

Multimedia Systems and Development

Chapter One Introduction

Outline

- 1. What is Multimedia ?**
- 2. What is Multimedia Application ?**
- 3. Categories of Multimedia**
- 4. Multimedia system**
- 5. Components or Elements of Multimedia**
- 6. Multimedia Software Categories**
- 7. Stages of Multimedia Project**
- 8. Applications of Multimedia**
- 9. Careers in Multimedia**

Discussion

- What is multimedia ?
- What is A Multimedia System ?
- What is HyperText and HyperMedia ?
- What do we need to develop a multimedia product?

1.1 What is Multimedia ?

- The Term “**multimedia**” comes from the Latin words “**multus**” which means “**numerous**” and “**media**” which means “**middle**” or “**center**”.
- Multimedia therefore means “**multiple intermediaries**” or “**multiple means**”.
 - **Multi(many)**:
 - “numerous, much, multiple” .
 - **Media (medium)**:
 - “middle, center” – agent for something.
 - Used for dissemination (distribute) and representation of information.
 - An intervening substance through which something is transmitted or carried on.
 - A means of mass communication such as a newspaper, magazine or TV.

1.1.1 Media Types

- Two broad classes:
 - **Static media** : time-independent discrete media Text, graphics, images. Information in these media consist exclusively of a sequence of individual elements without a time component.
 - **Dynamic Media**: time-dependent continuous media: Sound, video. Information is expressed as not only of its individual value, but also by the time of its occurrence.

1.1.2. Definitions of multimedia

- Multimedia can have many definitions these include:
 - “Multimedia is characterized by the presence of text, pictures, sound, animation and video; some or all of which are organized into some coherent program” (Phillips, 1997).
 - Multimedia is the usage of multiple agents (text, audio, video, images) in an attractive and interactive manner for disseminating and presenting information to audience (target user).
- A good general definition of multimedia as a field is:
 - **Multimedia is the field concerned with the computer-controlled integration of text, graphics, drawings, still and moving images (Video), animation, audio, and any other media where every type of information can be represented, stored, transmitted and processed digitally.**

1.2 What is Multimedia Application ?

- A Multimedia Application is an Application which uses a collection of multiple media sources e.g. text, graphics, images, sound/audio, animation and/or video.
- Hypermedia can be considered as one of the multimedia applications.
- Multimedia has become an inevitable part of any presentation. It has found a variety of applications right from entertainment to education. The evolution of internet has also increased the demand for multimedia content.
- Examples of multimedia applications might include:
 - learning from an educational CDROM played on a PC
 - navigating through an online tutorial that explains science concepts using animation
 - participating in video conferencing
 - watching a training DVD
 - listening to a streamed broadcast of an overseas radio network
 - Interactive gaming
 - Teleconferencing

1.3. Categories of Multimedia

- Before we divide multimedia in to categories first it is better to understand the term **interactivity** in multimedia systems.
- Computer-based multimedia presentations usually have an extra element called **interactivity**.
- Interactivity means that the **user and program respond to one another**.
- The program provides an ever-changing array of choices, which the **user selects to direct the flow of the program**.
- Interactivity refers to the way users interact with a multimedia application or program. The user can **use input devices such as a keyboard, joystick, mouse and touch screen to**
 - interact with the application through the computer.
 - Another example is a computer game. It allows the user to use the left and right

---Interactivity.

- Media that are interactive in this way are known as **hypermedia**.
- Any one of the **five major multimedia elements** can be given this kind of interactivity and turned into hypermedia, although most hypermedia are text-based links.
- When you click on the highlighted words on a web page containing text, you are following a link **called hypertext**, which is just one form of multimedia.
- **So based on their interactivity multimedia presentation can be divided in to two.**
 - **LINEAR multimedia**
 - **NON-LINEAR multimedia**

1.3.1 LINEAR Multimedia

- In linear multimedia, information is read or viewed in a **continuous sequence**.
- In linear multimedia, the user interacts with the multimedia application without controlling the progress of the content.
- Usually, these presentations begin at a predetermined starting point and end at a predetermined end point.
- Linear active content progresses often **without any navigational control** for the viewer such as a **cinema presentation or non-interactive lecture / demo show**.
- the content progresses **without you having to control the flow of the movie**. Your only control is to press the “**play**” and the “**stop**” buttons.
- This interaction is called linear interactivity

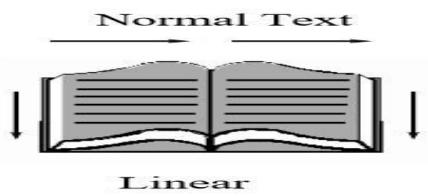
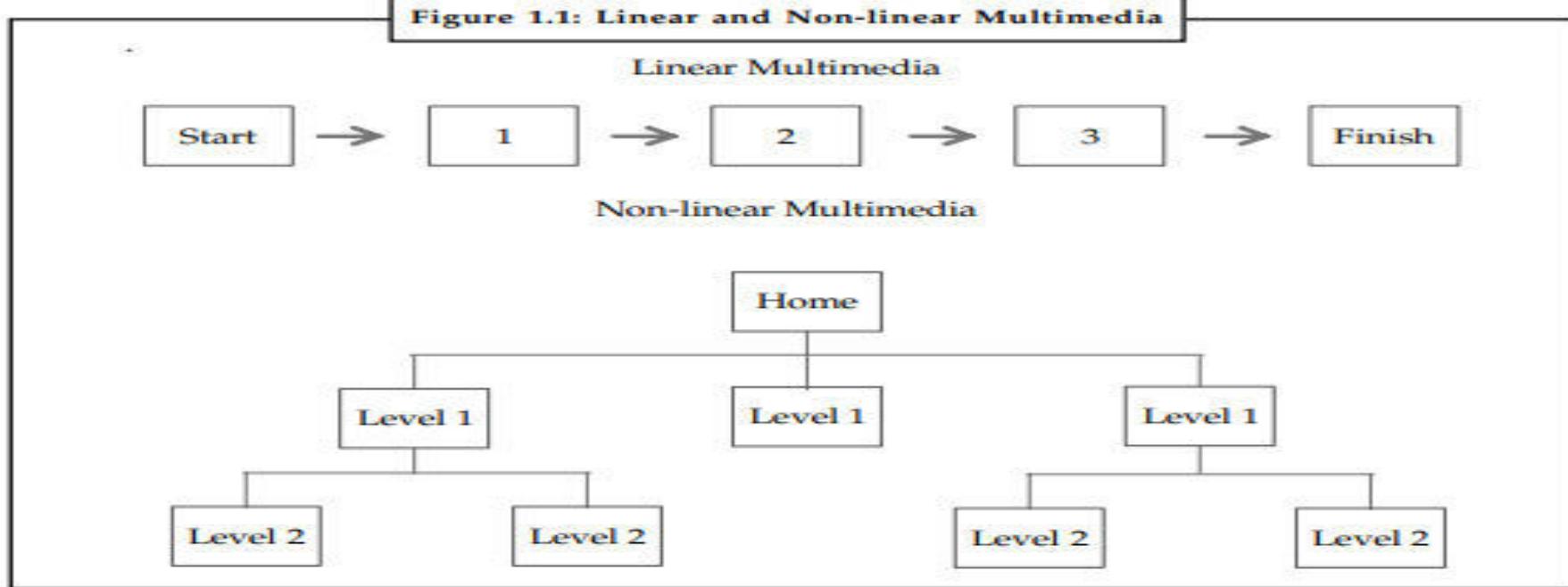
1.3.2 NON-LINEAR INTERACTIVITY

- non-linear multimedia information is **not presented in sequential or chronological manner.**
- Non-linear multimedia programs are **usually interactive and require audience interaction.**
- Non-linear **uses interactivity to control progress** as with a video game or self-paced computer based training. **Hypermedia is an example of non-linear content.**
- Non-Linearity is the **capability of jumping or navigating** from within a presentation with one point without appreciable delay.
- Unlike linear interactivity, non-linear interactivity **allows the user to interact with the content according to what the user wants from the content.** In other words, it is a **two-way communication.**
- Games, Courseware and Interactive Cd are examples of non-linear interactivity.



Example: One of the most common examples of this form of multimedia is the Web.

Figure 1.1: Linear and Non-linear Multimedia



• "Hot spots"

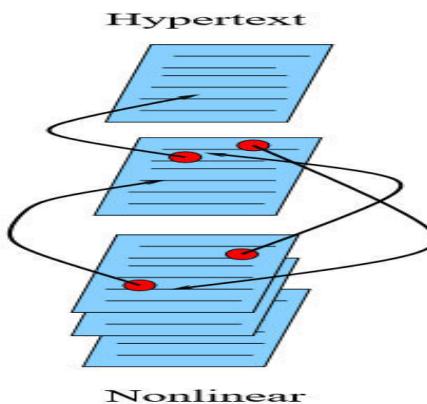


Fig 1.1: Hypertext is nonlinear

1.4. What is a Multimedia System?

- A **Multimedia System** is a system capable of processing multimedia data and applications.
- A **Multimedia System** is characterized by the **processing, storage, generation, manipulation and rendition** of Multimedia information



---contd

- A system that involves:
 - **generation**
 - **representation**
 - **storage**
 - **transmission**
 - **search and retrieval**
 - **delivery**
- production/authoring tools
- compression and formats
- file system design
- networking issues
- database management
- server design, streaming

of multimedia information

1.4.1. Key Properties / Characteristics of a Multimedia Systems

- A Multimedia system has four basic characteristics:
 - **Digitized** : All media including audio/video are represented in digital format
 - **Distributed** : The information conveyed is remote, either pre-produced and stored or produced in real time, distributed over networks
 - **Interactive** : It is possible to affect the information received, and send own information, in a non-trivial way beyond start, stop, fast forward
 - **Integrated** : The media are treated in a uniform way, presented in an orchestrated way, but are possible to

1.4.2. Components of a Multimedia System

- Now let us consider the Components i.e. Hardware and Software required for a multimedia system:

Capture Devices

- Video Camera
- Video Recorder
- Audio Microphone
- Keyboards
- Mice
- Graphics tablets
- 3D input devices
- Tactile sensors
- VR devices
- Digitizing/Sampling Hardware

Storage Devices

- Hard disk drive
- Zip drive
- Compact Disc
- Digital Versatile Disc
- Bluray Disc

Display Devices

- High resolution monitor
- High quality speakers
- Color printer
- Projector

Computer Systems

- Desktop computer
- Processor
- RAM
- Display card
- Sound card
- Capture card

Communication Networks

- Ethernet
- Token Ring
- Fiber Distributed Data Interface (FDDI)
- Asynchronous Transfer Mode

- Intranets
- Internets

1.4.3. Desirable Features for a Multimedia System

- Given the above challenges the following feature a desirable(if not a prerequisite) for a Multimedia System:
 - Very High Processing Power**- needed to deal with large data processing and real time delivery of media. Special hardware commonplace.
 - Multimedia Capable File System**- needed to deliver real-time media example Video or Audio Streaming.
 - Special Hardware/Software needed– example: special effect technology.
 - Data Representations**- File Formats that support multimedia should be easy to handle yet allow for compression or decompression in real-time.
 - Efficient and High I/O**- input and output to the file sub system needs to be efficient and fast. It needs to allow for real-time recording as well as playback of data.
Example: Direct to Disk recording systems.
 - Special Operating System**—used to allow access to file system and process data efficiently and quickly. It needs to support direct transfers to disk, real-time scheduling, fast interrupt processing, I/O streaming etc.
 - Storage and Memory**- it needs large storage units (of the order of hundreds of TB if not more) and large memory (several GB or more). Large Caches also required and high speed busesfor efficient management.
 - Network Support**- Client-server systems common asdistributed systems common.

Cont---

- Following are the common components of multimedia:
 - **Text**- All multimedia productions contain some amount of text. The text can have various types of fonts and sizes to suit the profession presentation of the multimedia software.
 - **Graphics**- Graphics make the multimedia application attractive. In many cases people do not like reading large amount of textual matter on the screen. Therefore, graphics are used more often than text to explain a concept, present background information etc. There are two types of Graphics:
 - **Bitmap images**- Bitmap images are real images that can be captured from devices such as digital cameras or scanners. Generally bitmap images are not editable. Bitmap images require a large amount of memory.
 - **Vector Graphics**- Vector graphics are drawn on the computer and only require a small amount of memory. These graphics are

Cont---

Audio- A multimedia application may require the use of speech, music and sound effects. These are called audio or sound element of multimedia. Speech is also a perfect way for teaching. Audio are of analog and digital types. Analog audio or sound refers to the original sound signal. Computer stores the sound in digital form. Therefore, the sound used in multimedia application is digital audio.

Video- The term video refers to the moving picture, accompanied by sound such as a picture in television. Video element of multimedia application gives a lot of information in small duration of time. Digital video is useful in multimedia application for showing real life objects. Video have highest performance demand on the computer memory and on the bandwidth if placed on the internet. Digital video files can be stored like any other files in the computer and the quality of the video can still be maintained. The digital video files can be transferred within a computer network. The digital video clips can be edited easily.

Animation- Animation is a process of making a static image look like it is moving. An animation is just a continuous series of still images that are

1.6 Multimedia Software Categories

- Following are the various categories of Multimedia software
 - Device Driver Software**- These softwares are used to install and configure the multimedia peripherals.
 - Media Players**- Media players are applications that can play one or more kind of multimedia file format.
 - Media Conversion Tools**- These tools are used for encoding / decoding multimedia contexts and for converting one file format to another.
 - Multimedia Editing Tools**- These tools are used for creating and editing digital multimedia data.
 - Multimedia Authoring Tools**- These tools are used for combining different kinds of media formats and deliver them as multimedia contents.

1.7 Stages of Multimedia Project

- A multimedia program should go through various multimedia production phases.
- There are three main stages of a multimedia project:
 1. **Pre-production:** The process before producing multimedia project.
 2. **Production:** The process in which multimedia project is produced.
 3. **Post-production:** The process after the production of multimedia project.
- These stages are sequential.
- Before beginning any work, everybody involved in the project should agree to what is to be done and why.
- After the clarification of why, what multimedia product has to do in order to fulfil its purpose is decided.
- The “why” and “what” determine all the how decisions including storyboards, flow chart, media content, etc

1.7.1 Pre-Production

- Given below are some of the things that people involved in **Pre**-production have to do:

- Idea or Motivation**

- During the initial why phase of production, the first question the production team ask is **“why” you want to develop a multimedia project?** Is the idea marketable and profitable? Is multimedia the best option, or would a print product being more effective?

- Product Concept and Project Goals**

- It takes several brainstorming sessions to come up with an idea. Then the production team **decides what the product needs to accomplish in the market.** It should keep in account what information and function they need to provide to meet desired goals. Activities such as developing a planning document, interviewing the client and building specifications for production help in doing so.

Pre-Production cont---

- **Target Audience**

- The production team **thinks about target age groups, and how it affects the nature of the product.** It is imperative to consider the background of target customers and the types of references that will be fully understood. It is also important to think about any special interest groups to which the project might be targeted towards, and the sort of information those groups might find important.

- **Delivery Medium and Authoring Tools**

- The production team **decides the medium through which the information reach the audience.** The information medium can be determined on the basis of what types of equipment the audience have and what obstacles must be overcome. **Web, DVDs and CD-ROMs are some of the common delivery mediums.** The production team also ascertain what authoring tools should be

Pre-Production cont---

- **Planning**

- Planning is the key to the success of most business endeavours, and this is definitely true in multimedia. This is because a lack of planning in the early processes of multimedia can cost later. **The production team works together and plan how the project will appear and how far it will be successful in delivering the desired information.**
- There is a saying, “If you fail to plan, you are planning to fail.” Group discussions take place for strategic planning and often the common points **of discussions are given below:** **What do you require for the multimedia project? How long will each task take? Who is going to do the work? How much will the product cost?** Planning also includes creating and finalizing **flowchart and resource organization in which the product's content is arranged into groups.**
- It also **includes timeline, content list, storyboard,** finalizing the functional specifications and work assignments. Detailed timelines are created and major milestones are established for the difficult phases of the project. The

1.7.2 Production

- In the production stage all components of planning come into effect.
- **During this phase graphic artists, instructional designers, animators, audiographers and videographers begin to create artwork, animation, scripts, video, audio and interface.**
- The production phase runs easily if the project manager has distributed responsibilities to the right individuals and created practical and achievable production schedule.
- Given below are some of the things that people involved in production have to do:

Production cont---

- **Scriptwriting**

- **The scripts for the text, transitions, audio narrations, voice-overs and video are written.** Existing material also needs to be rewritten and reorganized for an electronic medium. Then the written material is edited for readability, grammar and consistency.

- **Art**

- **Illustrations, graphics, buttons, and icons are created using the prototype screens as a guide.** Existing photographs, illustrations, and graphics are digitized for use in an electronic medium.
- Electronically generated art as well as digitized art must be prepped for use; number of colours, palettes, resolution, format, and size are addressed.

- **3D Modelling and Animation**

- **The 3D artwork is created, rendered, and then prepared for use in the authoring tool.** The 3D animations require their own storyboards and schedules.

Production cont---

- **Authoring**

- All the pieces come together in the authoring tool. Functionality is programmed, and 2D animation is developed. From here, the final working product is created. Every word on the screen is proofread and checked for consistency of formatting. In addition, the proofreader reviews all video and audio against the edited scripts.

- **Shooting and Recording**

- Digitizing Video The edited scripts are used to plan the budget, performers, time schedules and budget, then the shoot is scheduled followed by recording.

- **Quality Control**

- Quality control goes on throughout the process. The storyboards are helpful for checking the sequencing. The final step checks should be done for the overall content functionality and usability of the product. The main goal of production is to make the next stage, post production, run smoothly and flawlessly.

- Note: Production provides the raw components that will be blended together to create the final outcome of the multimedia project. If

1.7.3 Post-production

- After the production of the multimedia project, post-production technicalities **should be addressed to produce a perfect and error free project**. It is one of the most fundamental of all stages of production.
- The stage of post-production involves:
- **Testing**
 - The product is tested on multiple computers and monitors. It is **imperative to evaluate, test and revise the product to make sure the quality and success of the product**.
- **Mastering**
 - Mastering can be as simple as writing a CD-ROM or floppy disk. Or it can be as complex as sending the files to a service that will create a pre-master from which the master is made.

Post-production cont---

- **Archiving and Duplication**
 - Notes The original files, including audio, video, and the native software formats, are archived for future upgrades or revisions. The duplicates are created from the original and packaged accordingly.
- **Marketing and Distribution**
 - Marketing is significant to the success of a product. The survival of a company and its products depends greatly on the product reaching the maximum number of audience. Then comes the final step in the process which is distribution of the multimedia project

1.7.4 multimedia team members

- In the design, development and production of a multimedia project. A multimedia team members consists of the following:
 - Project manager
 - Multimedia designer
 - Interface designer
 - Multimedia programmer
 - Computer programmers Writer
 - Subject matter expert
 - Audio specialist
 - Video specialist
 - Producer for the Web
 - Permission specialist

The project manager is responsible for:

- The overall development, implementation, and day-to-day operations of the project.
- The design and management of a project.
- Understanding the strengths and limitations of hardware and software.
- Make schedules.
- Decide the budget of the project.
- Interact with team and clients.
- Provides resolution to development and production problems.
- Motivate people and should be detail oriented.

Multimedia designer

- This team consists of graphics designers, illustrators, animators, and image processing specialists, who deal with visuals, thereby making the project appealing and aesthetic.
- This team is responsible for:
 - Instructional designers, who make sure that the subject matter is presented clearly for the target audience.
 - Interface designers, who devise the navigational pathways and content maps.
 - Information designers, who structure content, determine user pathways and feedback, and select presentation media.
 - An interface designer is responsible for: Creating a software device that organizes content. It allows users to access or modify content, and presents that content on the screen. Biding a user friendly interface.

Cont---

- A multimedia writer is responsible for: Notes
 - Creating characters, actions, point of view, and interactivity.
 - Writing proposals and test screens.
 - Scripting voice-overs and actors' narrations.
- A video specialist needs to understand:
 - The delivery of video files on CD, DVD, or the Web.
 - How to shoot quality video.
 - How to transfer the video footage to a computer.
 - How to edit the footage down to a final product using digital non-linear editing system(NLE).
- An audio specialist is responsible for:
 - Locating and selecting suitable music talent.
 - Scheduling recording sessions.
 - Digitizing and editing recorded material into computer files

A multimedia programmer is responsible for:

- Locating audio/video resources.
- Selecting suitable audio/video clips.
- Creating audio/video clips.
- Interacting with project managers and instructional designers.
- Participating in the design process.
- Working on storyboard and uses it as a guideline.
- Finding out problems, solving them and fixing bugs.
- Writing understandable, easy and reusable codes
- Liaising with designers
- Integrates all the multimedia elements into a seamless project, using authoring systems or programming language.
- Manages timings, transitions and record keeping.

1.8 Applications of Multimedia

- There are a number of fields where multimedia could be of use. Examples are:-
 - **Business:** Sales / Marketing Presentation, Trade show production, Staff Training Application, Company Kiosk
 - **Education:** Courseware / Simulations, E-Learning / Distance Learning, Information Searching
 - **Entertainment:** Games, Movies, Video on Demand
 - **Home:** Television, Satellite TV, SMS services (chats, voting, reality TV)
 - **Public Places:** Information Kiosk, Smart Cards, Security



1.9 Multimedia Products

1. Briefing Products
2. Reference Products
3. Database Products
4. Education and Training
Products
5. Kiosk
6. Entertainment and Games

Multimedia Products



Briefing Products

- Small, straightforward, linear products used to present information quickly and concisely.
- Characteristic of briefing product:
 - ✓ Short Development Cycle
 - ✓ Limited Number of Presentations
 - ✓ Usage of text to present information with limited use of graphic, audio and video.
 - ✓ Have few navigational controls. (mouse click and button press to move from one page to another)
 - ✓ Content and the format are suitable for the audience and fulfill the purpose of the presentation.

Multimedia Products



Briefing Products

- Good briefing presentation depends on:
 - ✓ The understanding of the presented subject.
 - ✓ Seamless integration of content.
 - ✓ Consistent layout
- Example:
 - ✓ Corporate Presentation
 - ✓ Sales Presentation
 - ✓ Educational Lectures



Multimedia Products



Reference Products

- Often used for answering specific questions or for general browsing of information. (stored on CD/ DVD ROM)
- Characteristic of reference product:
 - ✓ Used by wide range of user (small – adult)
 - ✓ Have navigational menu, book marking, searching, printing utility
- 2 Basic classes of reference product:
 - ✓ Generalized Content (dictionary/encyclopedia)
 - Broad treatment of content at a limited depth
 - ✓ Detailed Content
 - Focus on specific area and provide extensive information.

Multimedia Products

2 Reference Products

- Good usability and success depends on:
 - ✓ The developers understanding the body of information and how the end user will want to access it.
 - ✓ Help function should always available to explain how to access and use the information
- Examples are electronic forms of:
 - ✓ Encyclopedia
 - ✓ Dictionaries
 - ✓ Cookbooks, Historical, Informative
 - ✓ Scientific surveys.

