PART II

SETTING UP A MULTIMEDIA STUDIO

PART OVERVIEW

Before we start doing any serious work on multimedia, we need to set up a multimedia workstation – with all the necessary hardware, software and drivers and configure it to achieve the best possible performance.

Multimedia technology is characterised by it's own set of hardware and software peripherals, which a normal computer may not consist of; and those that are equipped with such peripherals are generally called as 'multimedia computers'. Literally every media demands it's own exclusive set of peripherals, which make a multimedia computer a complex and expensive goodie!

The part starts with two introductory chapters on multimedia hardware and software essentials and concludes with the third, uncovering the fundamentals of digital media.

Chapter 2

Multimedia: The Hardware Essentials

CHAPTER OVERVIEW

Chapter two starts with an introduction to what makes up the multimedia hardware, followed by discussions on various hardware peripherals - most of them in the form of add-on cards.

The accessories and peripherals made use of by end consumers are usually lesser than that of the professionals who are directly involved in producing multimedia contents. We discuss these differences and look at some of the system configurations recommended for both classes of people.

Our discussions on multimedia hardware would be incomplete without those catchy 'multimedia upgrade kits' and the often-misleading 'plug and play' concepts...

It should be emphasised here that this chapter is meant to provide only an overview to all the peripherals that make up the ultimate multimedia system. Individual peripherals have bean dealt with - in much greater detail, in the later chapters.

2.1 Introduction

Today, most computers come equipped with multimedia capabilities – and this is particularly true, if you are buying things off the shelf. You can include all branded laptops, desktops and business and home computers in this category. But, if you are building a PC all by yourself or upgrading one of your old PCs to multimedia PCs, then you will have a broad spectrum of choice in choosing your multimedia peripherals.

The purpose of this chapter is to highlight some of the basic hardware peripherals and cards that are doing media content handling for you.

For example, when you were watching a DVD movie on your laptop, you probably didn't bother to see what peripherals were doing what kind of work. Now it is time to lift the hood and take a quick look at the various peripherals that work in harmony to deliver such wonderful multimedia contents.

Let us begin with the two distinct types of multimedia hardware that have emerged – followed by discussions on what peripheral equipment handles what kind of media and so on.

2.2 Multimedia hardware evolution

Traditionally, Computers were built by those who never imagined, even in their wildest dreams, that one day, computers will be comprehending with alien signals like Music and Video! Hence, the basic architecture of the Computer was not designed to support them directly.

The PC speaker, which was then added only to give warnings signals to the user, is perhaps, the forefather of all multimedia hardware today, and was misused beyond limits by the old DOS games. Some kind hearted folks took pity on it and developed something called a sound card or an audio board ...But, audio was only the *second* media to get the privilege of being handled computers - graphics had already entered the scenario by then, though not with millions of colours, as it is today.

From then onwards, many specialised equipments were slowly developed to make computers understand and play almost all other kinds of media...and this creative process continues even today.

Since every other kind of media demanded *its own set of hardware / software interfaces* to get along with the computer, peripherals were mercilessly added to the otherwise innocent PC, until the entire space inside the cabinet was occupied by countless PCB Boards!

But, things have changed much over these years and today, we see multimedia capabilities being built right into the heart of PC's motherboard architecture, so that you are left with some more space in the cabinet and a little piece of mind!

2.3   Basic types of multimedia hardware

Today – we have two distinct kinds of multimedia hardware available in the market:

1.   Those with multimedia enabled motherboards – requiring little or no additional multimedia peripherals.

2.   Those build with additional multimedia peripherals.

For example, you may choose to buy a motherboard with audio input and output capabilities and thus save some cost on buying an external sound card. Or you may choose to buy a basic motherboard without multimedia capabilities and later on, add your favourite sound card to it.

Now, the obvious question is: Which is the way to go forward?

Well, it depends on your usage. It depends on what you want to do with your sound card. It depends on how much audio capabilities you need for your multimedia project at hand.

For example, if you simply want to build up a professional multimedia system and use it for exploring various multimedia applications – then probably a Motherboard integrated multimedia is enough. But, if you are an audio professional – who wants to create next generation audio effects for your latest album, then you probably need a dedicated Sound card with advanced capabilities.

One good news, is that you can first buy a multimedia-integrated motherboard – if you are not sure how you will use it and later on *choose* to buy a Sound card and make use of the same. We will see how this can be done, as we go along.

2.4   Multimedia add-on peripherals

For a moment, let us forget motherboard-integrated multimedia and concentrate on external multimedia peripherals. As noted earlier, we need dedicated interfaces to handle different kinds of media.

Most of the multimedia Hardware Interfaces, take the form of **Add - On cards** *or Peripheral Cards* (which are basically printed circuit boards with the relevant chips / integrated circuits and input or output sockets built in) that fit into the 16/32 bit slots inside the computer. The necessary connection jacks alone protrude at the rear end of the system cabinet, so that you can connect them to the relevant external cables.

These cards basically provide an *analog to digital interface* between the external media handling devices, like the Tape or Video recorder and the Computer, so that data can be transferred between the two.

Let us see what are all the various types of cards available for us. Have a look at Figure 2.1.
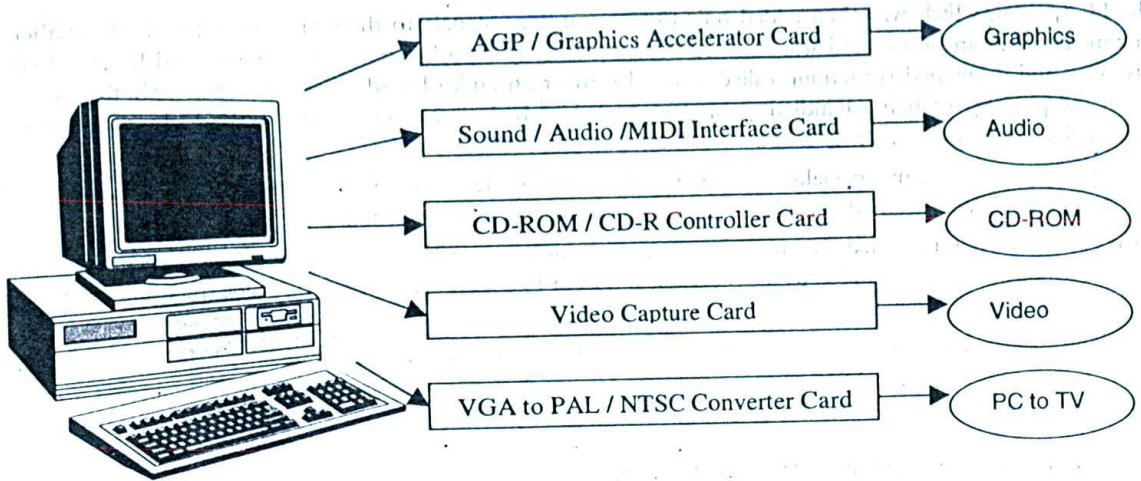
Figure 4: Various types of multimedia add-on cards that handle various types of media

Brief descriptions of what these cards are all about should be suffice for now. Later on, when we are to address each Media type in detail, we can learn more about them.

❑ AGP / Graphics accelerator cards interface between the computer and the monitor. While AGP cards merely handle the colour display and resolution, graphics accelerators do sophisticated 3D graphics acceleration and rendering for better visuals and performances in multimedia games.

❑ The sound cards or the audio cards manage almost all possible kinds of audio – including digital audio, MIDI (Musical instruments digital interface), mp3 etc. Remember! You need a pair of speakers or headphones and of course, two good ears to actually hear the sounds as they come out of a sound card.

