

Vector vs Raster Graphics

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Before we begin with what vector graphics and raster graphics are, we must understand a few basic terms:

Pixel : In Computer graphics a pixel, dots, or picture element is a physical point in a picture. A pixel is simply the smallest addressable element of a picture represented on a screen.

A majority of pictures that we see on our computer screen are raster images. The selfie that you click with your mobile phone is another example of a raster image. An image is made up using a collection of pixels referred to as a bitmap.

Bitmap : In computer graphics, a bitmap is a mapping from some domain (for example, a range of integers) to bits, that is, values which are zero or one. It is also called a bit array or bitmap index. The more general term pixmap refers to a map of pixels, where each one may store more than two colors, thus using more than one bit per pixel. Often bitmap is used for this as well. In some contexts, the term bitmap implies one bit per pixel, while pixmap is used for images with multiple bits per pixel.

Raster Graphics

Raster images use bit maps to store information. This means a large file needs a large bitmap. The larger the image, the more disk space the image file will take up. As an example, a 640 x 480 image requires information to be stored for 307,200 pixels, while a 3072 x 2048 image (from a 6.3 Megapixel digital camera) needs to store information for a whopping 6,291,456 pixels. We use algorithms which compress images to help reduce these file sizes. Image formats like jpeg and gif are common compressed image formats. Scaling down these images is easy but enlarging a bitmap makes it pixelated or simply blurred. Hence for images which need to be scaled to different sizes, we use vector graphics.

File extensions: .BMP, .TIF, .GIF, .JPG

Vector Graphics

Making use of sequential commands or mathematical statements or programs which place lines or shapes in a 2-D or 3-D environment is referred to as Vector Graphics. Vector graphics are best for printing since it is composed of a series of mathematical curves. As a result vector graphics print crisply even when they are enlarged. In physics: A vector is something which has a magnitude and

direction. In vector graphics, the file is created and saved as a sequence of vector statements. Rather than having a bit in the file for each bit of line drawing we use commands which describe series of points to be connected.

As a result a much smaller file is obtained.

File extensions : .SVG, .EPS, .PDF, .AI, .DXF

Conversions:

1. **Vector to Raster :** Printers and display devices are raster devices. As a result we need to convert vector images to raster format before they can be used i.e displayed or printed. The required resolution plays a vital role in determining the size of raster file generated. Here it is important to note that the size of vector image to be converted always remains the same. It is convenient to convert a vector file to a range of bitmap/raster file formats but going down opposite path is harder.(because at times we need to edit the image while converting from raster to vector)
2. **Raster to Vector :** Image tracing in computing can be referred to vectorization and it's simply the conversion of raster images to vector images. An interesting application of vectorization is to update images and recover work. Vectorization can be used to retrieve information that we have lost. Paint in Microsoft Windows produces a bitmap output file. It is easy to notice jagged lines in Paint. In this kind of a conversion the image size reduces drastically. As a result an exact conversion is not possible in this scenario. Due to various approximations and editing that is done in the process of conversion the converted images are not of good quality.

Differences between Vector and Raster graphics

The main difference between vector and raster graphics is that raster graphics are composed of pixels, while vector graphics are composed of paths. A raster graphic, such as a gif or jpeg, is an

array of pixels of various colors, which together form an image.

Raster Graphics	Vector Graphics
They are composed of pixels.	They are composed of paths.
In Raster Graphics, refresh process is independent of the complexity of the image.	Vector displays flicker when the number of primitives in the image become too large.
Graphic primitives are specified in terms of end points and must be scan converted into corresponding pixels.	Scan conversion is not required.
Raster graphics can draw mathematical curves, polygons and boundaries of curved primitives only by pixel approximation.	Vector graphics draw continuous and smooth lines.
Raster graphics cost less.	Vector graphics cost more as compared to raster graphics.
They occupy more space which depends on image quality.	They occupy less space.
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