Chapter 12

The World of Colours

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CHAPTER OVERVIEW

In this introductory chapter on multimedia graphics, we begin with discussions on the hardware side of graphics viz. colour display systems.

Two main parameters that control the quality of display – colour depth and resolution are dealt with in detail. Then we move on to the task of striking a fine balance between these two parameters, resulting in a particular video mode configuration. The most famous display system for the desktops, viz. the colour monitors, get a brief introduction - followed by a step-by-step methodology to configure video controller cards to required video modes.

We conclude the chapter with discussions on relatively lesser-known display systems – like public information display systems and presentation display systems.

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12.1 Introduction

Welcome to the wonderful world of colours!

But for those tens and millions of colours, which manifest themselves before our eyes in the form of eye-catching graphics, textures and patterns, multimedia would have been a boring alternative!

If you want to realise the importance of colours in multimedia, just try out your favourite CD-ROM, using a system with monochrome monitor. You will find it really frustrating to follow up the pale grey ball in the black and white fields, in Microsoft's title 'Golf'.

A variety of colour display systems are used to transport the viewers to the magical world of multimedia. The most widely used ones are the CRT colour monitors and of late – LCD monitors. Other kinds of display systems include touch screen monitors meant for multimedia kiosk applications and desktop projectors used for multimedia presentations.

Before taking a detailed look at these equipments, it would be worthwhile to spend some time on understanding the basics of colour display systems – what we mean by colour depth, resolution etc.

12.2 Basic concept of colour displays

If you ever thought that - after all, all colour monitors of same physical size are all one and the same - sorry! You may be wrong!

Apart from the physical size, there are actually a number of other parameters that ultimately govern how well Hollywood's Marilyn Monroe looks, in your 14" colour monitor - the most important parameters that govern being the colour depth and resolution of the monitor.

It is interesting to note that these two parameters are not actually controlled by the monitor – but by the AGP colour card or the graphics card that you use.

12.3   Colour depth

All colour display systems are capable of handling only limited number of colours, at any given point of time.

Systems with bare minimum configuration can manage to handle 256 different colours, for any given image and those with higher configurations can throw up to 16 million colours at any point of time!

It is interesting to note here that it's difficult for the human eye to recognise more than 256 different combinations of colours at any fraction of time. But please don't misunderstand me. This doesn't mean that we all can be content with 256 colours – there are other professional reasons to go for 16 million colours or more!

The total number of colours that could be handled by the monitor depends upon the memory capacity of the video controller card – often known as video random access memory or VRAM.

Video controller cards are also called as AGP card or Graphics card in certain systems. They all serve the same purpose i.e. to interface between the computer and the display device viz. the monitor.

Let us imagine that the entire monitor screen is made up of small dots, called pixels. Pixels are the acronym for picture elements.

The colours that are to be displayed by each pixel, at any fraction of time, are stored as colour data inside the VRAM. Thus, the total number of colours that could be displayed by the system at any point of time depends upon the amount of colour data that could be stored inside the VRAM.

The number of colours that could be stored by each bit in VRAM is obviously the total number of zero-one combinations possible. Ultimately, the total number of memory bits in VRAM dedicated to storing colour information, decides the total number of colours that would available for the display at any point of time.

Note: *Not all bits of VRAM can be used for storing colour data. We have to store another set of information called the resolution as well, which is explained later.*

Thus, we have the following sets of standard number of colours that could be made use of:

Table 18: Colour depth and the number of colours

Colour depth	No of colours
1 - Bit per pixel	2 Colours
4 - Bits per pixel	16 Colours
8 - Bits per pixel	256 Colours (also known as 8 bit colour)
16 - Bits per pixel	65, 536 colours (known as 16 bit colour or High colour)
24 – Bits per pixel	16.7 million colours (known as 24 bit colour or True colour)

Monitors equipped with a minimum of 8 Bit displays (i.e. with 256 Colours) are suitable for beginners, while 24 bit and 32 bit are recommended for professionals.

12.4   Resolution

Let us proceed further remembering our assumption the entire screen is made up of small dots called pixels. Now, how many such pixels are there on the screen, at any given point of time - is what is known as the resolution of the monitor.

Even these dots are stored as resolution data, inside VRAM. Thus, the available VRAM space is shared between colour depth and resolution data.

Another interesting point to note.

The pixels or dots over the screen, which we have been talking about all along, are logical pixels – and not physical ones!

But that does not mean that there are no physical picture elements on the monitor. It is just that these actual or physical pixels are different from the logical pixels that deal with colour depth and resolution.

The following table summarizes some of the popular resolutions adopted:

Table 19: Resolution and no of pixels

| Resolution	Pixels
640 * 480	640 rows and 480 columns of pixels
800 * 600	800 rows and 600 columns of pixels
1024 * 768	1024 rows and 768 columns of pixels
1280 * 1024	1280 rows and 1024 columns of pixels
1600 * 1200	1600 rows and 1200 columns of pixels

The resolution of the screen ultimately decides the size of the picture, on the screen. A picture that occupies the entire screen, in a 1024*768 resolution looks 'chopped off' at 648*480 resolution.
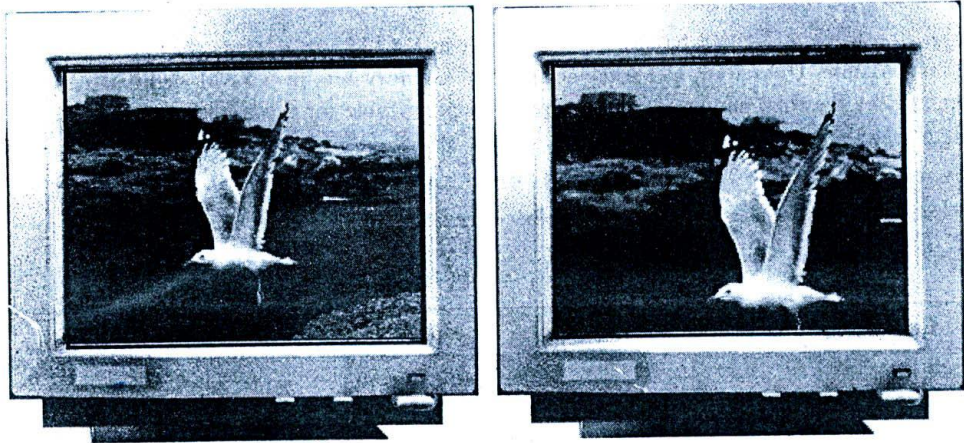
Figure 64: On your left hand side, you see the picture of a bird of size 1024*768 pixels. On the right hand side, you are seeing the same picture on the same monitor – but at a different resolution – 640*480. Notice that the bottom portions – below the legs are not seen. They can be reached only by scrolling down the picture.

This actually tells you about a potential resolution problem that might occur in your projects. For example, if you have designed a project at 1024 * 768 resolution monitor and deliver the same for a client whose is using a colour resolution of 640*480, then you are going to have problems getting your invoice through.

Another problem, which is relatively less damaging – is the case of viewing a lower size picture on a high-resolution monitor.
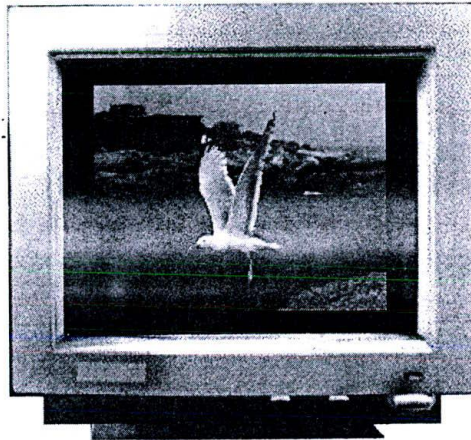
Figure 65: Imagine the same bird picture to be of a lower size – say 640*480. When it is viewed on a monitor with 1024*768 resolution using graphics software such as Paint shop pro, black borders appear on all the four sides to fill the gap left by the picture.

Though small monitors can be adjusted to give better resolutions, it may not be relevant to employ very high resolutions on small 14" monitors – because, as you increase the resolution, the system font sizes also tend to become small.

In fact, equilibrium should be stuck between the monitor size and the resolution. Refer the following table that provides recommended resolutions for monitors of various sizes.

Table 20: Monitor sizes and recommended resolutions

Monitor size	Resolution
14"	640 * 480 / 800 * 600
15"	800 * 600 / 1024 * 768
17"	800 * 600 / 1024 * 768 / 1280 * 1024
21"	1024 * 768 / 1280 * 1024 / 1600 * 1200

12.5   Monitor video modes

Number of colours as well as resolution data is stored in VRAM memory.

Since both are space hungry, sharing the available resource to optimum levels, becomes critical.

Both of them should be set to such values, so that they balance each other and provide a satisfactory output for all kinds of applications. Very high resolutions at very low colour depths or vice versa simply won't work.

To arrive at this balance, I'm providing a small table below, which details all the optimal combinations of resolution and number of colours – and the corresponding VRAM requirements.

Table 21: Memory and maximum resolution possible

Video memory requirements for various optimal combinations			
Resolution	No of colours		
	8 – Bit	16 - Bit	24 - Bit
640 * 480	300. KB	600 KB	900 KB
800 * 600	470 KB	940 KB	1.4 MB
1024 * 768	768 KB	1.5 MB	2.3 MB
1280 * 1024	1.3 MB	2.6 MB	3.8 MB

Considering the average user and standard VRAM sizes, which are 1 MB, 2 MB and 4 MB - we have the following popular combinations:

Table 22: Memory and maximum resolution possible

Video Memory	Maximum colour depth and resolutions possible
1 MB	640*480 with 24 Bit Colour
	800*600 with 16 Bit Colour
2 MB	1024*768 with 16 Bit Colour
	1280*1024 with 8 Bit Colour
4 MB	1024*768 with 16 Bit Colour
	1280*1024 with 8 Bit Colour

This combination of colour depth and resolution is usually called the video mode or colour mode of the monitor.

12.6   Impact of video modes on multimedia applications

When you are developing multimedia applications that are going to be distributed to the public, then the problem of resolution vs. colour depth takes problematic dimensions.

Since the users might have configured their system to any possible video mode listed above, there is no standard video mode to which we can design our application.

So, How to cope up with this problem?

There are two possible solutions, which we can adopt.

❑   The entire application may be so designed, that it's independent of the video mode or colour mode of the client system. This may involve usage of screen units that are independent of the monitor - i.e. something other than pixels. Certain specialised multimedia authoring environments automatically support this feature, so that the programmer need not worry about this problem at all. When compiling the executable module of the application, the software adds necessary codes that maintain integrity through various client platforms.

❑   The application can be designed for a specific optimal number of colours and resolution - generally 256 colours at 640*480 pixels - and add the necessary codes that port the application across various video modes. Such applications run normally under all resolutions and colours, but with a border surrounding the screen.
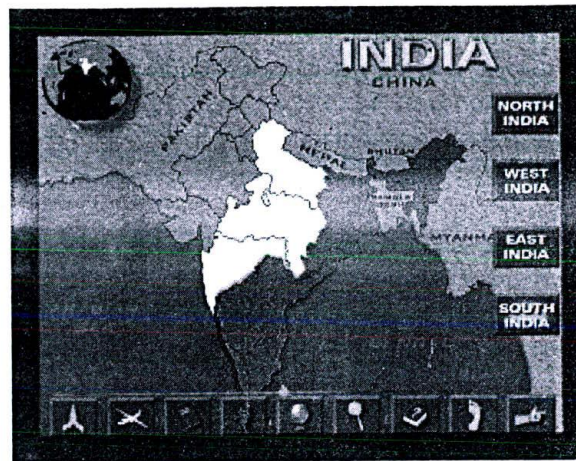
Figure 66: For Tourist's India CD-ROM, I created a black screen that filled the entire client system. Over this, I started placing the visuals at 640* 480. If you view the CD-ROM at this resolution, then you will just see the graphics without border. But on higher resolutions, you will see a black border around the screen.

12.7 Switching to different video modes

Now, let us see how to configure your system for a particular video mode and try out various other modes to find the combination best suited for your monitor and colour card.

☐ Right click on your desktop or laptop wallpaper and select Properties. The Display panel is thrown open.

☐ You've got the following screens on this panel: screensaver, appearance, web, effects and settings. Select the settings tab to open up the display settings screen.

☐ You have the following options in the settings screen, which configure the display system in various video modes.

☐ **Colours:** This setting controls the colour depth of your display. You have options like 256 colour, High colour (16 Bit), True colour (32 Bit) etc. The number of options available to you may be affected by the VRAM of your AGP card.

☐ **Screen area:** This setting controls the resolution of the display. You can choose various combinations – from 640 * 480 to 1600 * 1200.

☐ One important thing to note here is that – when you increase the resolution, you will find that your colours are adjusted automatically depending upon the overall VRAM memory available. For example, as I increase the resolution of my monitor to, say 1600*1200, I have only 16-bit colour option left in the colour panel and not 24 bit or 32 bit.

☐ When you click on the advanced options button, what you see is very specific to your display driver and manufacturer's utilities. Herein you may find many interesting options available to do finer control of your display settings. However, some experience is required to handle this and is recommended only for advanced users. *These advanced options will be enabled, only if you had installed the manufacturer's display drivers on top of default windows drivers.*

☐ Thus, it becomes important to install the right display drivers for your colour card. Otherwise, you may not be able to enjoy the capabilities of the display card to its fullest potential. Don't let your supplier go without the drivers for display card. The threat of not getting the display driver is more, when you purchase a system

off the shelf or ask some system engineer to assemble the system for you. Please ensure that all the device drivers are given to you along with the system itself – before you complete the purchase of your new multimedia computer.
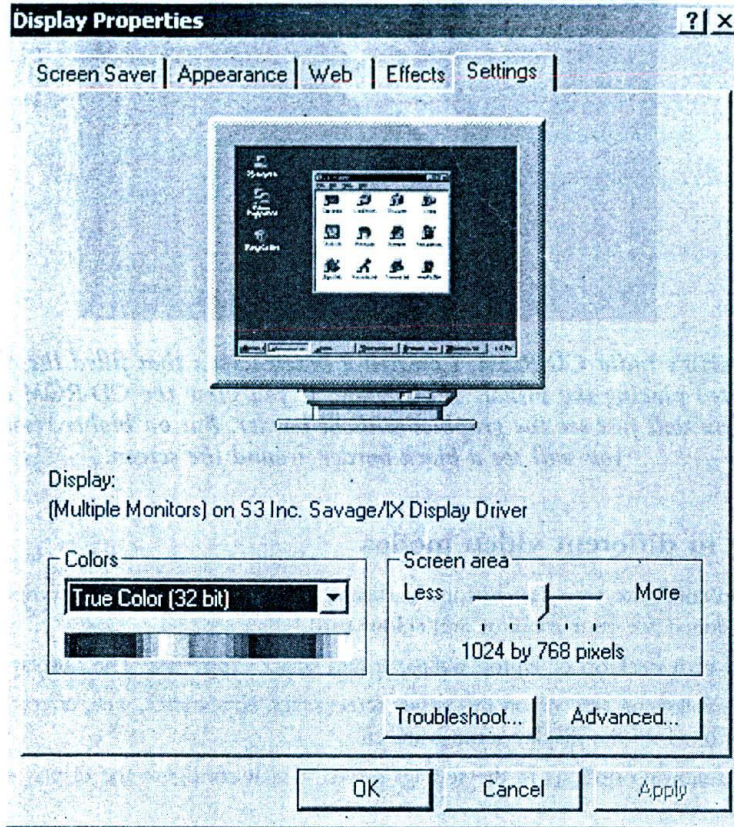

Figure 67: Switching to different video modes using display settings panel.

12.8   Colour monitors

Colour monitors are the most famous among the multimedia colour display systems.

Though colour monitors were introduced several years before, they could not make their way home to mass usage - until the dawn of the multimedia.

Today a large variety of high breed monitors sway the world market - and hundreds of types are available to suit the varying needs of the users, right from the simple desktop or office applications to complicated workstation or CAD environments.

Some manufacturers even bundle audio speakers in to their monitors and call them 'multimedia monitors".

Apart from resolution and number of colours, monitors are controlled by two other parameters: Dot pitch and Monitor refresh rates.

☑   **Dot pitch:** The dot pitch is the parameter that ultimately governs the sharpness of colour monitor. It is actually the physical distance between two actual picture elements (or actual pixels) on the monitor and is measured in millimetres. Normally, a dot pitch of 0.28 mm should be suffice for all 14" and 15" Monitors.

For higher sizes, typically a dot pitch of 0.26 mm or lesser, is most suitable. Unless you have specific reasons, it is better not to change to dot pitch of the monitor.
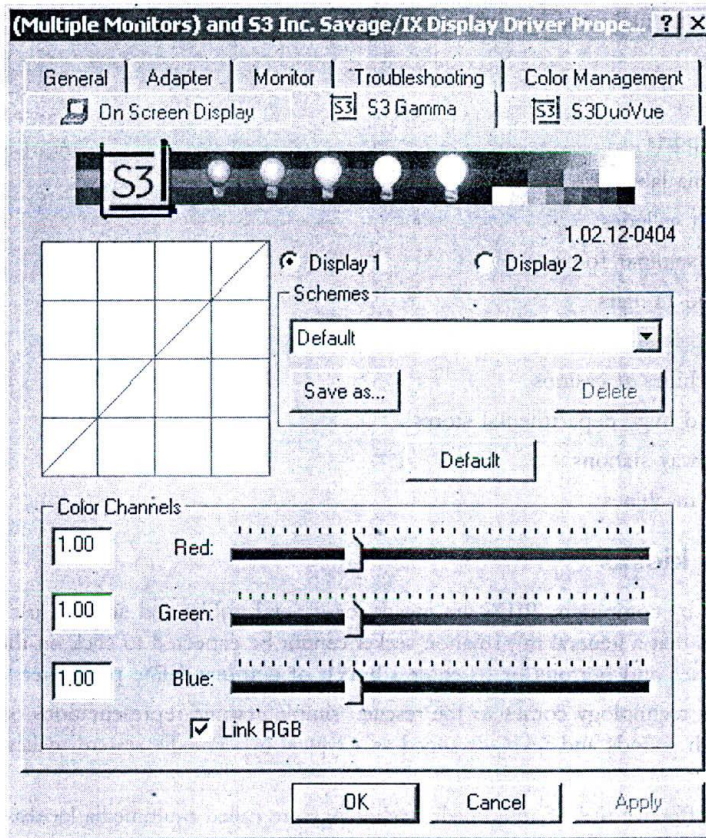

Figure 68: These are one of the advanced option panels available in my system. This panel is very specific to the SIS display driver I am using – you might be seeing a totally different panel, under advanced display options.

