

1.6 Graphics Packages

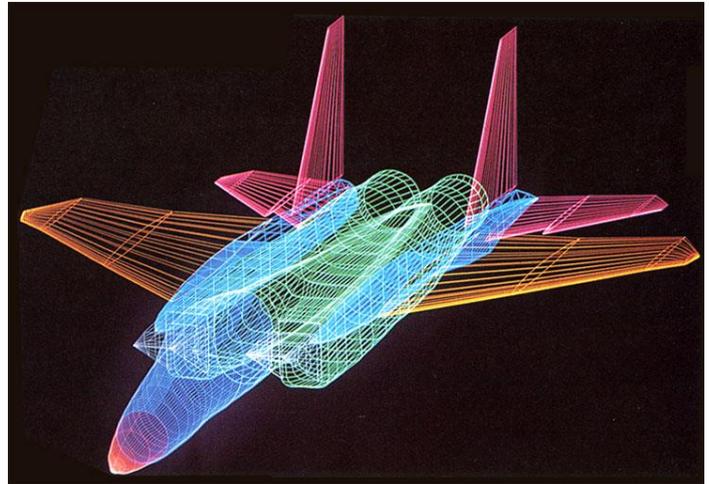
Graphics

Graphics refers to any computer device or program that makes a computer capable of displaying and manipulating pictures. The term also refers to the images themselves.

A **graphics monitor** is a display monitor that can display pictures. A **graphics board** (or **graphics card**) is a printed circuit board that, when installed in a computer, permits the computer to display pictures.

Many software applications include graphics components. Such programs are said to support graphics. For example, certain word processors support graphics because they let you draw or import pictures. All

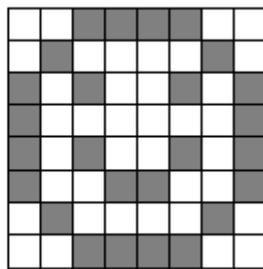
CAD/CAM systems support graphics. Some database management systems and spreadsheet programs support graphics because they let you display data in the form of graphs and charts. Such applications are often referred to as business graphics.



Bit-mapped Graphics and Vector Graphics

A **bit-map** is a representation, consisting of rows and columns of dots, of a graphics image in computer memory. The value of each dot (whether it is filled in or not) is stored in one or more bits of data. For simple monochrome images, one bit is sufficient to represent each dot, but for colors and shades of gray, each dot requires more than one bit of data. The more bits used to represent a dot, the more colors and shades of gray that can be represented.

```
00111100
01000010
10100101
10000001
10100101
10011001
01000010
00111100
```



The density of the dots, known as the **resolution**, determines how sharply the image is represented. This is often expressed in dots per inch (dpi) or simply by the number of rows and columns, such as 640 by 480.

To display a bit-mapped image on a monitor or to print it on a printer, the computer translates the bit map into pixels (for display screens) or ink dots (for printers). Optical scanners and fax machines work by transforming text or pictures on paper into bit maps.

Bit-mapped graphics are often referred to as **raster graphics**. The other method for representing images is known as vector graphics or object-oriented graphics. With **vector graphics**, images are represented as mathematical formulas that define all the shapes in the image. Vector graphics are more flexible



than bit-mapped graphics because they look the same even when you scale them to different sizes. In contrast, bit-mapped graphics become ragged when you shrink or enlarge them.

Fonts represented with vector graphics are called scalable fonts, outline fonts, or vector fonts. The best-known example of a vector font system is PostScript. Bit-mapped fonts, also called raster fonts, must be designed for a specific device and a specific size and resolution.

Graphics Applications

The following are also considered **graphics applications**:

- **Paint programs:** These allow you to create rough freehand drawings. The images are stored as bit maps and can easily be edited.
- **Illustration/design programs:** Support more advanced features than paint programs, particularly for drawing curved lines. The images are usually stored in vector-based formats. Illustration/design programs are often called draw programs.
- **Presentation graphics software:** Lets you create bar charts, pie charts, graphics, and other types of images for slide shows and reports. The charts can be based on data imported from spreadsheet applications.
- **Animation software:** Enables you to chain and sequence a series of images to simulate movement. Each image is like a frame in a movie.
- **CAD software:** CAD stands for Computer-Aided Design. This software enables architects and engineers to draft designs.
- **Desktop publishing:** Provides a full set of word-processing features as well as fine control over placement of text and graphics, so that you can create newsletters, advertisements, books, and other types of documents.



In general, applications that support graphics require a powerful CPU and a large amount of memory. Many graphics applications - for example, computer animation systems - require more computing power than is available on personal computers

and will run only on powerful workstations or specially designed graphics computers. This is true of all three-dimensional computer graphics applications.

In addition to the CPU and memory, graphics software requires a graphics monitor and support for one of the many graphics standards. Most PC programs, for instance, require VGA graphics.

VGA

VGA stands for video graphics array, a graphics display system for PCs developed by IBM. VGA has become one of the de facto standards for PCs. In text mode, VGA systems provide a resolution of 720 by 400 pixels. In graphics mode, the resolution is either 640 by 480 (with 16 colours) or 320 by 200 (with 256 colours).



Unlike earlier graphics standards for PCs (MDA, CGA, and EGA) VGA uses analogue signals rather than digital signals. Consequently, a monitor designed for one of the older standards will not be able to use VGA.