Multimedia Products

2 Reference Products

- Example:



Multimedia Products



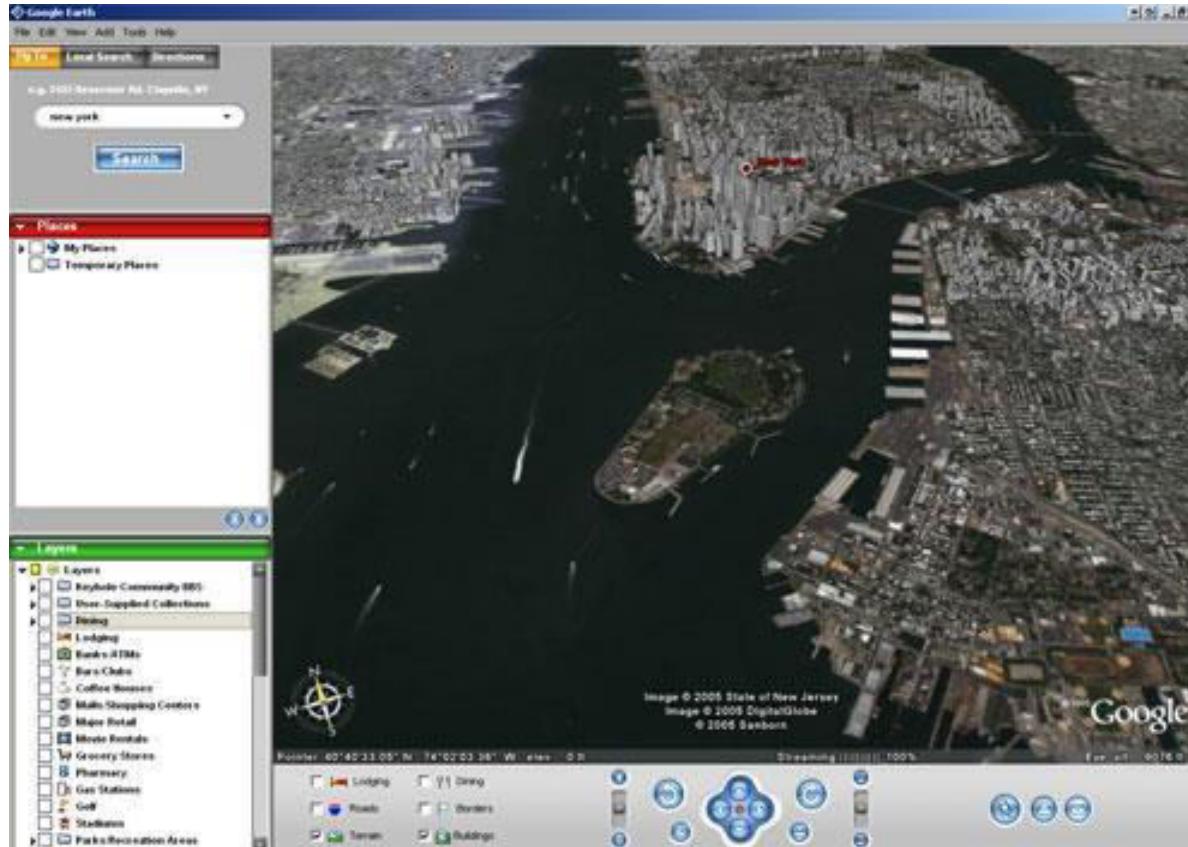
Database Products

- Similar to reference product in a sense that large amount of information are made available to the end user.
- Focus on storing and accessing the actual data (multimedia data such as text, graphic, audio, animation and video)
- Characteristics of Database Products are:
 - ✓ Manages multimedia data (large data)
 - ✓ Descriptive finding methods
 - Content based search
 - ✓ Simultaneous access
 - Online database
 - ✓ Relational consistency in data management.

Multimedia Products

3 Database Products

- Examples are:
 - ✓ Google Search
 - ✓ Google Earth



Multimedia Products



Education and Training Products

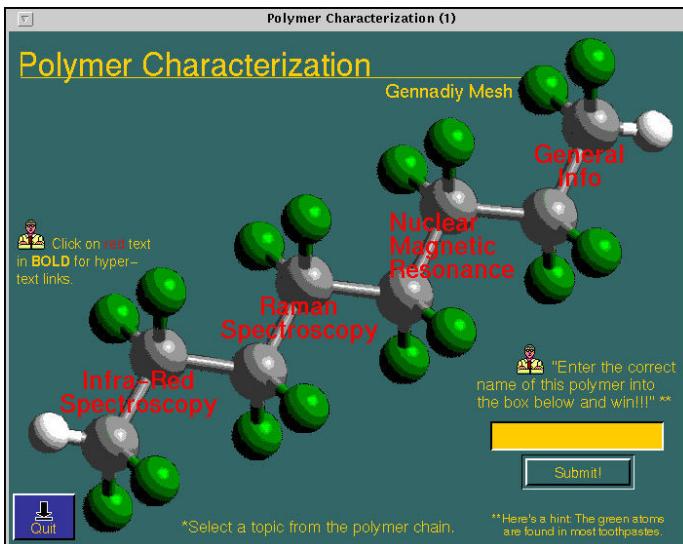
- Similar to textbook or training manuals but have added media such as audio, animation and video.
- Make up a significant share of the multimedia market ranging from pre-kindergarten to postgraduate offerings from technical to corporate training products.
- 2 categories of reference product:
 - ✓ Instructor Support Products
 - ✓ Standalone or Self-Paced Products
 - ✓ Combination Products
- Shares the same characteristics as Reference Product

Multimedia Products

4

Education and Training Products

- Example



The screenshot shows a math tutorial interface. The title bar says "Chapter 3 Simplifying Algebraic Expressions". The main content area says "Chapter 3 Simplifying Algebraic Expressions". A text box on the right says: "In this lesson, you will review some basic properties of real numbers, and you will learn to simplify algebraic expressions by grouping like terms and by using the distributive property." The bottom navigation bar includes "Introduction", "Tutorial", "Examples", "Summary", "Practice & Problems", "Extra Practice", "Self-Check", "Next", and "Previous". A user name "cdelgado" is visible in the bottom center.

Multimedia Products

5

Kiosk Products

- A product which is usually stationed at public places and allow the user to find information interactively and also other types of transaction.
- Characteristics of Kiosk Products:-
 - ✓ Limited target users and usage.
 - ✓ User friendly and easily used by user.
 - ✓ Fast response.



Multimedia Products

5

Kiosk Products

- Categories of Kiosk
 - ✓ Point Of Information
 - Provide certain information (example map, timetable etc)
 - ✓ Point Of Sales System
 - Allow users to purchase or make orders
- Example of Kiosk Products:-
 - ✓ Instant Photo Booth
 - ✓ Banking Kiosk (money deposit, cheque)
 - ✓ University Information Kiosk



Multimedia Products



Entertainment & Games

- Most popular
- Shipped in the form of Interactive CD / DVD ROM.
- Characteristics of E & G Products:-
 - ✓ Immersive.
 - ✓ Requires constant feedback and interaction with the user.
 - ✓ Challenging and sometimes intriguing for user
 - ✓ Enabled online play for more than one user experience.



chapter1: Introduction to Multimedia

1.10. Careers in Multimedia

- Executive Producer/Production Manager
- Multimedia Director/Architect
- Art Director
- Interface Designer
- Interactive Scriptwriter/Editors
- Content Specialist/Instructional Specialist
- Graphic Designer
- Animation Specialist
- Audio Specialist
- Sound Engineer
- Video Specialist
- Videographer
- Web Master
- Game programmer

?

Multimedia System and Development

Chapter 2

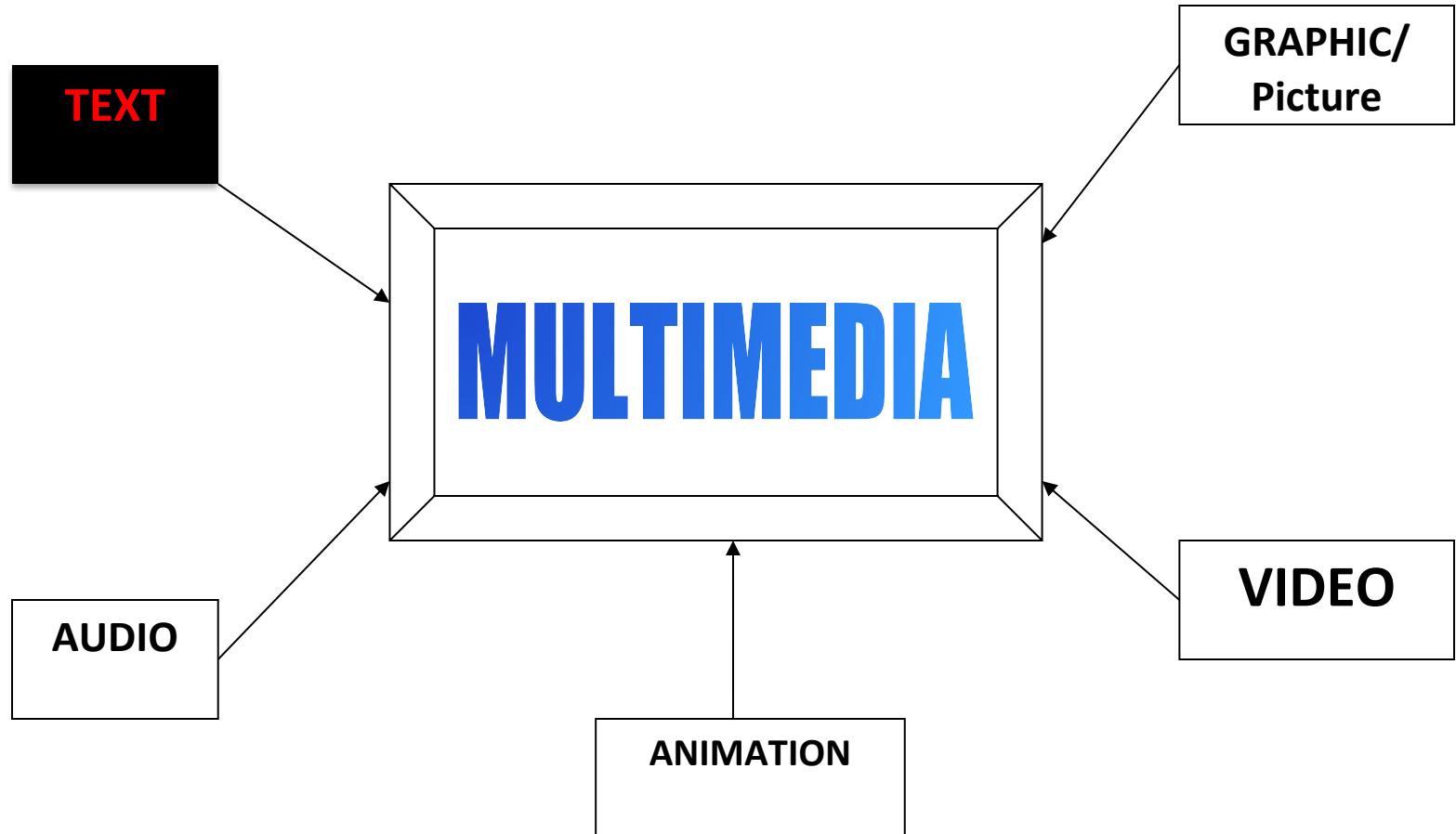
Multimedia Building Blocks
and Information Representation:

TEXT

Topics

- TEXT IN MULTIMEDIA
- TYPES OF TEXT
- FONTS
- SELECTING TEXT FONTS
- FONT EDITING AND DESIGN TOOLS
- TEXT COMPRESSION
- COMMON TEXT FORMATS

1. Multimedia Building Blocks



2.1 Text in Multimedia

- TEXT
 - characters that are used to create words, sentences, and paragraphs.

Titles

Multimedia is a rich medium that accommodates numerous instructional strategies. Multimedia addresses many of the challenges of instruction in both the academic and corporate environments. It is accessible over distance and time and provides a vehicle for consistent delivery. Multimedia can provide the best medium with which to communicate a concept.

- Monitor
- Keyboard
- Mouse
- Speaker

Cont---

- Text has become a part of our life. It consists of characters, punctuation symbols, etc. to convey a message.
- We read text in newspapers, magazines, pamphlets, billboards, books, websites, etc.
- Text is one of the most imperative components of multimedia and an essential source of presenting information to a wide range of people.
- Proper use of text, keeping in mind elements such as font style, size and various design tools help the content creator to communicate the idea and message to the user.
- Text is also the most widely used and flexible means of communicating information and ideas.

Cont---

- Text is the basic element of multimedia that is used to communicate information to the user.
- Most of the text in multimedia products will be keyed in or imported from applications such as Microsoft Word, so is **already in a digital format**.
- It can also be imported using optical character recognition (OCR) systems .
- Storage of text is 1 byte per char / more bytes for Unicode
- It involves the use of **text types, sizes, colors and background** color.
- Used in **contents, menus, navigational buttons**
- To produce an effective multimedia program there are three things that need to be considered.
 - the position of the text on the screen,
 - Length of the message And
 - legibility of the text.

Cont--

- Internally text is represented via binary codes as per the ASCII table.
- The **ASCII table** is however quite limited in its scope and a new standard has been developed to eventually replace the ASCII standard.
- This standard is called the **Unicode standard** and is capable of representing international characters from **various languages throughout the world**.
- We also generate text automatically from a scanned version of a paper document or image using **Optical Character Recognition (OCR) software**.

- The use of Text
 - Heading / Title
 - Bullet / list
 - Paragraph
 - Scrolling text
 - Navigation
 - Text as graphic
 - **advertisements**
 - **in a website**
 - **in films such as titles and credits**
 - **as subtitles in a documentary**



2.2 TYPES OF TEXT

- There are three types of text that can be used to produce pages of a document:
 - Unformatted text
 - Formatted text
 - Hypertext

Unformatted Text

- Also known as plaintext,
- this comprise of fixed sized characters from a limited character set.
- The character set is called **ASCII table** which is short for **American Standard Code for Information Interchange** and is one of the most widely used character sets.
- At first only included capital letters and numbers , but in 1967 was added the lowercase letters and some control characters, forming what is known as US-ASCII, ie the characters 0 through 127.
- It basically consists of a table where each character is represented by a unique 7-bit binary code.

Cont---

- All the characters are of the same height. In addition, the ASCII character set also includes a number of control characters.
- These include BS (backspace), LF (linefeed), CR (carriage return), SP (space), DEL (delete), ESC (escape), FF (form feed) and others.
- In 1981, IBM developed **an extension of 8-bit ASCII code**, called "**code page 437**", in this version were replaced some obsolete control characters for graphic characters.
- Also 128 characters were added , with new symbols, signs, graphics and latin letters, all punctuation signs and characters needed to write texts in other languages, such as Spanish.
- In this way was added the ASCII characters **ranging**

Standard and Extended ASCII table , ascii codes :

ASCII table with decimal, octal, hex, and Binary , ascii codes :

Decimal	Octal	Hex	Binary	Value
066	102	42	0100 0010	B
067	103	43	0100 0011	C
068	104	44	0100 0100	D
069	105	45	0100 0101	E
070	106	46	0100 0110	F
071	107	47	0100 0111	G
072	110	48	0100 1000	H
073	111	49	0100 1001	I
074	112	4A	0100 1010	J
075	113	4B	0100 1011	K
076	114	4C	0100 1100	L

Decimal	Octal	Hex	Binary	Value
077	115	4D	0100 1101	M
078	116	4E	0100 1110	N
079	117	4F	0100 1111	O
080	120	50	0101 0000	P
081	121	51	0101 0001	Q
082	122	52	0101 0010	R
083	123	53	0101 0011	S
084	124	54	0101 0100	T
085	125	55	0101 0101	U
086	126	56	0101 0110	V
087	127	57	0101 0111	W
088	130	58	0101 1000	X
089	131	59	0101 1001	Y
090	132	5A	0101 1010	Z

Unicode

- **Unicode**, formally the **Unicode Standard**, is an **information technology standard for the consistent encoding, representation, and handling of text expressed in most of the world's writing systems**.
- The standard, which is maintained by the Unicode Consortium, defines **144,697 characters** covering **159** modern and historic scripts, as well as symbols, emoji, and non-visual control and formatting codes.
- Unicode can be implemented by different character encodings.
- The **Unicode standard defines Unicode Transformation Formats (UTF)**: **UTF-8**, **UTF-16**, and **UTF-32**, and several other encodings.
- The most commonly used encodings are **UTF-8**

- UTF-8, the dominant encoding on the World Wide Web (used in over 95% of websites as of 2020, and up to 100% for some languages) and on most Unix-like operating systems,
- It uses **one byte(8 bits)** for the first **128 code points**, and up to **4 bytes** for other characters.
- The first **128 Unicode code points represent the ASCII characters**, which means that any **ASCII text is also a UTF-8 text**.
- **Ethiopic** is a Unicode block containing characters for writing the Ge'ez, Tigrinya, Amharic, Tigre, Harari, Gurage and other Ethiosemitic languages and Central Cushitic languages or Agaw languages

Ethiopic

Official Unicode Consortium code chart

Ethiopic

120	121	122	123	124	125	126	127	128	129	12A	12B
ሀ	ሐ	ወ	ኩ	ፋ	ቁ	በ	ተ	ኔ	ኤ	እ	ሁ
1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	12A0	12B0
ሁ	ሃ	ወ	ኩ	ፋ	ቁ	በ	ተ	ኔ	ኤ	እ	
1201	1211	1221	1231	1241	1251	1261	1271	1281	1291	12A1	
ዘ	ሐ	ወ	ኩ	ፋ	ቁ	በ	ተ	ኔ	ኤ	እ	ሁ
1202	1212	1222	1232	1242	1252	1262	1272	1282	1292	12A2	12B2
የ	ሐ	ወ	ኩ	ፋ	ቁ	በ	ተ	ኔ	ኤ	እ	ሁ
1203	1213	1223	1233	1243	1253	1263	1273	1283	1293	12A3	12B3
ዘ	ሐ	ወ	ኩ	ፋ	ቁ	በ	ተ	ኔ	ኤ	እ	ሁ
1204	1214	1224	1234	1244	1254	1264	1274	1284	1294	12A4	12B4
ሀ	ሐ	ወ	ኩ	ፋ	ቁ	በ	ተ	ኔ	ኤ	እ	ሁ
1205	1215	1225	1235	1245	1255	1265	1275	1285	1295	12A5	12B5
ሁ	ሐ	ወ	ኩ	ፋ	ቁ	በ	ተ	ኔ	ኤ	እ	
1206	1216	1226	1236	1246	1256	1266	1276	1286	1296	12A6	

Formatted Text:

- Formatted text are those where apart from the actual alphanumeric characters, other control characters are used to change the appearance of the characters,
- e.g.
 - bold, underline, italics, varying shapes, sizes and colors etc.,
- Most text processing software use such formatting options to change text appearance.
- It is also extensively used in the publishing sector for the preparation of papers, books, magazines, journals, and so on.

Hypertext:

- The term Hypertext is used to mean certain extra capabilities imparted to normal or standard text.
- Like normal text, a hypertext document can be used to reconstruct knowledge through sequential reading but additionally it can be used to **link multiple documents** in such a way that the user can navigate non sequentially from one document to the other for cross-references.
- These links are called **hyperlinks**.
- The underlined text string on which the user clicks the mouse is called an **anchor** and the document which opens as a result of clicking is called the **target document**.
- On the web target documents are specified by a specific nomenclature called **Web site address**

2.3 Fonts

- A font is a **collection of character or glyphs of a single size and style belonging to a particular typeface family.**
- Fonts are very useful as they help in gaining attention of the reader by highlighting headings, **increasing readability** and project an image.
- They can be classified into three categories – **serif, sans serif and decorative.** The serif is the little decoration at the end of a letter stroke.
- They are classified on the basis of Weights, Widths, Styles, Optical sizes, Grades, and Effects.
- Many fonts are also available online and people can download them from a server.

Here are the naming conventions of fonts:

- **Weights:** Hairline, Thin, Ultra Light, Extra Light, Light, Book, Regular/Roman, Medium, Semibold, Bold, Extra Bold, Ultra Bold, Black, Ultra Black.
- **Widths:** Compressed, Condensed, Semi Condensed, Narrow, Normal, Extended, Extra Extended, Expanded.
- **Styles:** Roman, Italic, Cursive, Oblique (a slanted roman), Small Caps (usually included as an OpenType feature rather than a digital font), Petite Caps (rare), Upright Italic (rare), Swash (usually an OpenType feature rather than a font).
- **Optical sizes:** Caption, Text, Subhead, Display, Deck, Poster.
- **Grades:** Grade 1, Grade 2, Grade 3, Grade 4 (subtly different weight to accommodate for different print conditions)

Figure 2.3: Examples of Serif, Sans Serif and Decorative Fonts

Bodoni

Interactive multimedia is called hypermedia.

(This is a serif font. In this font, a line or curve extension from the end of a letter. Serif fonts are best used for body text.)

Avant Garde

Interactive multimedia is called hypermedia.

(This is a sans serif font. There are no extensions in this font. Sans Serif fonts are best used for titles.)

Natura My Script

Interactive multimedia is called hypermedia.

(This is a decorative font. These fonts are stylish and formal and are best used for emphasis.)

- Example: Times New Roman, Bodoni, Bookman are some fonts which come under serif category. Arial, Avant Garde, Verdana are some examples of sans serif font

FONT vs Typeface

- Most people use the terms "font" and "typeface" interchangeably, and they are incorrect to do so. In most instances when people refer to fonts, they really mean typefaces.
- A typeface is the collective name of a family of related fonts (such as Times New Roman), while fonts refer to the weights, widths, and styles that constitute a typeface (such as Times New Roman Regular, Italic, Bold, etc.).
- A typeface is a particular set of glyphs or sorts (an alphabet and its corresponding accessories such as numerals and punctuation) that share a common design.
- In typography, a **font is a particular size, weight and style of a typeface.**
- Each font was a matched set of type, one piece (called a "sort") for each glyph, and a typeface comprised a range of fonts that shared an overall design.

Cont---

- For example, **Helvetica** is a well known typeface.
- A font is a particular set of glyphs within a typeface.
- So, **12 point Helvetica** is a font, and **10 point Helvetica** is a separate font.
- The same goes for different weights – a 14 point Helvetica Bold is a different font than a 14 pt Helvetica Light.
- They are different fonts, but the same typeface.

A. D. FARMER & SON TYPE FOUNDING CO.

ANTIQUE COND. No. 2.

PICTURE WITH ALL POINTS.

6 POINT 30 x 30 A.—\$2 25
THE GOVERNMENT SCHOOLS
For all Children Must be of an Absolute
Nature Depending From Day to
Day on the Word 379

6 POINT 30 x 34 A.—\$2 75
GOVERNMENT SCHOOLS
For Children Must be Absolute
in its Nature Depending
From Day to 123

10 POINT 30 x 34 A.—\$3 40
GOVERNMENT
Of all Schools for Children
Must Necessarily 23

10 Point 30 x 34 A.—\$3 40
GOVERNMENT
Absolute in its Nature
Depend From 45

12 Point 30 x 34 A.—\$4 00
GOVERNMENT SCHOOLS
For Children Must Necessarily be
of an Absolute Nature Depend

16 POINT 30 x 34 A.—\$6 00
THE GOVERNMENT
Of Schools for Children Must

20 POINT 30 x 34 A.—\$4 00
THE GOVERNMENT
Of Schools for Children

24 POINT 30 x 34 A.—\$5 40
GOVERNOR of Maine

A. D. FARMER & SON TYPE FOUNDING CO.

GOTHIC ITALIC No. 2.

6 POINT 30 x 30 A.—\$1 00
KANSAS WEEKLY REPORTS
Warm Weather Continued with Frequent
and Most Beneficial Raines in all
Localities and Crops 22

6 POINT 30 x 30 A.—\$2 50
THE SPANISH TORPEDOES
It is Even Matters for Surprise that
the Defenses of Spain 33

10 POINT 30 x 30 A.—\$1 00
NUMEROUS FAILURES IN ROCHESTER
Hard Times and Slow Collections the Supposed Cause of
the Numerous Failures Reported Yesterday at

10 POINT 30 x 34 A.—\$1 00
WILLING TO SELL TO BEST BIDDER
The Second Day of the Annual Sales of Delinquents
Brought a Large Number of Bidders to

14 POINT 30 x 34 A.—\$1 50
TYPICAL LUNAR LANDSCAPE
Since There Is No Atmosphere on the Moon
There Can Be No Skylight for There

18 POINT 30 x 34 A.—\$4 00
DOWN ON THE SHORE
Great Discoveries Made by Him

24 POINT 30 x 34 A.—\$5 00
HOTEL PROSPECT
Come Where the Sweets

Cont---

- The spacing between character pairs is called **kerning** and the space between lines is called **leading**.
- Text fonts are used for lengthy text passages, so they have to be simple and readable.
- Serif fonts are usually used for this purpose. On the other hand, display fonts are used for headlines and slogans.
- These fonts should be eye-catching and are not used for common purpose.
- Display font designed for multimedia may not look good on print whereas text fonts designed for print may not look good on a computer screen.