❑ The CD Controller Cards handle CD-ROM/CD-R Drives and are usually supplied along with the Drives. These cards are applicable only for Internal CD-ROM and CD-R Drives.

❑ Video Capture Boards – as the name implies – capture Analog video contents from VCRs and Handy cams into the computer, in digital video format.

❑ VGA to PAL/NTSC Converters are meant for viewing PC Contents via a Television. PAL is an Asian TV standard and NTSC is an American standard.

Table 1: Multimedia add-on cards and their usage

Card	Who will need them?
Basic AGP Card.	All (Users / Professionals)
3D / Graphics Accelerator Cards	3D Animation Professionals / Gaming Maniacs
Basic Sound Cards	All (Users / Professionals)
Advanced Audio Cards with various additional capabilities	Music / Audio Professionals
CD-ROM Controllers	All those who use Internal CD Drives
Video Capture Card	Digital Video Professionals / Those who want to 'create' their own VCD / DVDs
VGA to TV Converter	3D Animation / Video Professionals

Fortunately, not all of these cards are needed for *playing back* the multimedia contents inside the Computer. But professionals, who may want to *create and edit* various types of multimedia contents, end up with a variety of these cards.

For a better understanding, let us try to format a matrix – with multimedia peripheral cards on one side and those who will be using them on the other side.

2.5 External multimedia equipments

Apart form all those add-on cards that we listed in the above section; we may need some external multimedia equipments – to carry out our tasks.

Some of them are:

1. Scanners

2. Digital Cameras

3. Digital Handy cams / Camcorders

4. Colour Inkjet Printers

5. Microphones

6. Multimedia Speakers

Similar to multimedia peripherals, not all of us will require all of the above listed equipments. It all depends on the nature of multimedia projects and activities that are at our hand, how we want to do etc.

2.6 How to choose the right multimedia peripherals and equipments?

Given the myriad of brands and products available in the multimedia peripherals category, it is but a complex exercise to choose the best products among the lot and to identify those that provide professional services and offer good value for money.

A good starting point, before buying any piece of multimedia hardware – is to check up IT magazines and websites and catch hold of any reviews/comparisons about the product. There are many magazines that provide periodic test results each year and offer awards for the best of the breed in all category.

Unfortunately, I am not able to recommend you any brands straight away - though I can share some of the products / brands I have personally tried and found satisfaction.

Table 2: Multimedia peripherals and brands I have tried

Hardware	My Suggestions and Comments
Mother Boards	Any decent brand with Intel/AMD Chipsets
Processor	Intel, AMD
3D / Graphics Accelerator Cards	NVIDIA GeForce Fx series of cards – could be expensive but offer good results. There are many other less expensive brands that offer good value for money.
Sound Cards for a long time.	Creative has been a market leader in this segment
CD-RW	Many brands – HP, Samsung, Yamaha etc
Scanners	HP. I have not tried any other brand.
Digital cameras	Many brands. Nikon is my choice.

I repeat that the above list is rather suggestive and certainly not conclusive and it certainly does not imply that other brands not specified here are less superior in performance. Things do not remain stagnant in the world of IT and brand superiority is always subject to changes over a period of time.

There are quite a bit of things to watch out and specifications to be noted, before buying a particular piece of multimedia hardware. For example, while buying a Video capture card, you should notice the size of the captured video as well as the frame rate at which the capture occurs. We will reserve these discussions for the later chapters – wherein we focus on each media in detail. Thus, the discussions on video capture cards will fall under those topics that cover digital video.

2.7   Installation Tips

It is nearly impossible for us to discuss how each and every multimedia hardware device has to be installed on a Computer. Literally, every piece of Hardware we purchase should come bundled with installation manual and device driver software -- if not ask for the same.

However, we can list out a few generic guidelines here, which should be relevant – irrespective of the type of hardware you buy.

❑   Windows 2000 editions and above, come bundled with scores of device drivers and chances are that it might recognise your multimedia hardware automatically and install the default drivers on its own. However, for best performances, it is best to make use of device drivers and application software that comes bundled with the equipment. We will see how to change the default device drivers – in our discussions on device drivers in the next chapter.

❑   Ensure that the new hardware is compatible with the motherboard and other peripherals you have already got. If one slot is not working for a particular piece of hardware, try another.

❑   Ensure that the operating system is, indeed, making use of the hardware it is supposed to use. For example, assume that your motherboard is having an integrated audio device. Now, if you are to purchase a Sound Card for advanced features, you should ensure that the Operating System is making use of the new hardware bit instead of the old one, which is still installed and available for Windows. How to ensure this? The next section explains.

2.8   Finding the multimedia peripherals installed on your computer

Microsoft Windows OS has inbuilt capabilities to work with many of the multimedia peripherals and equipments that we discussed so far. How to recognize what are all the different kinds of multimedia software installed on your computer and identified by Windows?

Follow the procedure below, which has been illustrated on a Windows 2000 Professional edition.

1.   Go to Start → Settings → Control Panel → Sounds and Multimedia. Double click on the icon.

2.   The Multimedia Options panel opens up. This is probably the main place you need to refer, to know what are all the multimedia hardware devices installed in the system. As shown in the figure below, there are separate tabs for audio and other multimedia installed.

3.   Click on the Audio tab and you will see the list of Hardware devices used for Sound Playback / Recording and MIDI Playback. The preferred device is the one that is currently being used by the Operating system. You may want to ensure that your new audio board is listed and used as the preferred device. If you check use only preferred devices, Windows will not consider alternative devices at all.

4.   You can actually click on the 'Advanced' button - just out of curiosity and see what pops up. But I'll reserve my discussions on them for later chapters!
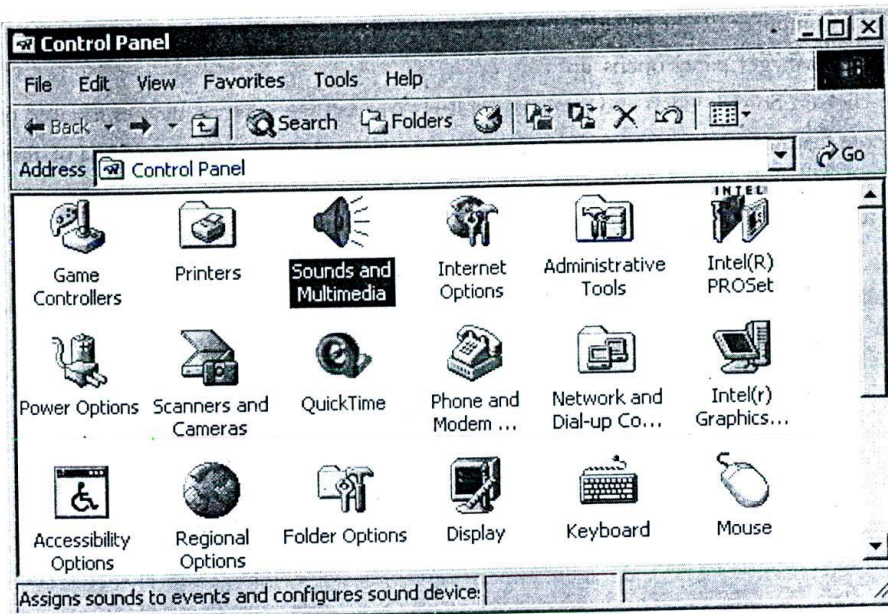
Figure 5: Reaching Sounds and Multimedia Panel from Control Panel