Monitor refresh rate: If we are to imagine the entire screen to be made up of rows of picture elements (or actual pixels) and the screen display at any second as a series of illuminations of such rows, then the monitor refresh rate signifies the speed with which every line is illuminated, one after another, and is measured in terms of hertz (Hz). The typical refresh rates employed, range between 60 Hz and 90 Hz. Without specific reasons it is better not to change to refresh rate of the monitor.

Though colour monitors are best suited for desktops and associated applications, they cannot be employed very effectively for certain other multimedia applications like multimedia presentations (for a large group of audience) and multimedia kiosks.

So a whole new breed of display systems had to be developed to fulfil this need. These are known by various names like public information display systems and presentations display systems.

Let us briefly discuss what they are.

12.9 Public information display systems (PIDS)

Computer aided public information display systems (or PIDS) are those that are kept for general access - in places

such as airports and star hotels – to provide necessary information to the public. PIDS usually take the form of multimedia touch screen kiosks, wherein the users can simply touch the relevant buttons on a touch screen monitor and seek the required information.

Some of the places that can make the best use of touch screen multimedia kiosks are:

❑   Tourist offices

❑   Start hotels

❑   International Airports

❑   School multimedia labs

❑   Museums and art galleries

❑   Exhibitions and seminar rooms

❑   Technological and IT fairs

❑   Corporate enterprises

❑   Video game machines at casinos

❑   Supermarkets and huge departmental stores

❑   Airports and railway stations

❑   Automatic teller machines

12.10 Multimedia kiosks

Though aided efficiently by computers, PIDS are meant for general public and are not just for computer literates. What follows naturally, is that a general information seeker cannot be expected to click on the relevant item in a list of perplexing menus boxes and buttons or to enter a bunch of command line parameters!

It's here, that multimedia technology comes to the rescue: simple graphic representations of the options available, associated preferably with sounds and texts, arranged as a typical hypermedia system makes things much easier to use.

Those PIDS that make effective use of multimedia technology are called multimedia kiosks. The most widely used display system for multimedia kiosks are the touch screen monitors.

Let us briefly discuss about them.

12.11 Touch screen technology

Touch screen systems come alive with the physical touch of a finger!

They need neither keyboard nor mouse, making them the best choice for public access.

Those who need information will simply have to touch the kiosk screen with their fingers, on the relevant area...and presto! The magic begins.

Internally, touch screens convert a user's touch to a mouse click – so there is no additional programming effort required, from a multimedia producer's point of view.

Touch screen monitors have the following advantages over conventional display devices, in the context of PIDS applications:

❑   Touch screen monitor sizes are usually much bigger than their counterparts, thus making them easier to use.

❑   Makes use of unambiguous input methodology - viz. a gentle touch.

❑   Touch screens are compatible with many operating systems and application software, thus making it easy to develop multimedia kiosk applications.

12.12 Composition of touch screen monitors

Touch screen systems internally have three major components:

- **Analog sensor:** Analog sensors recognise the touch of a person and send information to the computer, regarding the event and the place of touch. With this information, the multimedia application running behind the scene decides what the user is requesting and reacts accordingly.

- **Controller card:** A controller card is similar to all other multimedia interface cards. These cards manage to convert the incoming analog data from sensors to digital information. The X and Y coordinates of the touch point are identified and informed to the multimedia application. Both internal and external cards are available.

- **Driver software:** The device drivers make the digital information issued from the controller cards, available to the associated multimedia software applications. Drivers are available for both PCs and the MAC platforms.

Multimedia kiosk applications are getting widespread recognition worldwide, and consequently, the usage of touch screens is also on the increase.
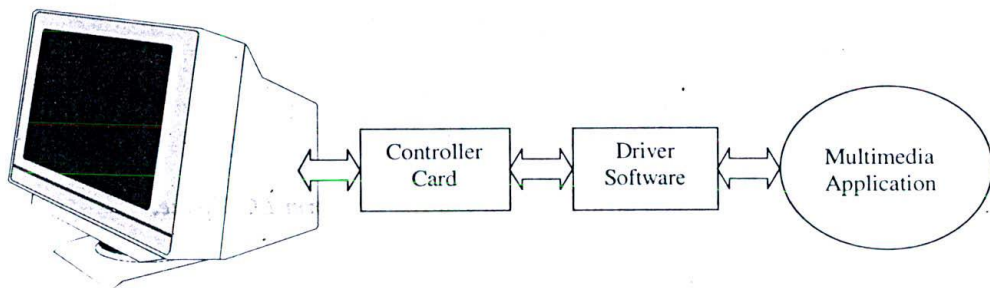

Figure 69: Components of touch screen kiosk system

12.13 Presentation display systems (PDS)

Presentation display systems – as the name implies - are those that are used for computer-aided presentations.

When the audience is very few, one can manage the show with a normal 17" Colour monitor. But as the number of participants increase, the choice for an alternative presentation system becomes imperative.

PDS display devices offer much higher screen sizes than the normal monitors.

The display is usually projected to a white screen, on the boardroom or seminar room. This latest technology is undergoing rapid metamorphosis; Of late, equipments whose resolutions are comparable to that of workstation monitors, are swaying the market.

Though all PDS display devices basically use of the same technology called LCD, they are offered in different flavours. Here, we shall take up the most famous among the lot viz. the LCD projection panels.

12.14 LED technology

A light emitting diode (LED for short) is an electronic device, capable of displaying any particular combination of RGB colours (The Red Green Blue system of colours used in computers) and is also transparent to light.

So, when a series of these LEDs are arranged in the form of a row column matrix, they can represent computer display – much like the way pixels represent computer output in a monitor. Remember – pixels are also picture elements, arranged in the form of a row column matrix.

Since LEDs are transparent, a normal overhead projection system can enlarge the image on this matrix and project it over a screen. This is the basic principle behind all LED projection systems and such LEDs arranged in the form of row-column matrix, are known as LCD panels.
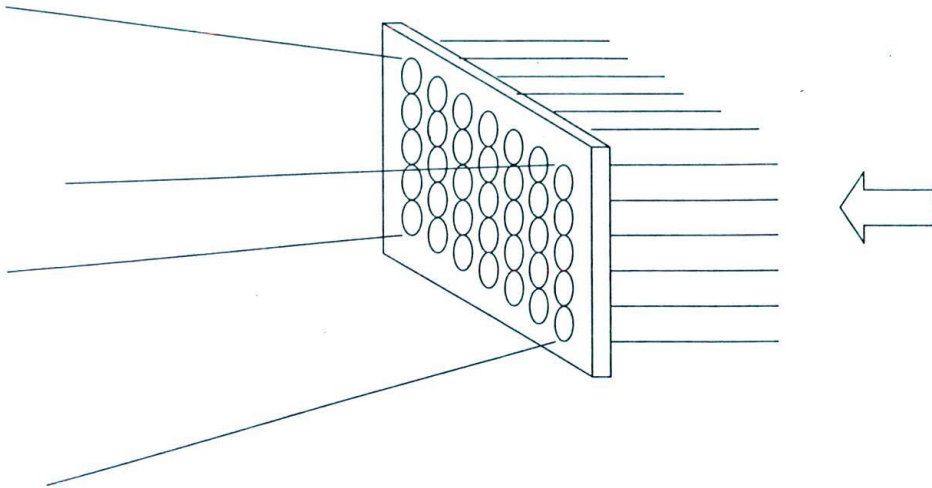

Figure 70: LEDs arranged in a matrix – to form LCD panel
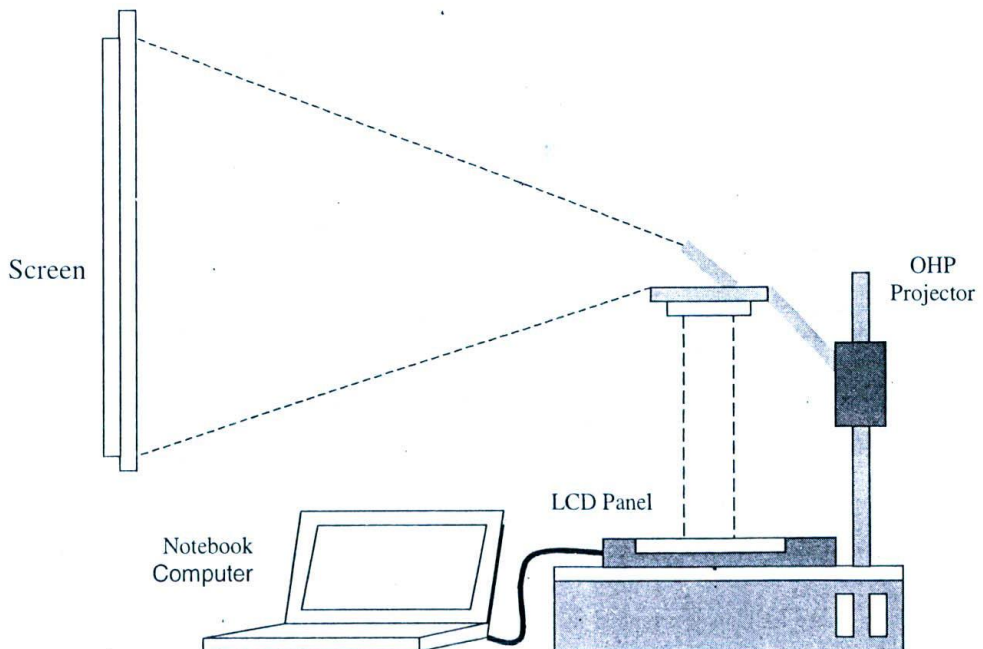
12.15 LCD projection panels

Figure 71: A multimedia presentation projected to screen through an LCD panel and overhead projector

In case of LCD projection panels, the output from computer is directed to a small and compact matrix of LCDs arranged in a specific pattern, which constitute the projection panel.

This panel is often kept over an overhead projector, in place of transparencies. And when the projector is illuminated, the graphics in the panel is projected over the screen, facing the overhead projector.

The advantages of LCD panels are their lightweights and smaller sizes. Most of them weight between 5 to 6 pounds only and can easily slide into a briefcase, which make them most suitable for travelling seminarians and presenters.

12.16 LCD panels - types and specifications

Two types of LCD panels are currently available - those with active matrix technology and the rest with duel scan passive matrix technology. Passive matrix panels suffer from lesser colour saturation/ contrast and slower response times than the active matrix - but passive matrix panels often cost less than their counterparts.

In general, passive matrix panels are more suitable for 'slide show like' presentations.... but once the presentation throws up a video or an animation sequence - it's much better to go for active matrix technology.

Almost all commercial panels are compatible with PC and MAC platforms. The device drivers - as usual, provide the necessary interface between the application and the device. Some panels even support sound projection facility, making your otherwise polite presentations rich in multimedia. Remote control mouse are the preferred accomplices, for such presentation shows.

In the introductory stages, the resolutions of most panels were limited to 640 * 480 - but now, situation has vastly improved – to 1024 * 768, 1600* 1200 or even higher resolutions.

But remember!

As the resolution increases, the supporting environment should cope up with the increasing standards - like, you may need to have a brighter overhead projectors - typically those with 4000 to 6000 lumens. Lumen is a unit for luminous intensity of the projector.

The number of colours is yet another criteria for LCD panels, and you have got systems with 512 to 16 million colours. Video is the ultimate test and the single most important reason for purchasing panels that support higher number of colours. With presentations involving extensive videos, it is better to have panels with 16 million colours. Computer graphic images with fine gradations of colour also look better in a 16 million-colour panel.

Typical panel screen sizes are 8.4 and 9.4 on lower ends and 10.4 on higher ends panels; and the projected image sizes can go even up to 300 inches - provided, the white screen is wide enough to accommodate.

12.17 Summary

Colour display systems like monitors, are used to display millions of colours in multimedia projects.

The way the colours are exhibited in a display system depends on two parameters: number of colours and resolution. The total number of colours that can be displayed as well as the resolution of the display depends on the memory capacity of the video controller card, also known as VRAM. A particular combination of colours and resolution is called the video mode.

Colour monitors have two other controlling parameters as well; viz. the dot pitch and monitor refresh rate. Colour monitors are best suited for all kinds of desktop applications.

Public information display systems make use of touch screen monitors, which can recognise the physical touch of a user. Those applications that make use of multimedia technology and touch screens are called multimedia kiosks.

Presentation display systems use LCD projection panels to project the display over a white screen.

12.18 Keywords

❑ **VRAM:** Video random access memory - The memory capacity of the video controller card, which serves as the interface between the computer and the display device.

- ❑ **Resolution:** Total number of logical pixels, in terms of rows and columns, supported by the display system.
- ❑ **Video mode** or **colour mode:** A particular combination of resolution and the total number of colours of the display system.
- ❑ **Multimedia kiosks:** Public information display systems that make use of multimedia technology.

Chapter 13

Digital Imaging

CHAPTER OVERVIEW

The chapter begins with discussions on various categories of multimedia graphics like interface design graphics, content graphics etc. Various sources of multimedia graphics and their distinctive attributes get our attention in the next paragraphs, followed by differences between raster graphics and vector graphics.

Graphics created with the help of 3 Dimensional utilities have been dealt with separately, as they form a separate class of still pictures. We also talk a bit about hyper graphics.

The chapter winds up with a bird's eye view on various kinds of software tools available for creating multimedia graphics. How these tools can be made use of for a given project – is the food for thought, in the next few chapters.

13.1 Introduction

What do we mean by graphics or multimedia graphics?

There can be no conclusive answer –as different people use this generic term to cover a wide variety of entities. Hence, it becomes important to understand the term multimedia graphics – as implied throughout this book - before we start our other discussions.

In this book, multimedia graphics represents a collective terminology that includes all kinds of still pictures like photographs, images and art works – as used in multimedia applications. It does not include any entities with dynamics and movement - like animations or videos.

Sometimes, the term graphics is used interchangeably with multimedia graphics.

With this discipline, we clearly come out of a potential misunderstanding of treating everything under the graphics umbrella. In later chapters, when we are dealing with animations, we will use specific terms like 2D animations and 3D animations - whenever possible, so that there is no ambiguity in understanding what we really mean.

Graphics play a pivotal role in all multimedia applications. The maxim 'a picture is worth a thousand words' is so factual that one cannot underestimate the impact of visuals over plain texts or audio – in the context of multimedia.

Since computers can seamlessly comprehend with millions of colours at any point of time, there are people who feel that computer based imagery is much better that other visual mediums like print or television.

13.2 Graphics in multimedia projects

Graphics employed in multimedia applications can be divided into two main categories:

❑   Graphics that are part of the application interface design and

❏   Graphics that are part of the contents presented

It's important that we clearly understand and distinguish between these two categories of graphics, before proceeding further. The following paragraphs will help you to do so.

13.3   Graphics for interface design

All multimedia applications present a graphical interface with which the user interacts.

Have a look at the interface of Microsoft Oceans CD-ROM. This is the first screen that greets the user – and throughout the title, the bottommost buttons are retained.

This is a classical example for the interface design graphics we are talking about.
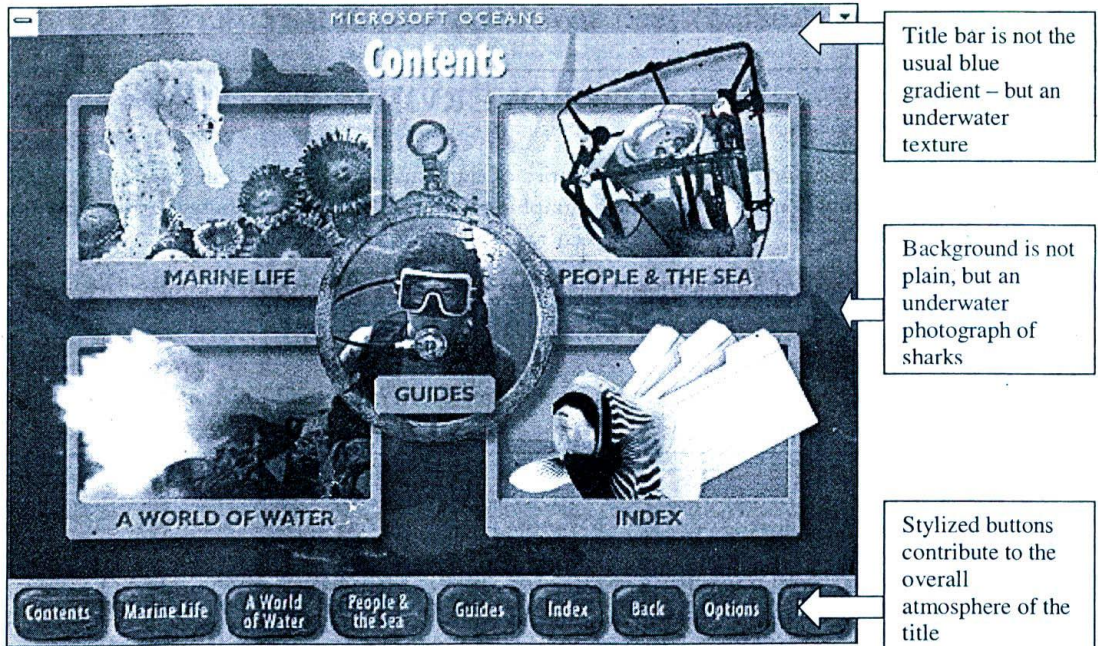
Figure 72: The main interface of Microsoft Oceans CD-ROM fittingly captures the mood and theme of underwater learning adventure. Take a close look at the buttons that have been modelled after underwater rock formations.

The interface graphics presents itself to the user throughout the course of the application. As the user navigates across various sections of the application, the contents may change a bit – but the overall theme of the interface has to be maintained consistently.

The user interface must be simple and friendly, with an attractive look - so that the user is inspired to explore the multimedia application further and further. In fact, interface design is an exclusive specialisation to some of the professionals in multimedia – who are frequently hired by companies, just to do the interface design.

Multimedia graphics play a vital role in evolving interface designs that appeal to all groups of audience.

Capturing the mood and theme of the title is probably the biggest task of an interface designer.

Suitable photographs or images can be added to the background as collages and texts can be super-imposed over them. Also, it is important to create the buttons and menus to capture the theme of the title as much as possible.

Have a look at the Microsoft Oceans interface, once again. See how the interface designer has created an appealing

underwater or 'oceanic' appeal by placing appropriate images in the background and adopting rock formations for buttons and title bars.

Good interface designs blend so well with other contents of the project that many a times it's difficult to distinguish and differentiate the actual combination of graphics that has been made use of.

