figure 2.6 shows extremes and ideal settings for the photographic image type.
Figure 2.6. The Color tolerance settings determine how sensitive the trace is for each pass to colour. Low values of tolerance make the trace consider more colours, and vice-versa. For multi-parse traces, each successive trace is less tolerant to colour than the last (determined by the two values of tolerance) and more colours are successively worked into the trace.
2.7 Accuracy

The Accuracy setting is similar to Illustrator’s path fitting setting, and determines how accurately the traced shapes match the original bitmap ‘shapes’ (regions of similar colour). Figure 2.7 highlights this; higher accuracy results in more shapes and points and more CPU intensive traces.

Figure 2.7. The Accuracy setting determines how accurately the traced shapes match regions of similar colour in the bitmap.
2.8 Smoothing

The *Smoothing* setting refers to edge smoothing. It determines how many control points make up the individual shapes produced. High *Smoothing* values have very few points and so may not accurately match the original bitmap image shapes; whereas low *Smoothing* fits many control points for a better match. More control points generate more complex results that require more CPU power to manipulate later. Illustrator’s ‘corner angle’ setting is similar to this. Figure 2.8 emphasises the effects of this setting.

![Original bitmap image](image1)
![Low smoothing values](image2)
![High smoothing values](image3)

*Figure 2.8. The Smoothing setting determines how many control points make up the traced vector shapes. Lower values yield higher edge accuracy, but less smooth and more complex shapes.*
3 Tracer comparison

This section will compare Illustrator’s Live Trace with Xara’s ten-year-younger Bitmap Tracer. For the comparison, two types of image will be converted into vector shapes; the first is a simple black and white line sketch drawing, and the other is a full colour photo—both representing typical uses of tracing utilities.

3.1 Line drawing

Adobe Illustrator provides a sketch of ‘AdobeMan’ (Figure 3.1) to test the Live Trace feature with, and so we’ll use that here. Double click the image to edit in Xara.

![Image of 'AdobeMan'; double click to edit in Xara.](image)
By selecting “black and white logo” from the preset menu in Illustrator (Figure 3.2), a suitable trace is performed and takes several seconds (on my machine).

Figure 3.2. Tracing the image in Adobe Illustrator. Further tweaking can be made using the options dialogue; however for our purposes the result is fine and can be seen here.
Now to trace in Xara: load the image into Xara, and right click. Select *Bitmap Tracer* to bring up the tracer options. This image is a greyscale image; it contains black, white, and shades of grey (for antialiasing). This type of image is thus best traced by selecting “Greyscale” from the drop down box. The finest results are achieved by selecting the settings shown in Figure 3.3. For images like this, *Remove noise* acts to remove detail in a similar fashion to *Minimum area*, therefore its setting is set to low.

![Figure 3.3. Tracing the image in Xara.](image-url)
• *Initial colour tolerance* is dimmed out because this is a grey scale image with a limited range of colours.

• *Final colour tolerance* should be set to maximum so that the fewest shades of grey are used to produce the cleanest result. Lower values will produce a messy result because the tracer will be more sensitive to the shades of grey at the edge of the lines.

• *Accuracy* should be set to its maximum value, as the result for these greyscale line images will have the fewest shapes that most closely match.

• *Smoothing* determines how closely the vector shapes match the size of the features in the bitmap image that are allowed by the *Minimum Area* value, by increasing the number of control points that make up the closed shapes. In this case the *Minimum Area* value was set to its lowest, and thus low smoothing would produce pixel-like outlines. A maximum value however can result in loss of accuracy in the mapping of the curved edges of the shapes to the bitmap image. Thus, smoothing was set to a value of about 30.

Click trace and notice the speed of tracing relative to the Live Trace of Illustrator—it took my machine just over 1 second to trace. The trace can now be inserted into the document, and consists of just a few hundred shapes. The two traces are comparable in accuracy as can be seen below in the zoom region of the utility belt (Figure 3.4). Only when zoomed in by several hundred percent is it clear that the Xara tracer shows slightly lower edge accuracy for this type of image tracing. This is due to the mosaic-like construction of images produced by the Bitmap Tracer. It’s likely that many years ago when Xara’s tracer was first developed, the primary use was to trace the second type of image—full colour photos which will be traced next.
3.1.1 Guest Tutorials