There is yet another place wherein you can see all the multimedia hardware installed in the system. This is however, recommended only for advanced users. Follow the procedure detailed below, if you are interested.
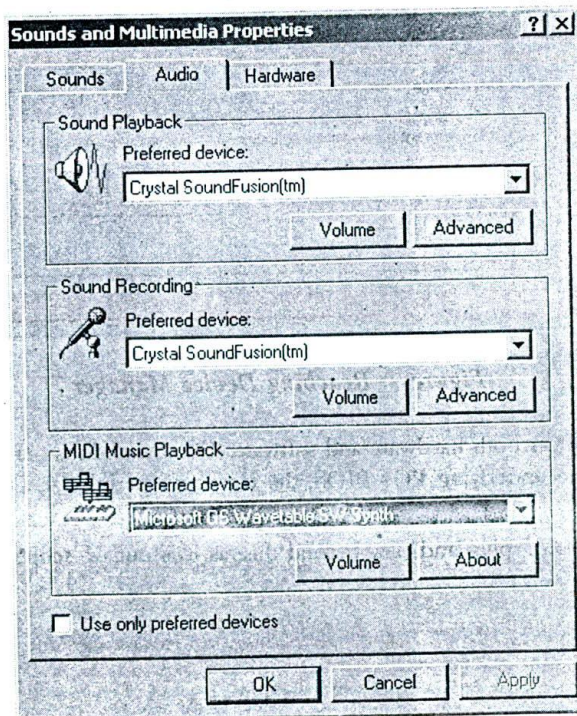

Figure 6: Sounds and Multimedia Panel in Windows 2000

1.   Go to My Computer (Right Click) à Properties à Hardware tab. Choose the Device manager button.

2.   The Device manager panel opens up.

3.   Double click on Sound, video and game controllers. You will see a list of devices installed on your system.

4.   Please note that not all that are listed here are multimedia hardware peripherals. Some of them - like codecs - represent software but are registered as devices.

2.9   Plug and play

Plug and play is Microsoft's design concept that radically simplified the complexities of attaching a new hardware device and installing Device drivers to the underlying operating system. Introduced from Windows 95, Plug and play has come a long way and its benefits can be perceived, right in front of your eyes in Operating systems like Win 2000 and XP – wherein almost any hardware attached is detected and configured automatically!
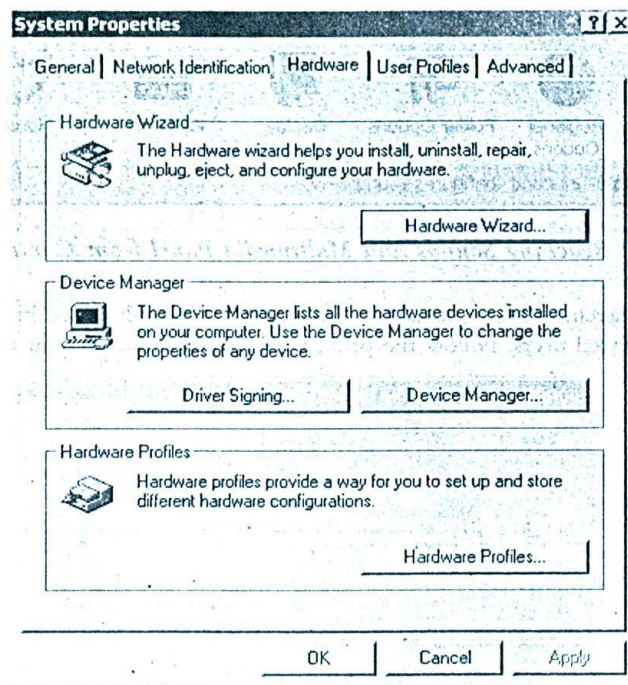

Figure 7: Reaching Device Manager

Plug and play specifications affect both hardware and software. The interactions pervade end to end and require the combined participation of the underlying PC's BIOS, the Hardware peripheral, Device driver and the Operating system.

We will not go into the details of plug and play beyond this, as it is out of scope of this work.
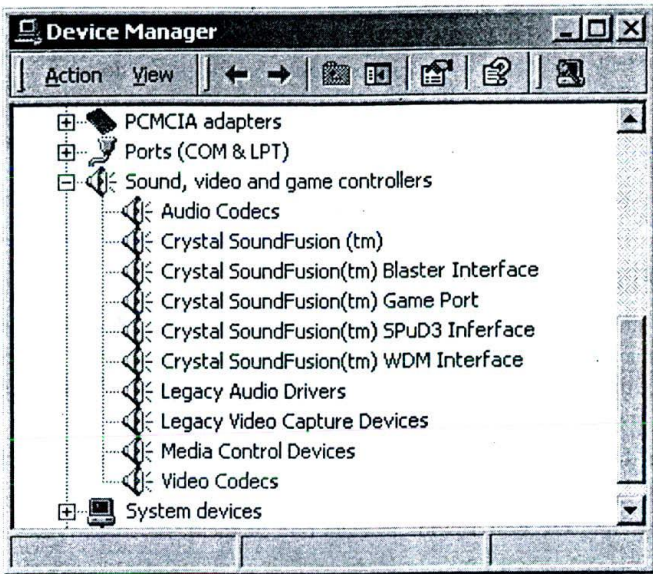
Figure 8: Device Manager Panel

2.10 A typical multimedia system configuration

Let me see if I could provide you with the configuration information of a typical multimedia system – that can be put to use for all of our projects coming up in the following chapters. I know my recommendation will be obsolete pretty soon, as more powerful processors keep hitting the market every six months – so, validate these details with your hardware dealer before making the purchase!

Also, this list *does not mean* that if your hardware is of lesser capacity than what is recommended, you should upgrade! If you are slightly lagging behind – here and there, you can still cope up. However, if you are managing a 4 to 5 year old Computer and want to do sophisticated work detailed in the coming chapters, then you may hit some bottlenecks.

Table 3: A typical multimedia system configuration

Hardware	Minimum required / Recommended spec
Processor	Intel Pentium 4 Processor with 2+ GHz or its equivalent. Anything higher is most welcome.
RAM	128 to 256 MB DDR SDRAM 1 GB recommended for 3D Animation & Video Professionals
Hard Disk	20 GB or more.80 GB recommended for 3D Animation, Audio & Video Professionals
CD ROM	24X read speed.52X recommended.
CD-R and CD-RW Drive	Highly recommended for all multimedia Professionals. Minimum 10X writing speed.
AGP / Graphics Accelerator	32 MB Dynamic Video Memory.Professional 3D Graphics accelerator with 64 MB DDR Video memory recommended for 3D / Video professionals.

Sound Card	Creative series of sound cards or their equivalent. Anything higher would be for professionals.
Monitor	17" and above with 24 Bit colour and 1024*768 resolution. Higher configurations and LCD Monitor recommended for professionals.
Speakers	4 Watt / 4 Ohm stereo speakers

2.11 Multimedia upgrade kits

Quite a good number of multimedia Hardware solution providers bundle all those items, other than the system itself, needed for multimedia computing as a single product and release them as the famous 'Multimedia upgrade kits'. You can usually expect these kits to contain a CD ROM Drive, a Sound Card, a Pair of Speakers, a Microphone and a set of associated Software and free multimedia CD ROM Titles.

You may want to consider this, if you already have a PC – but without multimedia peripherals.

I cannot really give you any assurance that this will be a better option rather than individual buys - because you'll miss the opportunity of selecting the best brands in each one of them.