2.4 Selecting Text Fonts

- There are a few things that a user must keep in mind before selecting fonts for a multimedia presentation. Reading the guidelines given below will help a user in choosing appropriate fonts:
 - Choose a font that is **legible and easy to read**. Example: San serif fonts are easier to read than serif fonts.
 - The different effects and colours of a font can be chosen to make the **text look distinctive**.
 - Try to **use few different colours** within the same presentation.
 - Try to use **few typefaces** within the same presentation. Play with the style and size to match up to the purpose and importance of the text. For instance use large font size for headings.

Cont---

- To attract instant attention to the text, the words can be **wrapped onto a sphere or bent like a wave**.
- In case of text links (anchors) on web pages the messages can be **highlighted**.
- Meaningful words and phrases can be used for **links and menu items**.
- **Overcrowding** of text on a single page should be avoided.
- **Do not use decorative passages** for longer paragraphs.
- The concept of using many fonts in a single

2.5 Font Editing and Design Tools

- A font editor is a class of application software **specifically designed to create or modify font files.**
- Font editors differ greatly depending on if they are designed to edit bitmap fonts or outline fonts.
- Most modern font editors deal with the outline fonts.
- Special font editing tools can be used to make your own type, so you can communicate an idea or graphic feeling exactly. With these tools, professional typographers create distinct text and displays faces.
 - Fontlab Studio.
 - Font Creator.
 - Fontographer.
 - Glyphs.
 - Robo font.
 - ResEdit
 - Fontographer
 - Type-Designer

2.6 COMPRESSION

- Data compression is a **bit-rate reduction** involves **encoding information using fewer bits than the original representation.**
- It is The process of coding that will effectively **reduce the total number of bits** needed to represent certain information.
- Large text documents covering a number of pages may take a lot of disk space.
- We can apply compression algorithms to **reduce the size of the text file during storage.**
- A **reverse algorithm** must be applied to decompress the file before its contents can be displayed on screen.
- There are three types of compression methods that are applied to text as explained:
 - **Huffman Coding:**
 - **Lempel-Ziv (LZ) Coding**
 - **Lempel-Ziv-Welsh (LZW) Coding**

2.7 TEXT COMPRESSION

- Using standard ASCII representation, each character (letter, space, punctuation mark, etc.) in a text document requires 8 bits or 1 byte.
- Suppose we have a fairly dense text with 50 lines of text per page and 100 characters per line.
- This would give 5 kB per page. If the text were a hefty 1000 pages, this would result in 5 MB. Alternatively, if we assume one word is on average 6 characters, then each word requires approximately 6 bytes.
- Therefore, a one million word document would require approximately 6 MB.
- Although these numbers may sound big, remember that this is for a very large text document. As we'll see other media result in significantly more data.

Cont---

- Assume the message =
BCCABBDDAECCBBAEDDCC
 - If we encode it using ASCII code ,Each character occupies 8 bits.
 - There are a total of 20 characters in the above string.
 - Thus, a total of $8 * 15 = 160$ bits are required to send this string.
 - It decodes like this :
- 01000010 01000011 01000011
01000001 01000010 01000010
01000100 01000010 01000001
01000101 01000011 01000011
01000010 01000010 01000001
01000101 01000100 01000100
01000011 01000011
- Using the Huffman Coding technique,
we can compress the string to a

Decimal	Octal	Hex	Binary	Value
65	101	41	0100 0001	A
66	102	42	0100 0010	B
67	103	43	0100 0011	C
68	104	44	0100 0100	D
69	105	45	0100 0101	E

TEXT COMPRESSION (cont---)

A. Huffman Coding:

- This type of coding is intended for applications in which the text to be compressed has known characteristics in terms of the characters used and **their relative frequencies of occurrences**.
- An optimum set of variable-length code words is derived such that the **shortest code word** is used to represent the **most frequently occurring characters**.
- This approach is called the **Huffman coding**

Huffman Code

- Huffman coding is a popular method for compressing data with **variable-length codes**.
- Given a set of data symbols (an alphabet) and their frequencies of occurrence (or, equivalently, their probabilities), the method constructs a set of variable-length codewords with the shortest average length and assigns them to the symbols.
- Huffman coding serves as the basis for several applications implemented on popular platforms.

Steps to build Huffman Tree

- Input is an array of unique characters along with their frequency of occurrences and output is Huffman Tree.
1. Create a leaf node for each unique character and build a min heap of all leaf nodes (Min Heap is used as a priority queue. The value of frequency field is used to compare two nodes in min heap. Initially, the least frequent character is at root)
 2. Extract two nodes with the minimum frequency from the min heap.
 3. Create a new internal node with a frequency equal to the sum of the two nodes frequencies. Make the first extracted node as its left child and the other extracted node as its right child. Add this node to the min heap.

Let us understand the algorithm with an example:

acccdbbecbcddaaacbbbed

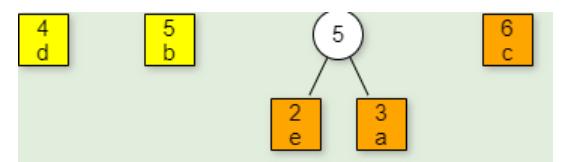
1 The following letters will be placed in a Huffman tree:



3 Choose the two smallest numbers: 2 and 3



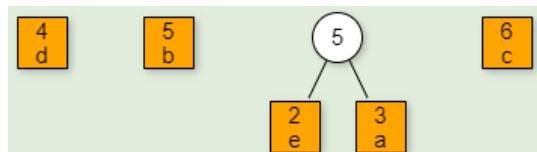
5 Choose the two smallest numbers: 4 and 5



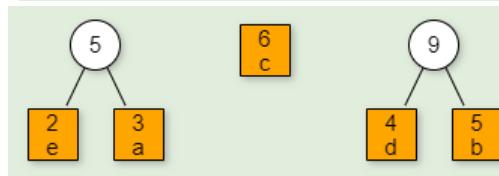
2 Sorting the data by frequency results in the following:



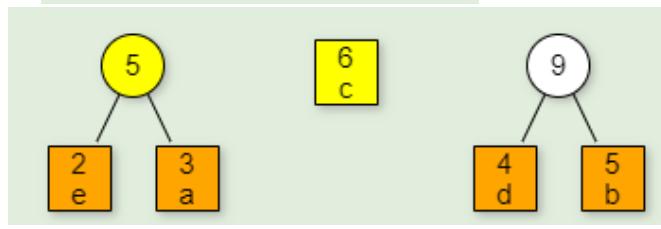
4 Merge them together to form a tree with sum "5", and reorder the list.



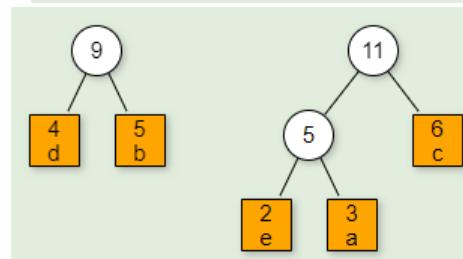
6 Merge them together to form a tree with sum "9", and reorder the list.



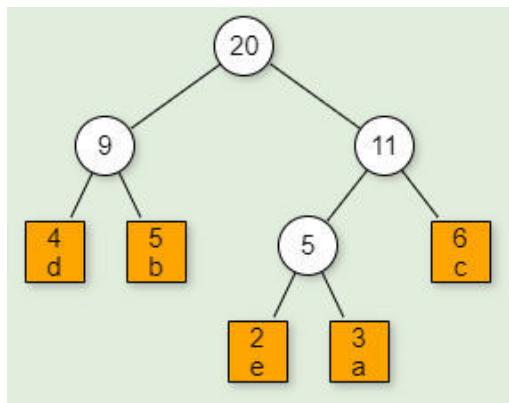
7 Choose the two smallest numbers: 5 and 6



8 Merge them together to form a tree with sum "11", and reorder the list.



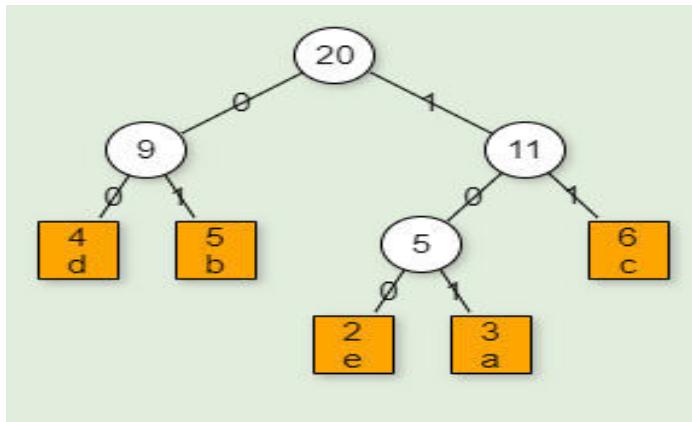
9 Merge them together to form a tree with sum "20", and reorder the list.



This is the final Huffman coding tree.

10 Now we see how the edges will be used to define the codes.

Assign 0 for left nodes
and 1 for right nodes

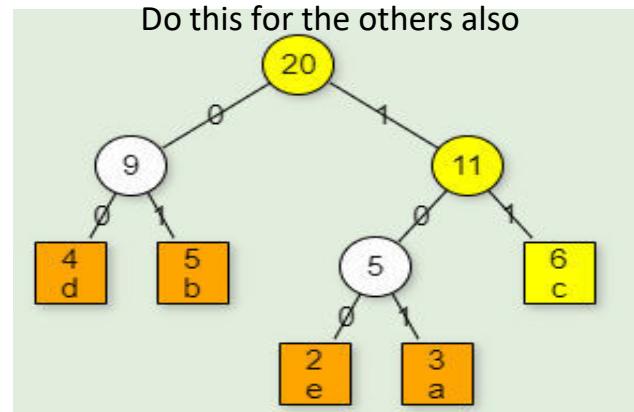


Char	Freq	Code	Bits
c	6	11	2
d	4	00	2
b	5	01	2
e	2	100	3
a	3	101	3

Here is a table showing all of the codes.

1 Now we are ready to compute the Huffman code for each character.

1 To get the code for 'c' we will follow the path and we will get 11.
Do this for the others also



1 Total bits needed = $6 * 2 + 4 * 2 + 5 * 2 + 2 * 3 + 3 * 3$
3 = $12 + 8 + 10 + 6 + 9$
= **45 bits** to represent the message

Number of Characters = 20

Average bits needed per symbol = $45 / 20 = 2.25$

Example 2

1. Construct a Huffman tree for the alphabet A B C D E F where the relative frequencies of each character are:
2. Use the tree to determine the code word for each of the character of this short alphabet
3. Find Total bits needed and Average bits needed per symbol
4. Encode the string “CADAECFB”

Char	Freq
f	5
e	9
c	12
b	13
d	16
a	45

Example 2 solution

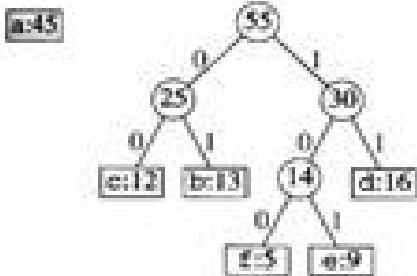
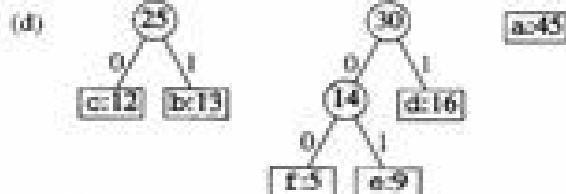
[f:5] [e:9] [c:12] [b:13] [d:16] [a:45]



(b) [c:12] [b:13] [d:16] [a:45]



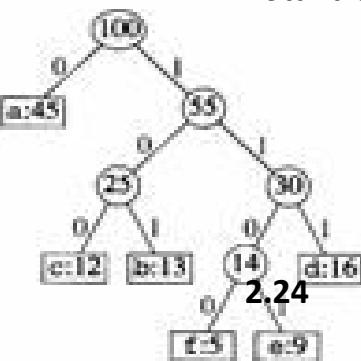
Char	Freq	Code	Bits
f	5	1100	4
e	9	1101	4
c	12	100	3
b	13	101	3
d	16	111	3
a	45	0	1



$$\begin{aligned}
 \text{Total bits needed} &= 5 * 4 + 9 * 4 + 12 * 3 + 13 * 3 + 16 * 3 + 45 * 1 \\
 &= 20 + 36 + 36 + 39 + 48 + 45 \\
 &= \mathbf{224 \text{ bits}} \text{ to represent the message}
 \end{aligned}$$

$$\text{Number of Characters} = 5+9+12+13+16+45 = \mathbf{100}$$

$$\text{Average bits needed per symbol} = 224 / 100 = \mathbf{2.24}$$

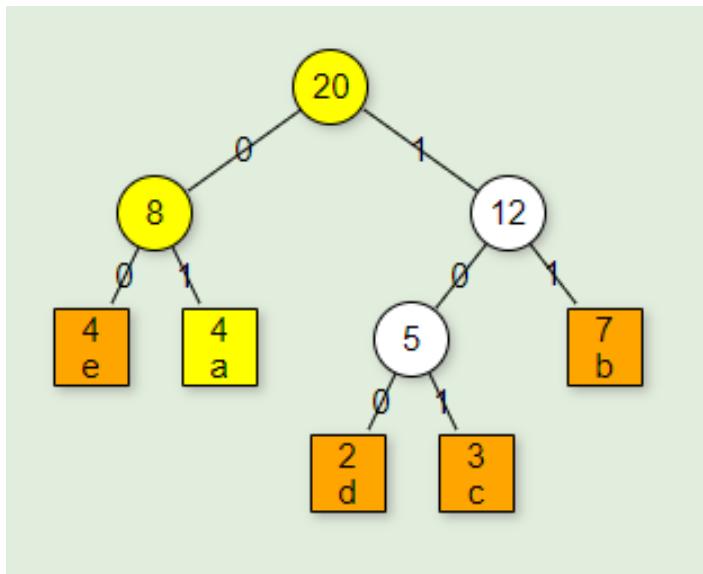


Exercise 1

1. Construct a Huffman tree for the alphabet A B C D E where the relative frequencies of each character are:
2. Use the tree to determine the code word for each of the character of this short alphabet
3. Find Total bits needed and Average bits needed per symbol
4. Encode the string “AECBCAD”

Char	Freq
c	3
d	2
b	7
e	4
a	4

solution



Char	Freq	Code	Bits
c	3	101	3
d	2	100	3
b	7	11	2
e	4	00	2
a	4	01	2

$$\begin{aligned}\text{Total bits needed} &= 3 * 3 + 2 * 3 + 7 * 2 + 4 * 2 + 4 * 2 \\ &= 9 \quad + 6 \quad + 14 \quad + 8 \quad + 8 \\ &= \mathbf{45 \text{ bits}} \text{ to represent the message}\end{aligned}$$

$$\text{Number of Characters} = 3+2+7+4+4=20$$

$$\text{Average bits needed per symbol} = 45 / 20 = \mathbf{2.25}$$

Exercise 2

1. Construct a Huffman tree for the alphabet A B C D E F where the relative frequencies of each character are:

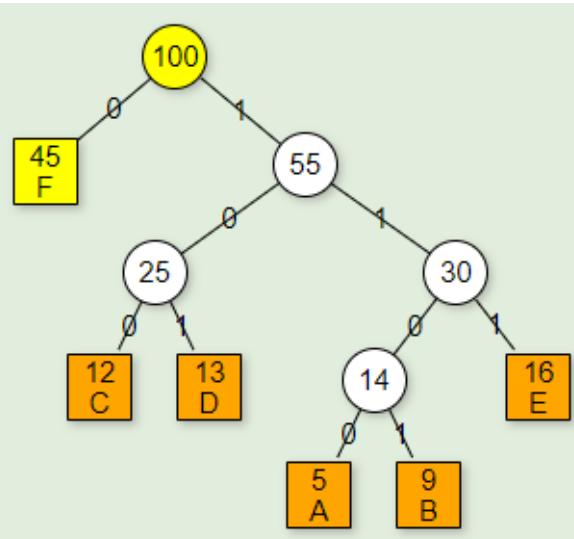
2 Use the tree to determine the code word for each of the character of this short alphabet

3. Find Total bits needed and Average bits needed per symbol

4. Encode the string “AECBCAF”

Char	Freq
A	5
B	9
C	12
D	13
E	16
F	45

solution



Character	Frequency	Code	bits	Size
A	5	1100	4	$5*4 = 20$
B	9	1101	4	$9*4 = 36$
C	12	100	3	$12*3 = 36$
D	13	101	3	$13*3 = 39$
E	16	111	3	$16*3 = 48$

Total bits needed = $5 * 4 + 9 * 4 + 12 * 3 + 13 * 3 + 16 * 3$
 $\underline{5 * 8} = 20 + 36 + 45 + 39 + 48$
~~40 bits~~ 179 bits to represent the message

Number of Characters = $5+9+12+13+16=45$

Average bits needed per symbol = $179 / 45 = 3.97$

Huffman Code

- ADVANTAGES:
 - uniquely decodable code
 - smallest average codeword length
- DISADVANTAGES:
 - LARGE tables give complexity
 - sensitive to channel errors

TEXT COMPRESSION (cont---)

B. Lempel-Ziv (LZ) Coding

- In the second approach followed by the Lempel-Ziv (LZ) method, instead of using a single character as a basis of the coding operation, **a string of characters is used.**
- For example, a table containing all the possible words that occur in a text document, is held by both the encoder and decoder.

TEXT COMPRESSION (cont---)

A. Lempel-Ziv-Welsh (LZW) Coding:

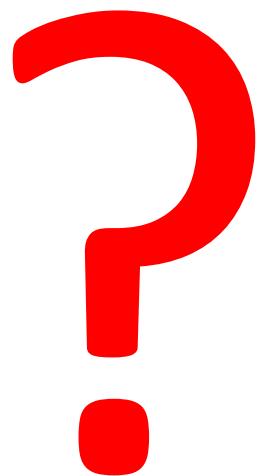
- Most word processing packages have a **dictionary associated** with them which is used for both spell checking and compression of text.
- The variation of the above algorithm called Lempel-Ziv-Welsh (LZW) method **allows the dictionary to be built up dynamically by the encoder and decoder** for the document under

2.8 Common TEXT FORMATS

- **DOC/DOCX** (Word Document) Microsoft's Word (word processing) software saves documents using the **.doc** filename extension. These files contain special **formatting codes** that identify how the text with look (bold, italic, color, typeface, etc.) as well as how the **page lays out** (margins, indentation, pagination, etc.). This file format was superceded in Word 2007 with the **.docx** filename extension.
- **RTF** (Rich Text Format) RTF documents are designed to transfer documents between word processing software. These files use **.rtf** filename extensions. While the text formatting options are as "rich" as those used by Word, RTF files **have limited page layout options**. For example, you cannot create columns, add page numbers, headers, or footers. The WordPad word processor included with Windows defaults to creating RTF documents.
- **TXT** (Text Only) TXT documents **only contain text**. **No formatting options**, like bold or center, are available. Any text contained in a **TXT** file must be plain text.

Cont---

- **PDF (Portable Document Format)**
 - Developed by Adobe Systems for **cross platform exchange** of documents. In addition to text the format also supports images and graphics. PDF is an open standard and anyone may write programs that can read and write PDFs without any associated royalty charges.
- **PostScript (PS)**
 - Postscript is a **page description language used mainly for desktop publishing**. A page description language is a high-level language that can describe the contents of a page such that it can be accurately displayed on output devices usually a printer. A PostScript interpreter inside the printer converts the vectors to pixels then sends them to the printer. This will result in a high-quality printout.



Multimedia System and Development

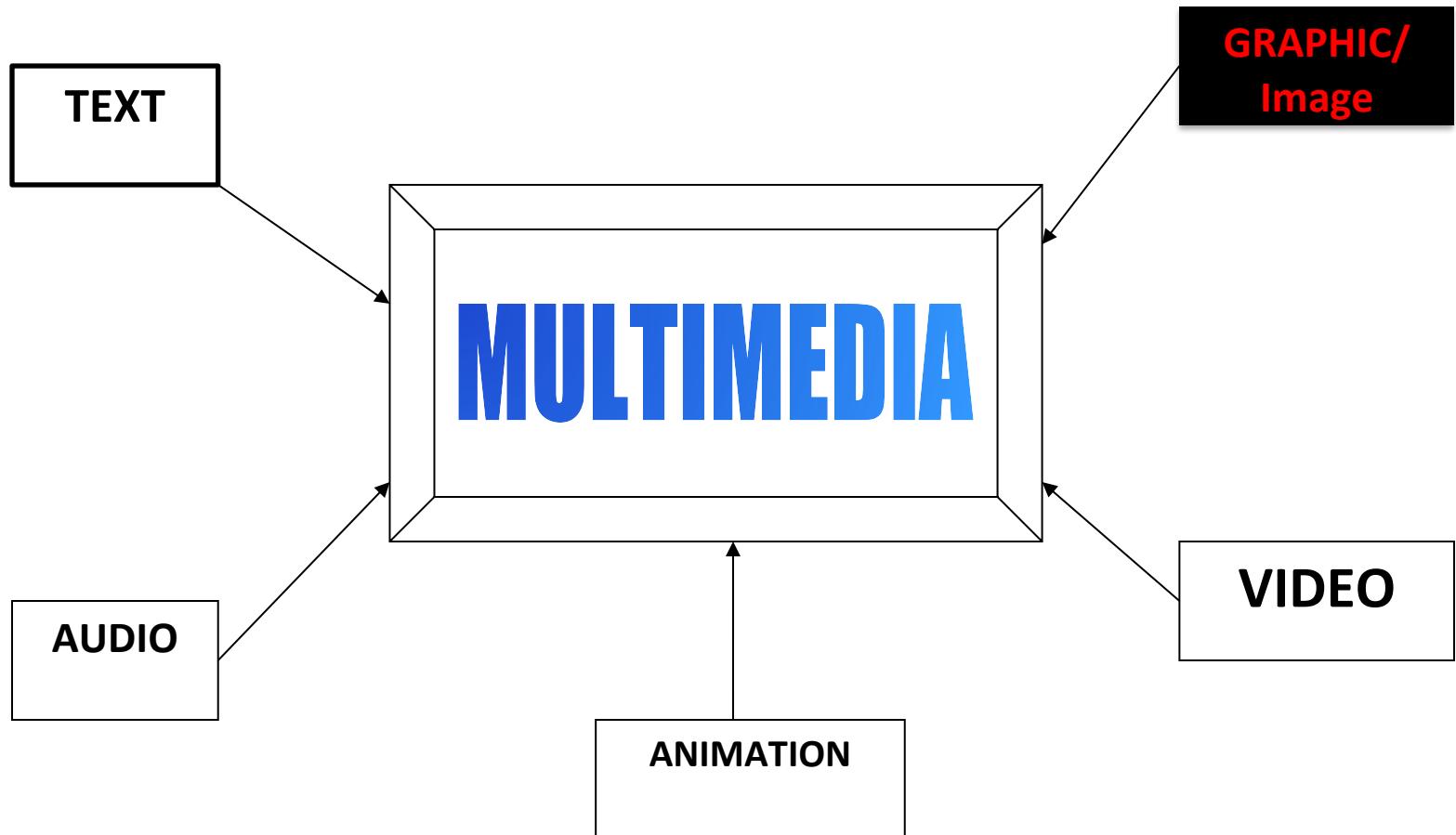
Chapter 3

**Multimedia Building Blocks
and Information Representation:
GRAPHIC/ Picture**

Topics

- What is image/ graphics ?
- The use of Graphics
- Advantages of Graphics in Multimedia
- Disadvantages of Graphics in Multimedia
- Graphics Categories
- Bitmaps and vector
- Image Data Types
- Color Theory/COLOR MODELS
- Additive and subtractive color systems
- IMAGE COMPRESSION TECHNIQUES
- IMAGE FILE FORMATS/POPULAR FILE FORMATS

1. Multimedia Building Blocks



1. What is an image?

- An **image** is the graphical and visual representation of some **information** that can be **displayed** on a computer screen or **printed** out
- A digital representation of non-text information, such as a drawing, chart, or photograph.
- Graphic files can add emphasis, illustrate concepts and provide background meaning.
- Used in multimedia to show more clearly what a particular information is all about (diagrams, picture).
- Graphics make the multimedia application **attractive**. They help to illustrate ideas through still pictures.