Of course, to achieve such a degree of seamless presentation, the original images may have to be manipulated and edited in many different permutations and combinations. Going back to the same example of Oceans interface design, you will be able to distinguish the following independent picture elements that have been blended seamlessly to produce the overall appeal you appreciate:

1. The title bar, which is an image by itself

2. The background underwater picture of sharks in the bay

3. The word "Contents" which is an element by itself

4. The four rectangular boxes that represent the chapters.

5. Collaged pictures contained inside these boxes - sea horses, diving equipments etc. Each of them, in turn, has been compiled from of more than one image.

6. The circular pendent in the centre and the diver in it.

7. The background for buttons

8. The buttons themselves

Now, you can see that – after all, the business that looked so simple a few moments ago is not that simple as it looks! Fortunately, the professional graphics editing tools that are currently available for PC and the Mac platforms present us with unlimited number of editing and special effect options that the ultimate design is limited just by your creativity and not by the capabilities of the tools.

To summarize, interface design graphics are characterized by the following attributes:

❑ They should be simple and appealing

❑ They should fittingly capture the theme and mood of the title

❑ There should at least be one background image or collage

❑ Buttons should be designed suitably, to fit the overall theme of the design

We will reserve further discussions on strategies and techniques for good interface design for a later chapter titled multimedia applications – project design, conception and execution.

13.4   Graphics for contents

Now, let us concentrate on the second category of graphics.

Graphics for contents include all photographs, clip arts and other kinds of still images that are made use of, as a part of the main contents presented. For example, in the same Microsoft Oceans CD-ROM, look at the following graphics under the topic 'Inflatable fish'.

Graphics are powerful companions to information, when presented suitably. Even in the example that we saw above, note that around 60 to 70% of the space is dedicated to graphics and only the rest has been filled with textual information. Hyperlinks have been provided at attractive places, for those who wish to explore more.

In general, each and every scene (or page) of multimedia applications should be filled with at least one main picture or image. Other contents and smaller images can be shown as hyperlinks or hotspots.
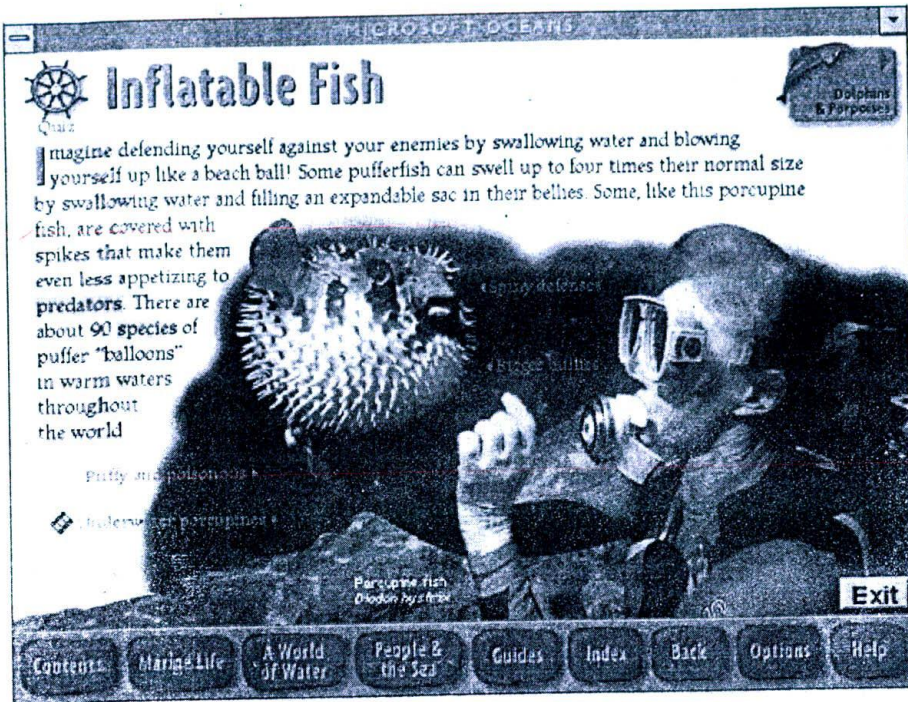
Figure 73: The same Microsoft oceans CD-ROM making use of colourful graphics to explain a topic.

Content design graphics are characterised by the following attributes:

❑ They are totally related to the topic under discussion and must be exclusively designed and developed for each project. For example, for its title Oceans - Microsoft should have either hired its own team of photographers to shoot all the pictures or more probably, should have acquired the copyrights for various photographs from oceanographic specialists.

❑ Content design graphics should be developed in exact concurrence with other forms of media presented – like texts and videos so that all these different elements fit together as one seamless stream of information. Thus it's imperative to decide exactly what photographs, pictures and clip arts need to be developed for the project, well in advance - so that there is no wastage of time, effort and resources.

❑ The more you plan, the better. For example, if you can decide exactly what sort of photograph or image should be featured in each page (or scene) of the title, then you can go ahead with the photo shooting or acquisition based on your specific requirements. But if you are unsure, you may end up accumulating loads of material which you might probably not make use of in the end.

With this, we conclude our discussions on categories of graphics and switch over to the other topics.

13.5 Types of graphic imagery

Types of graphic images made use of in multimedia projects, should fall under one of the following categories:

❑ Photographs (Either scanned or digitally photographed)

❑ Clip arts (Drawings drawn using specialised drawing packages)

❑ Three dimensional graphics (Images developed using 3D design packages)

❑ Miscellaneous variety (all other types of images)

Let us detail what they are and how they can be developed for a specific project at hand.

13.6 Photographic images

Photographic images include all types of photographs, stored as rastor bitmaps in the computer. They are either scanned from printed photos (scanned photos) using scanners or upload directly from digital cameras (digital photos).
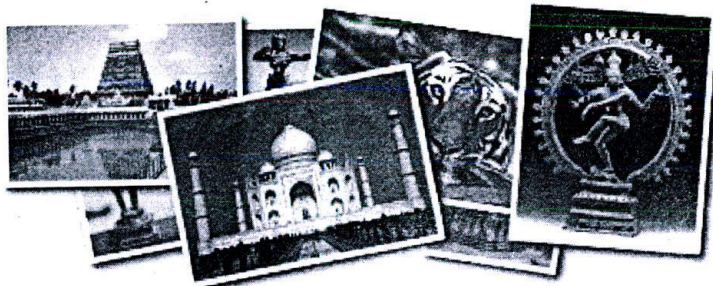

Figure 74: Photographs are either scanned from physical printouts or uploaded from digital cameras, directly.

There are no hard and fast rules as to which one is the best. The quality of the images is mainly determined by the capabilities of the equipments used.

For example, using a high-end professional scanner, it is possible to scan printed photos and pictures to the finest detail. Similarly, using high-end digital cameras, it is possible to take professional photographs of great quality.

However, there are limitations to both.

The quality of scanned photos is determined, not only by the quality of the scanner -- but by the quality of the original photograph itself. No high-end scanner will be able to improve the colours or resolution of a bad photograph beyond certain limits.

While digital camera photos do not usually suffer from such limitations – unless the photographer wants to take a low-resolution photograph, there are other constraints. Digital cameras as on date are unable to offer the level / variety of zooms and filters as available in conventional SLR cameras. The net result is that there are limitations to what a professional photographer can do with a digital camera, in terms of creativity.

Photographic images find extensive use in almost all multimedia projects. They can be effectively used in interface designs as well as contents.

13.7 Clip arts

Clip arts represent digital drawings that are drawn directly in a computer, using drawing tools like Corel Draw.

Digital artists make use of digital paints and brushes provided by specialised drawing environments of such package and gives life to his or her imagination straight through the monitor, instead of conventional mediums like paper

These drawing are usually stored as vectors. We will be seeing what vectors are, in a short while from now.

There are many misconceptions about digital drawing process.

Many imagine that the skills required for traditional artists and digitals artist are different - which is incorrect. True the methodology and techniques to be made use of are slightly different and digital artists seldom enjoy the 'free brush stroke independence ' of traditional artists - but the base creative talent required for artwork remains very much the same.
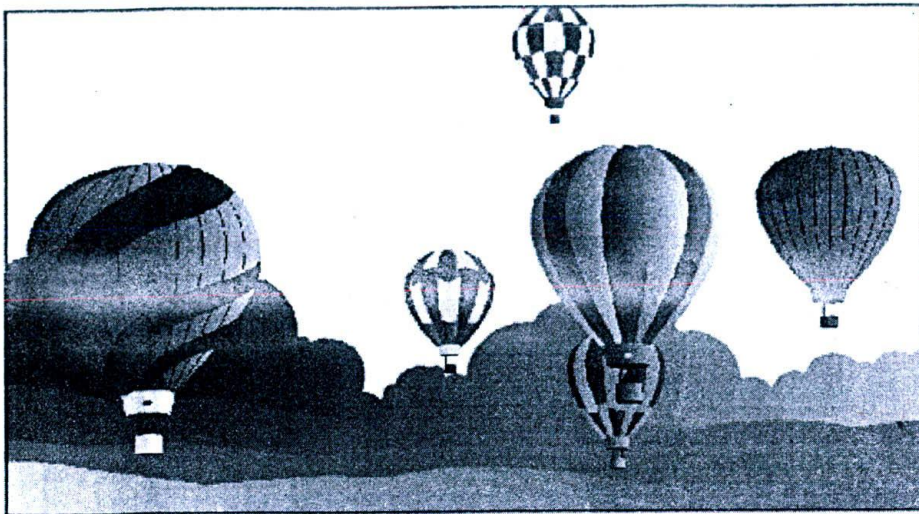
Figure 75: A simple line drawing, drawn using Corel Draw package

\ digital artist may have to try out different painting tools and stroke options available, before deciding upon the :xact combination that will result in desired output.

Software vendors, who are developing such packages, are ceaselessly updating their products to ensure that almost ıll possible brush strokes and other painting options available in traditional painting process are also available digitally. Professional tools like Adobe Illustrator, Corel Draw and Macromedia Freehand can bring out stunning outputs at :he hands of experienced digital artists.

13.8 3Dimensional graphic images

3 Dimensional graphic images are those that are developed using specialised 3D software packages and tools.

Figure 76: A surrealistic mount kailash developed using 3D software tools -
for cybervalley systems CD-ROM title 'Tales from Indian mythology'

We are grouping them as a separate category because, of late, there has been an increasing trend in making use of 3D tools for graphic imagery – particularly in those situations wherein conventional photography or digital drawing are not suitable or possible - like surrealistic landscaping, land and house modelling, imaginary worlds etc.

By placing various model elements in a virtual space and rendering them with a mixture of textures, lights and other environment variables – 3 dimensional artists are able to cross the limitations set by physical world and transcend to a different plane altogether.

Developing 3D graphics involves skilled expertise and time and hence must be sparingly made use of.

Advanced concepts of 3D graphics are reserved for later chapters - but, for the purpose of multimedia graphics, it would be suffice to note that realistic images of artificial entities can be developed using 3D graphic packages.

This characteristic is of immense use to graphics developers, in the following situations:

❏   When it's dangerous or impossible to take an actual photograph of the required entity or environment – like, say, a picture of a dinosaur or the close up shot of hot lava.

❏   Sometimes it is cost effective to construct a 3D model and develop images rather than going to the physical location, for the required images.

❏   Literally any view at any lighting and ambience, can be generated with 3D graphics.

But the decision to use 3D graphics should be taken, after considering the following limitations:

❏   It is not so very easy to develop and render 3D graphics.

❏   3D environments demand specialised skill and expertise to work with; also, at times it can be highly time-consuming process.

❏   3D packages are generally more expensive than other media packages and almost all high-end software demand robust system requirements.

It is the designer's job, to evaluate all these pros and cons of 3D imagery, before arriving at a final choice.

13.9 Types of graphics storage

We all know that computers store all kinds of information, as data.

Graphics that fill the entire 29" colour monitor with millions of colours are no exceptions. They have to be stored as some form of digital data, which the computer can understand and comprehend.

There are essentially two fundamental ways of storing graphical data:

❏   Rastor graphics and

❏   Vector graphics.

Let us explore these two a bit further.

13.10 Rastor graphics

Rastor imaging is the technique of dividing the entire image area into small logical dots called pixels and storing the colour information contained in each pixel. For example, for a picture of size 640*480, the rastor graphic should record colour information for around 307200 pixels!

These thousands of independent colour dots finally combine together to throw up the beautiful blonde you are staring at, in your colour monitor. If you can zoom-in on any portion of a rastor image, you will actually be able to see the independent pixels that make up the image.

This methodology of storing graphic data is what is known as raster imaging and the graphics thus stored are called rastor graphics. In Windows working environment, they are more commonly known as bitmapped graphics.

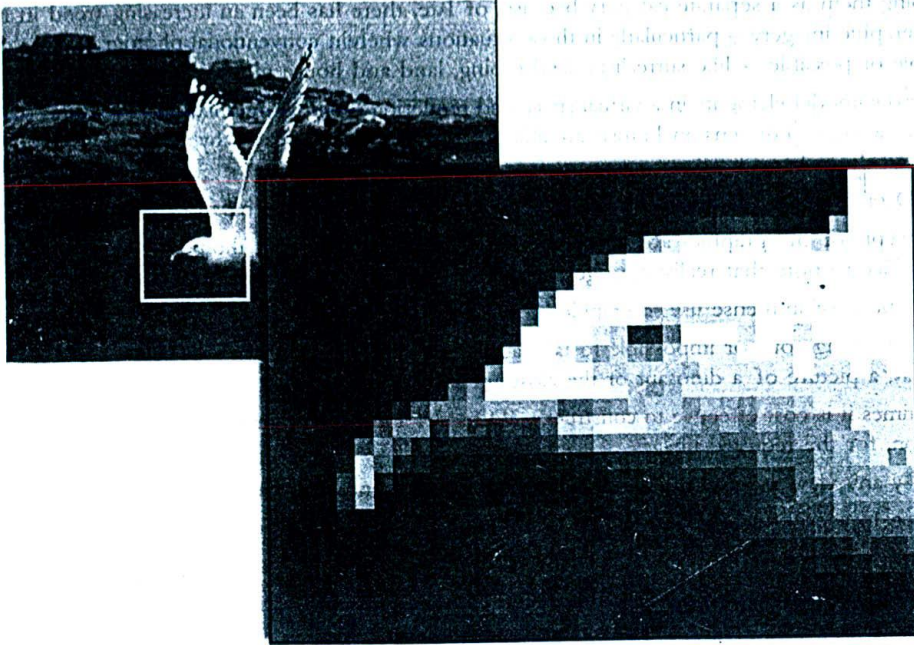In the context of this book, we will stick to the term rastor graphics.

*Figure 77: A small portion of a rastor bitmap, when enlarged several times,
will reveal the underlying pixels that make up the graphic.*

Rastor graphics is relatively a simpler form of storing image data. Many software manufacturers started coming out with different file formats of rastor graphics - to serve the needs of various applications.

The net result is that we currently have more than a dozen famous file formats or so to work with!

A good idea is to keep a software utility or package that converts an image, from one file format to another. These are called image conversion utilities and are available on the Internet, for free. However, if you are using one of the professional graphics editing programs like Adobe Photoshop, there is no need for such utilities – as the program itself recognizes many different file formats.

Among the different file formats available for rastor graphics, JPEG has evolved as the best among the lot – in terms of file size and quality. This format was evolved by Joint Photographic Expert Group and hence the name JPEG. It is one of the widely used formats in many multimedia applications.

On the flip side, JPEG is a lossy compression algorithm i.e. the image quality is sacrificed to some extent during conversion and this is unacceptable in certain situations like desktop publishing; and hence the need for using multiple file formats.

For a detailed list of various file formats available for rastor graphics, kindly refer the appendix.

Rastor graphics have their own advantages and limitations.

First, the positives:

❑   Almost all kinds of images - photographs, digital drawings, clip arts etc. can be stored as rastor graphics. In other words, there is no restriction on the nature of image that can be stored.

❑   They can be easily distributed across a wide variety of applications and are certainly in much wider usage than their counterparts: Vector graphics.

❑   Vector images can be converted to rastor images – but the contrary is not possible.

Now, the limitations:

❑   It is very difficult to modify the rastor images, once they developed. To change even a small curve, literally every pixel has to be erased and redrawn...thus, there is not much flexibility in modifying the image. All we can do is to alter the size, colours etc. This makes them inefficient for usage in digital art applications - wherein the artist, after painting a stroke or two with his graphic tablet, invariably wants to modify his earlier strokes little...without erasing and redrawing!

❑   Since every pixel or dot in the image has to be stored as data, generally the file sizes are very high. And the situation is much worse, if the file format used for storage adopts loss less compression algorithm. For example, a bitmap file (.bmp) with a single colour takes the same amount of space, 1.44 MB to be precise, as another with more than a million colours! This is because of the fact that, irrespective of the number of colours used, the colour information or data is recorded for each pixel!

13.11 Vector graphics

Instead of storing the graphic images as pixels of colour data, it would be better if we could identify the individual lines, arcs and curves that make up the ultimate image and store them as a group of such elements. This technique of storing image data is what is known as vector images the images thus stored are called vector graphics.

Vector graphics offer the unique advantage of modifying lines and curves, after they have been drawn – without affecting the quality of images. This capability is very significant for digital artists and designers.

Specialised graphic tools are available for developing vector graphics – Adobe Illustrator, Corel Draw and Macromedia Freehand are some of the prominent packages in the market. All these tools store an artist's creative strokes as lines, arcs and curves so that all modifications are possible at any point of time.

Vectors are not limited to just images. They are extensively used to construct 3D wire frame models as well. We will take a better look at this during our discussions on 3D animations.

Now, let us see the advantages and limitations of vector graphics.

Advantages

❑   Since vector graphics are stored as codes of lines and curves, they take up much lesser space than rastor images.
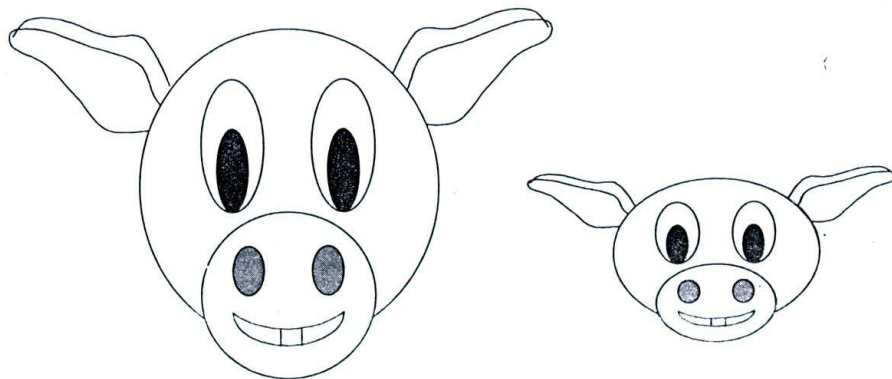

Figure 78: First, I drew this cartoon image using simple vector drawing tools. In the second diagram, I modified the first to evolve another character. Make a note that there is no loss of quality whatsoever, in this transformation. If you won't object, I'd like to call the first one a cow and the second one a pig.