But the obvious advantages are:

1. Lower Cost (in many of the cases)
2. Assured compatibility between the Devices and of course,
3. The free multimedia CD Titles.

If you are buying a PC afresh, do not consider this option; buy a multimedia enabled Computer off the shelf or assemble it with the brands you like most.

2.12 Summary

Two kinds of multimedia hardware are available in the market: Those with multimedia capabilities built into the motherboard and those that are available by means of add-on peripherals. Add on peripherals offer more choices and flexibility.

Apart from peripherals that fit into the motherboard, multimedia production also requires external equipments like scanners, digital cameras etc. The requirements may vary depending upon the project under development. A computer's operating system allows us to see what sort of multimedia peripherals have been installed on a system.

Microsoft Windows plug and play concept makes installation and configuration of device drivers easy.

Conventional computers can be upgraded to multimedia computers with the help of multimedia upgrade kits.

2.13 Keywords

❑   **Device drivers:** Software that provides the necessary interface required for interactions, between the Operating System and the multimedia hardware peripherals attached to the system.

❑   **Plug and play:** A set of design specifications incorporated with Microsoft's Windows OS, for most hardware and the software peripherals, that enables easy recognition and installation of device in Microsoft Windows platform.

Chapter 3

Multimedia: Setting up the Software

CHAPTER OVERVIEW

Having seen the multimedia hardware details in the previous chapter, it is time to look at some of the multimedia software rudiments.

Multimedia software is a very generic term encompassing a wide variety of tools and applications. Herein, we will be covering device drivers, multimedia player software that recognize and play different kinds of media, multimedia creation software – which are required to create and edit digital multimedia contents and finally, multimedia application software – which are end products enriched with multimedia contents.

The whole chapter has to be perceived as a curtain raiser to many of the forthcoming chapters, wherein, we will be discussing the multimedia creation tools and applications we can develop with them, in great detail.

3.1   Introduction

The term 'multimedia software' is very generic and conceptual in nature. Theoretically, any type of software performing some multimedia function or other can be termed 'multimedia software'. When detailed, it encompasses a wide variety of tools, applications, packages, device drivers and utilities – all related to multimedia, in one way or other.

Looking at the tools that are commercially available, the trouble only deepens. For example, how do you distinguish Microsoft Media Player and encoder? What sets Adobe Photoshop different from Acrobat? And where do multimedia CD-ROMs like Microsoft Encarta fit in?

Our first task is to categorize them into various groupings, so that it will be clear about what multimedia software we will be learning about, in this book and why.

3.2   Multimedia software categories

For the sake of our discussions, we will divide multimedia software into four broad categories.

1. **Device driver software** - meant for installing and configuring multimedia peripherals
2. **Media players** meant for handling multimedia file formats
3. **Media conversion tools** meant for encoding / decoding multimedia contents and for converting one file format to another.
4. **Media editing tools** meant for creating / editing digital multimedia data
5. **Multimedia authoring tools** meant for combining different kinds of media formats and deliver them as multimedia contents and
6. **Multimedia applications** created with the help of above mentioned tools & packages.

At this stage, it is imperative to have a bird's eye view of all these different categories of software and understand how they are differing from one another. Later on, during our exclusive discussions on every media type, we will be getting back to them with a sharper focus.

3.3   Device drivers

Every other hardware peripheral to be installed on a computer needs a device driver – that interfaces between the peripheral and the operation system. It is through the device driver software that the operating system instructs the peripheral device to carry on the instruction provided by the user.

For example, when you increase or decrease the volume of sound in windows operating system – the calls are issued out of OS and converted to specific instructions understandable by the audio card through the device drivers - and the speaker volume is subsequently increased or decreased.

In most of the cases, the Device driver software comes bundled with the peripheral equipment you buy. Even if it is not so, chances are high that a compatible driver is already available in your Operating system – particularly so, if it is Windows 2000 and above.

In order to derive maximum performance from the multimedia peripheral, it is best to make use of the Driver supplied by the manufacturer. Hence, it is important to ensure that the Driver software has been included with the equipment – before you pay the vendor.
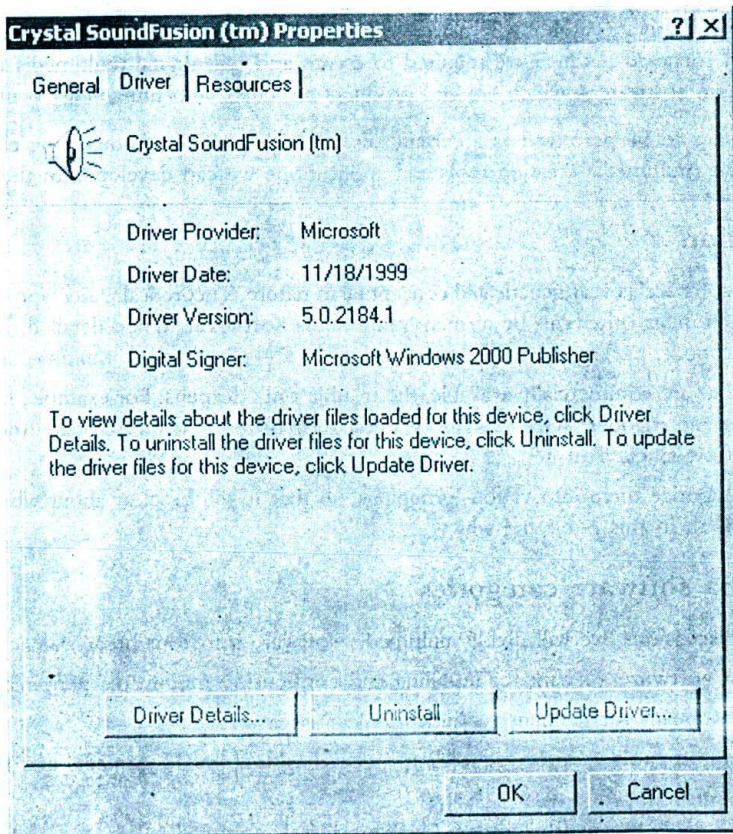

Figure 9: Device driver details for a given multimedia peripheral

During installation, Windows will prompt you with a dialog box – asking you to supply the necessary Device drivers. If not, then it means that Windows has already identified a proper driver for the hardware.

To know whether the device has been properly installed – with all the required drivers, the best place to consult is the Device manager. If you see a yellow question mark near any of the devices, then it means that the hardware has not been installed properly or the Driver is not available.

To see what Driver a particular device is using, right click over the device icon in the Device manager, choose properties and look at the panel that pops up.

If your device is installed and running properly, there is no need to change the drivers etc. Of course, if your vendor recommends an update to the driver, then you may consider downloading the relevant driver patch from the Internet and applying the same by means of 'update driver'.

It is best to undertake this exercise, if you are sufficiently informed about the peripheral and its drivers or can avail the services of a support engineer, nearby!

3.4   Media players

Media players are applications that can play one or more kinds of multimedia file formats. Most of them are available free of cost and can be downloaded directly from the Internet.

Let us see some of the most famous Media players that are used by consumers and professionals alike.