Cont---

- The better the quality of a graphic, the larger its file size will be.
- Larger file sizes can have a whole range of negative effects, including longer transfer and download times, larger storage space needs and greater cost.
- The type of image created depends on the display resolution and the hardware and software capabilities.
- ~~Images come in a variety of forms:~~ right hardware for
 - Photographs
 - Drawings
 - Paintings
 - Television and motion pictures
 - Semantics
 - Maps etc.

1. The use of image/Graphics

- Images show us the prominent features of the objects that they represent.

WILDCAT



These images are composed quite differently, each is an effective representation of its subject

The use of Graphics

- ω To add emphasis
- ω Direct attention
- ω Illustrate concepts
- ω Provide background content

1.2

Advantages of Graphics in Multimedia

- Convey information more quickly than when using text
- Make complex information simple
- Enhance online teaching and learning
- Enhance communication with some disabled groups, particularly those with learning difficulties or cognitive impairments

1.3

Disadvantages of Graphics in Multimedia

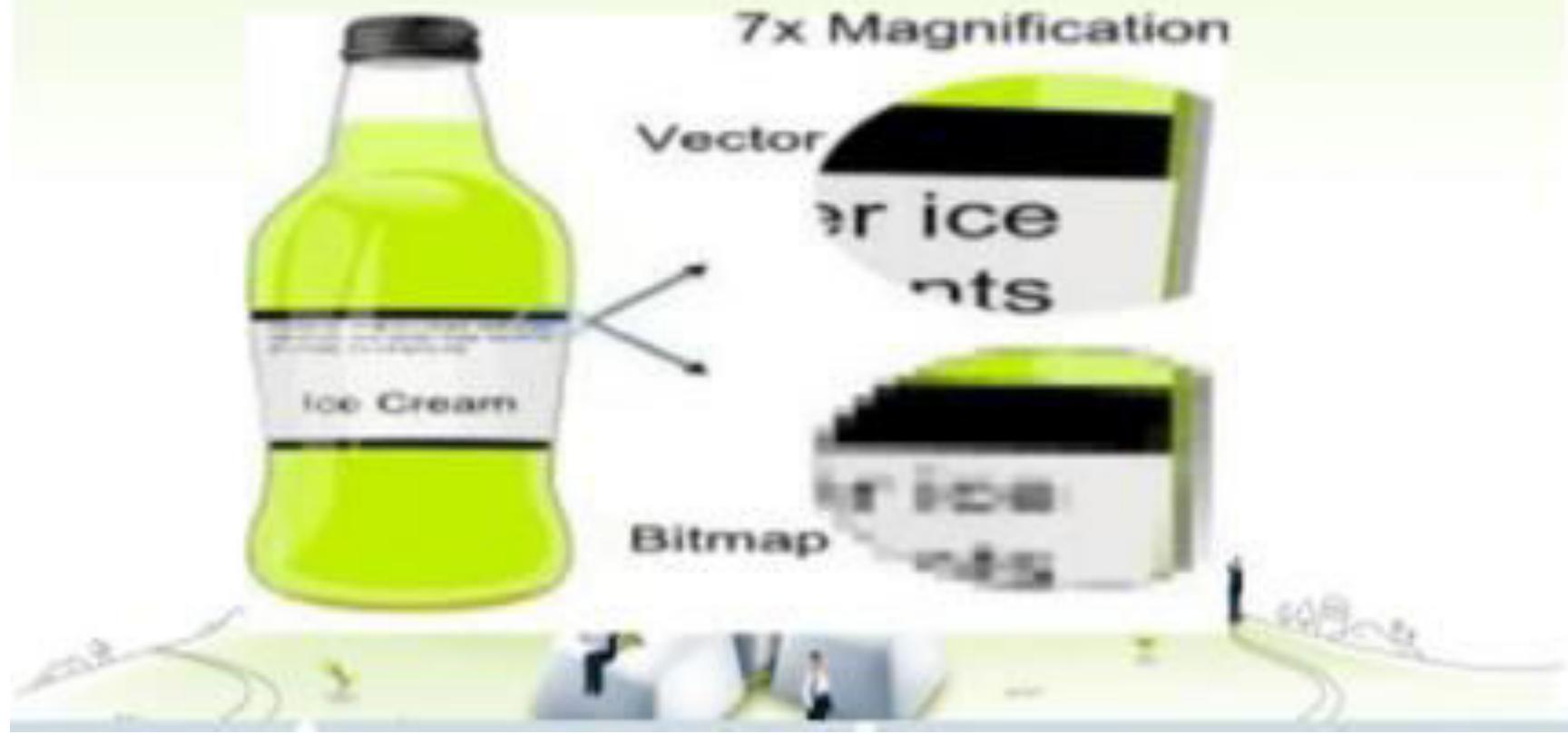
- Take longer to download
- Require the use of plug-ins that the user may not have or be able to install
- Create accessibility barriers for some users

2Types of graphics

- In the context of digital images, **an image format is a common manner to organize and store image data.**
- It defines how the data are arranged and the used compression type or level.
- There are two main classes of visual information that can be stored in a digital computer:
 - A. I □ Bitmapped images are stored as an **array of pixels**
 - B. V€ □ Vector graphics are stored as the **set of graphic primitives** required to represent the image

Cont---

- Bitmaps (or raster-based)
- Vector-drawn graphics.



A. Bitmaps (Raster graphics)

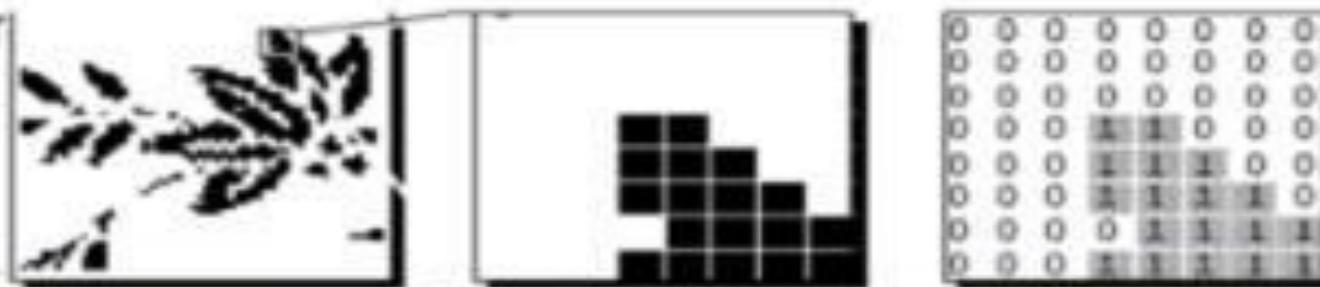
- raster graphics or bitmap files (map of bits), contain a representation of a graphic stored as pixels at a fixed resolution.
- Bitmap graphics are **stored as a series of tiny rectangular array of dots called pixels**.
- **Each pixel consists of two or more colors.**
- The image format is specified by two main parameters: **spatial resolution**, which is specified as **pixels x pixels** (example: 640x480) and **color encoding**, which is specified by bits per pixel. Both parameter values depend on hardware and software for input or output of images.
- The number of pixels determine the **quality of the image** (resolution).

- A **pixel** is the smallest element of resolution on a computer screen (Screen Resolution)
- A pixel is the basic unit of a digital images. Digital image is a picture that may be stored in, displayed on, processed by a computer.
- As mentioned, **bitmap** is composed of a matrix elements called **pixels**
- Each pixel can be in a specific **colour** and each pixel consists of two or more colors.

- ❑ The range of these colours is known as the **colour depth** .
- ❑ The color depth determined “How much data in bits used to determine the number of colors”.
- ❑ Colour depth is measured in **bits per pixel**
 - ❑ Remember: a **bit (binary digit)** is either 1 or 0 and that there are eight bits in a **byte**

The colour depth is determined by how much data, in bits is used to determine the number of colours e.g. one bit is two colours, four bits means sixteen colours, eight bits indicates 256 colours, 16 bits yields 65,536 colours and so on

- Bitmap is derived from the words 'bit', which means the simplest element in which only two digits are used, and 'map', which is a two-dimensional matrix of these bits.
- A bitmap is a data matrix describing the individual dots of an image that are the smallest elements (pixels) of resolution on a computer screen or pri

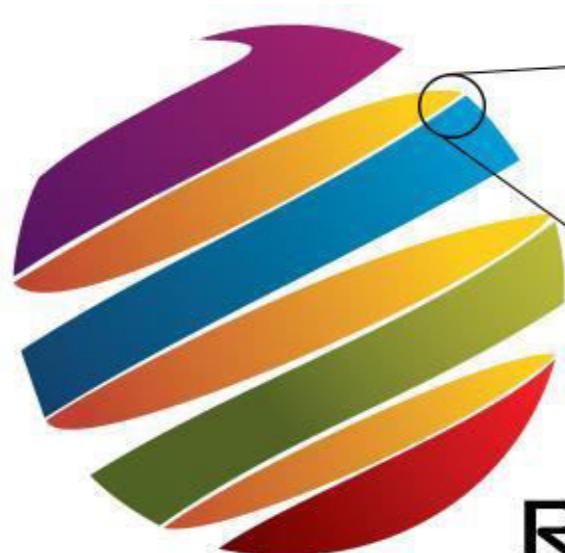


- More bits provide more color depth, hence more photo-realism; but require more memory and processing power.

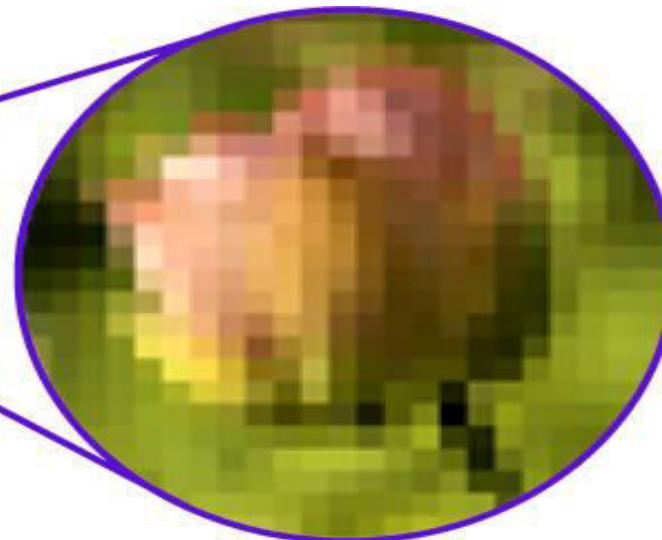
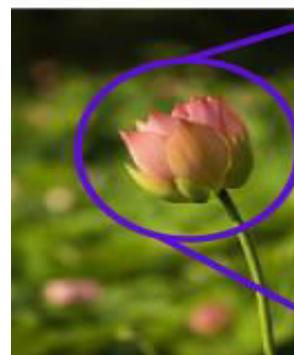
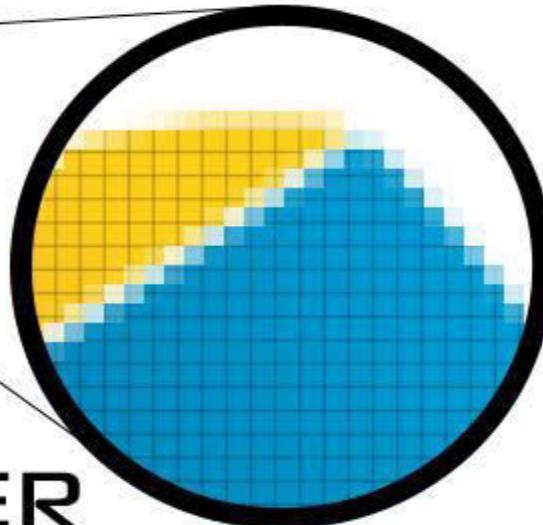
- Bitmap graphics can be edited by erasing or changing the color of individual pixels.
- Bitmaps are often used to store and display **photographic images**, as they can detail subtle gradients in colour.
- However they do lose visual quality and become distorted when resized.
- Commercially available programs for creating bitmap graphics include Paint Shop Pro and Adobe Photoshop.
- There are many different bitmap file formats:
 - TIFF for print; Photoshop's PSD and BMP; and GIF, JPG, and PNG for the Web.

Bitmap image examples

---cont



RASTER



2 Bitmap Image data types

- Images can be created by using different techniques of representation of data called **data type** like monochrome and colored images.
- BIT DEPTH is determined by the number of bits used to define each pixel. The greater the bit depth, the greater the number of tones (grayscale or color) that can be represented. Digital images may be produced in black and white (bitonal), grayscale, or color.
- A bitonal image is represented by pixels consisting of 1 bit each, which can represent two tones (typically black and white), using the values 0 for black and 1 for white or vice versa.
- Some important data types of images are following:
 - 1-bitA bitonal / monochrome images
 - 8-bit Gray scale images
 - 24-bit color images/ true color

2.1.1 Monochrome Bit-Map Image

- In 1-bit images, each pixel is stored as a single bit (0 or 1).
- A bit has only two states either on or off, white or black, true or false.
- Therefore, such an image is also referred to as a binary image, since only two states are available. 1-bit image is also known as 1-bit monochrome images because it contains one color that is black for off state and white for on state.

A 1-bit image with resolution 640*480 needs a storage space of 640*480 bits.

$$640 \times 480 \text{ bits.} = (640 \times 480) / 8 \text{ bytes} = (640 \times 480) / (8 \times 1024) \text{ KB} = 37.5 \text{ KB}$$

- The clarity or quality of 1-bit image is very low.



2.1.2 8bit Gray scale Bit-Map Image



- Each pixel of 8-bit gray level image is represented by a single byte (8 bits).
- Therefore each pixel of such image can hold $2^8=256$ values between 0 and 255.
- Therefore each pixel has a brightness value on a scale from black (0 for no brightness or intensity) to white (255 for full brightness or intensity).
- For example, a dark pixel might have a value of 15 and a bright one might be 240.

A 8-bit image with resolution 640×480 needs a storage space of 640×480 bytes = $(640 \times 480)/1024$ KB = 300KB. Therefore an 8-bit image needs 8 times more storage space than 1-bit image.

Cont--

- **Dithering**
 - Full-color photographs may contain an almost infinite range of color values.
 - **Dithering is the most common means of reducing the color range of images down to the 256 (or fewer) colors seen in 8-bit GIF images.**
 - Dithering is the process of juxtaposing pixels of two colors to create the illusion that a third color is present.
 - simple example is an image with only black and white in the color palette. By combining black and white pixels in complex patterns a graphics program like Adobe Photoshop can create the **illusion of gray values**:



Full-color image
dithered
to two colors



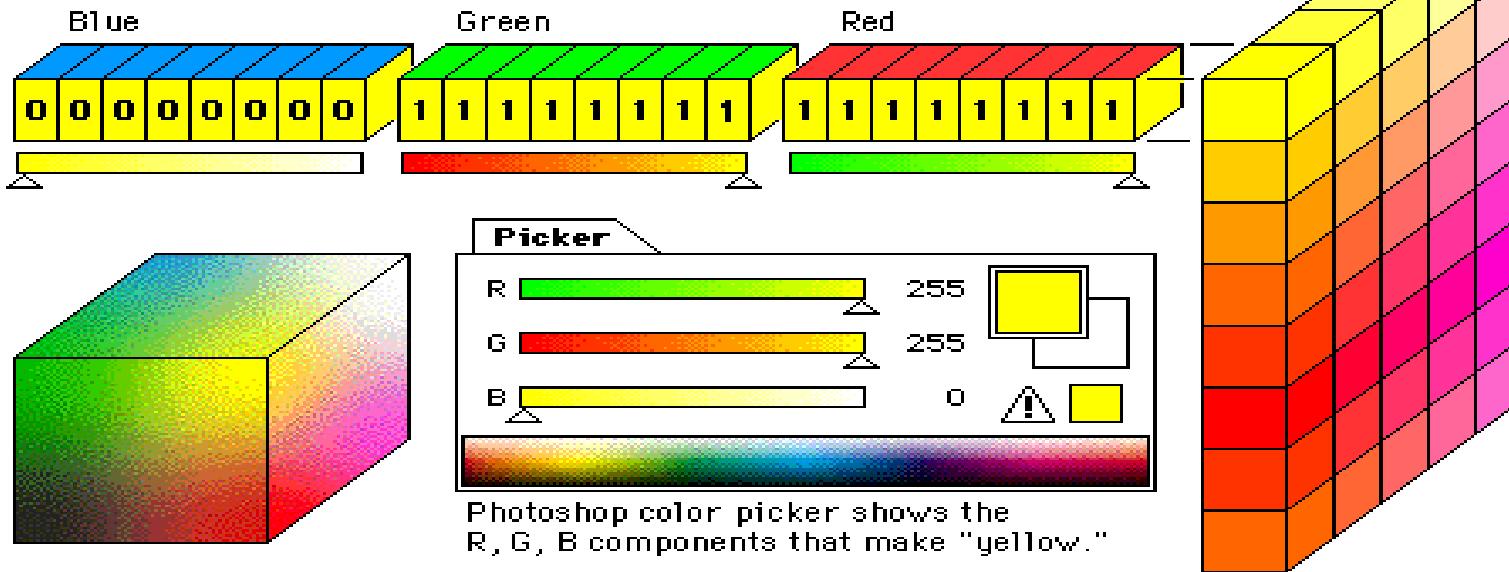
2.1.3 24-bit color Bit-Map Image

- In 24-bit color image, each pixel is represented by three bytes, usually representing RGB (Red, Green and Blue).
- Usually true color is defined to mean 256 shades of RGB (Red, Green and Blue) for a total of 16777216 color variations.
- It provides a method of representing and storing graphical image information in an RGB color space such that a large number of colors, shades and hues can be displayed in an image such as in high quality photo graphic images or complex graphics.

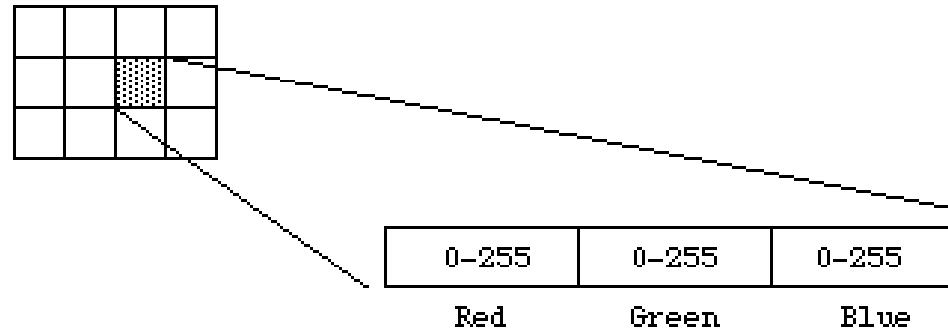
A 24-bit color image with resolution 640×480 needs a storage space of $640 \times 480 \times 3$ bytes = $(640 \times 480 \times 3) / 1024 = 900$ KB without any compression. Also 32-bit color image with resolution 640×480 needs a storage space of $640 \times 480 \times 4$ bytes= 1200 KB without any compression.

24-bit "true color" displays

Each screen pixel is represented by three groups of eight pixels, for a total of 24 bits.



Twenty-four bits (three bytes) per pixel gives us a possible 16 million (approx.)



2.1.4 8-bit color Bit-Map Image

- 8-bit color graphics are a method of storing image information in a computer's memory or in an image file, so that each pixel is represented by **8-bits (1 byte)**.
- The maximum number of colors that can be displayed at any one time is 256 or 2^8 .
- 8 bit Indexed color is a more economical way of storing color bitmaps without using 3 bytes per pixel.
- As with 8 bit grey bitmaps each pixel has one byte associated with it only now the value in that byte is no longer a color value but an index into a table of colors called a

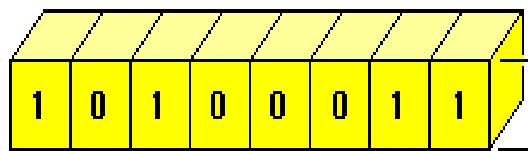
Cont--

- Therefore, 8-bit image formats consists of two parts: a color map describing what colors are present in the image and the array of index values for each pixel in the image. In most color maps each color is usually chosen from a palette of 16,777,216 colors (24 bits: 8 red, 8 green, 8 blue).

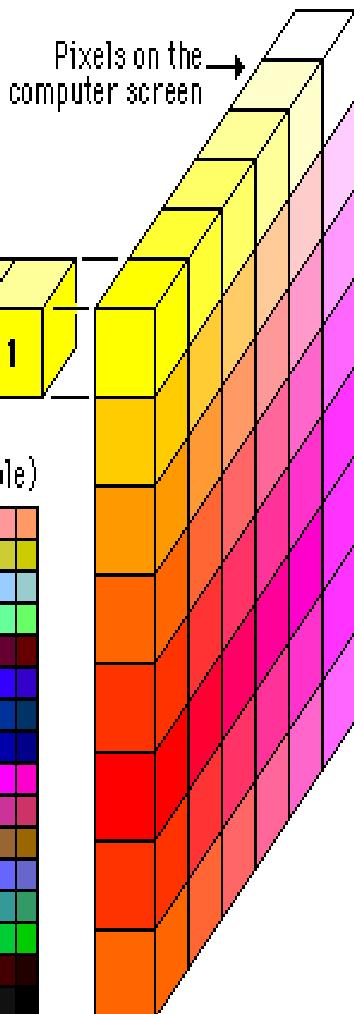
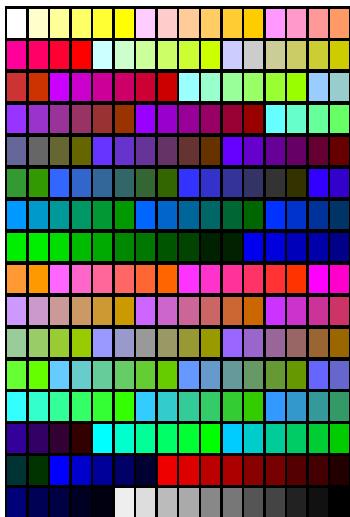
A 8-bit color image with resolution 640×480 needs a storage space of 640×480 bytes = $(640 \times 480) / 1024\text{KB} = 300\text{KB}$ without any compression.

8-bit or 256 color displays

Each screen pixel is represented by eight bits of memory.



256 colors (Color Look Up Table)



Index	Red	Green	Blue
0			
1			
2	0-255	0-255	0-255
3			
4			
14			
15			

Eight-bit colour stores the colour of each pixel in eight binary digits (bits) which gives 256 colours in total.

