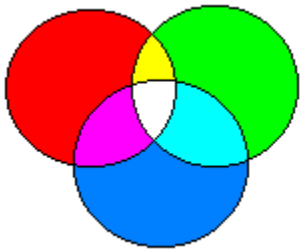
GRAPHIC APPLICATIONS SOFTWARE

Graphic files - Adding colour



The picture on a **computer monitor or Video Graphic Array (VGA)** , is made up of an array of dots, or**pixels** and is known as a **bitmap**. A typically display might consist of a line of 800 horizontal dots, each line is repeated vertically 600 times to make a **frame**. The number of dots in a frame is referred to as the **screen resolution**. The more dots, the higher the **resolution**, and the sharper the image.

This is exactly the same way pictures are produced in newspapers, or on film for example. If you use a magnifying glass you can easily seen the dots in a newspaper picture. Some software also allows you to **zoom** in are out of a picture, so at high magnification you can seen the individual pixels. The higher the resolution the sharper the image will be, and the finer the detail.

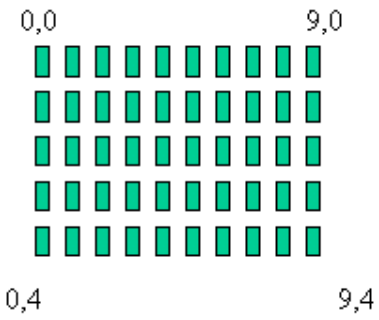
Colour images are formed using just three **primary colours** Red, Green and Blue (RGB). Within the computer colour information is added by increasing the number of bits (or bit planes) used to describe each dot (or **pixel**). e.g. 8 bits allows 256 colours or shades of gray (the **gray scale**).

1 bit	black or white
8 bit	256 colours or gray scale
16 bit	65,536 colours
24 bit	16,777,216 colours referred to as True colour

While this is similar to the way images are printed, there are some important differences. The **complementary colours** cyan, magenta and yellow (CMY) are used for printing as well as black. Because the pigments which make the coloured inks are not pure colours, the range of colours you can print is less than the range of possible colours you can see on a monitor.

Displaying shapes

. The idea that a basic shape is calculated can be applied to simple graphical shapes like, straight lines, rectangle, circle, (or ellipse) triangle. Now instead of storing the shape as a bitmap file, the application stores the **rules to draw the shape**.



This is then drawn onto the screen and saved as a bitmap when the user saves the drawing file.

The rules now need to use **a co-ordinate system** to specify which pixels must be changed to draw the shape. These are specified as **2 dimensional** (2D) **x,y co-ordinates.**

The diagram shows the co-ordinates of the pixels at each corner of the array. In this example the**origin of the co-ordinate system** (the pixel 0,0) is in the top left hand corner. So to draw a horizontal line across the middle of screen the following co-ordinates must be changed.

0,2	1,2	2,2	3,2	4,2	5,2	6,2	7,2	8,2	9,2

Vector Graphics

Suppose the picture to be stored is made up of simple shapes, such as a power point slide for example. Now instead of storing the **bitmap image** suppose instead we store the **instructions to draw the image**. So to store the straight line above we need to store

- the name of the shape, e.g**. Line**
- its starting point and end point e.g. 0,2 to 9,2
- Its colour

This uses far less memory and the method of storage is known as **vector graphics**. Now when the application opens the file it recalculates the image and draws it on the screen.

All CAD packages and many business graphics software applications, such as Libre Office Impress, or Microsofts Power Point use vector graphics to store the images they create.

A 3D CAD package for example will build a **wire frame model** of the object. This can then be covered with either a smooth surface or a textured surface. Architectural software may use a brick texture to cover a wire frame model of a building. The ability to manipulate 3D graphics generally relies on vector graphics. To make these images more realistic, **lighting and shading** effects can also be added.

Storing and transmitting image files

Storing bitmap images takes up a lot of memory. If the screen resolution is 800 x 600 pixels then a simple black and white image needs 480,000 bits (or 60,000 bytes). **Remember 8 bits = 1byte.**

If the screen was a colour monitor displaying 256 colours then each pixel needs 1 byte so the stored file is now 480,000 bytes. Images which are described as true colour use 24 bits to store the colour information (i.e. 16,777,216 colours) will need 1.44Mbytes. The different colours are produced by changing the mix of the 3 primary colours. Some graphics software will let you choose the mix for yourself. Bitmap files (.bmp) are **lossless and uncompressed**, and because of their size are not generally suitable for web applications

Image File compression

Bitmap files are given a file extension of **.bmp**. This way of saving images is actually very wasteful. There are various ways to **compress** image files. One format is to save the file as a **.gif** file. This will compress the file **without any loss of information**, i.e. it uses a **lossless compression algorithm.**, however this format can only handle 256 colours. An alternative to .gif is a .png (portable network graphics) format. This to uses a lossless compression algorithm, and consequently the file sizes are usually larger than an equivalent .jpg file.

An example of lossy compression is **.jpg** format. This will reduce the file size still further but at the expense of some loss of information, i.e.

lossy compression. Compression is achieved by making use of the redundant data in the file. Files with very little fine detail, but large areas of colour for example, should compress well. Most digital camera's use the .jpg format.

File compression is particularly important when images have to be transmitted over a network, e.g. web applications. Clearly the larger the file the longer it takes to transmit, and the more it costs! Again the larger the file the longer it will take to load onto the screen. In the case of compressed files although they may take less time to load from disk, they must at some stage be **unpacked** (decompressed) before they can be displayed.

Graphic application categories

Being able to express yourself with a graphical aid can be the difference between a bored audience and a receptive one. There is a wide range of graphical software available, and as packages have evolved, to add new features, many spill over into several categories, so its important you select the right package for the job.

- **Graphic design - Drawing, Illustrations, photo editing and animations (both 2D and 3D)**
  e.g. GIMP, Inkscape and Blender. The GIMP is the open source equivalent of (Adobe) Photoshop, the commercial brand leader. The GIMP has a plug-in extension called GAP (graphic animation package) which extends the basic functionality provided for animation.

Inkscape is an open source alternative to CoralDraw and Adobe Illustrator and is based on the W3C scalable vector graphics (SVG) standard.
For 3D grahics and animation, Blender is probably the most obvious choice, however you may find working in 3D initially rather daunting.

- **Business Presentations**

e.g. Libre Office Draw, or Libre Office impress.

- **Technical drawings (CAD both 2D and 3D**

e.g Librecad, openCASCADE and pythoncad. There are fewer open source packages in this category to rival the commercial brand leader, (Adobe) AutoCAD.

The primary advantage offered by computers is precision, so the first graphics packages were concerned with technical drawings. CAD packages today are highly specialised, and although not originally designed to be *art* tools many have evolved and spread into this category. At their heart is **vector graphics**.

Illustration packages

Many illustration packages are page orientated to produce striking full colour posters. Features include good text handling and eye catching special effects. For commercial printing it must be possible to colour separate your drawing.

Graphic drawing packages

While vector based graphic packages offer flexibility and control, if you want more "natural" looking illustrations, the alternative approach is bitmap graphics. Features to look for in illustration software are, **Masking, object retouching** and **colour separation**. Different images can be loaded into a single file, but kept separate on different **layers**. This is a feature also found in CAD packages In the case of CAD, different layers can be turned on or off to reveal different details. e.g. All dimensional information may be kept on one layer. This can be turned off while **panning** and **zooming** around a 3D image for instance.

Source : http://www.soslug.org/node/1742