1.   **Microsoft Windows media player** – Probably the most famous in the lot, Windows media player plays a wide variety of media file formats like Wav, mp3, mpgs, mov, avi... and what not? It is usually bundled with the Windows Operating system and can be reached at Start à Programs → Accessories → Entertainment → Windows Media Player.
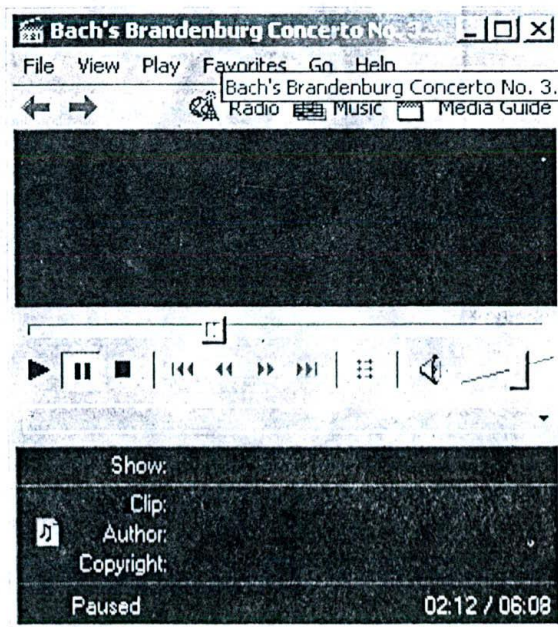

Figure 10: Windows Media Player – playing a MIDI File

However, if you want to download the latest Media player which is above the one that comes with your OS, checkout the following website:

2.   Apple's QuickTime player is also an equally popular player in the market. It has attractive options for adding some cool sound effects like boss, treble etc. Also, you can download some of the latest movie trailers in QuickTime format from Apple's website.

To download the latest Quick Time player, check out the following URL:

http://www.apple.com/quicktime/

There is an advanced version of QuickTime Player called the QuickTime pro – but this is not free.

3.   After Windows media player and QuickTime, it is the Real One player that has captured the hearts of users around the world. The attraction of this player is that it can play streaming real audio and real video files at decent speeds.

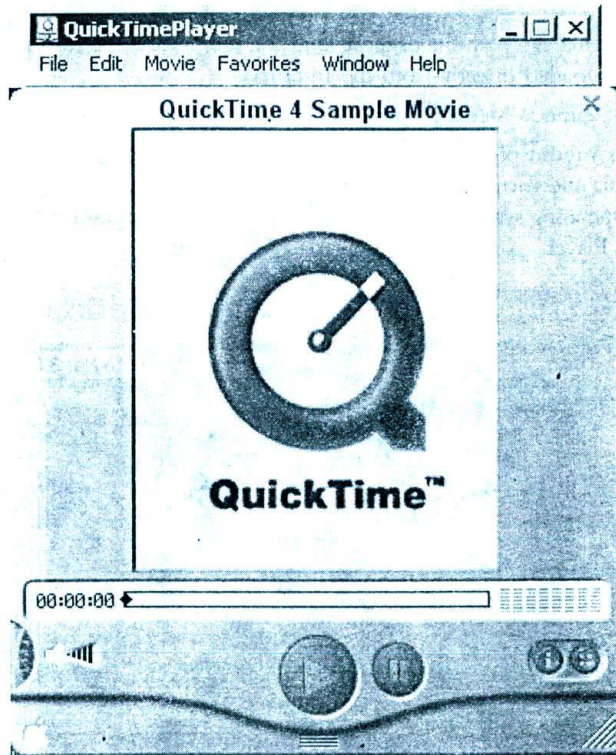To download the latest player, check out the following URL:

http://www.realaudio.com

Figure 11: Apple's Quick Time Player – playing a .mov File

4.   The next important media player that comes in our list is Macromedia's Flash Player. Macromedia flash is perhaps the most famous technology for delivering multimedia contents over the Internet and we will be spending a good deal of time to understand the same – later in these chapters. Unlike other media players, Flash player will be installed as a Web browser plug-in component.

To download the latest flash player, check out:

http://www.macromedia.com/software/flashplayer/

3.5 Media conversion tools

When you undertake multimedia projects, you constantly feel the need to change the media file formats from one to another. A true multimedia professional should be well aware of the wide range of choices he has got – in this direction and take advantage of specific file formats.

The need for conversion arises mainly because of the fact that multimedia professionals have to put up with uncompressed media file formats – whereas the multimedia consumers can only be provided with compressed file formats.

Professionals work with uncompressed files – because, they do not want to lose the quality of contents, as the media contents undergo editing. But once all the editing is done and the required contents available for delivery, then the file size needs to be reduced by means of compression. This will enable easy distribution to end consumers.

For example, Audio professionals always prefer to work with uncompressed file formats like .Wav files – but during distribution, this may be converted to .mp3 or any other suitable file format that serves the purpose best, without losing much quality.

There are other needs for multimedia files format conversions – as well. For example, you might want to convert one of your favourite VCDs to DVDs! This necessarily involves file format conversions and you may need suitable tools to do that.

Media conversion tools are meant for this purpose. There are scores of free / cheap tools available in the Internet - for converting file formats and to do encoding / decoding. The following table lists some of the file format conversations, frequently undertaken by professionals.

Table 4: Multimedia file format conversions

Media	File format conversions frequently done
Audio	Wav to mp3 and vice versa
	Aifff to Wav / mp3 and vice versa
	Midi to mp3, Wav etc.
	Wav to WMA (streaming audio)
	CD Audio to Wav and vice versa
Video	AVI to Mpeg file formats and vice versa
	VCD to DVD file formats
	Avi to animated GIF
	AVI to WMV (streaming video)
Graphics	Many file format conversions involved.
3D Animation	Models / Wire frames file format conversions

There are scores of other media file formats and conversions involved in real life – so the above table is just a sample and not an exhaustive listing.

Also, the process of multimedia file format conversion is not as simple as it sounds and there are a number of things to be taken care of. We will focus upon this – as we proceed to delve deep into each media, in detail.

3.6 Media editing tools

Multimedia editing tools are meant for editing various types of digital media contents. Raw media files are hardly useful; they need to be edited, massaged and converted to required file formats – to satisfy the requirements of a given project.

Learning these different tools and making an effective / combined use of all of them – is what constitutes the core of multimedia learning. In the chapters that follow, we will be focussing mostly on many of these tools and utilities.

For each media, there are different sets of tools available from different vendors.

But, the unfortunate part is that there is **no single tool** that can be purchased for editing all kinds of media...! Which means that you end up buying one good tool for editing every other media!

For example, if your project involves audio, video and some graphics – then you are most likely to end up with at least two to three tools, if not more! The reason is that the nature of these media are so different from one another, that it is virtually impossible to provide editing tools for all of them – in a single application.

Let me try to list out some of the famous professional editing tools, available for each media.

Table 5: Multimedia Editing Tools

Media	Tool	Company
Audio	Cool Edit Pro	Syntrilliyum Software(http://www.syntrilliyum.com)
	Sound Forge	Sonic Foundry(http://www.sonicfoundry.com)
	Sonar www.cakewalk.com)	Twelve tone systems(http://
	Wave lab	Steinberg(http://www.steinberg.com)
Video	Adobe Premiere	Adobe systems(http://www.adobe.com)
	Video Studio	Ulead(http://www.ulead.com)
	Windows Movie Maker (XP Only)	Microsoft(http://www.microsoft. com)
Graphics (Image editing)	Adobe Photoshop	Adobesystems(http://www.adobe.com)
	Corel Photo paint	Corel
	Photo Impact	Ulead(http://www.ulead.com)
Graphics (Vector illustrations)	Adobe Illustrator	Adobe systems(http://www.adobe.com)
	Corel DRAW	
	Freehand	Macromedia(http://www.macromedia.com)
3D Animation	3D Studio Max	Discreet
	Maya www.alias.com)	Alias Wave front(http://
	SoftImage www.softimage.com)	Avid Technology(http://
	Light wave 3D	Newtek(http://www.newtek.com)

Professionals and industry folks use the above listed tools.