Since its introduction in 1987, several other standards have been developed that offer greater resolution and more colours (e.g. SVGA, 8514/A graphics

standard, and XGA), but VGA remains the lowest common denominator. All PCs made today support VGA, and possibly some other more advanced standard.

Palette

(1) In computer graphics, a **palette** is the set of available colours. For a given application, the palette may be only a subset of all the colours that can be physically displayed. For example, a SVGA system can display 16 million unique colours, but a given program would use only 256 of them at a time if the display is in 256-color mode. The computer system's palette, therefore, would consist of the 16 million colours, but the program's palette would contain only the 256-color subset.

A palette is also called a CLUT (colour look-up table).

On monochrome systems, the term palette is sometimes used to refer to the available fill patterns.

(2) In paint and illustration programs, a **palette** is a collection of symbols that represent drawing tools. For example, a simple palette might contain a paintbrush, a pencil, and an eraser.



Graphics File Formats

A **graphics file format** is a file format designed specifically for representing graphical images. Graphics file formats can be broadly categorized into bit-mapped formats and vector formats.

Some of the most used and common graphics formats used today are:

- **TIFF:**

- Stands for Tagged Image File Format.
- It is widely used in business, offices, and commercial printing environments. TIFF files are commonly used in desktop publishing, faxing, 3-D applications, and medical imaging applications.
- Stores bit-mapped images on personal computers (both PCs and Macintosh computers).
- TIFF graphics can be any resolution, and they can be black and white, grey-scaled, or colour.
- Several versions have been created, which does not guarantee compatibility between all programs.
- Files use the .tif and .tiff extensions.
- TIFF file sizes are reduced using one of several compression methods. LZW provides ratios of about 1.5:1 to 2:1. Ratios of 10:1 to 20:1 are possible for documents with large amounts of white space.
- Since the original TIFF standard was introduced, people have been making many small improvements to the format, so there are now around 50 variations of the TIFF format.
- Recently, JPEG has become the most popular universal format, because of its small file size and Internet compatibility.



- **JPEG:**

- Short for Joint Photographic Experts Group.
- JPEG is a **lossy compression** (compare with **lossless compression**) technique for colour images. Although it can reduce files sizes to about 5% of their normal size, some detail is lost in the compression.
- The JPEG format is very popular due to its variable compression range. JPEGs are saved on a sliding resolution scale based on the quality desired. For example, an image can be saved in high quality for photo printing, in medium quality for the Web and in low quality for attaching to e-mails, the latter providing the smallest file size for fastest transmission over slow connections.

- It is not suitable for graphs, charts and explanatory illustrations because the text appears fuzzy, especially at low resolutions. Compressing images in the GIF format is much better for such material.
- It depends on the image, but ratios of 10:1 to 20:1 may provide little noticeable loss. The more the loss can be tolerated, the more the image can be compressed.
- Compression is achieved by dividing the picture into tiny pixel blocks, which are halved over and over until the desired amount of compression is achieved. JPEGs can be created in software or hardware, the latter providing sufficient speed for real-time, on-the-fly compression.
- When you create a JPEG or convert an image from another format to a JPEG, you are asked to specify the quality of image you want. Since the highest quality results in the largest file, you can make a trade-off between image quality and file size.
- Together with the Graphic Interchange Format (GIF) and Portable Network Graphics (PNG) file formats, the JPEG is one of the image file formats supported on the World Wide Web, usually with the file suffix of ".jpg".



- **GIF:**
 - **GIF** stands for graphics interchange format, a bit-mapped graphics file format used by the World Wide Web, CompuServe and many BBSs. GIF supports colour and various resolutions.
 - It also includes data compression, but because it is limited to 256 colours, it is more effective for scanned images such as illustrations rather than colour photos.
 - GIFs and JPEGs: Both GIF and JPEG images are widely used on the Web and are supported by all Web software. Charts, screen shots and technical drawings are typically GIFs, because GIFs uses lossless compression, and the text is maintained properly. Photos are generally better rendered as JPEGs, which support 24-bit colour and can be highly compressed.
 - File extension: .gif.

- Animated GIF an image encoded in graphics interchange format (GIF), which contains a number of images or frames in a single file and is described by its own graphic control extension. The frames are presented in a specific order in order to convey animation. An animated GIF can loop endlessly or stop after a few sequences.
- **PNG:**
 - Short for Portable Network Graphics it is a new bit-mapped graphics format similar to GIF.
 - In contrast, PNG is completely patent- and license-free. The most recent versions of Netscape Navigator and Microsoft Internet Explorer now support PNG.
 - It is expected to eventually replace the GIF format, because there are lingering legal problems with GIFs.
 - PNG provides advanced graphics features such as 48-bit colour and colour correction, tight compression and the ability to display at one resolution and print at another.
 - Like a GIF, a PNG file is compressed in lossless fashion. Typically, an image in a PNG file can be 10 to 30% more compressed than in a GIF format.
 - File extension: .png



Graphic Features in Word Processors

Here is a list of a few graphic features in the latest word processors:

- Embedding a picture or logo etc. created by a graphics package.
- Embedding a chart etc. from a spreadsheet program, or a table from a database program.
- Clipart
- Shapes like flowchart symbols
- Libraries of graphical images.