❑ · Vector graphics can be edited easily, without losses.

Limitations

❑ Not all types of images can be stored as vector graphics. For example, photographs and digital camera pictures, made up of many thousands of colours, cannot be stored as vectors.

❑ As already pointed out, no rastor image can be converted as vector graphics.

Like rastor storage, there are various file formats for storing vector graphics as well. For a list of file formats, please refer the appendix.

13.12 Multimedia graphic tools

Different kinds of software tools and packages are currently available in the market, for digital imaging applications. Though it is difficult to pin point any specific tool as the best one, some have emerged as the industrial standards, because of their quality and the features.

Multimedia graphic tools can be broadly classified as:

❑ Tools and packages meant for digital image editing and processing

❑ Tools and packages meant for digital artistry

❑ Tools and packages meant for 3 Dimensional graphics and

❑ Miscellaneous utilities.

The following table lists some of the famous software in each of the above-mentioned categories.

Table 23:Examples for various categories of multimedia graphics tools

Category	Tools and packages
Image editing	Adobe Photoshop
	Corel Photo paint
	Jasc Paint shop Pro
Digital artistry	Adobe Illustrator
	Macromedia Freehand
3D Graphics	Maya
	3D Studio Max
	Corel Bryce

13.13 Class - I :Image editing tools

This class of tools are mainly meant for retouching / editing and manipulating images that are already available as rastor bitmaps.

A digitised photographic image may have to be edited for several reasons like improving the quality of the image, removing unwanted portions, altering the size of the image, adding special effects or combining objects in one or more images.

Hardly there are any situations in reality, wherein a photographic image may be directly used in the multimedia project without any editing.

Adobe Photo shop and Corel Photo paint are some of the tools in the forefront. Adobe Photo shop supports third party plug in software functionality, which extends the core capabilities of the program to new heights.

13.14 Class - II: Digital artistry tools

Apart from editing rastor images like photographs and images already available, a digital artist may want to create drawings on his own. Digital artistry tools are meant for this purpose.

These tools support a number of drawing options normally required by digital artists – like freehand drawings, colour gradients, geometric figures etc with the help of which, creative artists are able to give shape to their imaginations.
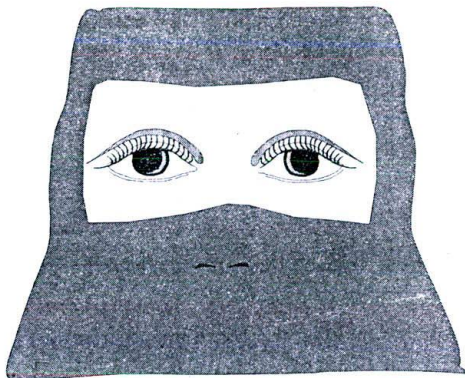
Figure 79: One of my simple drawing attempts, using digital artistry tools.
The original clipart is available in Multimedia Magic CD-ROM.

The resulting files are usually stored in one of the vector file formats.

Adobe illustrator, Macromedia Freehand and Corel Draw are some of the famous software packages available in the market for digital artists. Paint shop pro supports limited but interesting set of vector tools.

13.15 Class - III: 3 Dimensional graphic tools

3D software tools are specialized environments in which one can model, texture, light and render objects. The skills and expertise required to master 3D are almost completely different to the earlier set of tools – handling 3D is much more complex and time consuming and hence must be carefully used.

3D software demand more CPU and RAM resources and are generally available only on high-end platforms.

Most 3D graphics packages demand muscular hardware because of intense mathematical computations involved in working with 3 Dimensions. Hence they are available mostly on high-end platforms, though PCs based 3D development is also getting popular.

Alias Wave front, SoftImage, Maya and 3D studio max are some of the software available for 3D graphics development.

13.16 Class - IV: Miscellaneous utilities

Miscellaneous utilities include small programs meant for converting graphic file formats, tools for organising and sharing images etc.

Often, while working with multimedia graphics, one has to toggle between various raster and vector file formats, because of the multiplicity of popular imaging standards available.

It is true that most of the Class I tools recognize a wide variety of image formats – but there might be situations wherein you need to use certain file format not supported by your tool. In this case, you may have to go for one of the suitable conversion tools available.

Organising and maintaining a catalogue of images can be come a menace over a period of time. Under such situations, it is better to use 3rd party tools meant for organising your graphics to various categories and groupings.

Such utilities are mostly available free, on the Internet. Check out www.download.com for the latest set of tools you want.

13.17 Summary

The term multimedia graphics represents digital photos, scanned pictures, digital artworks and 3D images. Multimedia graphics can be broadly classified as interface design graphics and content design graphics. Sources of images could be photographs, clip arts etc. Graphic data can be stored in 2 ways: as rastor and vector graphics.

Multimedia graphic tools can be classified as image editing tools, digital artistry tools, 3D graphic tools and miscellaneous utilities. Adobe Photoshop and illustrator, Corel Draw and Photo paint, Macromedia Freehand, Jasc Paint shop pro are some of the tools well known in the market.

13.18 Keywords

❑   **3 Dimensional graphic images:** Images that are developed using high-end 3D software packages or platforms.

❑   **Rastor imaging:** The technique of dividing the entire image area into pixels and recording the data on each pixel.

❑   **Vector imaging:** The technique of storing a digital drawing as a group of mathematical lines, arcs and curves.

❑   **Plug - Ins:** Programs developed by third party developers, to extend the core functionality of specific software packages.

Chapter 14

Scanning and Digital Photography

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CHAPTER OVERVIEW

Scanning and digital photography are two indispensable sources of digital imagery.

In this chapter, we briefly look at the different types of scanners and the basic principle behind scanning, followed by discussions on professional scanning techniques.

Digital photography is a profession as well as an art and has hit the mainstream in recent years. We take a quick look at different types of cameras available and then concentrate on what makes a good digital photograph.

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14.1 Introduction

Sources of multimedia graphics could be digital photographs, clip arts, 3 Dimensional graphic images or any other miscellaneous sources.

Digital photographs have to be developed - either by scanning or by digital photography.

While clip arts and 3 dimensional graphic images can be generated within the computer itself - using relevant set of software tools, digital photographs can be acquired only with the help of dedicated equipments: scanners or digital cameras.

Let us focus our attention first, on scanners since they predate digital cameras.

14.2 Scanners – an introduction

Scanning is a very simple process of converting any picture data in paper, to a digital image. Once the image is saved in the computer, it can be edited using relevant software.

Apart from photographs, scanners can also be used to digitise texts in paper, which can then be converted to an MS Word document or so – using a specialized technology called OCR (Optical Character Recognition). This is nothing less than a boon for converting voluminous load of textual information, in books - to a digital format, without the need of typing in the entire book, page by page.

Several types of scanners are available in the market to suit the needs of different applications. These include:

❑ Sheet-fed scanners

❑ Flat bed scanners and

❑ Hand Held·scanners

Though these equipments look so different from one another, the basic principle behind them remain very much the same. A scanner head is used to read the image data with the help of light beams and the reflections are recovered

by a series of light sensitive diode crystals, that ultimately transmit the corresponding digital information to the system - in the form of electrical signals.
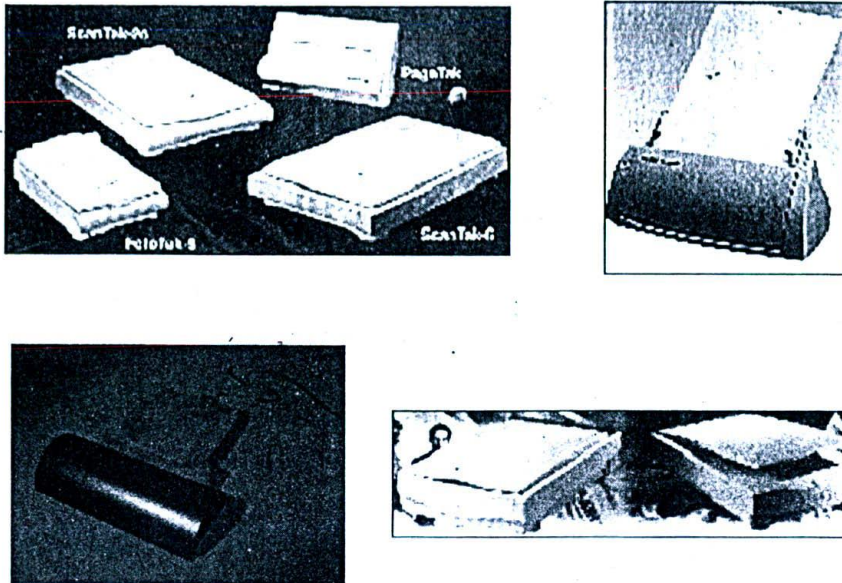

*Figure 80: Different types of scanners are available in the market –
to suit the needs of different applications*

The major difference between these different types of scanners lie in the way the page containing the photograph and the scanner head that reads the picture data, move past each other.

14.3   Sheet-fed scanners

Sheet fed scanners, as the name implies, are used to scan sheets of paper.
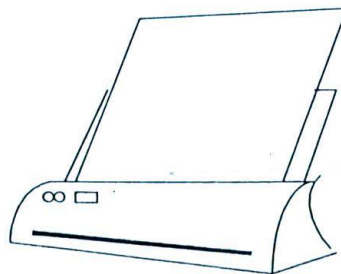
Figure 81: Sheet fed scanners

Here, the scanner head remains stationary, and a series of soft mechanical motors move the paper past the scanner head - slowly.

They are mainly used in office applications, where scores of pages may have to be scanned - every day. The results are pretty good, but the serious limitation that restricts their usage in multimedia environments, is that they cannot accept sheets thicker than a single page — and thus cannot be used to scan books etc. without destroying the latter!

14.4   Flat bed scanners

In case of flat bed scanners, the page containing the photograph remains stationary over a reflective glass plate and the scanner head moves over the plate, on the other side - scanning the picture data

Here also, the results are quite superior - and more importantly, they can be used to scan pictures from books, magazines etc. without a hitch.
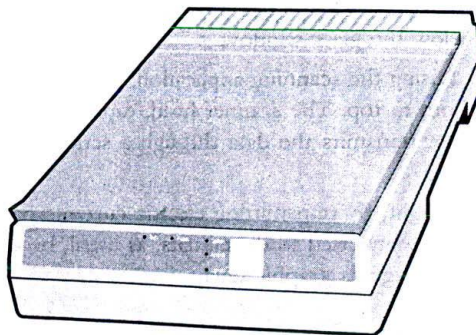
Figure 82: Flat bed scanners

The page that has to be scanned should be placed softly over the glass bed - much like the copiers — and the scanning process should be initiated in the software application that controls the scanner. The process is simple and straightforward.

One distinct advantage of flat bed scanners is that they can be used to scan even very large images - part by part.

Flat beds are the most widely used type of scanners — among the three.

14.5   Hand held scanners

In this type of scanner, the scanner head has to be moved manually over the paper — portion by portion.
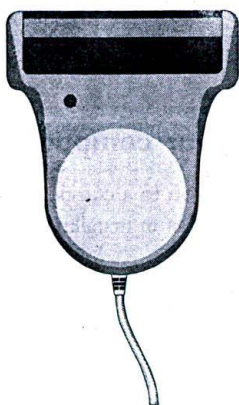
Figure 83: Hand held scanners

Since human hand movements cannot be expected to be even, the results are usually not comparable to that of flat bed scanners. However, the purpose of hand-held scanners is different and they generally do not require that high a degree of accuracy.

Such scanners can be spotted in places like retail markets – where they are used to read the bar codes in the labels.

14.6 Basic principle behind flat bed scanning

At the start of scanning process, a powerful light source illuminates the paper containing the picture data - placed upside down. The side adjacent to the glass window is the side to be scanned.

The idea is that the blank or white spaces will reflect more light, when exposed, than inked or coloured dots.

The scanning head is located right below the glass window.

When the scanning process is initiated using the scanning application, a motor moves the scanner head on the other side of the window, slowly from bottom to top. The scanner head, capable of sensing the light that's bounced off from the various portions of the paper, transmits the data through a series of mirrors - to a light sensitive diode matrix system.

These diodes react to the exposure of light, by transmitting electric currents proportional to the intensity of light falling on them. These electric signals are converted to digital data, as usual, by analog to digital converters - before being passed on to the computer for storage as graphic data.
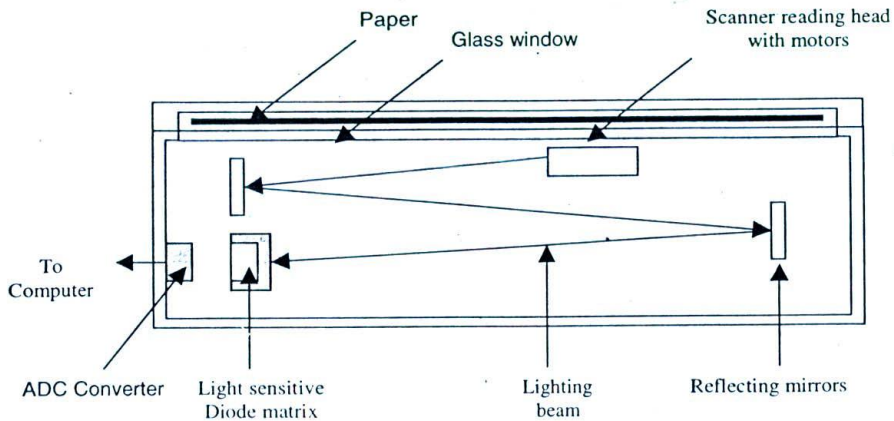

Figure 84: Principle behind Flatbed scanning

14.7 Hooking the scanner on to your computer

A few years before, the process of installing scanner on to a computer and establishing the communication protocols, use to be a complex exercise. The main complexity was in installing the SCSI scanner card that served as an interface between the computer and the scanning equipment.

But now, with the introduction of USB port, there is no need for a dedicated interface card and the equipment can directly be plugged into the system. This has simplified the scanner installation process dramatically.

The procedure can be explained in few simple steps and this is more or less the same for almost all brands of flatbed scanners.

The first step is to install the scanner software that comes bundled with the equipment. This software contains an application that can control the equipment as well as the device drivers required to recognize the hardware – when plugged in through the USB Port.

Once the drivers are successfully installed and the machine is rebooted, we can say that the system is ready to interface with the scanner.

In Windows 2000, you can directly plug-in the equipment through the scanner cable whose one end is connected to the computer and the other end is inserted into the machine's USB port. The Operating system immediately recognise the presence of a new hardware and configures the same for usage.

14.8   Scanning process

The actual scanning process is pretty simple.

❑   Place the required photograph or drawing on top of the glass panel and close the scanner with the white board cover.

❑   Initiate the scanning process using the application that came bundled with the scanner. If you are starting the scanner for the first time in the day, you may get "Warming up the lamp" message.

❑   After warming up, the scanner head traverses back and forth and the photograph is shown on the scanning application.

❑   At this point, you need to select the settings with which you want to do the scanning. You may have to set the DPI (Dots Per Inch - i.e. the sharpness or the resolution at which the pictures are scanned) of the picture. You don't need anything more than 150 – 200 DPI for normal applications, but if you are going to print the scanned photograph, you can go up to 300 DPI or even more.

❑   Do the actual scanning process and select where the resulting data should go. If you select file, then the image will be saved as a .bmp or .jpg file. It is better to save the scanned pictures as bitmaps first, before converting them to jpg images using some graphics application like paint shop pro.

14.9   Tips for scanning

❑   The quality of the scanned image very much depends upon the quality of the original photograph or drawing. Hence, use good quality photographs or drawings.

❑   The DPI of the scanning relies, to a considerable extent, on the quality of paper being used. Better the quality of paper, higher the DPI that can be employed during scanning! For example, if you are scanning colour photographs printed by photo studios, then you can easily engage a higher DPI; on the other hand if you are scanning pictures from magazines or newspapers, you will find that higher DPI often reveals the RGB colour dots – thus making the image useless.

❑   While placing the paper over the glass panel, always try use the central area - leaving some gap in the edges. This will result in even pressure across the paper – when the white board presses the paper.

❑   Go for DPI above 200 only if the photograph is of exceptional quality.

❑   With some scanners, you can even zoom in on a particular portion of the photograph -during the scanning process.

❑   The scanned picture may have to be edited to suit the particular multimedia project under production, before embedding the graphics. Various image editing software are available for this purpose.

❑   Though a variety of filters and editing options are available in the image editing software, most of them are only capable of making a good picture look better – and not in making bad pictures look good! So, there is no point in banking upon them heavily. Not only the photograph, but also the quality of paper containing the photograph - plays an important role in scanning. Art paper and other high quality paper printouts achieve best results.

14.10   Digital photography

Digital photography is the process of taking photographs using specialized digital cameras and storing the image directly as digital data - without making use of any film at all!

Digital photography is currently revolutionising not just the multimedia industry, but also a whole lot of other sectors like printing and news - throughout the world.

For example, reporters now can take a digital photograph of an incident and transmit the data immediately via e-mail to his or her office - wherein, the editor can embed the same on to the paper directly and print it! Thus, superior quality pictures can be transmitted in no time, to the destination without getting troubles like 'exposure of film roll', 'washing the films' etc.!

As in the case of scanners, though a variety of digital cameras are available in the market, the basic principle remains almost the same, as illustrated below.

14.11 Basic principle of digital photography

The image that's focused with the camera lens, is cast over a special chip called a charged coupled device, whose face is studded with an array of transistors - that create electrical currents, proportional to the intensity of light that's cast over them.

Logically, each of these transistors ultimately makes up the pixels of the digital bitmap that's going to come to our monitor!

Note

Colouring information has to be recorded as a combination of Red Green and Blue intensities (RGB Values). To capture this information, one transistor is actually not enough. Hence, digital cameras actually make use of more than one transistor per pixel to capture all the millions of colour dots that needs to be recorded!