I have not included the free tools and shareware utilities – since the listing may grow too long.

The options and capabilities available with these different kinds of tools may vary, depending upon the quality of

the product. Hardcore multimedia Professionals make use of advanced packages and others stick to lower end products. Interestingly, some very good tools are available in the freeware / shareware category as well – and we will be taking a look at some of them, later in the chapters.

3.7 Multimedia Authoring Tools

Authoring tools enable creation of true multimedia contents. By providing abilities to handle and amalgamate multiple media, authoring tools open out the doors of unlimited imagination - to a creative professional.

We will briefly list out some of the leading authoring tools here and reserve our detailed discussions for later chapters.

Table 6: Multimedia Authoring Tools

Product	Company
Director	Macromedia(http://www.macromedia.com)
Author ware	Macromedia(http://www.macromedia.com)
Flash	Macromedia(http://www.macromedia.com)
Tool book Instructor	Click2learn(http://www.click2learn.com)

3.8 Multimedia Applications

Today, multimedia applications are made use of in many spheres of life – from educational institutions to enterprises and entertainment, its usage is wide and complex.

We will try to classify these wide varieties of applications into specific categories – hopefully for a better understanding and appreciation.

❑ Knowledge books / reference applications: These applications, mostly issued as multimedia CD- ROMs, serve as encyclopaedias or references - on a variety of topics.

Many titles are currently available in the market, in this category. Since multimedia can handle many types of Media interfaces, the information available in various media forms, pertaining to a particular topic are effectively integrated and stored.

Examples of these applications are Microsoft Encarta and Manorama's Knowledge adventure CD-ROMs

❑ Training and classroom applications (CBT): More popularly known as the CBTs (Computer Based Training/ Tutorials), these applications make use of multimedia technology to teach some academic curriculum or technical topic. We will meet one very interesting CD ROM in the following section, wherein the very multimedia Technology has been ingeniously used to teach... Well, multimedia technology!

❑ Gaming and entertainment applications: This category includes all Computer games, adventures and other related stuff that make use of multimedia technology. It should be admitted that games remain as one of the most popular applications of multimedia – with thousands of titles being available in the market and thousands more under production!

❑ 3D/ Graphics applications: 3D Animation and graphics technologies used for Movies and Television dramas have evolved into a separate stream of businesses. This multi-billion dollar industry is growing at a tremendous pace – throughout the world.

❑ Presentation applications: These applications are mainly used in corporate boardrooms. Though simple PowerPoint applications still remain as the most popular choice, there are many occasions to call for specialized multimedia presentations for clients and business partners.

❑ Public utility kiosks / Touch screen applications: These applications are exclusively developed for public access - in places like Hotels, Airports etc.- for delivering the required information in an interactive and

lively manner. They necessarily make use of one or more Public Information Display Systems (PIDS).

❑   Miscellaneous applications: We can include all other miscellaneous multimedia applications that fail to fit into any of the above categories – here.

3.9   CD Premiere: A Meeting with the Professor

Welcome to 'Professor Multimedia' - an edutainment (or CBT) CD ROM for learning multimedia Technology in an interactive manner, published by Individual Software Inc., USA.

This title is introduced here, for two reasons:

1.   With this, we get to know how a typical multimedia CD-ROM works and how each media is employed to deliver an engaging title. This knowledge will be useful for us, because it will help us to understand the power and specialities of each media, in a better way.

2.   In a way, this CD Title is slightly different from all others. There is certainly some degree of innovation in utilizing the very technology, which it is supposed to teach us: In other words, it's *multimedia, learning through multimedia!*

3.10   The Journey

Most of the multimedia CD-ROM titles install few executable files (applications), DLLs (Window Dynamic link libraries) and other files required for their operations. These are usually installed in a directory of user's choice, on the Hard disk.

Professor Multimedia CD-ROM installs around 6 MB of such files and creates its own Icon under the Program manager in Windows.
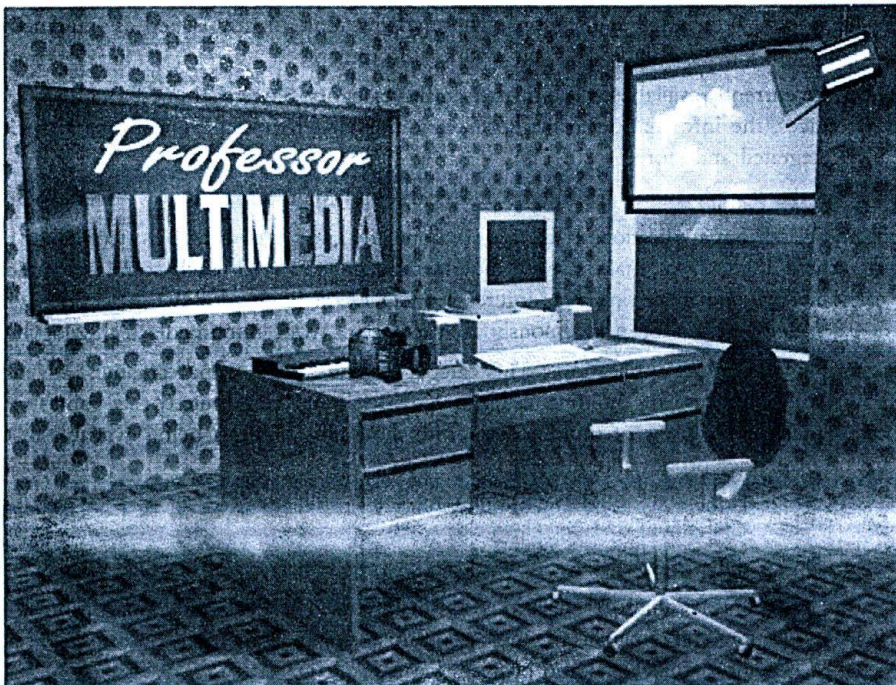

Figure 12: Professor Multimedia CD-ROM

When we click on the icon…presto!

We enter the professor's personal premises - a 3D room with a multimedia PC, with a voice greeting us to the world of multimedia; and a menu is thrown open to us immediately.

This again, is typical for many multimedia CD-ROMs, particularly the edutainment ones, which are organised into various topics through which the user can navigate freely. This Main menu, in turn, splits up to various submenus that take us directly to any part of the title we want to access.

This is another advantage of Interactive media: At any stage, we can come back to this menu and go directly to another topic of our choice…!