2.2 Colour depth

1 bit per pixel = 2 colours (monochrome)

2 bits per pixel = 4 colours

4 bits per pixel = 16 colours

8 bits per pixel = 256 colours

Generally good enough for colour images

16 bits per pixel = 65536 colours

Better quality for photograph-like images, also known as *high colour*

24 bits per pixel = >16 million possible colours

Used to recreate photo realistic images, also known as *true colour*

Cont---

- ❑ The more colours that are allowed per pixel, the greater the size of the image
- ❑ The number of pixels is related to the size of file that required to store an image.
- ❑ Remember, two factors effect the size file bitmap are:
 - ❑ Resolution
 - ❑ Color Depth

2.3

Calculating the size of a raster image

$$\text{size in bytes} = \frac{\text{width} \times \text{height} \times \text{colour depth}}{8}$$

- ❑ Where:
 - ❑ Width of the images measured in pixels
 - ❑ Height of the images measured in pixels
 - ❑ Colour depth is the number of bits used for color measured in bits per pixel
- ❑ Remember:

File size naming convention: Because digital images often result in very large files, the number of bytes is usually represented in increments of 2^{10} (1,024) or more:

1 Kilobyte (KB) = 1,024 bytes

1 Megabyte (MB) = 1,024 KB

1 Gigabyte (GB) = 1,024 MB

1 Terabyte (TB) = 1,024 GB

Example

- A 640 x 480 pixel image in 24-bit colour would require how much disk space?

$$\begin{aligned}\text{size in bytes} &= \frac{640 \times 480 \times 24}{8} = \frac{7372800}{8} \\ &= 921600 \text{bytes} \\ &= \underline{900 \text{KB}}\end{aligned}$$

Exercise 1

A BMP photo is 1024×512 px. in 24-bit colour

Calculate the file size of this image in **megabytes**.

solution

A BMP photo is 1024×512 px. in 24-bit colour

Calculate the file size of this image in **megabytes**.

$$1024 * 512 * 3 = 1,572,864 \text{ bytes.}$$

$$1,572,864 / 1024 = 1536 \text{ kilobytes.}$$

$$1536 / 1024 = \mathbf{1.5 \text{ megabytes.}}$$

2.4 Popular bitmap formats

- ❑ Microsoft bitmap (.bmp)
 - ❑ Used in microsoft windows
- ❑ TIFF - Tagged Image File Format (.tif)
 - ❑ Used for faxing images (amongst other things)
- ❑ JPEG - Joint Photographic Expert Group (.jpg)
 - ❑ Useful for storing photographic images

Cont---

- GIF - Graphics Interchange Format (.gif)
 - Used a lot on web sites
- PNG - Portable Network Graphics (.png)
 - A new format for web graphics
- PCD – Kodak photo CD
 - A new format for store image in a compressed form on a CD

2.5 Bitmap Software's

The industry standard for bitmap painting and editing programs are:

- Adobe's Photoshop and Illustrator.
- Macromedia's Fireworks.
- Corel's Painter.
- CorelDraw.
- Quark Express.



Cont---

Image editing programs enable the user to:

- Enhance and make composite images.
- Alter and distort images.
- Add and delete elements.
- Morph (manipulate still images to create animated transformations).

High Resolution Image : based on dot per inch (dpi) & effect file size



B. Vector graphics:

- **vector graphics**(also called draw-type graphics) contain data described as mathematical equations consisting of lines and curves that make shapes.
- Vector graphics are ideal for **illustrations, line art, and type**.
- Vector graphics generally represent an image as a **geometric shape made up of straight lines, ovals and arcs** (for example, when a line is drawn, a set of instructions is created which stores information about the size, colour, position and shape).
- vector graphics are quite small and are easier to

- The main disadvantage is that vector images are not photo quality and most browsers do not support vector graphics.
- As a result, vectors have to be converted to bitmap (rasterized) before being displayed on the Web.
- Vector images can be resized to any required resolution without loosing clarity. They are generally unsuitable for photographic images.
- Commercially available programs for creating vector graphics include Corel Draw and Adobe Illustrator.

Cont---

- Draw type or vector graphics
 - Geometric shape stored as set of instructions
 - Smaller than bitmap
 - Resize, rotate, no distortion
 - No photo quality



Cont---

- ❑ Storing and representing images by mathematical equations is called **vector graphics** or **Object Oriented graphics**.
- ❑ Each primitive object has various **attributes** that go to make up the entire image
 - ❑ e.g. x-y location, fill colour, line colour, line style, etc.
- ❑ Example:
 - ❑ RECTANGLE : rectangle top, left, width, height, color is (0, 0, 200, 200, red)

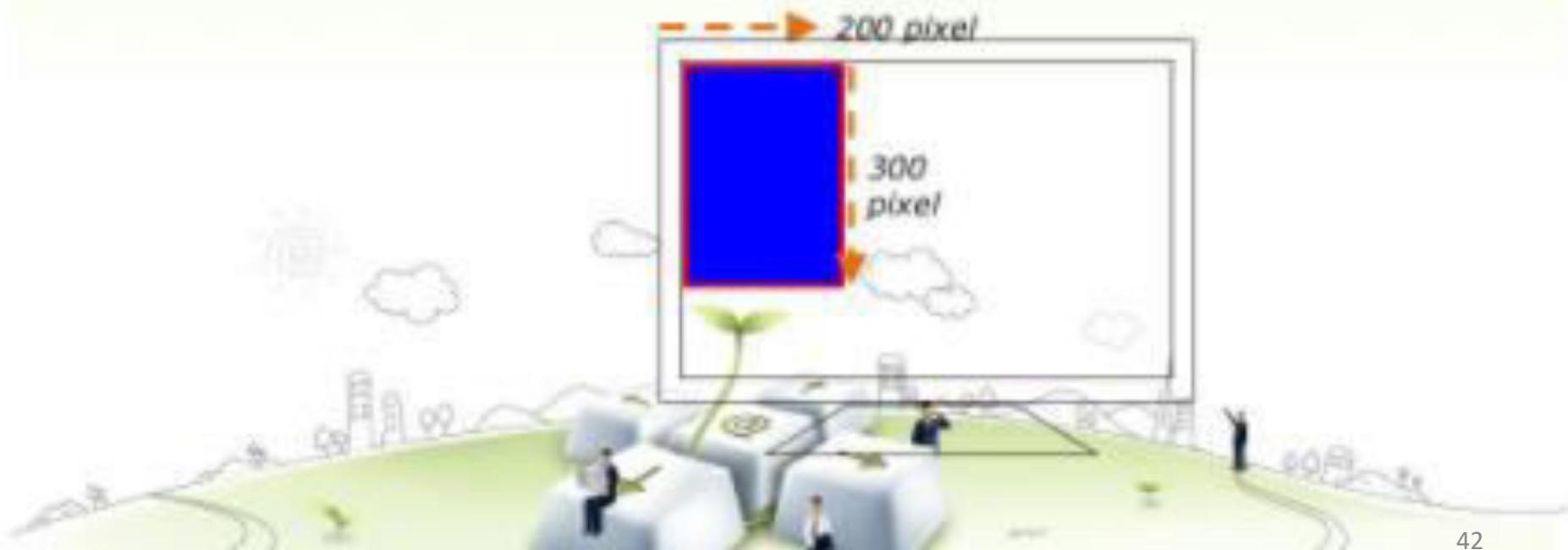
Cont---

- ❑ CIRCLE : circle top, left, radius, color
- ❑ LINE : Line x1, y1, x2, y2, color
- ❑ Vector image or vector graphics can be resized without losing the integrity of the original image.
- ❑ Scaling a vector is a mathematical operation - only the attributes change, the image is unaffected
- Vector-drawn images are used in the following areas:
 - Computer-aided design (CAD) programs.
 - Graphic artists designing for the print media.
 - 3-D animation programs.
 - Applications requiring drawing of graphic shapes.

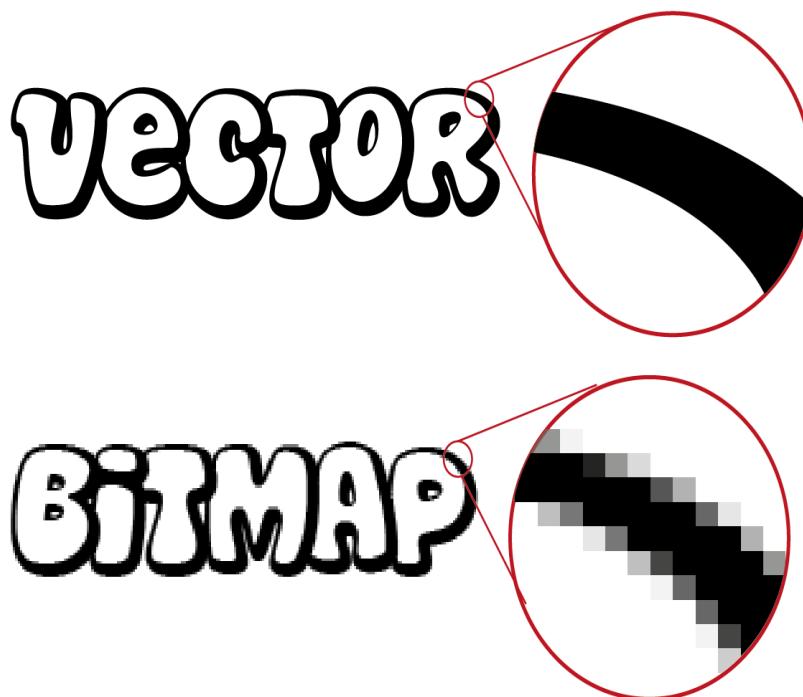
- Example

RECT 0,0,200,300,RED,BLUE says

- “Draw a rectangle starting at **0,0** (upper left corner of screen) going **200 pixels** horizontally right and **300 pixels** downward, with a **RED** boundary and filled with **BLUE**.”



Vector Vs. bitmap



2.6 Software to create vector images

- **Graphics programs** are tools that allow an artist to create and edit designs used in multimedia applications.
- Generally, graphics programs can be categorized as:
 - **Drawing programs**
 - Creating draw type graphics
 - Provide freehand. Example geometric shape
 - Example : Adobe Illustrator, Corel Draw,
Macromedia Freehand

<http://www.adobe.com/products/illustrator/main.html>

2.7 Vector formats

- ❑ Windows metafile (.wmf)
 - ❑ Used by Microsoft Windows
- ❑ SVG - Scalable Vector Graphics (.svg)
 - ❑ A new format devised for the web
- ❑ CGM - Computer Graphics Metafile (.cgm)
 - ❑ Older format commonly used for clip art
- ❑ Adobe PostScript (.ps)
 - ❑ A page description language used to control printers

- ❑ Adobe Portable Document Format (.pdf)
 - ❑ A page description language common on the web
- ❑ Drawing Exchange Format (.dfx)
 - ❑ Store 3D image created by design program AutoCAD
- ❑ Encapsulated PostScript (.epf)
 - ❑ Professional printing: Illustration program, Adobe Systems, Desktop Publishing programs

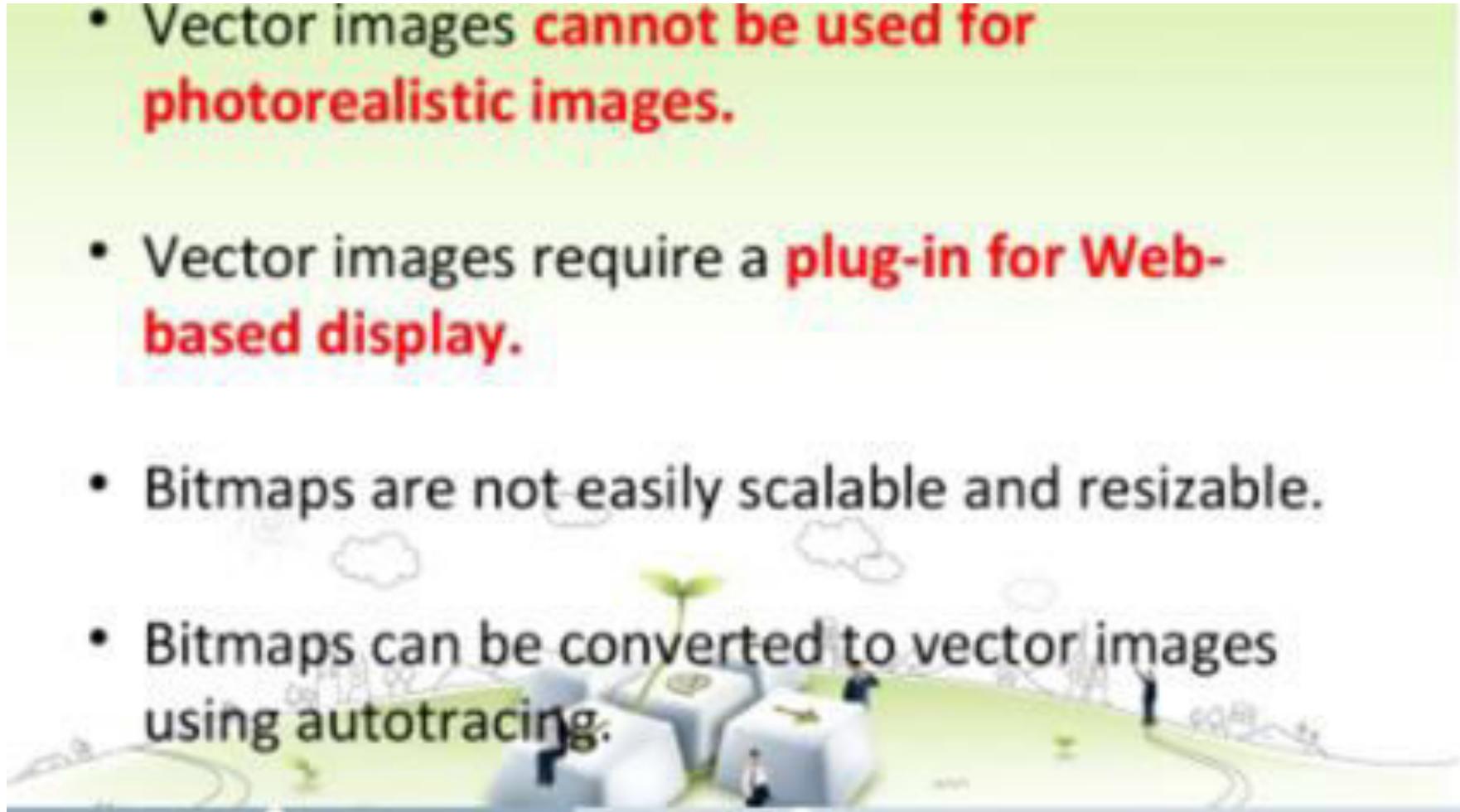
2.8 Vector vs Bitmap

- Vector images use **less memory space** and have a **smaller file size (.svg)** as compared to bitmaps.
- For the Web, pages that use vector graphics in plug-ins download faster, and when used for animation, draw faster than bitmaps.



Cont---

- Vector images **cannot be used for photorealistic images.**
- Vector images require a **plug-in for Web-based display.**
- Bitmaps are not easily scalable and resizable.
- Bitmaps can be converted to vector images using autotracing.



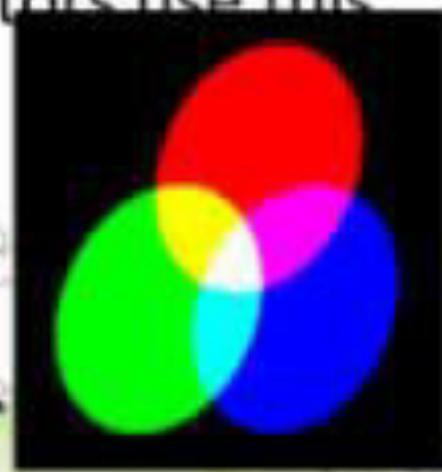
3. what is color model?

- Is an abstract mathematical model describing the way colors can be represented as tuples of numbers, typically as three or four values or color components
- The tools we use to describe color are different when the color is printed than from when it is projected.
 - Projected color is additive.
 - Printed color is subtractive.
- **2 basic method** of making color
 - Additive
 - Subtractive

Color

3.1 Additive Color

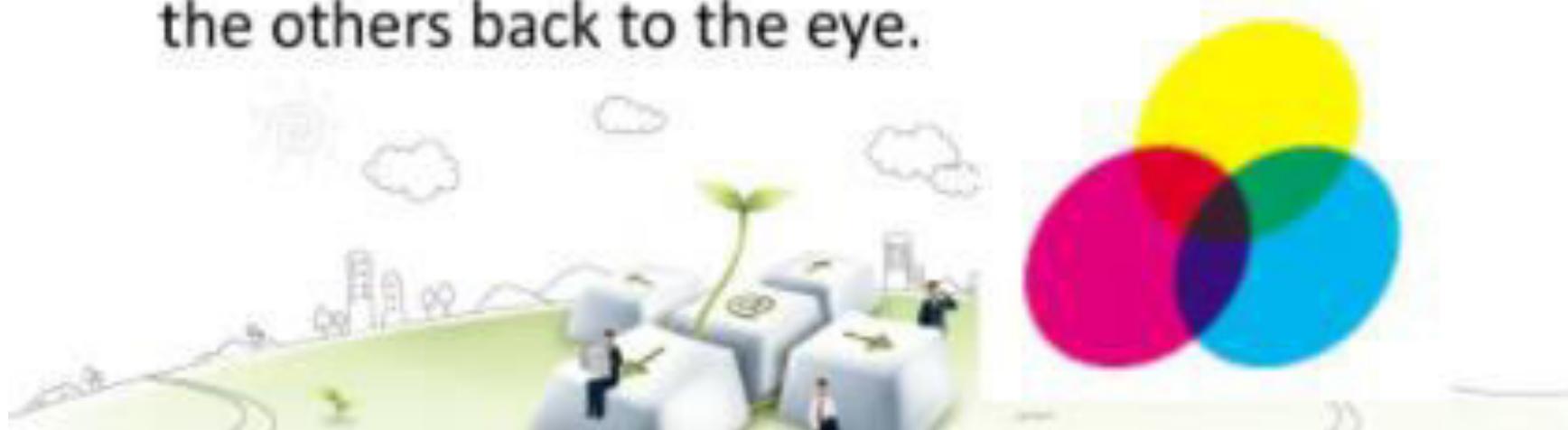
- In the additive color method, a color is created by **combining colored light sources in three primary colors - red, green, and blue (RGB)**.
- OLD TV and computer monitors use this method.



3.2

Subtractive Color

- In the subtractive color method, color is created by combining colored media such as paints or ink.
- The colored media absorb (or subtract) some parts of the color spectrum of light and reflect the others back to the eye.



Cont---

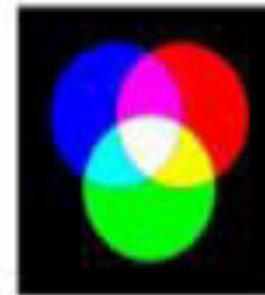
- Subtractive color is the **process used to create color in printing.**
- The printed page consists of tiny halftone dots of three primary colors- cyan (complement of Red), magenta (complement of Green), and yellow (Complement of Blue) (CMY).



3.4 Color models

- **Color models:**

- Different ways of representing information about color
- Example:
 - RGB
 - HSB
 - CMYK

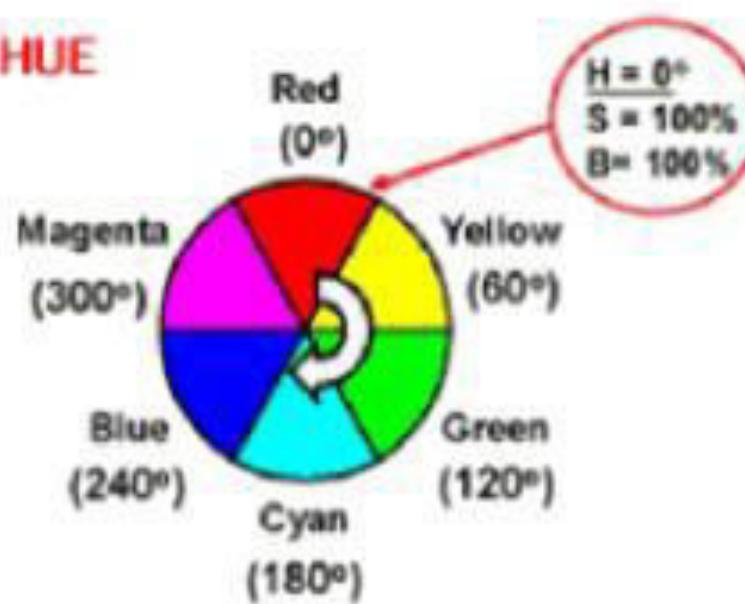


3.4.1 HSB model

- Based on human perception of color, describe three fundamental properties of color:
 - **Hue**
 - **Saturation (or chroma)**
 - **Brightness** - relative lightness or darkness of color, also measured as %
- * *There is no HSB mode for creating or editing images*

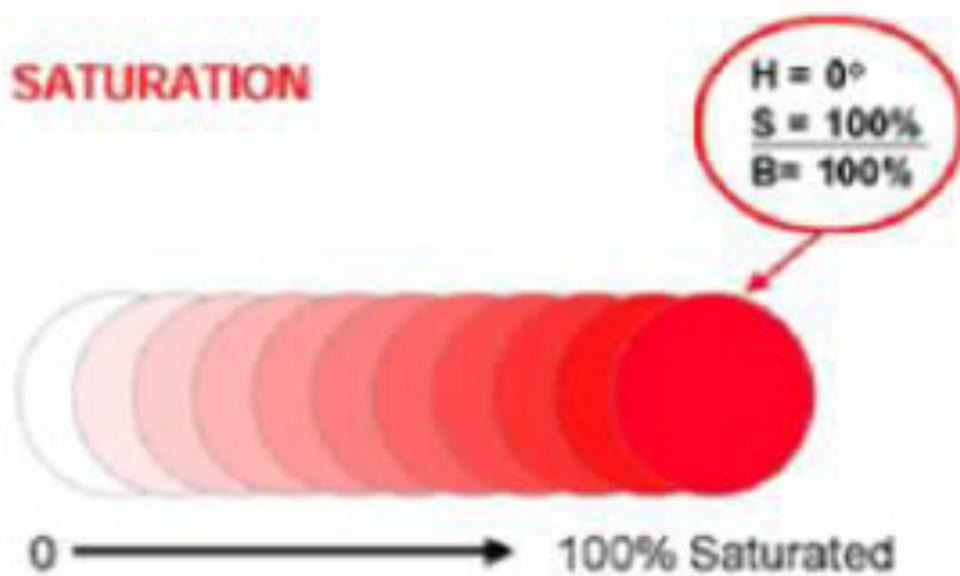
Cont---

- **Hue** - color reflected from or transmitted through an object, measured on color wheel



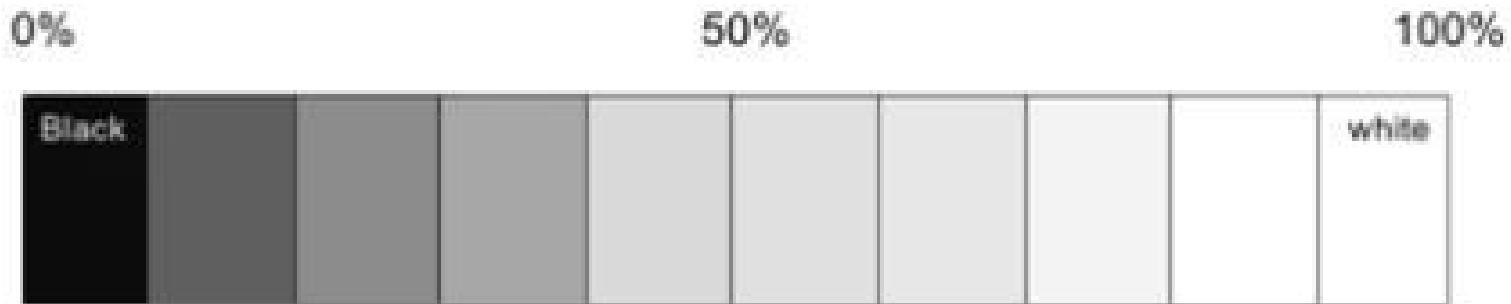
Cont---

- **Saturation (or chroma)** - strength or purity of color (% of grey in proportion to hue)



Cont---

- **Brightness** - relative lightness or darkness of color, also measured as %



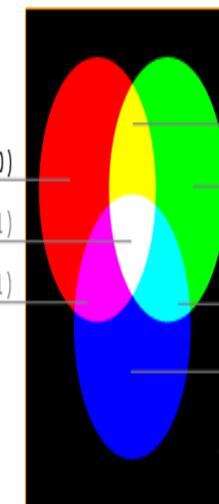
3.4.2 RGB color Model

- Add red, green and blue to create colors, so it is an **additive** model.
- **Assigns an intensity value** to each pixel ranging from 0 (black) to 255 (white)
 - A bright red color might have R 246, G 20, B 50



Additive Color Composition

RGB Color Format



Yellow - $\text{RGB}(1, 1, 0)$

Green - $\text{RGB}(0, 1, 0)$

Red - $\text{RGB}(1, 0, 0)$

White - $\text{RGB}(1, 1, 1)$

Magenta - $\text{RGB}(1, 0, 1)$

Cyan - $\text{RGB}(0, 1, 1)$

Blue - $\text{RGB}(0, 0, 1)$

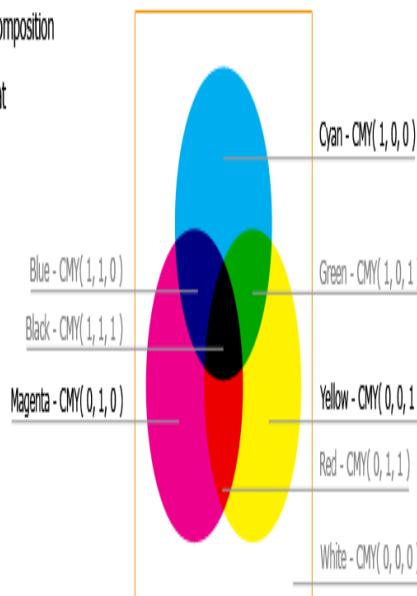
Black - $\text{RGB}(0, 0, 0)$

3.4.3 CMYK Model

- Based on light-absorbing quality of ink printed on paper
- As light is absorbed, part of the spectrum is absorbed and part is reflected back to eyes
- **Associated with printing**; called a **subtractive** model
- Four channels: **Cyan (C)**, **magenta (M)**, **yellow (Y)** and **black (K)**

Subtractive Color Composition

CMY(K) Color Format



- In theory, pure colors should produce black, but printing inks contain impurities, so this combination produces muddy brown
- K is needed to produce pure black, hence CMYK is four-color process printing

Other models

Color Models

RGB	Used for designing electronic documents such as Web pages or PDF files that will be distributed electronically.
CMYK	Used for designing commercially printed documents.
LAB	Used for converting images from one color space to another; generally not used to define colors in graphics applications.
HSB	Used to define color in terms of hue, saturation, and brightness; generally should not be used to define colors in graphics applications.
Special Libraries	Used in combination with CMYK to create specific colors outside the CMYK gamut, or as the only colors in a one-, two-, or three-color job.
Hexachrome	Adds green and orange to the CMYK inks to extend the color gamut.
Web-Safe	Used for designing electronic documents; this is an abbreviated version of RGB, which attempts to ensure the appearance of color from one monitor to another is the same.

