

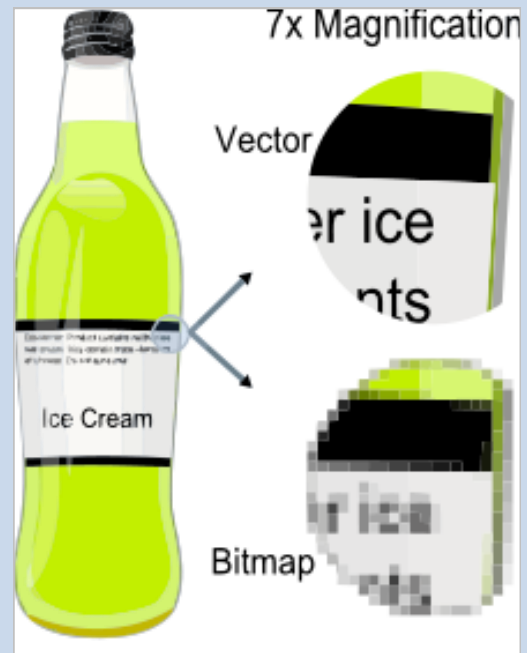
Vector Graphics

Source: [Wikipedia](http://en.wikipedia.org/wiki/Vector_graphics) ; article: "Vector Graphics" http://en.wikipedia.org/wiki/Vector_graphics

Vector graphics is the use of geometrical primitives such as points, lines, curves, and shapes or polygon(s), which are all based on mathematical expressions, to represent images in computer graphics. "Vector", in this context, implies more than a straight line.

Vector graphics are based on vectors (also called paths, or strokes) which lead through locations called control points. Each of these points has a definite position on the x and y axes of the work plan. Each point, as well, is a variety of database, including the location of the point in the work space and the direction of the vector (which is what defines the direction of the track). Each track can be assigned a color, a shape, a thickness and also a fill. This does not affect the size of the files in a substantial way because all information resides in the structure; it describes how to draw the vector.

Example (right) showing effect of vector graphics versus raster graphics. The original vector-based illustration is at the left. The upper-right image illustrates magnification of 7x as a vector graphic. The lower-right illustrates the same magnification as a raster (bitmap) graphic. Raster images are based on pixels and so when scaled there is a loss of clarity, while vector-based graphics can be scaled by any amount without degrading quality.



Computer displays are made up from grids of small rectangular cells called pixels; the term comes from "picture elements". The picture is built up from these cells. The smaller and closer the cells are together, the better the quality (resolution) of the image, but a larger file is required to store the increased pixel count. However, modern storage devices and working memory have gigabyte, even terabyte capacities, so there is less need for particularly compact forms of data.

Modern displays and printers are raster devices; vector formats have to be converted to raster format (bitmaps – pixel arrays) before they can be rendered (displayed or printed). The size of the bitmap/raster-format file generated by the conversion will depend on the resolution required, but the size of the vector file generating the bitmap/raster file will always remain the same. Thus, it is easy to convert from a vector file to a range of bitmap/raster file formats but it is much more difficult to go in the opposite direction, especially if subsequent editing of the vector picture is required. It might be an advantage to save an image created from a vector source file as a bitmap/raster format, because different systems have different (and incompatible)

vector formats, and some might not support vector graphics at all. However, once a file is converted from the vector format, it is likely to be bigger, and it loses the advantage of scalability without loss of resolution. It will also no longer be possible to edit individual parts of the image as discrete objects. The file size of a vector graphic image depends on the number of graphic elements it contains; it is a list of descriptions.

In computer typography, modern outline fonts describe printable characters (glyphs) by cubic or quadratic mathematical curves with control points. Nevertheless, bitmap fonts are still in use. Converting outlines requires filling them in; converting to bitmaps is not trivial, because bitmaps often don't have sufficient resolution to avoid "stairstepping" ("aliasing"), especially with smaller visible character sizes. Processing outline character data in sophisticated fashion to create satisfactory bitmaps for rendering is called "hinting".

Although the term implies suggestion, the process is deterministic, and done by executable code, essentially a special-purpose computer language. While automatic hinting is possible, results can be inferior to that done by experts.

Vector formats are not always appropriate in graphics work. For example, devices such as cameras and scanners produce essentially continuous-tone raster graphics that are impractical to convert into vectors, and so for this type of work, an image editor will operate on the pixels rather than on drawing objects defined by mathematical expressions. Comprehensive graphics tools will combine images from vector and raster sources, and may provide editing tools for both, since some parts of an image could come from a camera source, and others could have been drawn using vector tools.

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