Professor Multimedia has the following topics in the Main menu: Pizzazz, Elements of Multimedia, The Multimedia Presentation, Multimedia Applications, Glossary and Tips and Multimedia Quiz.
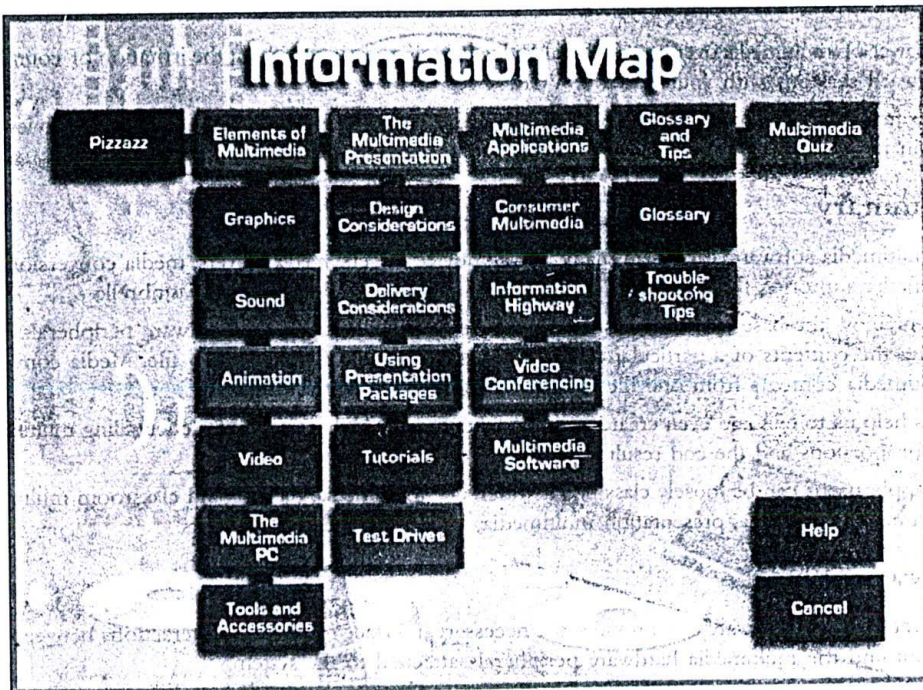

Figure 13: Professor Multimedia Menus and Sub-menus

Additionally, there is a Guided Map that lists all the Submenu items apart from the Main menu, in the form of a Map, which, in turn, facilitates greater navigation control and independence – as we skim through the title.

3.10.1 Eat the pizzazz

The Pizzazz section gives a sneak preview of what multimedia is all about: Some fine sound clips… accompanied by animation and video, introduce us to the world of multimedia wonders. The capabilities and powers of the technology also get some illustration. Now, are we all set to bottle the genie?

3.10.2 Elements of multimedia

The second part, which is the very heart of the title, has the following as the sub menu items: Graphics, Sound, Animation, Video, The multimedia PC and tools and Tools and accessories.

When we click on, say, the animation button, we directly enter the world of mind boggling 2D and 3D computer animations; and as we begin to understand and appreciate what's meant by a "Text Animation", we are suddenly pointed out that throughout our proceedings, till this current screen, how many text animations have passed by!

Oops! We try to sit erect - and begin to watch the title with an entirely different perspective!

This is yet another strength of multimedia: Explaining things with extensive graphics and animations, which can easily make one, understand the concepts clearly. Remember... a picture is worth a thousand words!

The title proceeds to explain all other medias in a similar manner...Immediately providing us with direct examples of the subject and without mincing up with words! Imagine hearing a real sixteen-bit .Wav audio file, immediately after reading what a sixteen-bit sound is all about! Well, you may say it is a direct hit!

As we go along, we perceive yet another advantage of multimedia learning: Supposing we didn't hear what the tutor...sorry, the professor just said, we can immediately click on a button with 'Sound' icon to hear the lesson once again!

This is the power of multimedia over conventional Video Training sessions without the irritation of countless rewinding and fast forward sessions with your dear old VCR!

As our aim is just getting to know how a typical multimedia CD-ROM feels like, and certainly not reviewing Professor Multimedia in its totality, let's give a bidding farewell to our dear professor!

3.11   Summary

The term 'multimedia software' can mean many things: device drivers, media players, media conversion tools, editing tools, multimedia authoring tools and end applications - all come under this broad umbrella.

Device drivers allow the base operating system to execute various tasks on the hardware peripherals. Media players enable playing the contents of a particular media type - say an audio file or a video file. Media conversion utilities convert multimedia contents from one file format to another relevant file format.

Editing tools help us to edit and even create multimedia contents. Authoring enables cocktailing multimedia contents in different proportions and the end result is multimedia applications.

Multimedia applications can be loosely classified as reference multimedia, training and classroom multimedia, gaming and entertainment multimedia, presentation multimedia, kiosk multimedia and others.

3.12   Keywords

❑   **Device drivers:** Software that provides the necessary interface required for interactions between the operating system and the multimedia hardware peripherals attached to the system.

Chapter 4

Understanding Digital Data

CHAPTER OVERVIEW

This small chapter is devoted to digital data. Remember that all multimedia contents are nothing but digital data.

The chapter begins with an overview of what an analog signal is and why it cannot be used in computers, followed by discussions on digital signals and the process of converting analog signals to digital data (often called as the digitising process).

Two important parameters connected with digitising process viz. the sampling rate and the sampling size - have also been dealt with, in detail.

4.1 Introduction

Various kinds of media, as we perceive them in our daily life with the help of electronic equipments - say, the music that's coming out of a tape recorder or the movie clip that's being broadcast in television - all of these are basically *Analog signals*, in nature.

But in the world of multimedia computing, all data are digital data.

Before we start exploring the media, let us understand what are all the different fundamental forms of data. We will begin with analog signals, as they were the first to arrive.

4.2 Meeting the analog signal . . .

The word *analog* means *'continuously varying'* - and in fact, the whole world is 'analog' by nature.

For example, let us consider sounds.

We produce sounds by fluctuating a medium. And this medium is the air that surrounds the sound source. When a music note is coming out of the speakers, the surrounding atmospheric air is actually compressed and decompressed at various rates - depending upon the source signal, and this process ultimately carries the media from the source to the destination - in our case, our ears.

Consequently, what it means is that there is no sound, without a medium! We may not be able to hear anything if the music is being played in vacuum.

When these variations are recorded electronically as some form of signals, say, over a magnetic media, then they become reproducible - as the signals can be understood and played back at a later point of time. This is the fundamental principle behind all electronic media handling devices and transmissions.

The signals thus recorded, are called *analog signals*.

If we were to follow a single analog wave very closely, we will end up with something as shown in the figure.

This curve, which is the most common representation of an analog signal wave, is mathematically called a '*sine curve*'. This curve is formed by a series of crests (upward movements) and troughs (downward movements) occurring at specific intervals of time. The height of a signal wave at any point of time is its *Amplitude* and the specific time intervals, at which it occurs is called its *Frequency*.

4.3 The world of digits

Fortunately or unfortunately, the world of Computers is full of digits - zeros and ones, at the micro level. That means, at any point of time, only two states can be represented by Computers and these signals are called *Digital Signals*.

Thus, it becomes impossible to handle Analog signals using Computers, as the latter necessarily varies in magnitude, with time - continuously. So, How are we to represent sounds, movies and all other interesting media signals which are basically in Analog format, in a way computers can understand and handle?
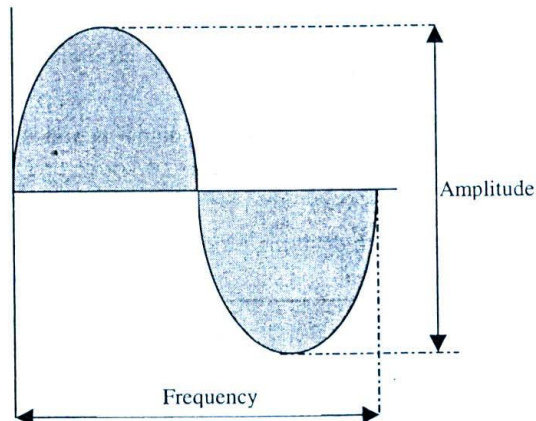

Figure 14: A typical analog signal

The technique is to create an approximately similar Digital signal, as that of the original Analog signal - using very large quantities of zeros and ones. This conversion process will be applied to multimedia data – before it is fed into the computers.
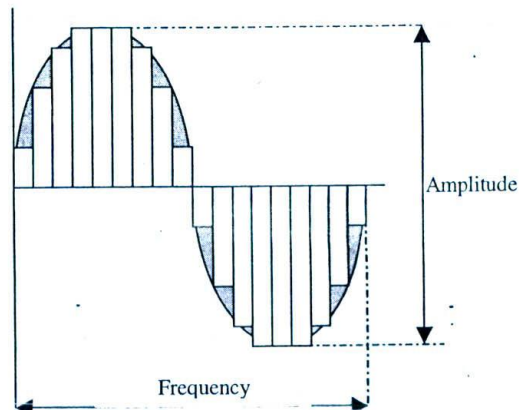

Figure 15: Analog to digital conversion process

The following figure, illustrates this process of converting Analog signals to equivalent Digital signals. In a way, it is nothing but fooling around the innocent computers, to manage aliens signals - by representing them in a form that's familiar to them.