You can very well imagine the complexity of the circuitry - when the said camera is capable of taking, say, pictures at 1024*768 resolution!
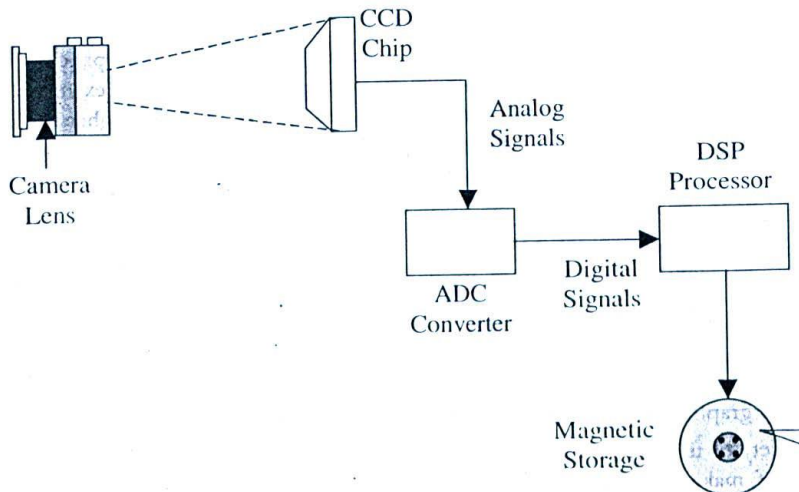

Figure 85: Basic principle of digital photography

The continuous stream of electrical analog signals generated by each of the transistors, move over to the ADC converter, wherein they are converted to digital zeros and ones and sent to a digital signal-processing unit (DSP) that has been already programmed to manipulate photographic data. The DSP adjusts the contrast and detail in the image to that perceivable by monitors, compresses the RGB pixel data that make up the image, and finally store the same in the camera's magnetic memory slot.

This memory may be a permanent magnetic memory or simply a RAM chip, depending upon the type of camera. Some cameras allow floppies to be inserted into a special mini floppy drive, so that the image data can be stored and then transferred to computers.

Digital cameras are available for both Microsoft Windows and the Apple Macintosh platforms. Depending upon the sharpness, quality of the picture and the associated storage space, the price may vary.

14|12 Camera specifications

We need to understand the parameters and specifications that dictate the capabilities of a digital camera and thus control the quality of the pictures taken.

They are:

- [ ] No of effective pixels (usually expressed in mega pixels)
- [ ] Different image sizes possible (directly proportional to CCD pixels)
- [ ] Optical zoom (expressed as 1x, 2x, 3x etc.)
- [ ] Digital zoom (also expressed as 5x, 10 x etc.)
- [ ] Image quality, type etc
- [ ] Memory card specifications
- [ ] Video capture / output
- [ ] Power / battery requirements
- [ ] Other camera specifications like exposure, shutter speed, aperture range, flash etc.

Here, we will discuss certain important parameters and specifications you need to know while purchasing a digital camera.

- [ ] **Effective pixels:** This is perhaps the most important parameter, which controls the quality of the pictures taken. The more the effective pixels are, the better. A 5-mega-pixel camera can capture more details of the shot taken than a 3-mega-pixel camera and hence better quality pictures. On the flip side, the size of the pictures will be big and hence we need more memory to store each picture.

- [ ] **Zoom:** Optical and digital zooms control the zooming capacity of the camera. The most important point to take note of is that, while optical zoom does not result in loss of quality, digital zoom does result in pixalation and other problems and hence results in loss of quality.

- [ ] **Image size and quality:** Images can be captured at various resolutions and colours, using a digital camera. The higher the resolution or number of colours, the better is the image quality. Popular resolutions are 1600*1200, 1024*768 and 640*480.

- [ ] **Memory specifications:** The flash card or the memory card that is slid into the camera, serves as the storage medium for pictures taken. Memory cards are available with 64 MB, 128 MB or 256 MB capacities. The capacity of the card dictates the maximum number of pictures that can be taken using the camera. Once the memory slot is full, you have to either insert a new flash card into the slot or download all the pictures into a PC and release the memory of the card for reuse. The following table gives you an approximate idea of how many pictures can be stored in a 64 MB memory card – at different sizes and quality.

Table 24: Number of pictures that can be taken using a 64 MB flash card – at various settings (approx.)

Resolution\ Quality	1600*1200	1024*768	640*480
Best	66 pictures	159 pictures	390 pictures
Medium	131 pictures	306 pictures	709 pictures
Basic	256 pictures	578 pictures	1301 pictures

❏ **Video capture:** Certain digital cameras, apart from capturing pictures, can also record videos without sound. This is a desirable feature, if you want to record small clippings for your projects. The movies are usually stored as mpeg files.

❏ **Power / battery capacity:** This is not as less important as it looks! Particularly when you use flash for each and every photograph, the power consumption is pretty high. Add the LCD display's power consumption on top of this! All this necessitates a very powerful battery capacity.

14.13 Summary

Scanning is the process of converting images and photographs on paper to digital imagery. There are three types of scanners: Sheet-fed, Flatbed and Hand-held scanners. Flatbeds are the widely used ones.

Results of scanning process depend on two parameters: the number of colours and DPI (dots per inch) used for scanning. High-end scanners can capture more details from a given photograph, than their low-end counterparts.

Digital photography is the process of taking photographs using a digital camera.

The parameters that control the results of a digital camera are number of effective pixels, optical zoom, digital zoom, resolution and number of colours.

Here again, high-end digital cameras can capture more details from a given scene than low-end cameras.

14.14 Keywords

Dots per inch (DPI): The total number of dots used to capture one square inch of a physical image. This parameter dictates the quality and resolution of scanned pictures.

Chapter 15

GRAPHICS EDITING

CHAPTER OVERVIEW

Having seen what are all the different categories of tools available for graphics editing and manipulation, we now need to take a detailed look at the different graphic manipulation options and how they can be put to use in a given project.

For illustration, we take Jasc Inc's Paint shop pro – a cute little image editing tool with the help of which, we can master all the fundamentals and gear up for complex editing tools like Adobe Photoshop.

Graphics editing and manipulation operations are literally unlimited in number – there are functions to edit the colour, orientation of the image, add special effects, enhance the quality etc. You will learn most of the fundamental operations and how to apply them in combination.

The chapter winds up with an introduction to various ready-made sources of professional digital images.

15.1 Introduction

We already saw in one of the previous chapters that sources of multimedia graphics could be photographic images, clip arts or 3 dimensional graphic images, apart from all other miscellaneous sources.

We also saw that the photographic images have to be obtained either by scanning or by digital photography and digital images thus obtained must be edited and manipulated, before they can be used in multimedia applications.

In this chapter, we are going to concentrate on the latter part of the story viz. digital image editing and manipulation. We will first understand some of the technical terms, terminologies and concepts, before looking at some of the actual tools that help us to do digital image manipulations.

15.2 Need for graphics editing and manipulation

All digital photographic images must be edited before being embedded into a given project.

Why?

Well, there may be more than one reason.

❑ We may want to improve the look and feel of the image, by altering some of its attributes like brightness, colour contrast etc (editing).

❑ We may wish to remove some of the unwanted portions of the image or might wish to add something from another photograph (manipulation)

❑ We may have to adjust the size, resolution and number of colours that make up the image. Refer the following section for more details (editing)

❏   We may wish to add certain special effects that are not available with conventional or digital photography. A variety of filters, functions and effect options are available with image editing software tools that enable us to try out hundreds of special effects (manipulation)

❏   We may wish to convert one file format to another.

15.3 Basic attributes of an image – size, resolution and number of colours

Before proceeding further, we should understand the three basic traits of any digital image. We have already come across these terms in the previous chapters – but under a different context.

They are:

❏   **Image size:** Every image has a width and a length – expressed either using as physical dimensions (cm, inches etc) or logical dimensions (pixels). If you are going to print the resulting image after editing and manipulation, then it is better to use physical dimensions. Otherwise, use logical dimensions.

❏   **Image resolution:** The number of dots that fill up a square inch or square cm in the image. As we increase this number of dots, the image size becomes pretty big – since it contains more details per square inch. Once again, if you are going to print the resulting end image – use higher resolution and if you are going to use them in pc multimedia applications, use lower digits.

❏   **Image colours:** Every image is made up of a number of colours. This number could be as low as 256 or as high as several millions of colours. This parameter indicates how many colours are contained in a particular image.

These parameters have a direct impact on the physical memory of the image. Higher size or number of colours implies higher memory requirements.

For a better understanding, I've drawn a table comparing the memory requirements of various images of various sizes, resolutions and no of colours.

Table 25: Memory requirements of a bitmap image – comparative study

Size (Pixels)	Resolution (Pixels / inch)	No of colours	Size (KB / MB)
640*480	72	16.7 Million (24 bit)	900 KB
	72	256 (8 bit)	301 KB
	300	16.7 Million (24 bit)	900 KB
	300	256 (8 bit)	301 KB
800*600	72	16.7 Million (24 bit)	1.3 MB
	72	256 (8 bit)	469.7 KB
	300	16.7 Million (24 bit)	900 KB
	300	256 (8 bit)	301 KB
1024 * 768	72	16.7 Million (24 bit)	2.2 MB
	72	256 (8 bit)	769 KB
	300	16.7 Million (24 bit)	2.2 MB
	300	256 (8 bit)	769 KB

You will notice that it is the number of colours that is the major decision factor that affects the physical size of the image. It is important that we understand this very clearly at this point of time.

15.4   Number of colours in an image

Each digital image may contain a few hundred or few thousand or a few million colours!

Technically, these are called 8 Bit, 16 Bit, 24 Bit and 32 Bit colour schemes. 24 Bit scheme can contain as many as 16.7 million colours and is sufficient for most applications.

Have a close look at the images shown.

I can guarantee you that one of them is an 8-bit image and that the other is a 24-bit. But you are unable to distinguish them.

Even if you were to refer the CD-ROM that comes with this book and have a very close look at the original colour images, you will still have difficulty identifying the 8-Bit image.

This is mainly because of the fact that human eye cannot distinguish anything beyond 256 colours.

Thus it is possible to reduce the number of colours of most images – if not all – to 256, without market difference in the resulting image. However, if you are going to print the resulting digital image, better stick on to 16.7 million colours – as printing machines are more sensitive than human eyes.

Before we conclude, let me break the answer: The image on the right hand side is an 8-bit image!
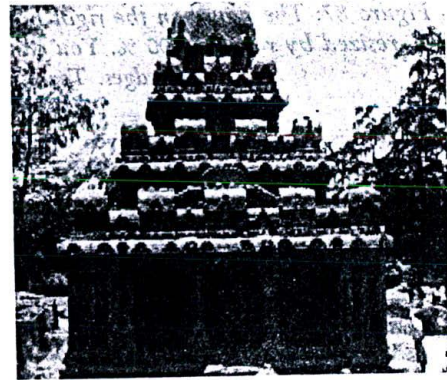
Figure 86: Can you tell which one is an 8-bit image and which is a 24-bit image?

15.5   Graphics editing concepts

Graphics editing tools we see in the market today were developed over a period of time. During this period, several concepts have evolved in this space and almost all professional tools make use of these concepts – in one way or other.

In this chapter, it may not be possible for us to discuss all the concepts – but we will see some of the important ones, listed below:

- ❑   Anti aliasing
- ❑   Layering
- ❑   Selections
- ❑   Masking
- ❑   Image filters

Let us discuss these concepts, one by one.

15.6   Anti-aliasing

The term anti-aliasing should not sound alien to those who have read one of the previous chapters titled 'Multimedia texts'. There, we saw that anti-aliasing is used to smooth out the edges (or jaggies) of the text by way of employing a series of colour gradients - in and around the sharp edges.
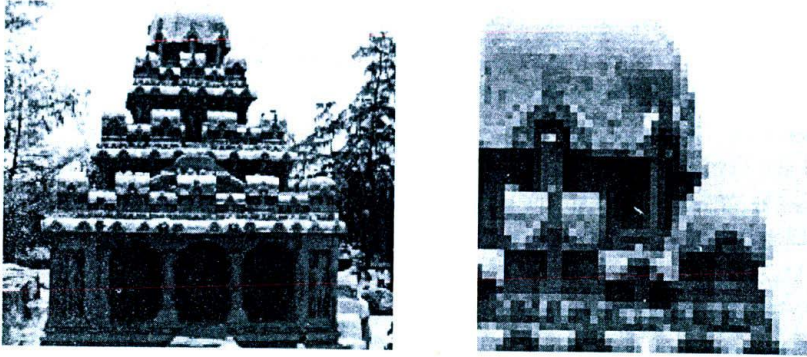
Figure 87: The figure on the right hand side shows just a portion of the image - resized by roughly 400 %. You can see the rough squares protruding out of the dome's edges. Technically, this is called pixelation.

The problem of jaggies comes into picture even with digital graphics and anti-aliasing is required to smooth out the sharp edges resulting.

Unlike text data, wherein jaggies develop even during the initial typing stage itself - graphic images are prone to jaggies only when edited...and more noticeably so, during the zooming or picture resizing operation!

Anti-aliasing pictures involve much more complicated algorithms than texts - something like pixel interpolations and replicating each pixel by a mathematical factor etc., and only professional photo editing software are endowed with the same. Without anti-aliasing, enlarged pictures almost become unusable in professional multimedia applications.
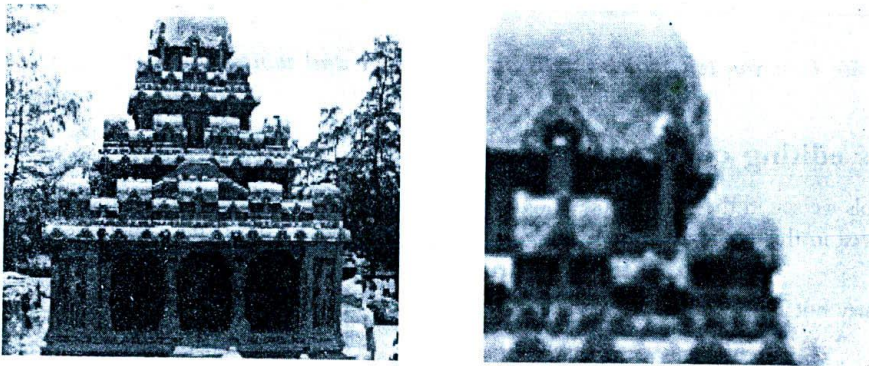
Figure 88: Here too, the right hand side image has been resized by roughly 400 %. But it looks much better than the previous one - at least without the square edges, because of specialized mathematical algorithms that are made use of during resizing operation.

If you are sure that the image is going to be enlarged and if the source of the image is in paper or photograph, then you can perform the zooming operation during scanning process itself. The results are better that software based zooming.

15.7 Layering

Layering is an important concept in the world of graphics editing – as it gives immense power to a creative digital artist.
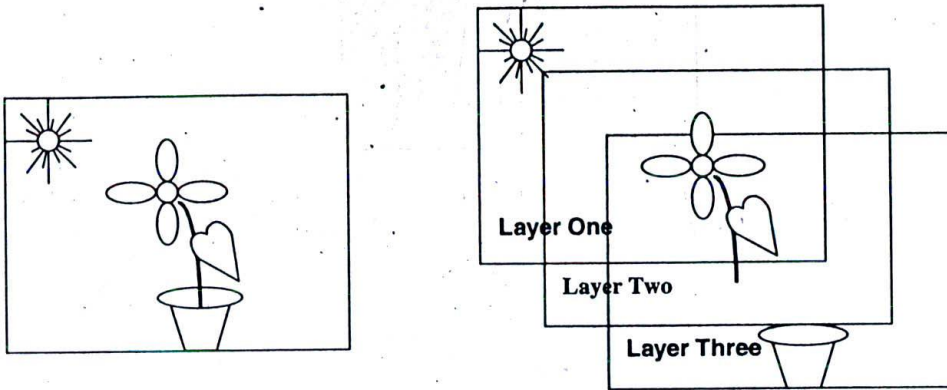

Figure 89: According to the concept of layers, each image is composed of one or more layers. In this sample figure, what you see as a single picture on the left hand side is actually composed of three layers – one containing the pot, one containing the plant and a third one containing the background.

According to this concept, each image is made up of one or more layers. What you see as an integral picture may actually be composed of several elements in different layers.

The biggest advantage of having layers is that you can edit a specific portion of the image, without disturbing the rest. For example, you can retain the same image as shown in the example – and just change the background to evolve a totally new picture with minimal effort.
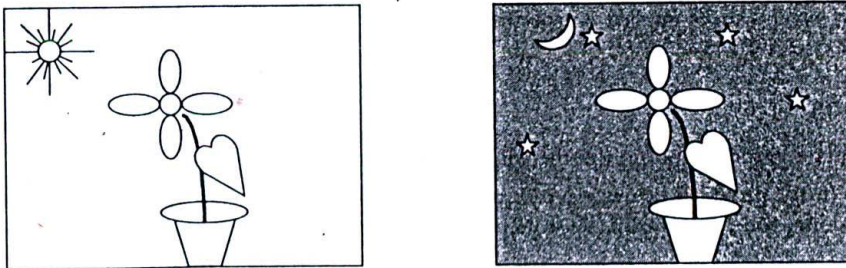
Figure 90: The right hand side picture was evolved from the left –
by simply replacing the background layer with a night effect.

For this reason, the bottommost layer below all other layers – is usually called the background. Digital artists use it to put a basic background for their pictures, on top of which - they add the image objects they wish to add.

To reveal the contents below, each layer should have certain portions transparent.

In the previous example, many portions were transparent – that is why you were able to see the night background – when the background image was changed. For your understanding, I've shaded the transparent portions in layers two and three.
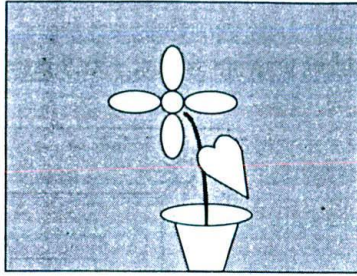
Figure 91: Certain portions of the top layer should be transparent – revealing the image from the bottom layers. In this picture, the shaded portion represents transparent areas.
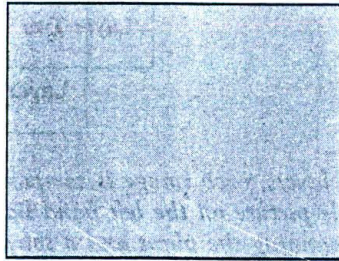

Figure 92: The opacity of the top layer has been set to 50%; hence all lines are visible only as dashed outlines.

Apart from transparency, each layer may also have an opacity element associated with it. If the opacity is 100%, then the layer is totally opaque and if it is 0% then the layer is totally transparent. In between zero and hundred, one can choose any degree of opacity he wants and can actually produce very cool effects with it.

Unlike transparency, which can be applied on specific portions of a layer, opacity has to be adjusted on a layer-by-layer basis.