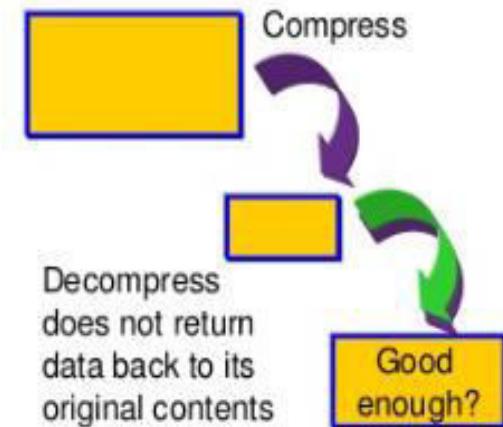
4. Multimedia Data Compression

- data compression, source coding, or bit-rate reduction involves encoding information using fewer bits than the original representation
- Digital files such as image files are often "compressed" to reduce their size and/or to change various attributes, such as:
 - file type
 - dimensions
 - resolution
 - bit depth
- Compression reduces the size of a file, often without appreciable loss of information.
- It can be either **lossless or lossy**.

data compression Techniques

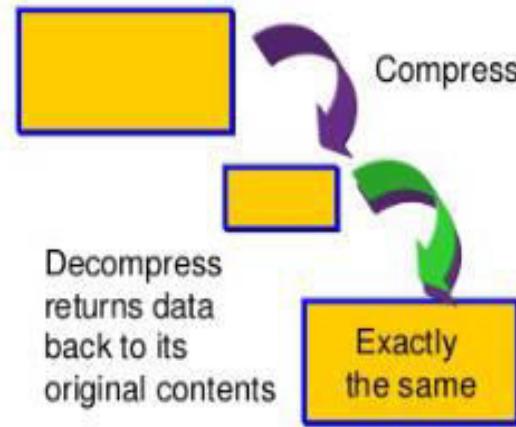
- Compression can be either **lossy** or **lossless**.

Lossy vs. Lossless Methods



- **Lossy**

- Used with music, photos, video, medical images, scanned documents, fax machines



- **Lossless**

- Used with databases, emails, spreadsheets, office documents, source code

4.1 Lossless compression Techniques

- In **lossless** data compression, the integrity of the data is preserved.
- The original data and the data after compression and decompression are exactly the same.
 - in these methods, the compression and decompression algorithms are exact inverses of each other.
 - no part of the data is lost in the process.
 - Redundant data is removed in compression and added during decompression.
 - Lossless compression methods are normally used when we cannot afford to lose any data.
 - not good enough for MM data!
- applies compression to an uncompressed file, but it doesn't lose information or degrade the quality of the digital file.
- The Graphics Interchange File (GIF), an image format used on the internet, is generally compressed using lossless compression. RAW, BMP and PNG are also lossless image formats.

Cont---

- The algorithms used in lossless compression are:
 - Run Length Encoding
 - Lempel-Ziv-Welch (LZW)
 - Huffman Coding
 - Arithmetic Encoding
- The key benefit of lossless compression is that the quality of the file (e.g., an image) can be retained while achieving a smaller file size.
- The drawback of this compression technique is that larger file sizes are required to maintain post-compression quality.

4.2 Lossy compression Techniques

- will result in some loss of data as the compression algorithm eliminates redundant or unnecessary information.
- basically it losses what it sees as irrelevant information.
- lossy formats are the best for multimedia applications as they significantly reduce the file size.
- It is in general only redundant information that is lost—such as backgrounds
- has become popular online because of its small file size, it is easier to transmit over the Internet

Cont---

- Lossy compression is a method of data compression in which the size of the file is reduced by eliminating data in the file.
- In doing so, image quality is sacrificed to decrease file size. Any data that the compression algorithm deems expendable is removed from the image, thereby reducing its size.
- Although the file doesn't have the same data as it did before compression was used, often this won't be noticeable, even though the resolution of the image has suffered.

Cont---

- Lossy compression results in a significantly reduced file size (smaller than lossless compression), which is its most noteworthy benefit. It is supported by many tools, plugins and software products that let the user choose their preferred degree of compression.
- The disadvantage is that it also results in quality loss, which may not be acceptable for some applications or users. The higher the compression ratio, the more quality degradation. Additionally, the original file -- with original quality -- cannot be recovered after compressing.
- The most common type of lossy file are JPEGs. Caution should be taken when using JPEGs if image quality is important.

cont---

- The algorithms used in lossy compression are:
 - Transform Coding
 - Discrete Cosine Transform
 - Discrete Wavelet Transform
 - Fractal Compression

Lossless vs. lossy compression

	Lossless	Lossy
WHAT IT DOES	<ul style="list-style-type: none">■ Restores, rebuilds compressed file data in original form.	<ul style="list-style-type: none">■ File data removed during compression and not restorable to original form.
USED TO COMPRESS	<ul style="list-style-type: none">■ Files where data loss is unacceptable or information loss could pose a problem (e.g., financial data).	<ul style="list-style-type: none">■ When file information loss is acceptable.
APPLICATIONS	<ul style="list-style-type: none">■ Images, audio, text	<ul style="list-style-type: none">■ Images, audio, video
FORMAT EXAMPLES	<ul style="list-style-type: none">■ Image: GIF, RAW, BMP, PNG■ Audio: WAV, FLAC■ General: ZIP	<ul style="list-style-type: none">■ Image: JPEG■ Audio: MP3, AAC■ Video: AVC, HEVC, MPEG
ALGORITHMS USED	<ul style="list-style-type: none">■ Run Length Encoding■ Lempel-Ziv-Welch■ Huffman Coding■ Arithmetic Encoding	<ul style="list-style-type: none">■ Transform Coding■ Discrete Cosine Transform■ Discrete Wavelet Transform■ Fractal Compression
ADVANTAGES	<ul style="list-style-type: none">■ Retains file quality in smaller size	<ul style="list-style-type: none">■ Significantly reduced file size■ Supported by many tools, plugins, software■ Can choose preferred degree of compression
DRAWBACKS	<ul style="list-style-type: none">■ Larger compressed file sizes	<ul style="list-style-type: none">■ Result in file quality loss, degradation■ Original file quality cannot be recovered with decompression

5. Common graphic formats

- Most popular formats:
 - **JPEG** (Joint-Photographic Experts Group)
 - **GIF** (Graphical Interchange Format)
 - **PNG** (Portable Network Graphic)
 - Other formats:
 - **BMP, PSD, TIFF/TIF, TGA, EPS, PCX, ICO**

JPEG

- For continuous tone images, such as full-color photographs
- Supports more than **16 millions** of color (**24-bit**)
- Uses **lossy** compression (averaging may lose information)

GIF

- For **large areas of the same color** and a **moderate level of detail**.
- Supports up to **256 colors**
- Allows **transparency** and **interlacing**
- Uses **lossless** compression

PNG

- **lossless, portable, well-compressed** storage of raster images
- patent-free replacement for GIF
- also replace many common uses of TIFF
- Support indexed-color, grayscale, and true color images + an optional alpha channel for transparency

Other Formats

- **BMP – Bitmap File Format.**
 - Native bitmap file format of the Microsoft Windows environment.
- **PSD – Photoshop Document.**
 - Native bitmap file format of the Adobe Photoshop graphical editing application.
- **TIFF – Tagged Image File Format.**
 - Used to exchange documents between different applications and platforms.

Other Formats

- **TGA – Targa File Format.**
 - An image format designed for systems using Truevision video boards
 - supported by MS-DOS platforms.
- **EPS – Encapsulated PostScript**
 - file format. Adobe drawing format supported by most illustration and page layout programs.

Other Formats

- **PCX – ZSoft IBM PC Paintbrush** file format.
 - One of the oldest bitmapped formats popularized by MS-DOS paint programs that first appeared in the early 1980's.
- **ICO – Icon** file format.
 - Created by Microsoft for icons.

Common image formats summary

TIFF (.tif)	Tagged Image File Format – Large files generally saved with a great deal of data information (color range, resolution, etc.);	Initial image capture, hard-copy publication photos, images
BMP (.bmp)	Bitmap – Used for Windows images; Format inefficient, but standardized enough to be reliable;	Rudimentary Windows graphics, Windows icons
PICT (.pct)	An Apple Macintosh picture file format;	Image capture, still video image capture
GIF (.gif)	Graphics Interchange Format – Limited to 256 colors or less; Displays single color areas best; File sizes not good for large images; Supports transparency;	Diagrams, Clip Art, Maps, Limited color-range images
JPEG (.jpg)	Joint Photographic Experts Group – Best for photo display; Image compression user-defined, but image quality can suffer;	Photographic images
PNG (.png)	Portable Network Graphic format – ‘Lossless’ format; Works best with Windows browser applications; Displays 24-bit color AND supports transparency; “Scales” within windows;	Browser images
PSD (.psd)	Native Photoshop file format ; Can be imported into other image manipulation programs;	Image manipulation

?

Multimedia System and Development

Chapter 4

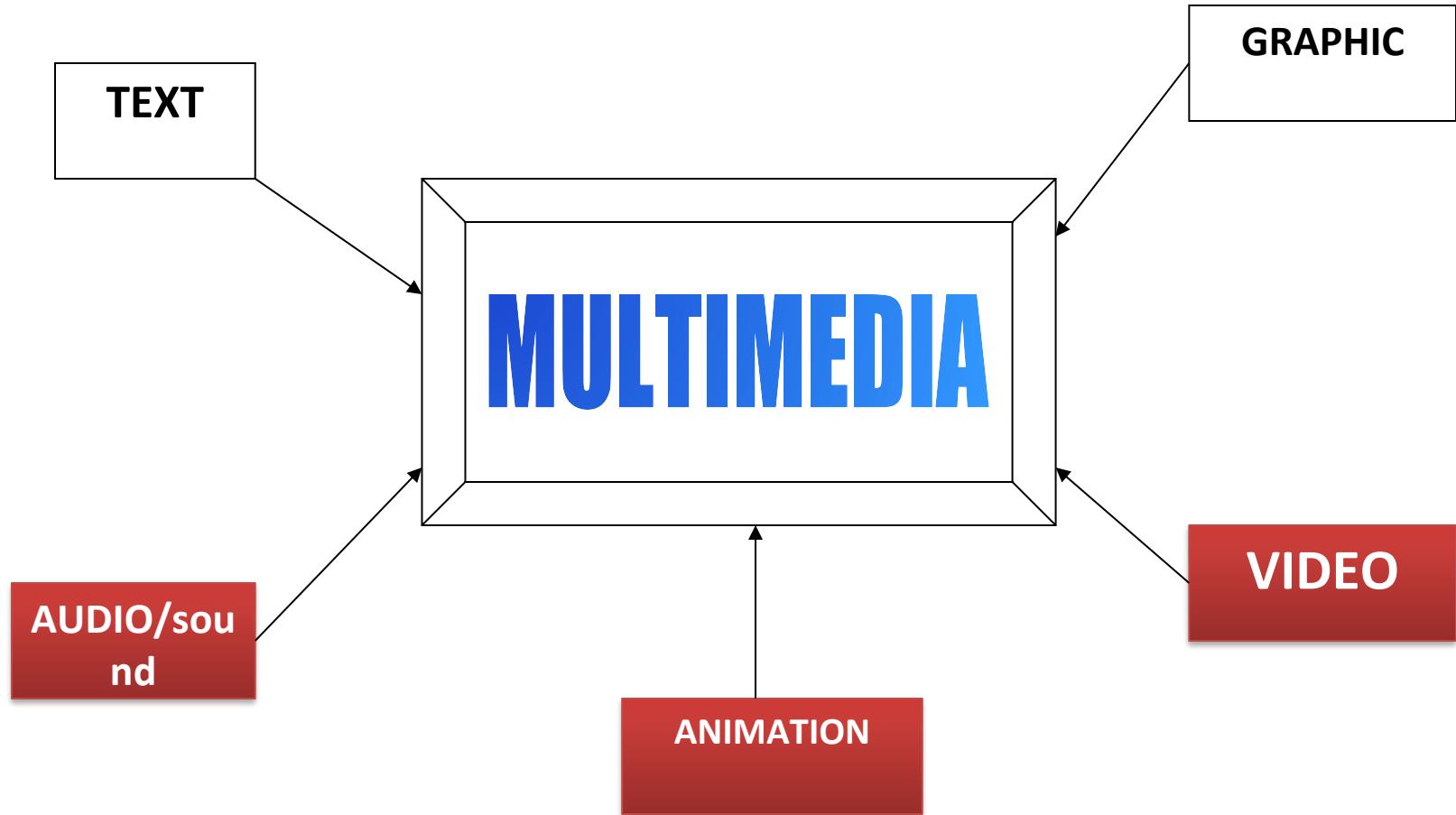
**Elements of multimedia
Audio, Video and Animation**

Topics

- Elements of multimedia
 - Sound
 - Video
 - Animation
- **Multimedia Authoring Tools categories**

1. Elements of multimedia

1. Elements of multimedia

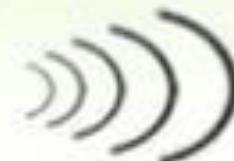


1. AUDIO

- In multimedia, audio could come in the form of speech, sound effects and also music score. These are called audio or the sound element.
- In early multimedia tools, audio or sound was often limited to simple **sound effects on a PC** (such as a siren or bell, etc).
- Now sound includes **high quality music and speech** and is an essential element in communicating information.
- An Audio object needs to store information about the sound clip.
- Information here means length of the sound clip, its compression algorithm, playback characteristics, and any annotations associated with the original clip.
- There are two basic types of audio or sound: analog

1.1 What is Sound ?

- Sound comprises the spoken word, voices, music and even noise.
- It is a complex relationship involving:
 - a **vibrating object** (sound source)
 - a **transmission medium** (usually air)
 - a **receiver** (ear) and;
 - a **preceptor** (brain).



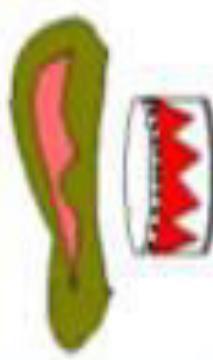
1.2 The Power of Sound



Something vibrates
in the air



Waves of pressure
Ear drums will translate
these changes in wave
Forms as sound



- Sound pressure is measured in → **dB (decibel)**
- Sound waves are known as **waveforms**.

Decibel Table

Sounds	dB SPL
Rocket Launching	180
Jet Engine	140
Thunderclap, Air Raid Siren 1 Meter	130
Jettakeoff (200 ft)	120
Rock Concert, Discotheque	110
Firecrackers, Subway Train	100
Heavy Truck (15 Meter), City Traffic	90
Alarm Clock (1 Meter), Hair Dryer	80
Noisy Restaurant, Business Office	70
Air Conditioning Unit, Conversational Speech	60
Light Traffic (50 Meter), Average Home	50
Living Room, Quiet Office	40
Library, Soft Whisper (5 Meter)	30
Broadcasting Studio, Rustling Leaves	20
Hearing Threshold	0



How Loud Is Too Loud?

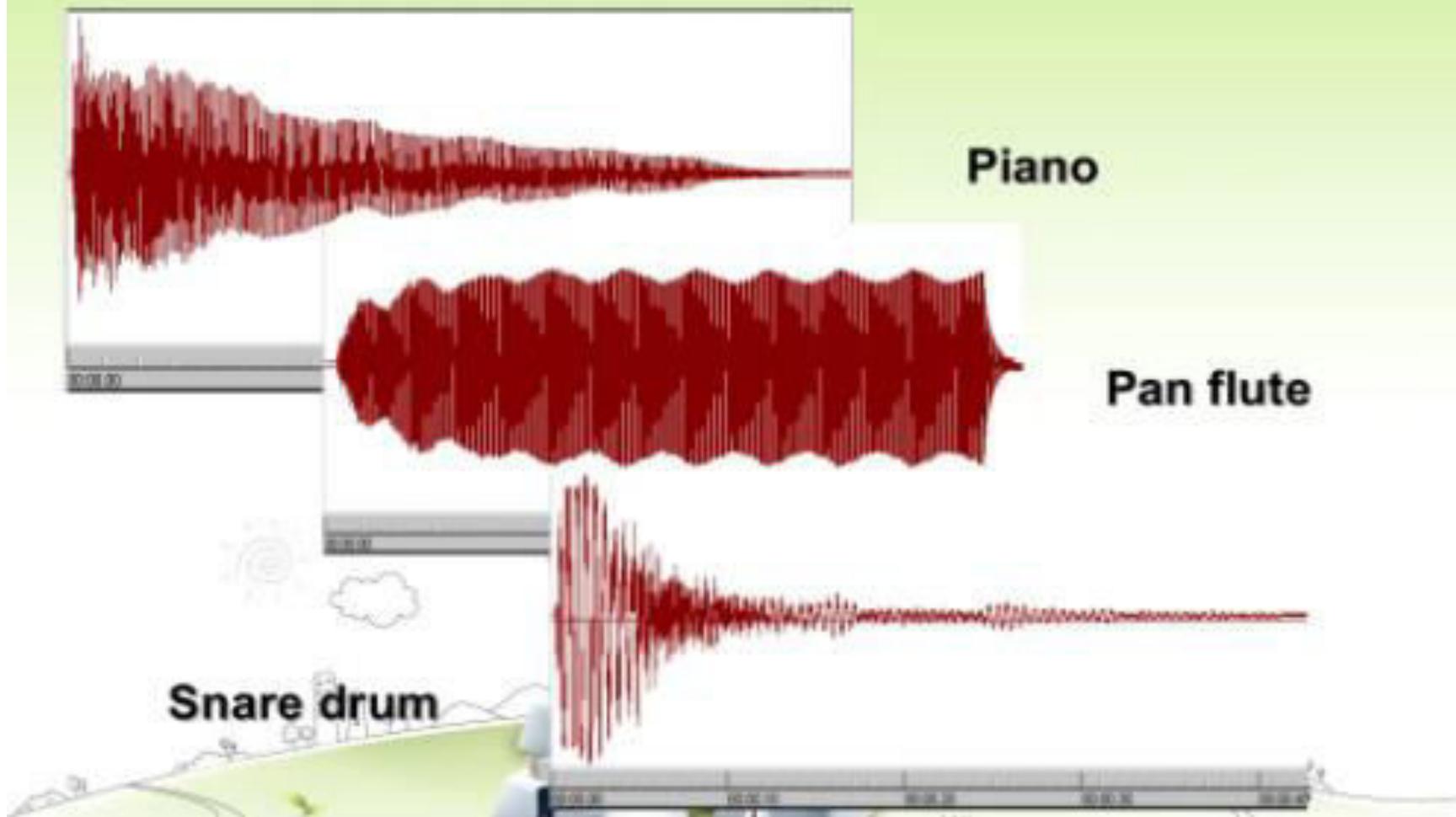
Noise-induced hearing damage is related to the duration and volume of exposure. Government research suggests the safe exposure limit is 85 decibels for eight hours a day. Some common decibel levels:



Source: Argus/University of Michigan Health System

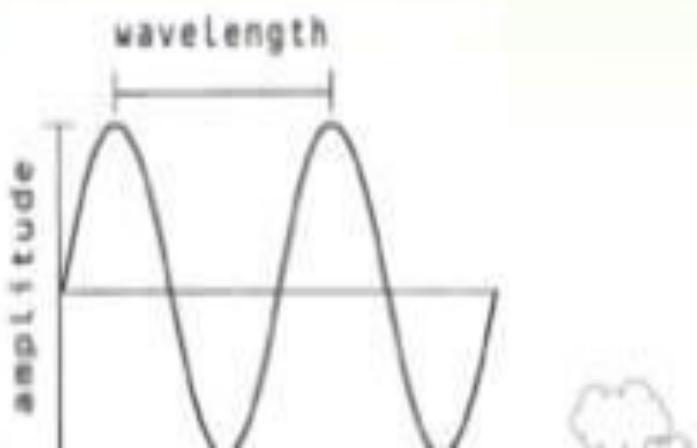


Example of Waveforms



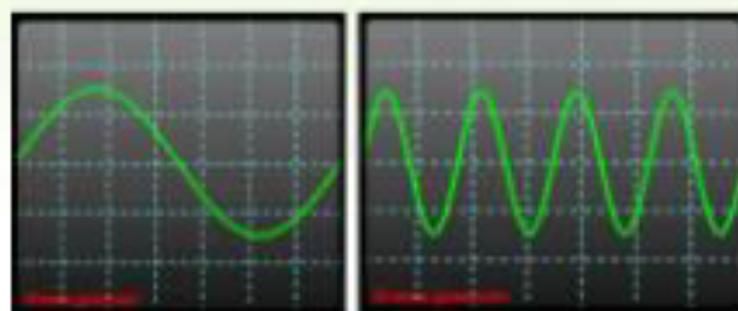
1.3 Characteristics of Sound waves

- Sound is described in terms of two characteristics:
 - Frequency (or pitch)
 - Amplitude (or loudness)



Frequency

- **Frequency** is a measure of how many vibrations occur in one second. This is measured in *Hertz* (abbreviation Hz) and directly corresponds to the **pitch** of a sound.
 - The more frequent vibration occurs the higher the pitch of the sound.