But, this technique demands its own price to pay: Usage of binary digits in very large quantities results in voluminous data! And that's why necessarily all multimedia programs and data file sizes are incomparably huge!

This principle of *'Digitising'* the Analog source signals, is the very heart of all multimedia Computing. Almost all multimedia handling peripherals and devices, which we met earlier in the earlier chapters, basically try to accomplish, only this.

For example, a Sound card converts the Analog sound signals to Digital signals and feed them into the Computer during recording. It also converts all digital data, after all editing and manipulations, back to their earlier form, during playback.

4.4   Secrets of digital recording

Let us take a good look at a typical Digitised wave signal, which is shown in the figure below:
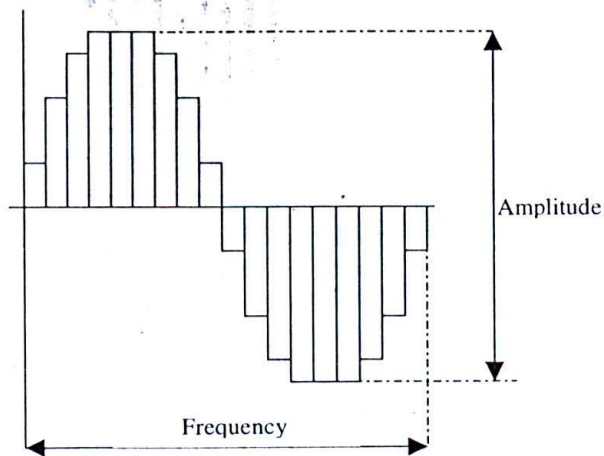

Figure 16: A typical Digital signal

It's more or less like a staircase steps that ascend and descend perpetually. You can see how a sample of the original Waveform has been recorded, over precise increments of time- by repeating which - the original signal has been reconstructed intelligently.

4.4.1   Sampling Rate

How often these samples are taken during digitising, is called the *'Sampling Rate'* and is a very important parameter in reconstructing the original signal. Because, closer these samples are (i.e. at lesser time intervals), better is the similarity between the source and the digitised signal.

In other words, a higher sampling rate implies that more samples are taken during the given time interval and ultimately, the quality of reconstruction is better.

To illustrate this, I've included another digitised sample of the same source signal we saw earlier. This time, it has a higher sampling rate than it's predecessor. You will notice that this wave is closer in its construction to the original source signal, than its predecessor.

The Sampling rate is measured in terms of **Hertz**, Hz in short, which is the term for Cycles per second. A Sampling

Rate of 6000 Hz (or 6 kHz, which is a more common usage) implies that the samples are taken - 6000 times in one second: and this signal will be better than one with a 4000 Hz Sampling Rate.

However, there is a cache here: Higher Sampling rates *also* imply, whether you like it or not, **increased file sizes!** So, a compromise must be stuck between the quality of the Signal and Size of the resulting file.

Usually, a sampling rate that is twice as that of the highest frequency expected from the source, is made use of. For example, if you're recording a Sound signal which reaches, say, around 2000 Hz at its maximum level (Which is typical for a human voice), then you can comfortably use a sampling rate of 4000 Hz - for decent reproduction.
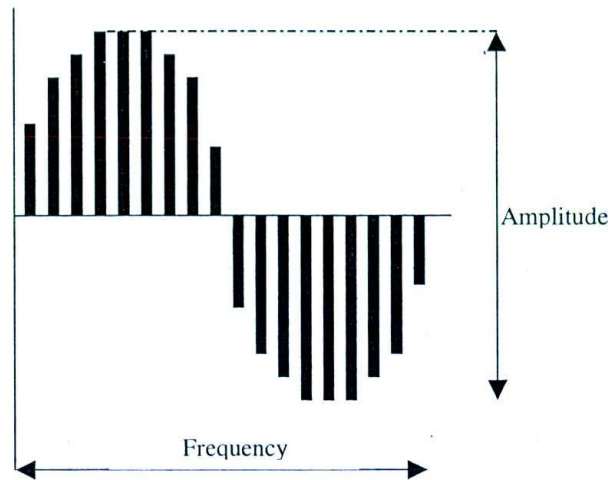

Figure 17: Digital signal with higher sampling rate

4.4.2 Sampling Size

Another important parameter connected with digitising signals, is the '*Sampling Size*' - which is the number of zeros and ones (Bits), required to represent a given signal - in digital form.

For example, by using 8 Bits, we have 256 (With 1 Bit, 2 combinations are possible; so, with 8 Bits, the possible combinations are -2 raised to power 8, which is 256) discrete levels, which can be used to construct an Analog signal.

Again, the higher the sampling size, the better is the reproduction, as the reconstruction of the signal will be closer to the original.

Thus, a digitised signal with 16 Bit Sampling size, which implies a whooping 65,536 discrete levels, is much more indistinguishable from the original signal, than its 8 Bit partner; Similarly, a 32 Bit recordings sound a lot better than 16 Bit.... and, Hold your breath! Some professional recordings even employ 64 bits of sampling size! And, of course the menace is sill out there: As you increase the sampling size, the file sizes become astonishingly huge!

So here is the lesson to remember:

In digitising any source signal, engage higher sampling rates and sampling sizes - after taking care of the expected file sizes and the storage space available for recording multimedia data.

Multimedia computing did not evoke good response in its infancy, as a good digital video clip file with sound lasting for just one minute sat on a mind boggling 45 to 50 MB of hard disk space...and when a few animations and graphics were added...Good heavens! The hard disk was full!

So, the need for a huge, powerful and yet, commercially viable storage medium was strongly felt and it was only after the introduction of the reliable CD-ROM storages, which could store more than 600 MB of data effortlessly at bare minimal costs, that multimedia rose to its full bloom.

4.5 Summary

Almost all kinds of media that we perceive in our daily life are basically analog signals - or continuously varying signals. But computers can handle only digital data. Hence, all of these analog signals must be converted to digital signals, before they can be processed using computers.

This conversion process is called digitising and almost all multimedia peripherals perform this process.

Two important parameters that govern the ultimate quality of digitising are: sampling rate and sampling size.

4.6 Keywords

❑ **Analog signals:** Continuously varying signals, used to record media wave patterns.

❑ **Digital signals:** Signals constructed solely using zeros and ones, which the computers can understand and handle.

❑ **Digitising:** The process of converting analog signals to equivalent digital signals, by way of taking discrete samples.

❑ **Sampling rate:** The time interval taken between two samples of the original analog data, during digitising process.

❑ **Sampling size:** The number of zeros and ones (bits) required to represent a given analog signal, in digital form.