15.8   Selections

A selection represents a particular portion in the whole image.

For example, in the image provided below, you can treat the sun, plant and the pot as independent selections. Once you select the sun alone, you can actually adjust its placement, control its colour or do other forms of editing and manipulation.
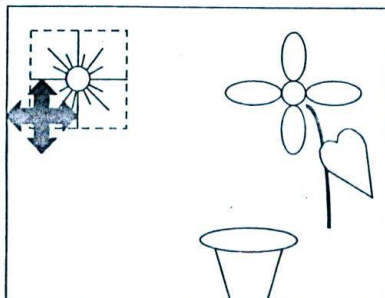
Figure 93: Selections help us to manipulate independent portions of the image.

It will be very interesting to compare selections with layers.

You may actually think that you can have the sun, the plant and the pot in independent layers and adjust the placement of the layer straight away, instead of making independent selections of the objects. In reality this is impracticable and cumbersome – for the following reasons:

☐ You cannot keep adding layers to every other object featured in the image. As the number of objects increase, it becomes very difficult to manage the image.

☐ Increasing the number of layers also increases the size of the image and it becomes difficult even to load the image due to heavy size. This is undesirable as it takes long time to save and load the image every time.

The right methodology is to strike a balance between the layers and the selections. When the numbers of objects are small, see if you can manage without a layer or with one layer.
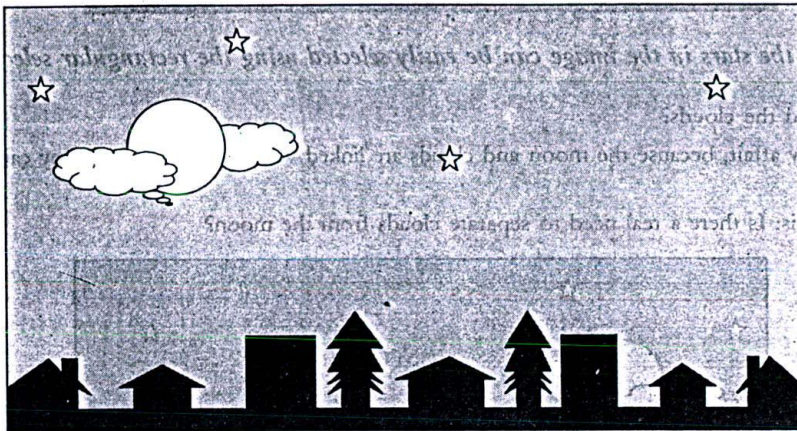
Figure 94: In the image shown, how many layers you think you really need?

The key to arrive at this balance lies in understanding how selections really work and how different objects of a given image need to be manipulated.

In the example image provided, you may want to move the stars, moon, clouds, houses and the trees - independent of each other. In order to achieve this independence, will you keep all these objects in independent layers? If you were to do so, you may have to manage at least 20 different layers for such a simple image!

This is really not worth it and an unintelligent / resource intensive option.

Instead, try to think what are all the objects you can place in one layer and select them easily.

Let us assume we place the moon and the stars in one layer.

Can we select them at ease?

Very much! Since there are no objects around them, we can easily select them using the selections tools available with the software we are using. Most of the professional graphics editing applications feature various kinds of selection tools – to suit the needs of different projects.

For example, we can select the stars using rectangular selection tool, as shown below:
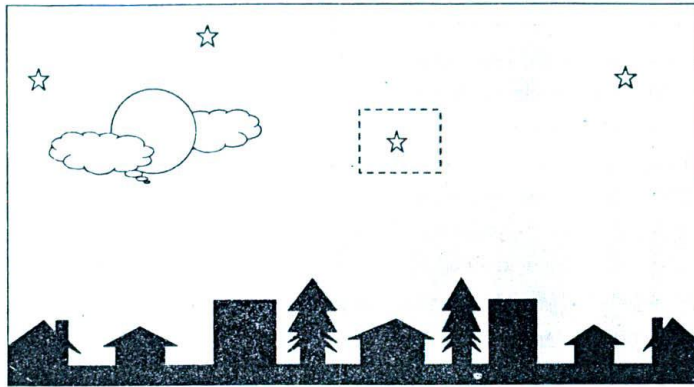
Figure 95: All the stars in the image can be easily selected using the rectangular selection tool.

How about moon and the clouds?

This is a slightly tricky affair, because the moon and clouds are linked with each other and they cannot be selected independently.

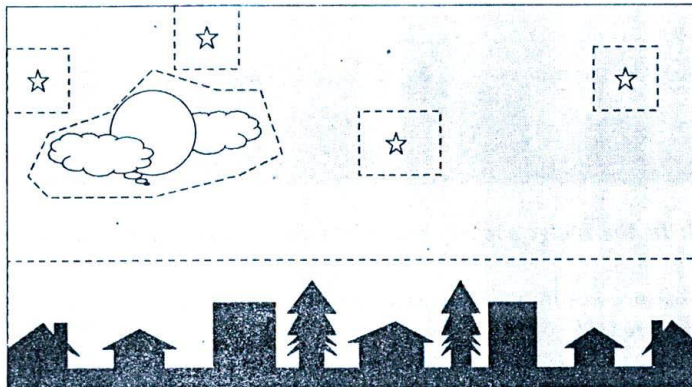But the question is this: Is there a real need to separate clouds from the moon?

Figure 96: All objects, other than the background - selected using various selection tools.

There can hardly be a situation! The combination looks good; let us leave them as they are.

Now, we have ended up with one layer with moon, clouds and the stars.

Next, look at the buildings and the 'not so good-looking' trees. We can as well put them in the same layer as the moon and the stars -- because they are featured in the bottom portion of the image and hence can be selected without disturbing the rest.

In order to get things clarified further, we've provided you an image with each of these objects selected using appropriate selection tools.

The selection tool used to select moon and the clouds -- looks interesting. Unlike the rectangular selection tool that is used to draw geometric selections, this tool is used to select objects using irregular contours. Some applications call this a freehand selection tool. This freehand selection tool is probably one of the most innovative tools that you will frequently use in real life projects.

Now, we have ended up with a much simpler figure -- with one background and one layer with all objects put together.

Layer 2 with all objects and a transparent background

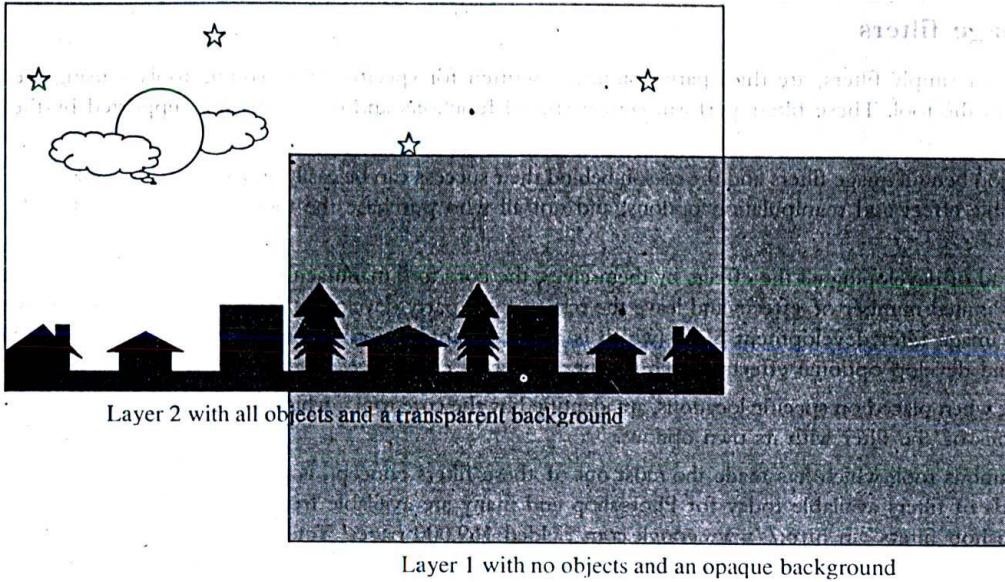Layer 1 with no objects and an opaque background

Figure 97: The final layers arrangement we have ended up with.

It will be interesting to note that all the objects could be selected in the second layer easily because we segregated the background. If we were to mingle the background with the objects, selections would have become pretty difficult – since the areas around the stars and the moon would not have been empty, by then!

15.9 Masking

Masks are special kinds of layers – which hide specific portions of the underlying image and expose the rest.

For example, let us introduce a mask - in the sample image we have been dealing with in the above pages. This mask exposes a circular portion of the underlying image – blocking the rest from the eyes of the viewer.

Masks can be saved and reapplied over any other image.

Like layers, masks also have the opacity element attached with them. This can be used create faces in-between the layers.

Figure 98: The mask over the image exposes selected portions of the image

15.10 Image filters

Image filters or simply filters, are third party routines – written for specific image editing tools – using the APIs provided with the tool. These filters perform certain special functions and operations not supported by the main tool.

The inspiration behind image filters and the reason behind their success can be easily understood: No tool can support all the possible effect and manipulation options; and not all who purchase the tool may find usage for all those options.

Hence, instead of developing all the effects by themselves, the core tool manufacturers (like Adobe & Corel) expose only certain limited number of effects and leave the rest to third party developers. These third party developers get hold of the image filter development SDK (which is a sort of application programming interface or API to the core tool) and develop optional effects, which can be purchased either free or for a cost.

These filters, when placed on specific locations, are identified by the core tool – which then integrates the functionality and operations of the filter with its own options.

The most famous tool, which has made the most out of these filters concept, is Adobe Photoshop. Literally there are thousands of filters available today for Photoshop and many are available free on the Internet. (My search on "Free Photoshop filters" in http://www.google.com yielded 169,000 pages! You should find at least a couple of them very useful!)

15.11 Basic editing operations

Digital artists make use of a variety of editing operations over the original image – in order to achieve the desired results. This section introduces some of the basic operations most commonly found in all graphics editing software.

15.11.1 Re-sampling or resizing

This is the process of changing the size of the image, to suit the needs of the application at hand.

It is always safer to reduce the size of the image rather than increasing it – because enlarging the original images almost invariably results in reduced image quality.

There are many different techniques involved in resizing like bilinear re-sampling, bi-cubic re-sampling, pixel resizing, smart sizing etc. Unfortunately, these topics demand in-depth analysis and discussions and are beyond the scope of this book.

Please refer the section on anti-aliasing – earlier in this chapter, to see how enlarging operation reduces the quality of the image.
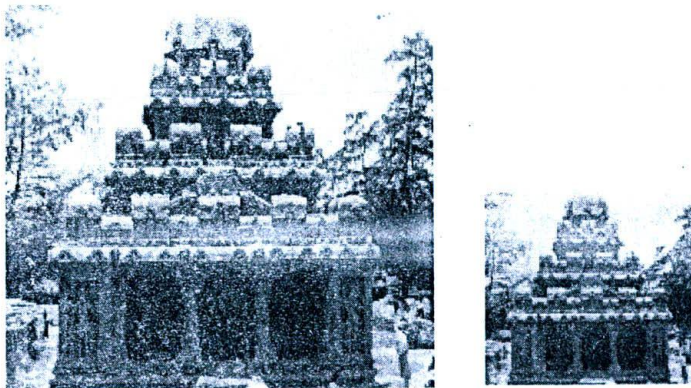

Figure 99: Original image resized to 50% of its size

15.11.2 Dithering

Remember our discussions on the number of colours that make up an image – earlier?

Well, dithering operation is very closely related to that concept.

Each colour image has a colour palette associated with it. This colour palette contains the list of colours that are made use of, within the image.

For a 256-colour image, this colour palette will obviously have 256 different slots and so on.

When an image made up of millions of colours has to be reduced to another with – say, just 256 colours or so, then we obviously need a process by which the million colours in the colour palette can be reduced to just 256.

A mathematical technique called dithering is employed for this purpose.

Dithering reduces the number of colours by identifying all the basic colours and simulating the rest by intermingling pixels of two or more palette colours. If these simulated colours are not too close to the original colours, then the resulting image appears to be a bit grainier.
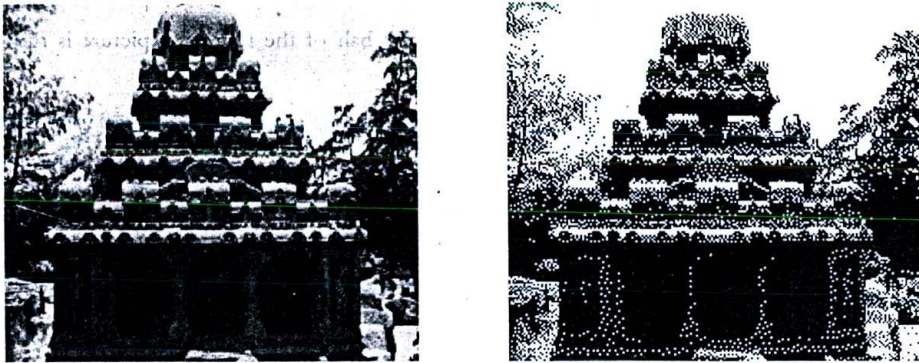
Figure 100: In order to produce this effect – that looks pretty amazing in the print medium, I used dithering to reduce the number of colours from 16 million to just 2! Process used was error diffusion. Certain details have been totally lost (like the sculptures on the left and right side of the first tier) – but the image, as a whole, looks like an Indian ink line drawing!

There are several processes of dithering - like reducing to nearest colour, error diffusion etc. Error diffusion is usually considered as a better option.

15.11.3 Flipping

Flipping is the process of producing a mirror image of the graphic image.

There are horizontal and vertical flip operations, resulting in horizontal and vertical reflections of the bitmap.

I frequently use horizontal flips to produce symmetrical images that look almost 'picture perfect'. To produce these kinds of images, we need to select one half of the picture, produce a horizontal flip of the same – and blend it seamlessly with the original half.
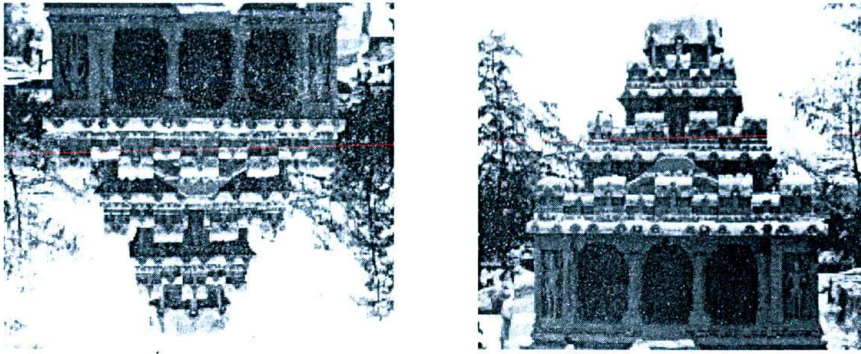
*Figure 101: One on the left is the vertical flip and the other is a horizontal flip –
compare them with the original image*

Without referring to the previous page, can you tell me which half of the following picture is from original image and which one is the flipped half? Left, or right?
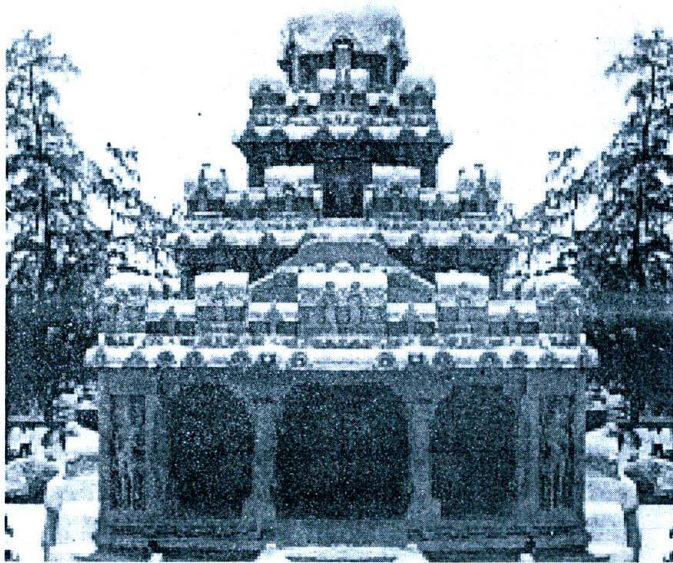

*Figure 102: By combining one half of the original picture with a horizontal flip of the same –
I created this interesting replica of the original temple. Challenge is to find out
which one is the original half - left or right?*

15.11.4 Rotating

This is the process of rotating the picture to required inclinations.

Perpendicular rotations like 90 degrees, 180 degrees etc. do not result in loss of picture quality, because they are as good as flipping pictures. The rest invariably result in slight loss of quality – mainly due to the development of jaggies.
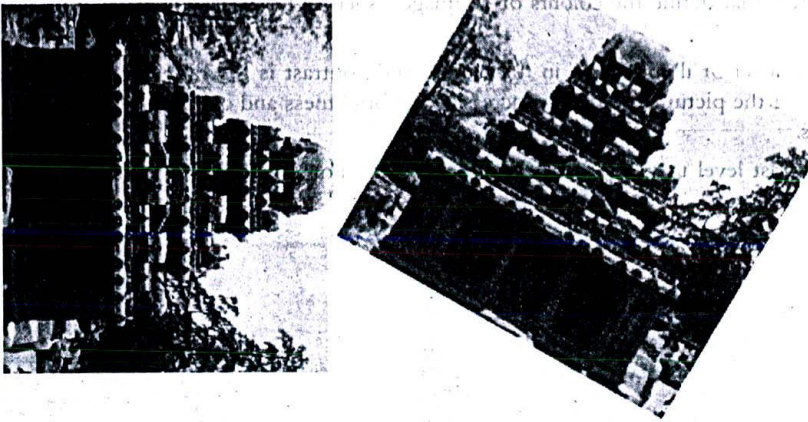
Figure 103: First image is a regular rotation – 90 degrees. No loss of quality is noticeable. The second is a 30-degree rotation. The sharpness of the original picture has been lost a bit, but the quality is still tolerable.

15.11.5 Zooming

Zooming is the process of enlarging a particular portion of the image, either to have a better look at it or to do some editing in that portion.