Paul Söderholm in Guest tutorial 49 on the Xara Xone used a number of different software packages to edit and trace the image before inserting into Xara for completion. Just to highlight that the final result is possible without ever leaving Xara, the original, unedited image used will be traced. Following the above procedure, the Xara trace is shown below in Figure 3.5 and consists of approximately 100 shapes. Paul later readdressed this in Guest tutorial 62.
Figure 3.5. Example of a full line sketch, trace and fill in Xara (double-click to load into Xara and inspect). Originally part of Guest Tutorial 49 on the Xara Xone.
3.2 Full colour photo

For full colour image tracing, the bitmap image used is shown in Figure 3.6 (double-click to edit). This is a complex image that would test the tracers.

![Full colour test image](image)

**Figure 3.6.** Full colour test image used test both tracers. Double-click to load into Xara.

The settings used to trace this image in both applications are shown in Figure 3.7. These settings were chosen to maximise the quality and accuracy of the traced image.
Figure 3.7. Tracer settings used for each application.
The traced results are shown in Figure 3.8 and a smaller (but still 100% zoom) section of the traced image is shown for clarity:

*Figure 3.8. Results from the tracers.*
The results show that both traces are comparable in quality at these settings. The most interesting aspect of this comparison isn’t the comparable image quality of brand new software with relatively old software, but the practicalities of doing the tracing. Illustrator CS2 took 92 seconds to trace the image on my machine, and sent RAM usage through the roof. In fact, more than 1 gigabyte of RAM was required after a few re-traces with different settings; windows may run low on virtual memory causing your computer to crunch to a halt, requiring a restart! However, Xara at maximum quality settings took just 5 seconds to trace the image, and even after many re-traces used very little memory in comparison. It is considerably more practical to do the trace in Xara.

One more image will be examined; this image has a lot of gradual smooth changes in colour. Again these images were traced in both applications with the settings shown (for maximum quality traces). Live Trace took 30 seconds; Xara took just 8 on my machine. Live Trace also ate up a huge amount of memory again.
You can see that in this case, Xara does a noticeably better job at tracing smooth colour changes on the spheres owing to its diffusive mosaic compilation. This same technique however makes the Bitmap Tracer less ideal for tracing line drawings—but it is nevertheless doable with acceptable results. Live Trace has the advantage for simple black and white line drawings; Xara’s Bitmap Tracer has the advantage when it comes to much more complex images involving smooth colour transitions. The Bitmap Tracer is also far more efficient with memory and time of tracing, and is thus far more practical to use.
4 Other Tracers

4.1 Corel Draw X3 PowerTRACE

A new tracer was released with CorelDraw X3 known as PowerTRACE; this tracer shares similarities with Adobe Illustrator’s Live Trace. It produces good results when tracing simple line drawings or logos, but when subjected to tracing full colour photos, the output is considerably poorer than either Live Trace or the Bitmap Tracer—even for photos not containing colour gradients. This is shown in Figure 4.1.

Figure 4.1. Traces produced by CorelDraw X3’s PowerTRACE of the exact same full colour photos used earlier. All settings were set to produce the highest quality traces. The output of edges is comparable with Adobe Illustrator; however photos and colour gradients are noticeably lower in quality.
4.2 VectorMagic

Another tracer has been recently launched online at http://vectormagic.stanford.edu/. VectorMagic produces traces of line drawings or non-photo images that are of the highest quality of any tracer that has been tested here. For full colour, complex photos, the quality is superior to Corel Draw X3’s output, but not as good as Illustrator’s—details are lost, as seen in Figure 4.2. Colour gradients are very well traced however, and are of higher quality than Live Trace or PowerTRACE; Xara’s Bitmap Tracer however produces better results owing to its mosaic-like object placement.

Figure 4.2. Traces produced by VectorMagic of the exact same full colour photos used earlier. Edge quality is the highest of the tracers examined, gradients are the second highest quality, but full photos lose fine detail.
VectorMagic currently seems geared toward producing high quality edge-tracing output for line drawings and logos—in which it excels, rather than output for photos or colour gradients—but even these are of high quality. Typically, its tracing speed is quicker than Illustrator, but slower than Xara. Once tracing is complete, the web-based program currently allows you to save the image in EPS or SVG vector formats, but not PDF or XAR.

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