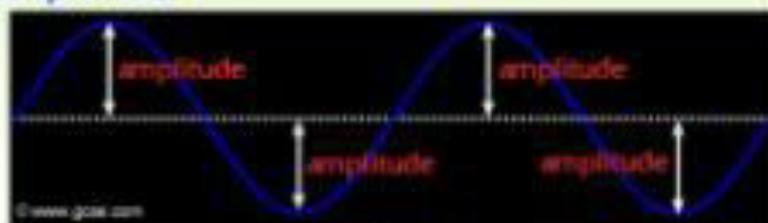
Low pitch

High pitch

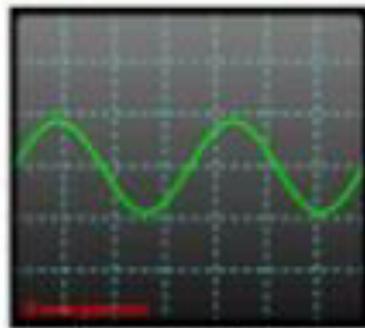
- Optimally, people can hear from 20 Hz to 20,000 Hz (20 kHz)
 - Sounds below 20 Hz are infrasonic
 - sounds above 20 kHz are ultrasonic.

Amplitude

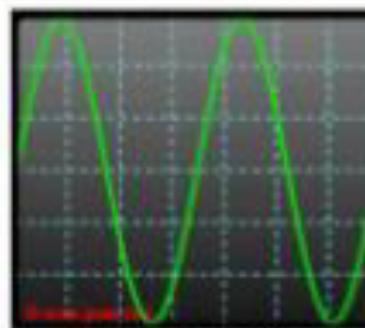
- **Amplitude** is the *maximum displacement* of a wave from an equilibrium position.
 - The louder a sound, the more energy it has. This means loud sounds have a **large amplitude**.



Quiet



Low amplitude

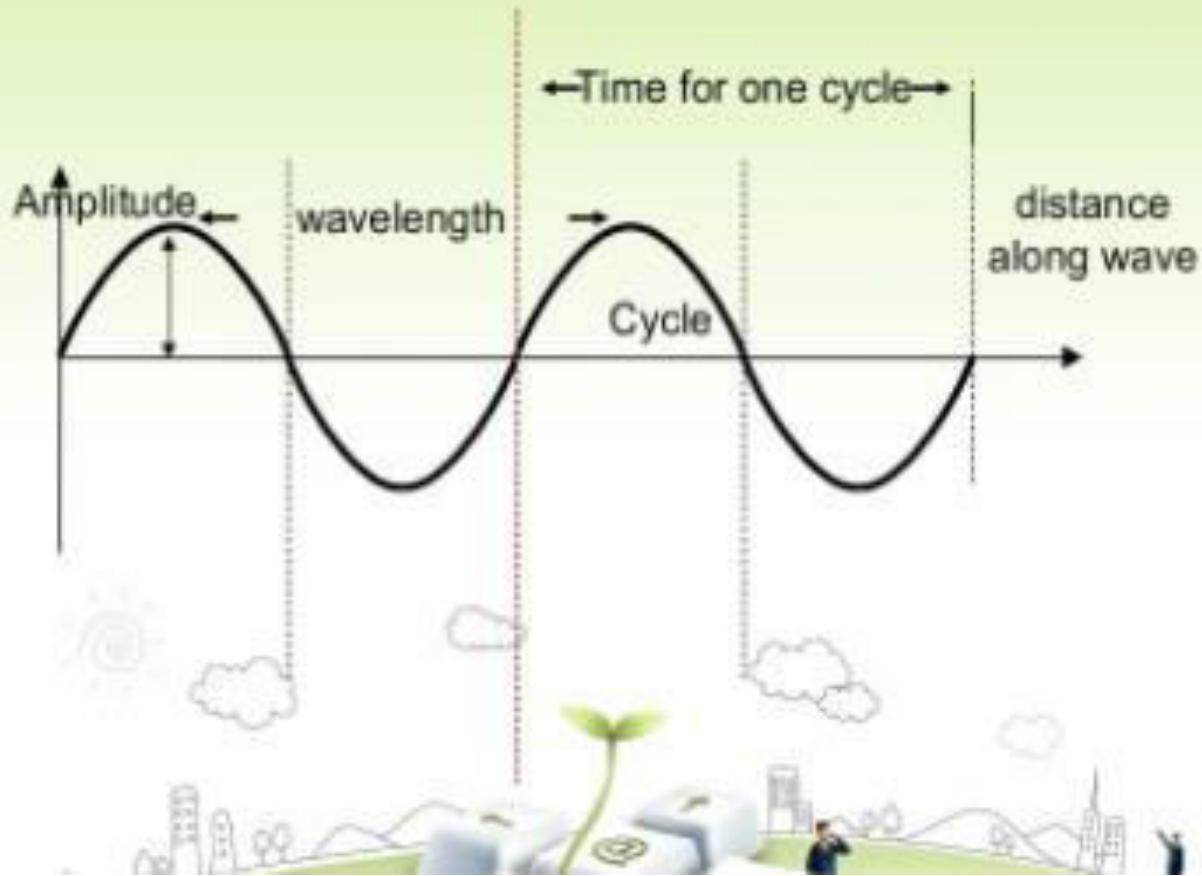


High Amplitude

Loud

- The amplitude relates to how loud a sound is.

Characteristic of Sound Waves



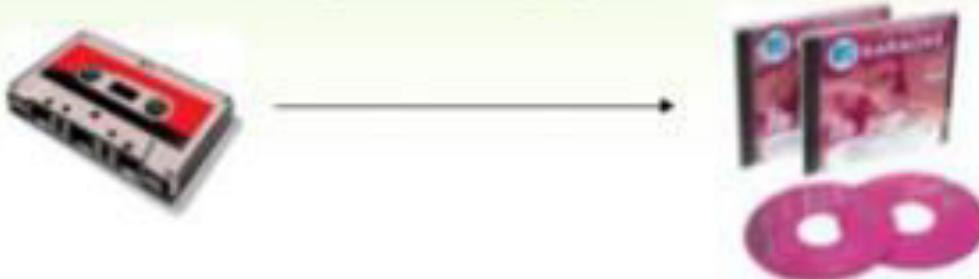
1.4 Analogue to Digital Audio

Analogue audio

- The name for an electronic signal that carries its information of sound as continuous fluctuating voltage value.
- non digital tape or audio tape recording of sound.

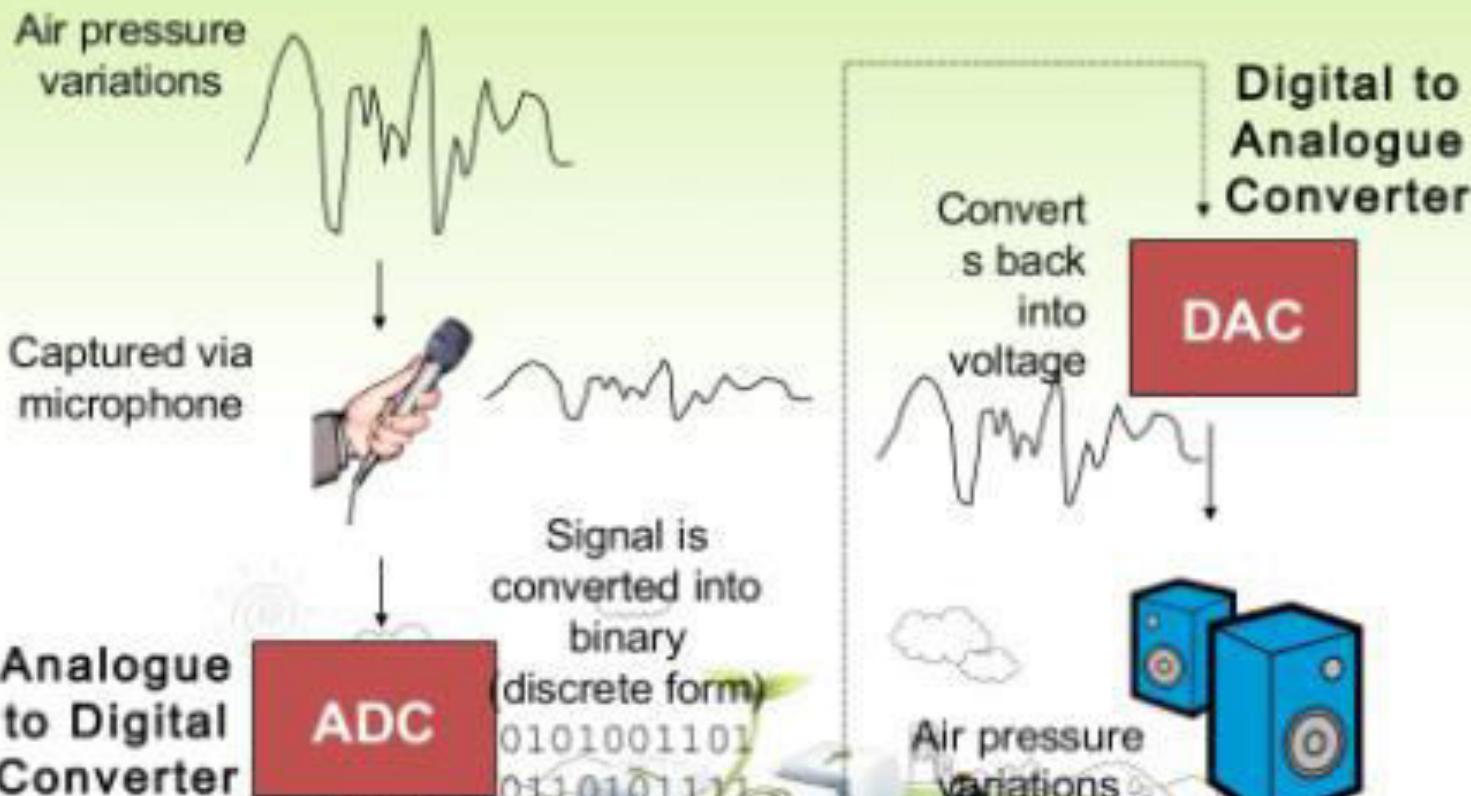
Digitizing

- the process of converting an analog signal to a digital one.



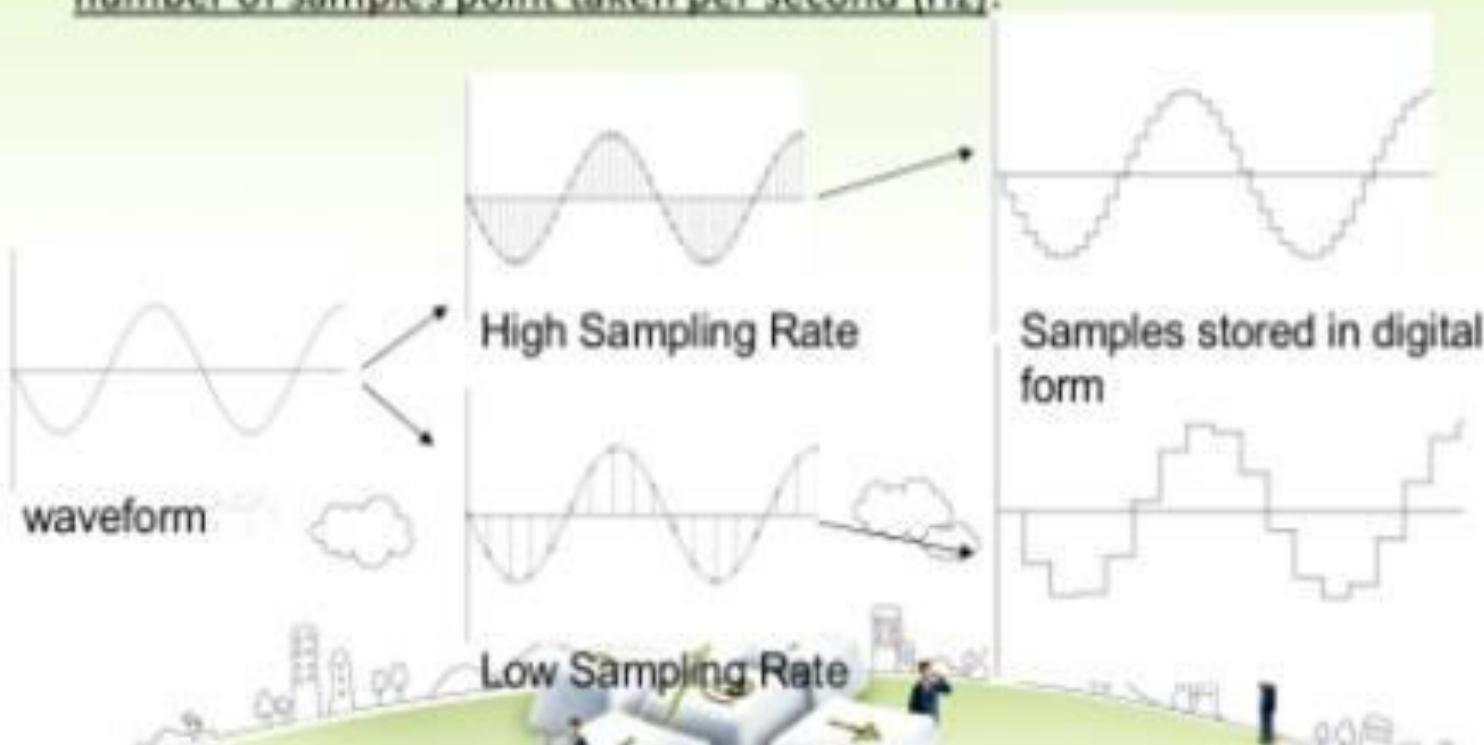
- A sound is recorded by making a measurement of the amplitude of the sound at regular intervals which are defined by the "sample rate".
- The act of taking the measurement is often called "sampling" and each measurement is called a "sample point".

Capture & Playback of Digital Audio

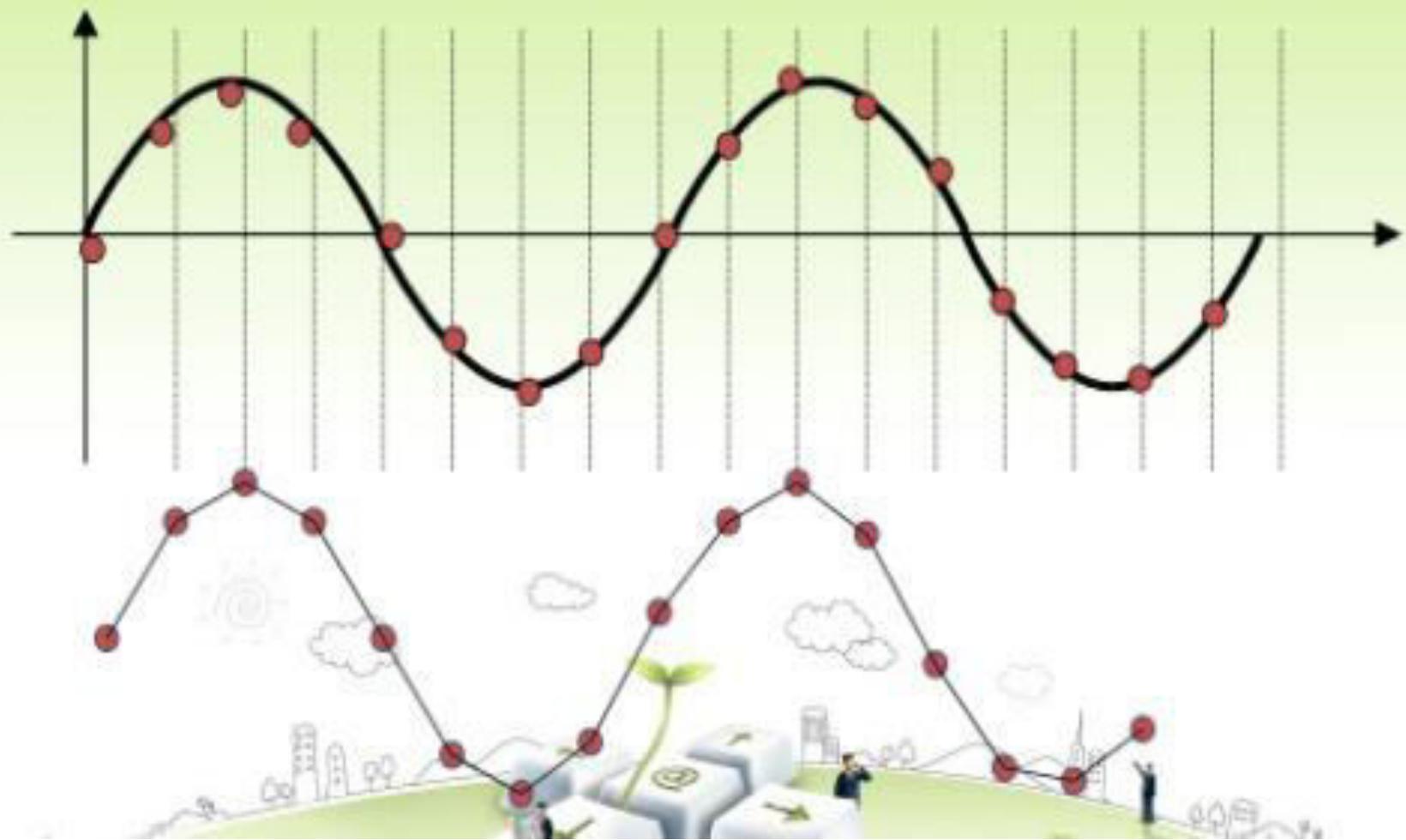


1.5 Digital Audio

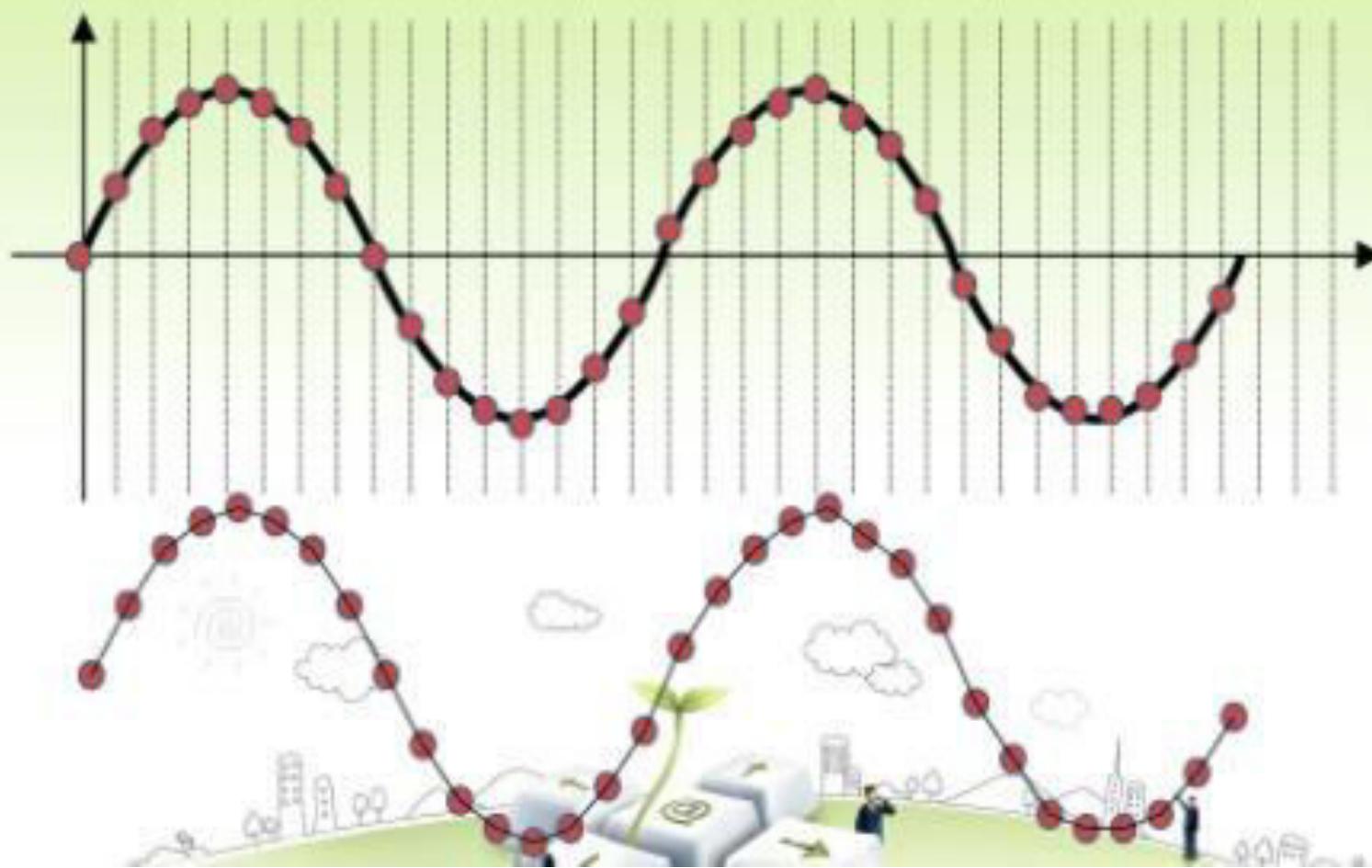
- Digital audio data is the representation of sound, stored in the form of samples point.
- Quality of digital recording depends on the sampling rate, that is, the number of samples point taken per second (Hz).