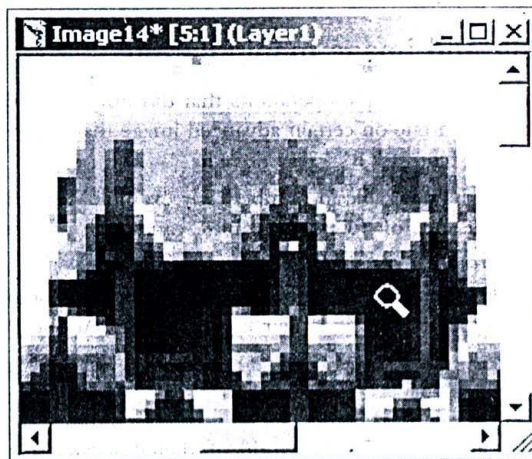For example, we could zoom in on just the top portion of the temple, in order to see the details and edit them a bit.

Figure 104: Image zoomed in using the zooming tool in Paint shop pro software

During zooming operation, the actual size of the image remains very much the same.

The process of enlarging a picture is totally different form zooming and was discussed under an earlier topic called resizing.

15.11.6 Colour corrections

Various parameters that define the colours of an image - such as brightness, contrast, intensity, hue and saturation - are editable.

Brightness is the level of illumination in the picture and contrast is the difference between the brightest and the darkest portions of the picture. By slightly increasing the brightness and contrast, we can actually improve the quality of most images.

I usually set contrast level to twice that of brightness level. For example, if I increase the brightness 6 times, I set contrast to 12 times.
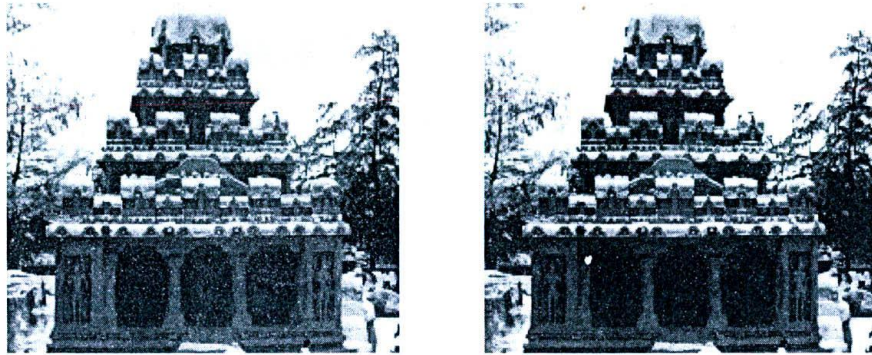

Figure 105: Frankly, our sample picture does not need any serious colour corrections. For the sake of illustration, I slightly improved the brightness and contrast. The one on the right is the edited picture.

It's difficult to explain these different colour effects with words and black and white pictures. You may have to try them out yourself using relevant graphic editing tools like paint shop pro.

15.12 Advanced editing and image manipulations

So far we have been looking at relatively simple operations that did not distort the original image to a great extent. In this section, we are going to concentrate on certain advanced image manipulation operations that may well distort the original image to a very great extent.

Frankly, these effect operations are innumerable in number! For example, for Adobe Photoshop – a premier digital image-editing tool – there are thousands of 'filters' available... and each of these filters comes with one or more special effect operations!

Here, we will look at some of the special effect options available. The terminology used is pretty close to Jasc Inc. Paint shop pro – but you should be able to find their equivalents in Adobe Photoshop or Corel Photo paint – pretty easily.

15.12.1 Drop Shadows

This is probably the most widely used effect in the world of digital artistry.

The effect produces shadows below or above the contours we define. The contours are usually the edges of the whole picture – but that is not a strict rule.

For example, in the illustration provided below, the first image throws a shadow down the whole photograph whereas the second projects the temple out of the photograph!

There are many parameters you can control, with drop shadow effect – like the angle, length, blur and opacity of the shadows.
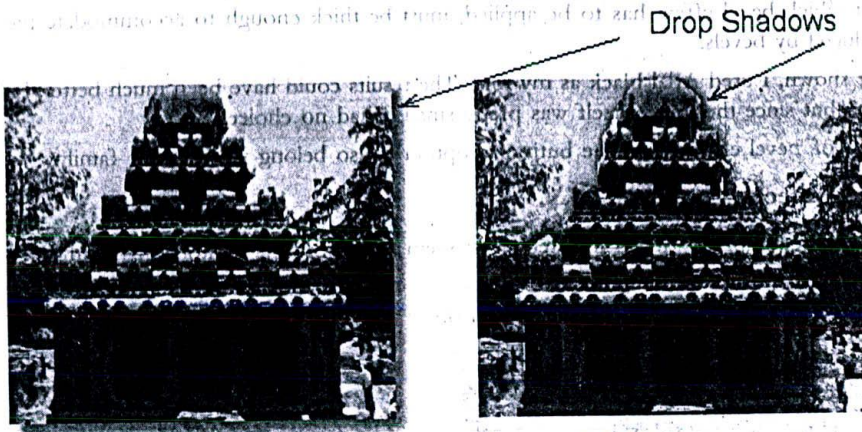
Drop Shadows

*Figure 106: Drop shadows are usually cast downwards over the whole picture (left),
but they can also be applied in many other ways (right).*

15.12.2 Bevel Effects (Inner bevel / Outer bevel)

Bevel effects produce dramatic effects on ordinary images. They are responsible for the 3 dimensional projections you enjoy in most digital artworks.

By changing the brightness and contrast over the edges of the image (or selection), bevels produce effects, which project things out of the plain paper.

Look at the sample image I have provided. The bevel effect applied over the image is a type of inner bevel that gives frame like appearance to the image. To increase the overall impact, I've coupled drop shadows with this.

Bevels are at their best with multimedia texts – they can make any ordinary text look extraordinary!
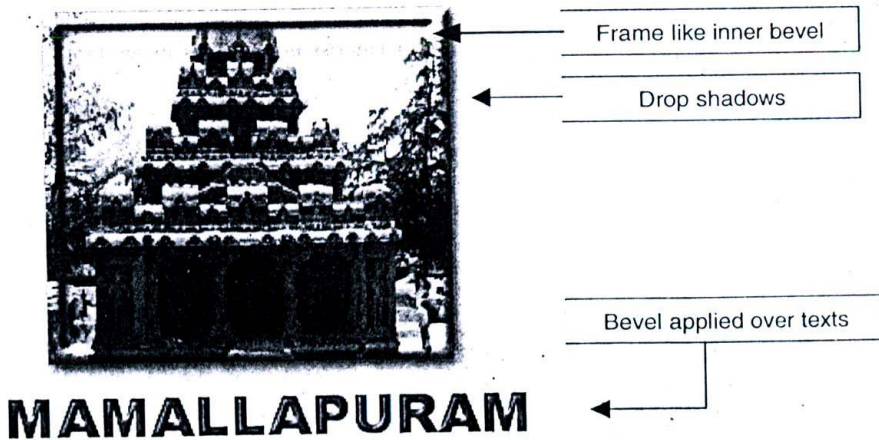

Frame like inner bevel

Drop shadows

Bevel applied over texts

MAMALLAPURAM

*Figure 107: Bevels and drop shadows are excellent combination –
when used appropriately, as illustrated here.*

Remember our discussions on 3D texts in an earlier chapter on the same topic. Bevels are the ideal tools for producing 3D effect in texts.

The fonts over which bevel effect has to be applied, must be thick enough to accommodate the shades are light variations produced by bevels.

In the example shown, I used Arial black as my font. The results could have been much better, had I increased the size of the font; but since the image itself was pretty small, I had no choice.

Minor variations of bevel effects, like the buttonize option – also belong to the same family.

15.12.3 Emboss effects

Emboss – as the name implies – result in effects that seem to emboss the contour of the image over a metal plate or a stone surface.

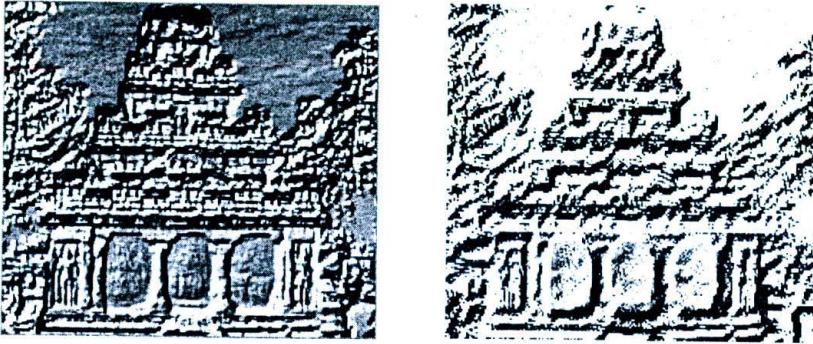Have a look at the two examples I've provided – in order to understand the effect.

Figure 108: Two types of emboss effects – sculpture and charcoal - applied over the original image.

In the first image, the original picture looks like a rock cut sculpture. One can choose the background and the texture colours. This effect is called sculpture.

This effect is particularly useful – when you want to show simple texts as archaeological epigraphs!

The second effect, called 'charcoal' – is another variation of emboss effect. This image looks more like a crayon pencil drawing, than something embossed on a solid surface!

15.12.4 Deformations

Quite a number of effects come under this umbrella – the famous pinch / punch, cylinder, perspective, skew etc.

Deformations change the very contour of the image over which they are applied – as shown in the examples below.
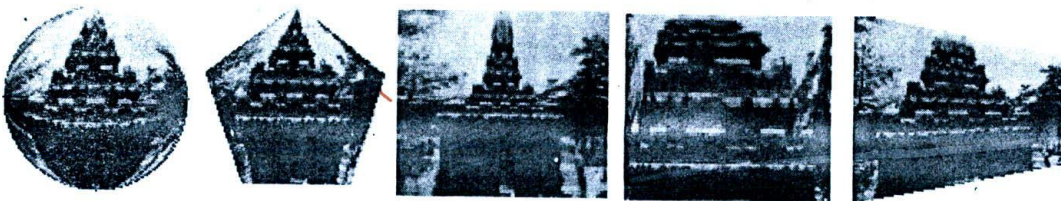

Figure 109: Many types of deformations – circle, pentagon, pinch, punch and perspective - illustrated.

I have no hesitation in terming deformations as a sort of fancy effect – which is of lesser use in real life projects, as compared to drop shadows and bevels.

15.13 Jasc Inc Paint shop Pro

Having seen so much about the types of special effects that are available at the disposal of a digital artist, let us get hands on with one of the professional tools available in the market – Paint shop pro!

Note: What I will illustrated here is version 6.0, but I could see that version 8.0 is already available in the market – from their website http://www.jasc.com. But this is not a serious handicap for the overall understanding of the subject, since paint shop pro version 6.0 itself incorporates most of the features – we have been discussing all along.
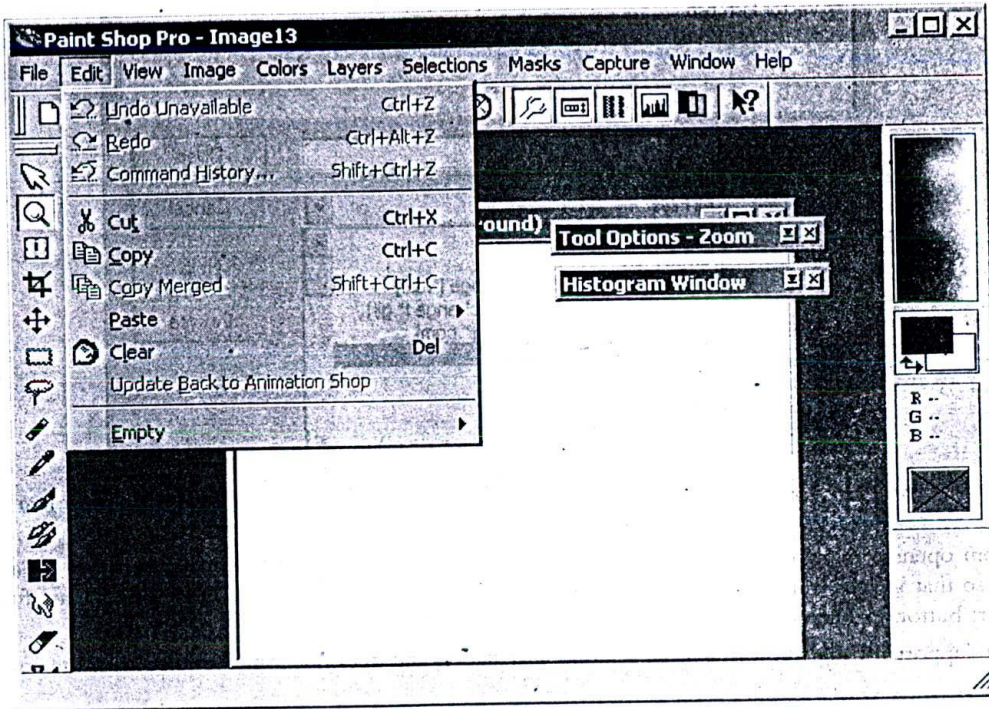

Figure 110: Jasc Inc Paint shop pro is a professional digital image editing solution.

Paint shop Pro can be used, either to create new pictures by digital drawing processes or to edit any of the existing digital photographs.

Apart from the usual File, edit, view, window and help menus – there are six other menus in which we are interested. They are: Image, colours, layers, selections, masks and capture menu.

15.13.1 File menu

The 'File Open' option can be found under the file menu item in the menu bar. Click the option, and the open dialog box is displayed.

Paint shop Pro supports almost all of the famous graphic file formats - including bitmap (.bmp), Corel draw graphics (.cdr), computer graphics metafile, CompuServe .gif, Targa .tga, .tiff, windows meta files (.wmf) and what not ?

Images in all these file formats can be directly opened and edited without a hitch.

What's more important, is that any of these files can be saved back in any other file format – using 'save as' option! Thus, apart from being a graphics editing and manipulation tool, Paint shop pro can also be used as an image conversion utility – suitable for most projects. This is one reason why I love this cute little tool.
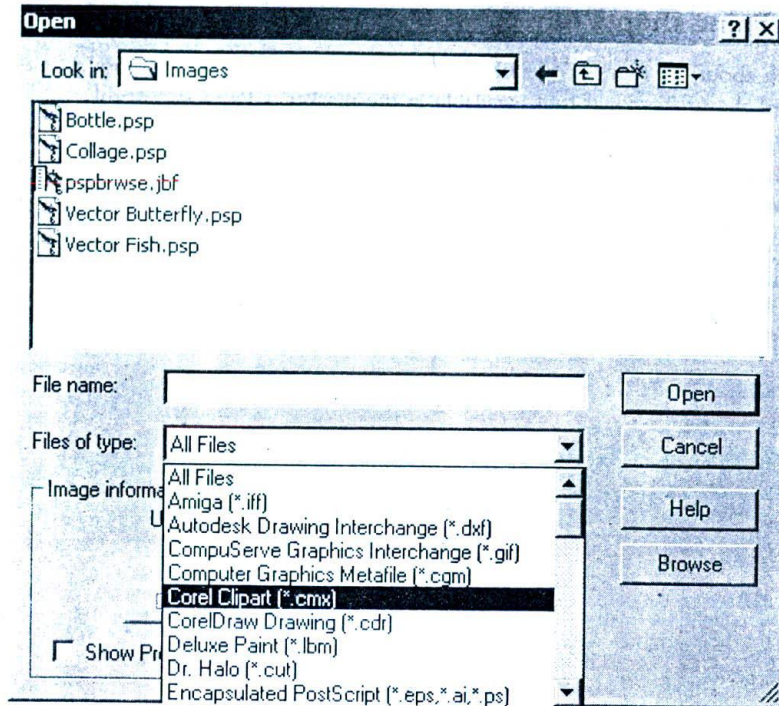
Figure 111: Almost all popular graphic file formats are supported by Paint shop pro

Apart from opening many different file formats, Paint shop pro also buckles with many versions of latest digital cameras- so that images from those cameras can be directly imported into the tool. These options are found under the Import button in File menu.

Note that support for digital cameras is an optional installation and does not come bundled with the core package.

15.13.2 Edit and View menus

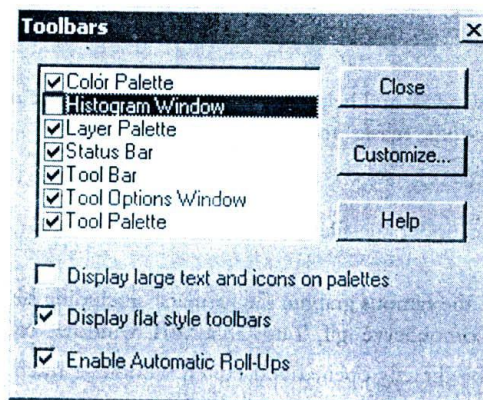Edit and view menus present all the usual options and I hope you can explore them yourself.

Figure 112: Toolbars window: Most of the palettes and windows are useful in Paint shop pro – and must be turned on, always!

I'd like to highlight the toolbar button in view menu – however. This button pops up a window that shows, which are all the toolbars that are currently displayed inside the Paint shop panel.

Do ensure that the options - as shown in the figure - are selected properly.

You will notice that we have switched all the toolbars on, but for the histogram window. This is because of the fact that most of these windows are pretty useful for our work.
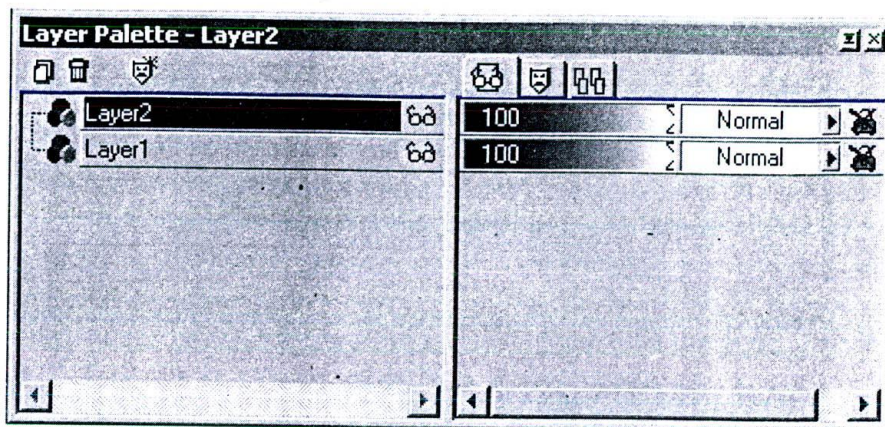

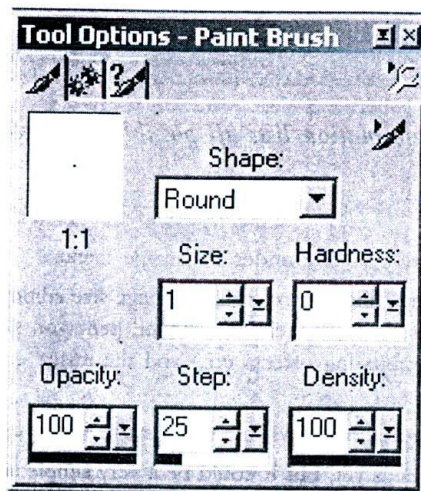*Figure 113: Layer palette that helps us to move between the layers...*

Figure 114: ... and tool options window that helps us to select various parameters for editing tools. Both panels can be made visible by clicking the right options in the Toolbar window.

In particular, the layer palette and the tool options window are two places where you need to go very frequently. Note that these two are floating panels and you may sometimes close them by mistake. If you are stuck up, come back to toolbars and switch the option on. The palette will be visible again.

Similarly, the image information button under the view menu helps us to view the different parameters associated with the current image – like the length, breadth, resolution, number of colours, number of layers, size etc. - in one place. The shortcut to reach this panel is shift+ i.
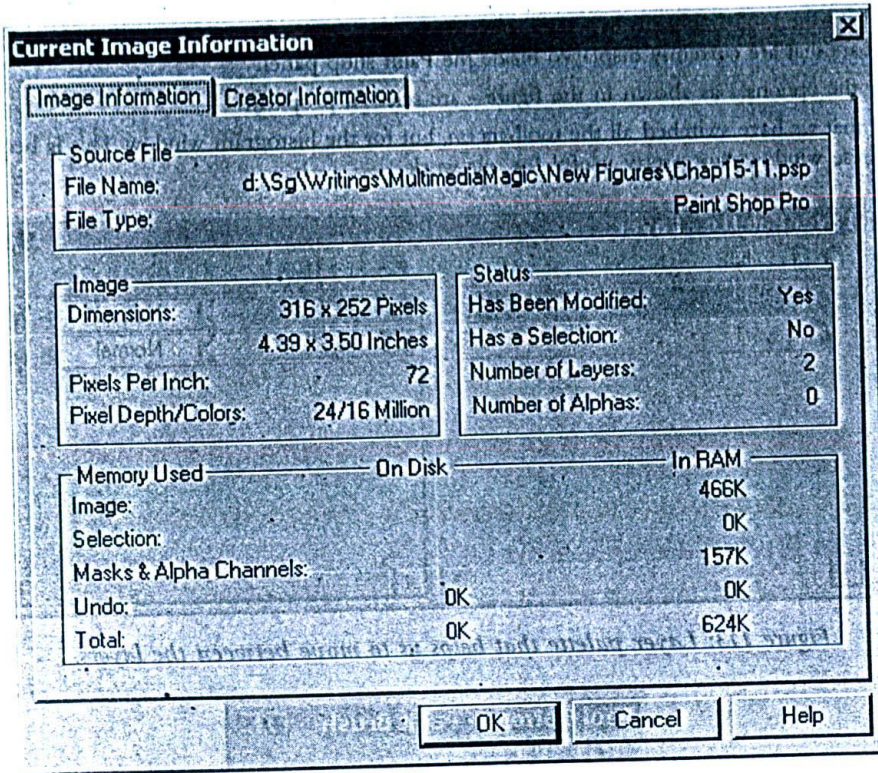
Figure 115: Current image information lists all possible parameters associated with the image.

15.13.3 Image menu

Quite a number of editing options are available under the image menu.

These include image orientation editing (flip, mirror, rotate), image size editing (add borders, canvas size, resize etc), all the deformation options we discussed earlier (circle, cylinder, pentagon skew etc.), all the special effect options under effects (drop shadow, bevel, embossing effects etc.) and the image correction options (blur, sharpen, noise etc).

The watermarking facility allows us to embed invisible watermarks inside our images, for copyright protection.

We haven't explored the picture frames as yet, but it could be a very simple and interesting effect to try out on your own. Essentially it adds a frame around any image; the nature of picture frame and the texture applied could be selected from the dialog box.

The next sections of effects are called 'filters' in paint shop pro. These filters are slightly different from the third party image filters we discussed about, in an earlier section in this chapter. These effects are organized under five different categories: blur, edge, noise, sharpen and other effects. The terms are self-explanatory.
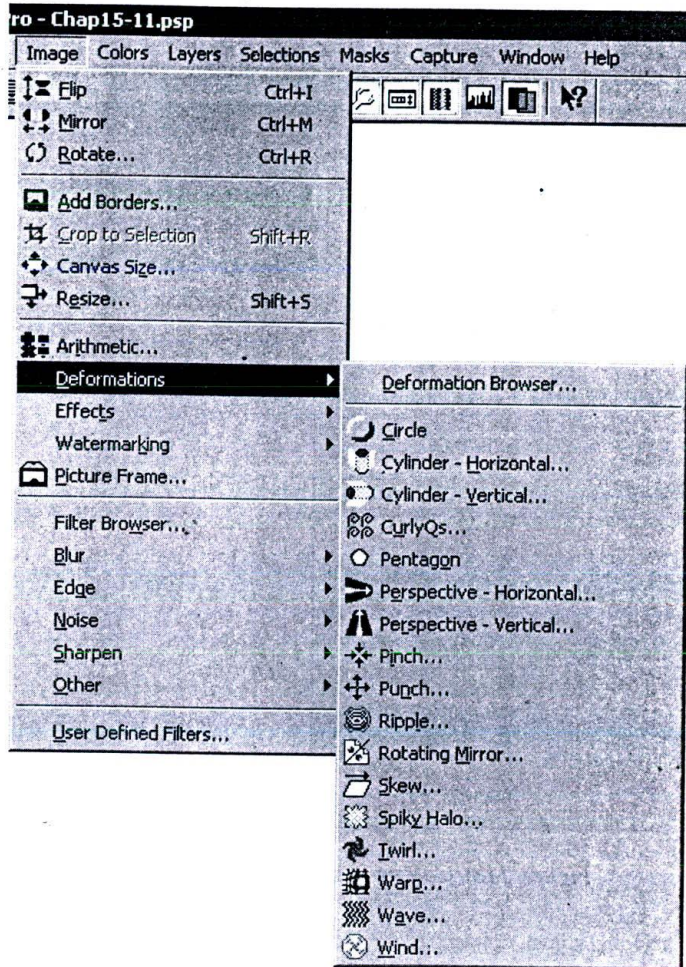
ro - Chap15-11.psp

| Image | Colors | Layers | Selections | Masks | Capture | Window | Help |

↕ Flip	Ctrl+I	
↔ Mirror	Ctrl+M	
↻ Rotate...	Ctrl+R	
Add Borders...		
Crop to Selection	Shift+R	
Canvas Size...		
Resize...	Shift+S	
Arithmetic...		
Deformations ▶		Deformation Browser...
Effects ▶		Circle
Watermarking		Cylinder - Horizontal...
Picture Frame...		Cylinder - Vertical...
		CurlyQs...
Filter Browser...		Pentagon
Blur ▶		Perspective - Horizontal...
Edge ▶		Perspective - Vertical...
Noise ▶		Pinch...
Sharpen ▶		Punch...
Other ▶		Ripple...
		Rotating Mirror...
User Defined Filters...		Skew...
		Spiky Halo...
		Twirl...
		Warp...
		Wave...
		Wind...

Figure 116: Options available under the Image menu item in Paint shop pro.

The filter browser is a convenient dialog box that lets you to experiment with various filters, before you actually apply them over the image.
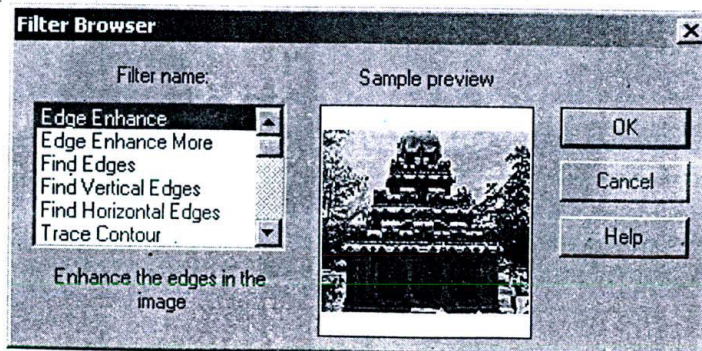
Filter Browser

Filter name:

Sample preview

Edge Enhance
Edge Enhance More
Find Edges
Find Vertical Edges
Find Horizontal Edges
Trace Contour

Enhance the edges in the image

OK
Cancel
Help

Figure 117: Filter browser gives you the option to try out all the effects before you apply them.

15.13.4 Colours menu

Colours menu is a sort of one-stop-shop for all the colour manipulations you can do with paint shop pro.
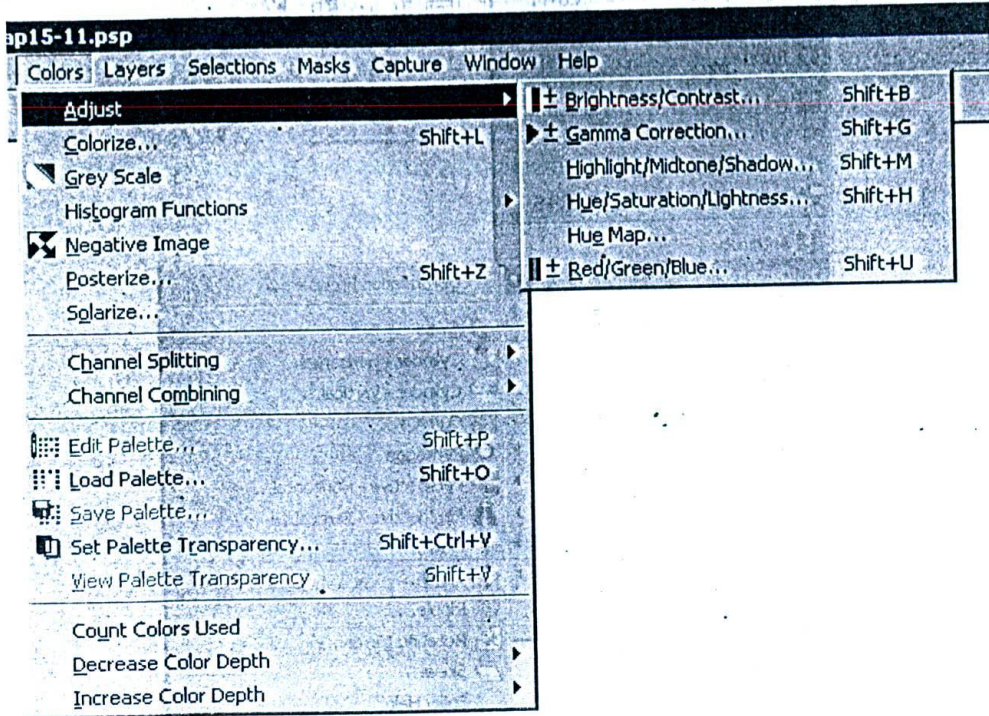

Figure 118: Colour menu in paint shop pro

The first set of options – including adjust, colourize, greyscale, histogram etc. enable a wide range of colour correction and manipulation functions. In particular, the colour adjustment panel has a number of options like controlling brightness/contrast, hue/saturation/lightness and red/green/blue. We can safely claim that these powerful tools can meet most of our colour correction requirements.

Greyscale is used to convert a colour image to a black and white image. I have used this option for almost all pictures featured in this book.
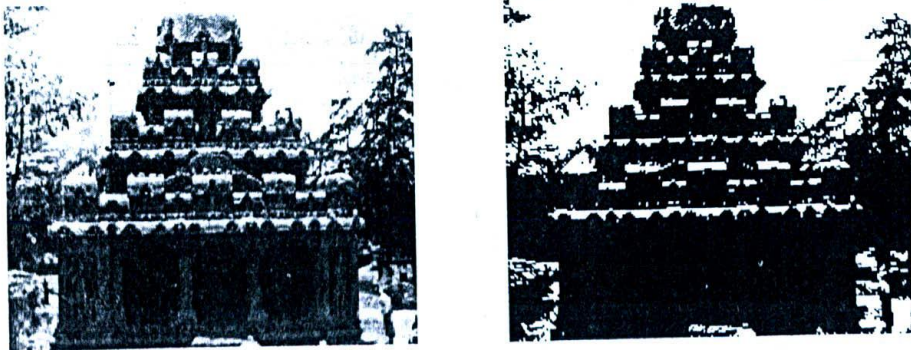

Figure 119: I used decrease colour depth function to 2 colours – to produce this effect

Channel splitting enables segregation of colours that make up the original colour picture to RGB or CMYK. These options are particularly useful for those involved with the printing industry.

Increase / decrease colour depth functions are probably the most frequently used ones in the whole colour menu options. We already discussed – earlier in this chapter, that any colour image can be made up of colours as low as 2 or as high as 16 million.

The colour depth function allows us to convert a picture with 16 million colour depth to just two colours or vice versa. More often than not, you will be juggling between 16 million and 256 colours.

In the example I've provided, I decreased a 16-bit colour image to a 2-colour image – and just selecting the blue channels during the reduction process. For the sake of better understanding, I'm also providing the exact set of options I used.
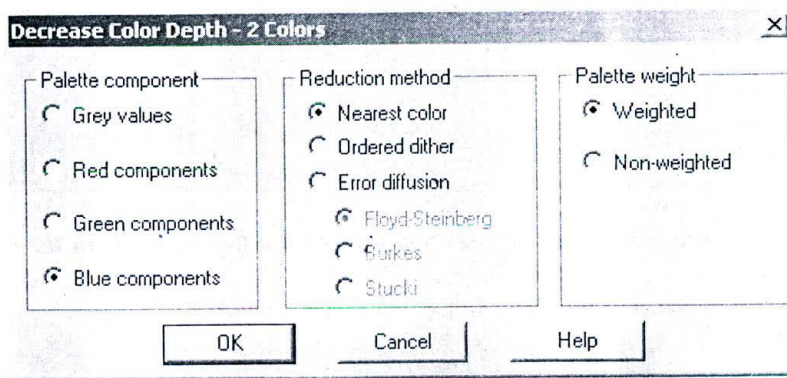

Figure 120: The options I used for reducing the number of colours to just 2 – from 16 million!

It is interesting to compare this with the dithering effect we discussed earlier. While dithering traced the basic profile of the image using a number of dots, decrease colour depth just identified the major colour regions and produced a different look for the same temple.

Which one looks better - dithering or decrease colour depth?

Well, the answer is a matter of one's taste and there can be no definite answers!

I'll conclude this section with one observation:

Most of the options like layering and effects will be available, only on a 16-bit colour image – in paint shop pro! So, even if your final image is of depth 256, work with a 16 bit image till you have completed all the imaging manipulations and finally convert the same to a 256 image using decrease colour depth option.

Note: I always have the habit of beginning all of my images as a .psp picture – the default file format in which paint shop pro saves its images. The .psp file format is of 16-bit colour depth and remembers all the multiple layers, masks and other information about the image. When all the manipulations are completed, I take a copy of the image (Ctrl+D) and save it as .jpg or whatever file format that is required for my project. I remember to save the original .psp in a separate folder – so that I can always come back to that original image, in case I need to do further manipulations on the same image. Many of the images featured in this book were originally saved in .psp file format and only a copy was used inside the book.

15.13.5 Layers menu

The next menu item that calls for our attention is layer menu.

Unfortunately, this is not of very great use – as we have a better and faster option for controlling the layers: The layer palette window!

The layer palette lists all the layers associated with a given image, identifies whether it is a masked layer or an invisible layer etc. and also displays the opacity of the layer. You can create a new layer, delete an existing layer and also change the order of layers...

Well, these are all the main options you really need, in order to work with the layers!
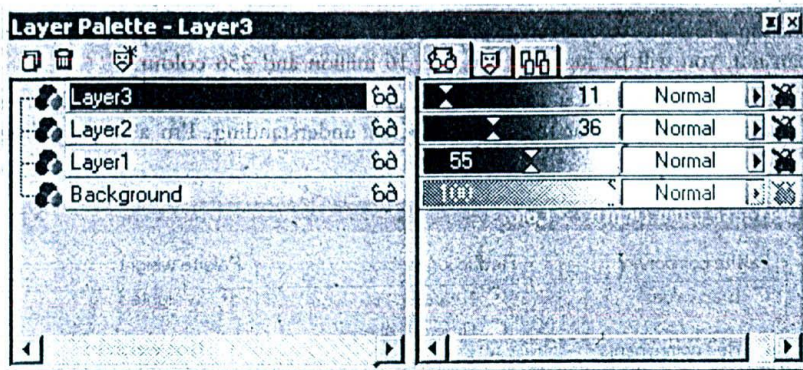

Figure 121: The layer palette allows you to control different layers in the image.

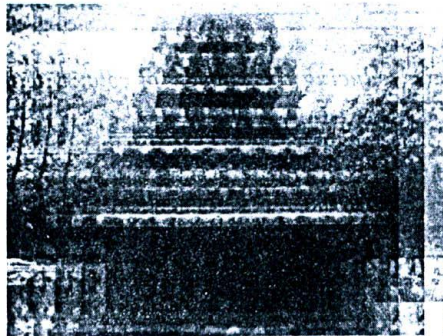To illustrate the power of layers, I'm providing you with a simple example.

Figure 122: This "hazy" stuff is not a ready-made effect available in paint shop pro!
It was done, purely with the help of layers.

I produced this hazy effect by super imposing same image multiple times – over different layers with slight offset. The only difference was in the opacity of the layers.

The exact options I am talking about, is already available in the earlier image on layer palettes.

15.13.6 Other menus

There are other menu items like selection, masks and capture – which you can try on your own. In particular, capture function is most useful for capturing screen shots in various modes.

This brings us pretty much to the conclusion of our detailed discussions on paint shop pro. What I have discussed here is but a tip of the iceberg. As you start using the tool and try out new effect options, you will understand that there is always something new to uncover – in this wonderful world of multimedia graphics!

15.14 Summary

The three basic attributes of an image are image size, resolution and colour depth. An image can be made up of colours as low as 2 or as high as 16 million. Anti-aliasing, layering, selections, masking and image filters are some of the important concepts behind graphics editing.

Basic editing operations include re-sampling, dithering, flipping, rotating, zooming and correcting colours. Special effect operations like drop shadows, bevel effects, emboss effects, deformations etc can be termed as advanced manipulation options.

Jasc Inc.'s paint shop pro supports numerous colouring and image manipulation effects - apart from providing layering, masking and other functionalities.

15.15 Keywords

❑ **Dithering:** The process of changing the RGB value of the colour pixels that makes up the image, to the closest matching colour in a predefined fixed colour palette, using complex mathematical algorithms.

❑ **Masking:** The process of blocking out selected portions of the Image, for a particular editing operation.