Digital Sampling

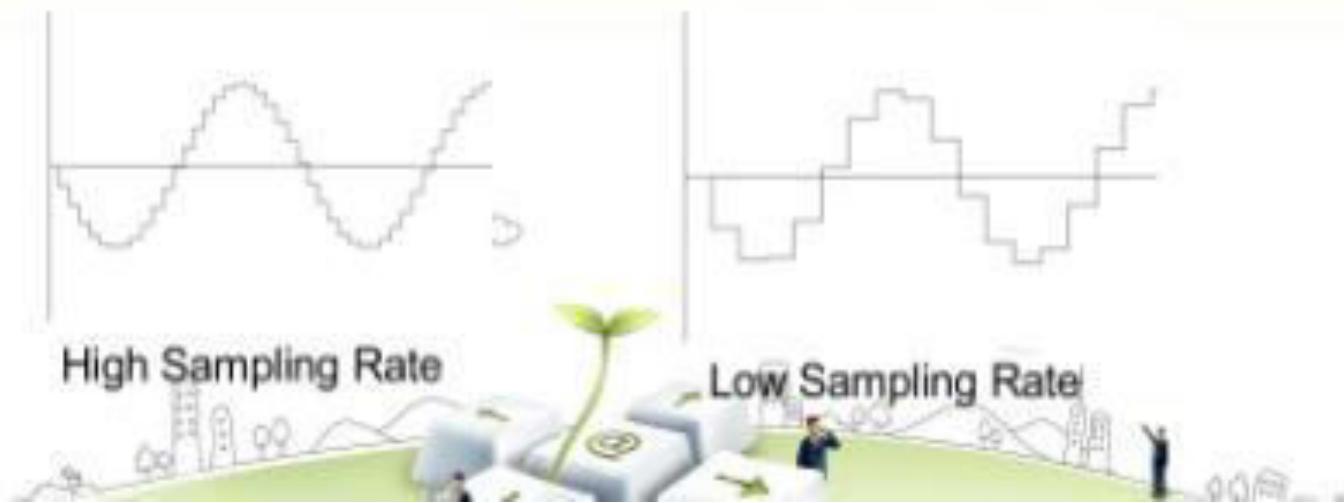


Digital Sampling



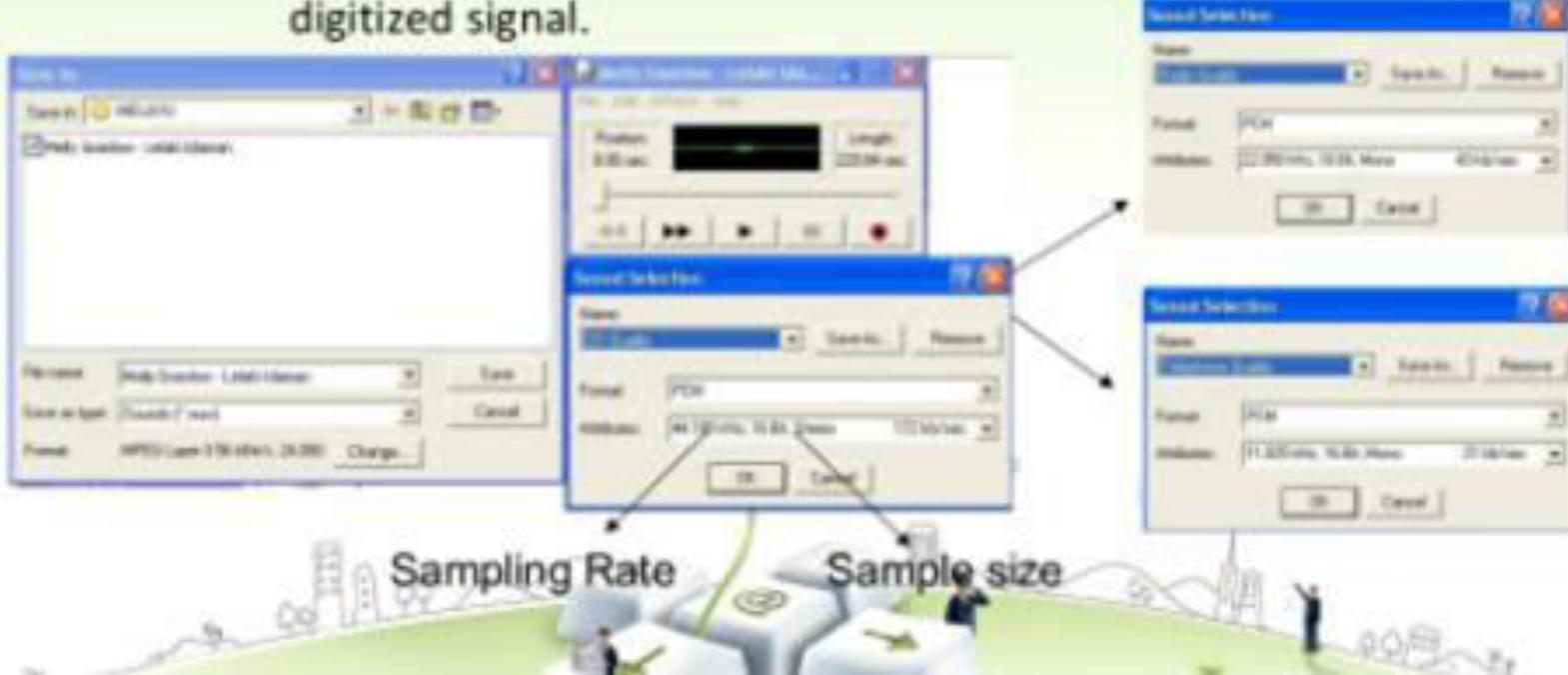
Cont---

- The three sampling frequencies most often used in multimedia are **44.1 kHz, 22.05 kHz and 11.025 kHz**.
 - The higher the sampling rate, the more the measurements are taken (better quality).
 - The lower the sampling rate, the lesser the measurements are taken (low quality).



1.5.1 Quality Factors For digital Audio

- Quality factors for digital audio file :
 1. Sampling Rate
 2. Sample Size (resolution)
 - the number of bits used to record the value of a sample in a digitized signal.



Cont---

- Other than that, it also depends on:
 - The **quality of original** audio source.
 - The **quality of capture device** & supporting hardware.
 - The characteristics used for capture.
 - The capability of the playback environment.



1.6 Digital Audio editing software's

- More advanced Digital audio editing software:
 - One of the most powerful and professional PC-based packages is a tool called **Sound Forge**



<http://www.sonicfoundry.com/>

- Others audio editing software:
 - COOL Edit Pro
 - Gold Wave
 - PROSONIQ SonicWORX
 - Samplitude Studio



1.7 Factors considering before adding sound to multimedia Projects

1. **File formats** compatible with multimedia authoring software being used along with delivery mediums, must be determined.
2. Sound **playback capabilities** offered by end user's system must be studied.
3. The **type of sound**, whether background music, special sound effects, or spoken dialog, must be decided.
4. **Digital audio or MIDI** data should be selected on the basis of the location and time of use.



1.8 Advantages and Disadvantages of using audio

- Sound adds life to any multimedia application and plays important role in effective marketing presentations.
- **Advantages**
 - Ensure important information is noticed.
 - Add interest.
 - Can communicate more directly than other media.



Cont---

- **Disadvantages**

- Easily overused.
- Requires special equipment for quality production.
- Not as memorable as visual media.



1.1 Common AUDIO/SOUND/MUSIC FORMATS

- **MPEG** (Moving Picture Experts Group) Audio MPEG files employ **lossy** data compression and use the **.mp3** filename extension. Digital music, pod casts and audio books are often saved as MPEG3 files. Older MPEG files are usually designated with an extension of **.mp2**. Computers using MPEG3 need a 16-bit sound card. One minute of music takes up approximately 1MB of storage space.
- **WAVE** (Resource Interchange File Format Waveform) Wave files employ an **uncompressed audio format** that uses **.wav** filename extensions. This file format is a **proprietary** format that was sponsored jointly by Microsoft and IBM. The **.wav** format can support both monaural (single-channel) and stereo (multichannel) audio. One minute of stereo music takes up approximately 10MB of storage space.
- **MIDI** (Musical Instrument Digital Interface) MIDI files are very small, but are **not compressed**. They use **.mid** or **.midi** filename extensions. A MIDI file is not a recording of music being played; it is a description of **how to create the sound**.

(contd.)

- **WMA** (Windows Media Audio) WMA file formats use a **lossy compression** developed by Microsoft and is widely recognized by a variety of players and jukeboxes, like Winamp and MusicMatch. Windows Media Audio files use a **.wma** filename extension.
- **AIFF** (Audio Integrated File Format) AIFF uses the **.aiff** file extension and is the native audio file format developed by Apple for the Macintosh computer platform. **It is an uncompressed audio format.** This means that it is much larger in file size than MP3 but can **support the highest possible audio recording quality** as well as lower quality settings. AIFF can support music from the highest quality 48K recording through to lower quality recordings.
- **Ogg** Ogg is an audio compression format that uses the **.ogg** file extension. It's used to store and play digital music, but it differs in that it is **free, open and unpatented.**
- **Real Audio** Real Audio is a **proprietary file format** that uses **.rm, .ram, .ra** as file extensions. Used mainly for **real-time streaming of audio and video** it requires RealPlayer (Windows and Mac) software.
- **AAC** (Advanced Audio Coding) This is a standardized lossy compression and coding scheme for audio files that uses the **.aac** file extension. **Intended to be the successor to MP3 format.** AAC

2. VIDEO

- Photographic images that are played back at speeds of 15 to 50 frames a second and the provide the appearance of full motion.
- Raw video can be regarded as being a series of single images.
- There are a variety of video (analog and digital) formats
- Is the technology **of capturing, recording, processing, transmitting, and reconstructing moving pictures.**
- Video provides a powerful impact in a multimedia program.

- Digitised video is often very large in size and this has been a major technological hurdle to multimedia developments in IT.
- Several elements contribute to file size, such as:
 - Frame rate (such as 30 frames per second)
 - Image size (such as 200 x 150—which is a screen on a 800x600 resolution desktop)
 - Colour depth (such as 16 bit colour, 64 000 colours or 24 bit, millions of colours).
- The following simple calculation can be used to work out the file size of a digital video:
 - **Frames per second (fps) X Image size X Colour**

2.1 Common VIDEO FORMATS

- **MPEG** (Motion Picture Experts Group) Video MPEG files are also a **common format for digital videos and movies** and use the filename extensions of **.mpg or .mpeg**. The latest MPEG version, MPEG4, uses the **.mp4** filename extension. Don't confuse .mpg or .mp4 video files with the popular .mp3 audio (sound only) files. often used for creating downloadable movies.
- **MOV** (QuickTime Movie) The QuickTime video and movie file format was originally developed for the **Apple Macintosh**, but is now recognized by all personal computers. QuickTime movies use **the .mov** filename extension. Sometime you will see the **.qt** filename extension used as an alternative.
- **AVI** (Audio/Video Interleave) The AVI video and movie file format was originally developed by **Microsoft for Windows-based** personal computers and uses the bfilename extension. It is the nominal standard for personal computers using Windows.
- **WMV** (Windows Media Video) WMV file formats are propriety to Microsoft licensed products **and are not widely recognized by non- Windows players**. Windows Media Video files use a **.wmv** filename extension. Files stored in this format are intended to be played, **not edited**.
- **RealVideo** RealVideo is a **proprietary** file format that uses **.rm, .ram, .ra** as file extensions. Used mainly for real-time streaming of

3 . Animation

- Animation is **defined as the act of making something come alive.**
- It is **concerned with the visual or aesthetic aspect of the project.**
- Animation is an **object moving across or into or out of the screen.**

- Animation is possible because of a biological phenomenon known as persistence of vision and a psychological phenomenon called phi.
- In animation, a series of images are rapidly changed to create an illusion of movement.



Cont---

- Animation is the rapid display of a sequence of images of 2-D artwork or model positions in order to create an illusion of movement
- Flipping through a series of still images. It is a series of graphics that create an illusion of motion.
- Movies on film generally run at 24 frames per second (fps), TV uses 30 fps. Multimedia animations can generally run at anything above 14 fps.
- While animation was once mostly associated with cartoons, films and children's entertainment, it is of increasing use as a tool to explain complex concepts (such as mechanical processes, demonstrations of equipment and scientific concepts).

3.1 Usage of Animation

- Artistic purposes
- Storytelling
- Displaying data (scientific visualization)
- Instructional purposes



3.2 Types of Animation

Animation can be rendered in:

- **2-D space** - 2-D animations are very simple and static.
- **2-1/2D space** - An illusion of depth is created through *shadowing, highlighting, and forced perspective*, though in reality the image rests in two dimensions.
- **3-D space** - Complicated and realistic animations are done in 3-D space.



3.3 Animation Techniques

- Methods of creating animation (type of animation):
 - Cel animation
 - Path animation
- Computer animation.
- Animation process.

3.3.1 Cel Animation

- Cel animation is a technique in which a series of progressively different graphics are used on each frame of movie film.
- The term "cel" is derived from the clear celluloid sheets that were used for drawing each frame.
- Cel animation begins with keyframes.



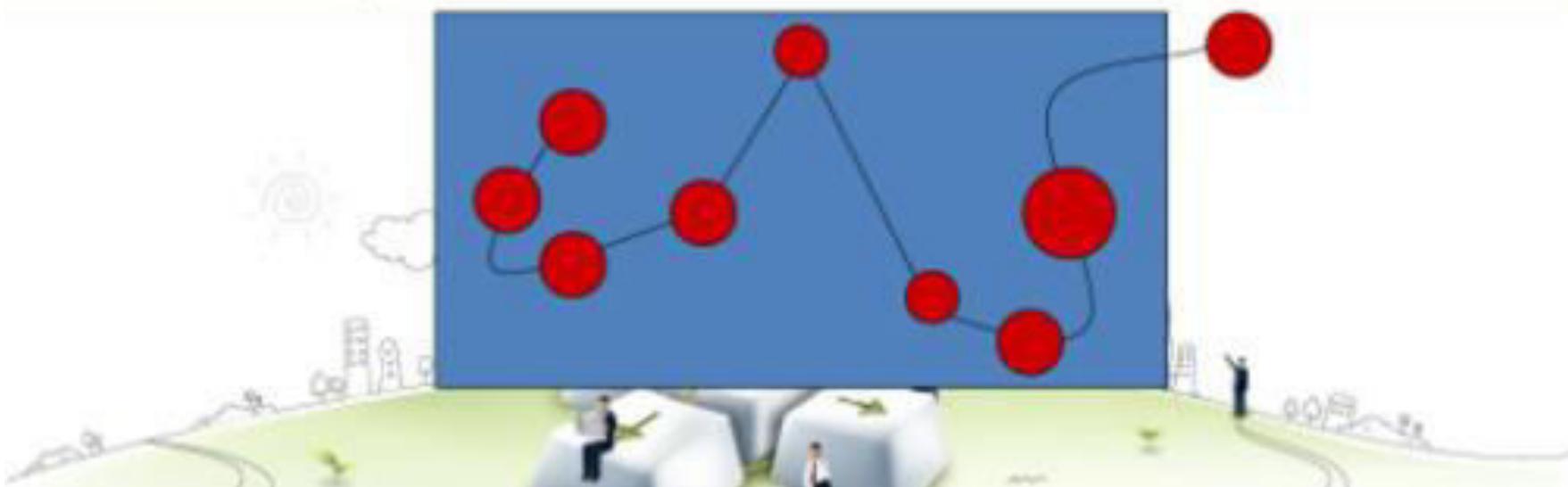
Cont---

- Keyframes refer to the first and the last frame of an action.
- The frames in between the keyframes are drawn in the tweening process.
- Tweening depicts the action that takes place between keyframes.
- Tweening is followed by the pencil test.



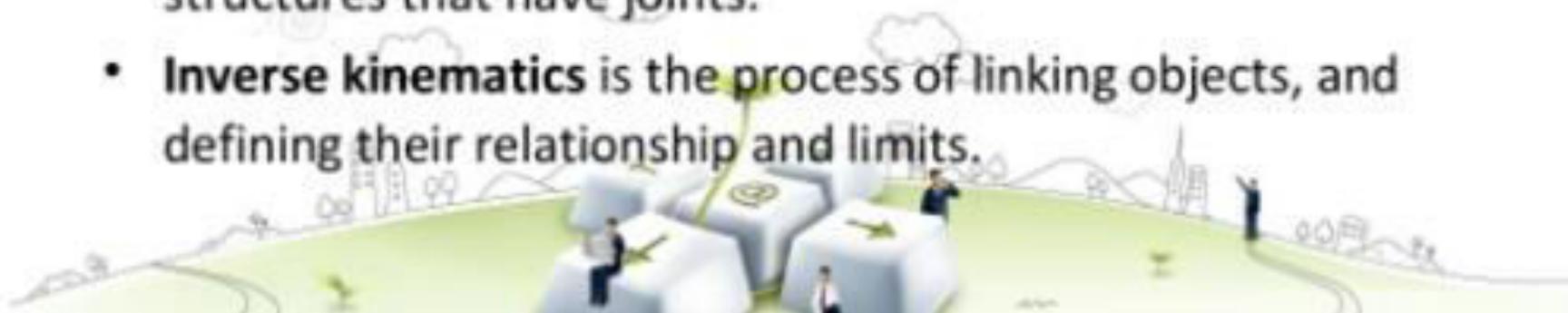
3.3.2 Path Animation

- The movement of an object happened along a predetermined path on the screen.
- The path could be a straight line or any number of curves.
- The object does not change, although it might be resized or reshape.



3.4 Computer Animation

- Electronically generated **movement of anything on your computer screen.**
- Computer animation is **very similar to cel animation.**
- The primary difference is in **how much must be drawn by the animator and how much is automatically generated by the software.**
- **Kinematics** is the study of the movement and motion of structures that have joints.
- **Inverse kinematics** is the process of linking objects, and defining their relationship and limits.



Cont---

- Morphing is an effect in which a still or moving image is transformed into another.



3.5 File formats used in animation

- .dir and .dcr - Director files.
- .fli and .flc - AnimatorPro files.
- .max - 3D Studio Max files.
- .pics - SuperCard and Director files.
- .fla and .swf - Flash files.
- GIF89a file format:
 - It is a version of the GIF image format.
 - GIF89a allows multiple images to be put into a single file and then be displayed as an animation in the Web browser.
 - Applications like BoxTop Software's GIFmation or ULead's GIF Animator are needed to create GIF89a animation.

3.6 Making Successful Animation

- Use animation carefully and sparingly.
- High quality animations require superior display platforms and hardware, as well as raw computing horsepower.
- File compression is very important when preparing animation files for the Web.

Cont---

Some animation tools are:

- Macromedia's Flash.
- Kai's Power Tools' Spheroid Designer.
- Alias|Wavefront's Maya.
- NewTek's Lightwave.

4. Multimedia Authoring Tools categories

4. Multimedia Authoring Tools

categories

- Tools that provide the capability for creating a **complete multimedia presentation, including interactive user control**, are called authoring programs.
- A program that helps you to develop **multimedia applications**.
- Multimedia authoring tools provide the important framework you need for **organizing and editing the elements of multimedia** like graphics, sounds, animations and video clips.
- Authoring tools are used for designing **interactivity** and the user interface, for presentation your project onscreen and assembling multimedia elements into a single cohesive project.
- Authoring software provides an **integrated environment** for binding together the content and functions of your project.
- Authoring systems typically include the ability to create, edit and import specific types of data: assemble raw data

4.1 Types of Authoring Tools

- The various authoring tools can be classified in three categories based on the metaphor used for sequencing or organizing multimedia elements and events.
 - A. Card or page based tools**
 - B. Icon base, event driven tools**
 - C. Time base and presentation tools**

A. Card or page based tools

- The card concept in authoring tools are based on the idea of card stacks containing graphics, audio, video, text and animation. **Elements and events in card concept authoring tools are organized as pages in a book or a stack of cards.** When card concept authoring tools starts, a blank page is displayed. Certain objects can be inserted e.g. text, pictures and buttons.
- By inserting objects into several pages, a multimedia "book" is eventually created. This tool provides a simple and easily understandable metaphor for organizing multimedia elements. It contains media objects such as buttons, text files and graphic objects. It provides facilities for linking objects to pages (or) cards. The software required is Hypercard and linked

---cont

A. Card or page based tools

- **Advantages:**
 - Easy to understand
 - Easy to use
 - Easy to link
 - It consumes very less time for developing an application.
- **Disadvantages:**
 - Few applications run only on one platform.
 - Card and page tools are not powerful as unique stand alone.
- **Examples of authoring tools**
 - HyperCard (Mac)
 - ToolBook (Mac / Windows)

A. Card or page based tools example



Fig. 2.3: Two Cards in a Hypermedia Stack

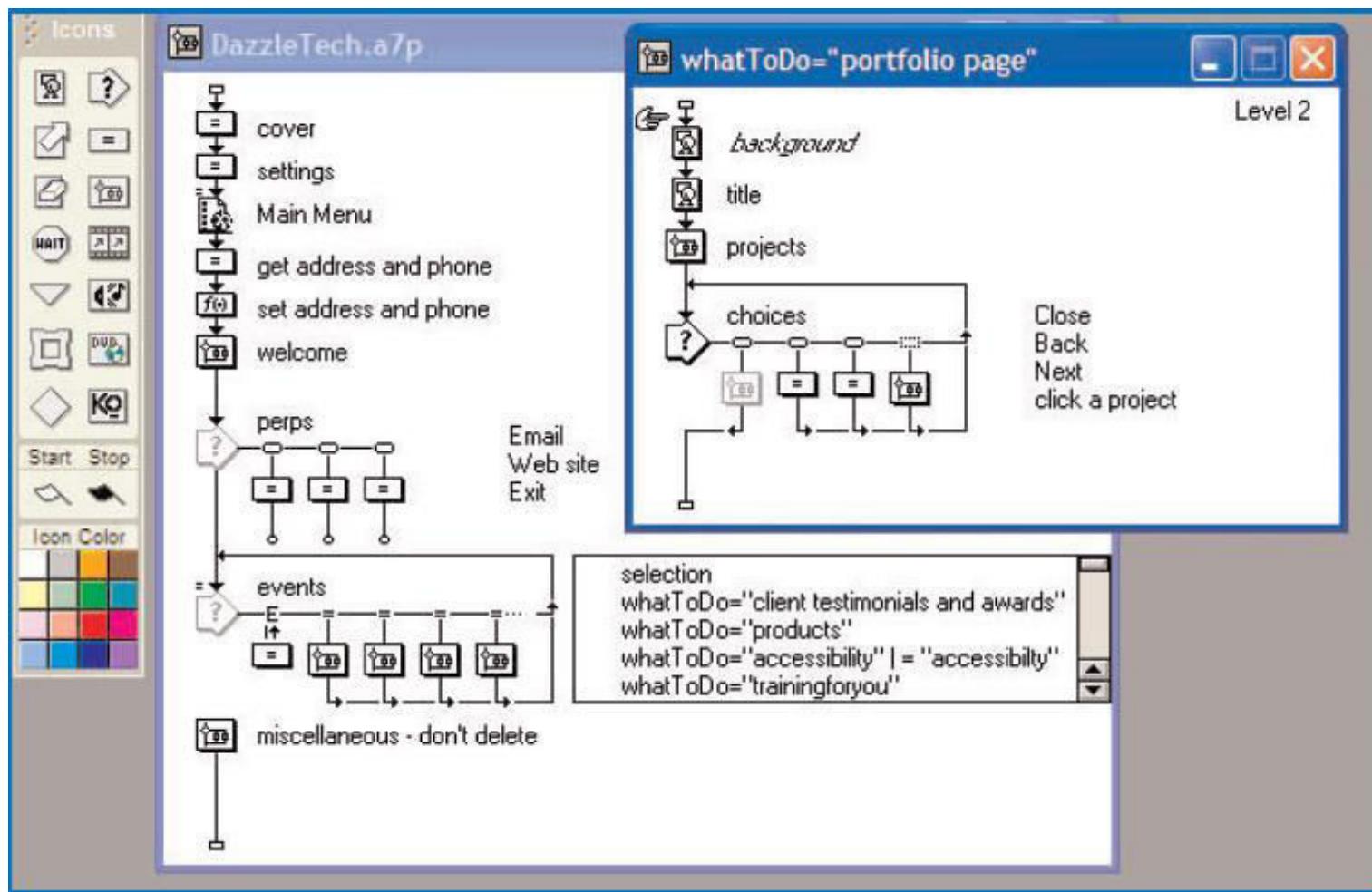
B. Icon based (event driven) tools

- Multimedia Systems In this authoring system, multimedia elements and interactions cues are organized as **objects in a structural framework or process**.
- The icon concept in authoring tools provides the multimedia developer with a visual programming approach to **sequencing events** in the multimedia application.
- In this concept, elements and events are organized in **a structural framework**. With icon authoring tools, users can present visually a logical flow of events by dragging icons from an icon menu.
- **The icon can represent graphics, audio files, animation, text, movies, and other elements should be played in a logical flow or flow chart.**
- These entire icon concept authoring tools use "drag and drop" to pick up and place icons on the presentation page.
- These icons represent:
 - events such as mouse clicks, key press.
 - actions to be performed after an event e.g. a transition, a sound
 - routines to perform loops, conditional branches

B. Icon based event driven tools

- **Advantages:**
 - It has a clear structure [appropriately designed flow charts].
 - Easy to edit and update the elements.
- **Disadvantages:**
 - Learning process is very difficult.
 - Very expensive in nature.
- **Examples of authoring tools**
 - •Authorware(Mac/Windows)
 - •IconAuthor (Windows)

B. Icon based event driven tools Authorware window



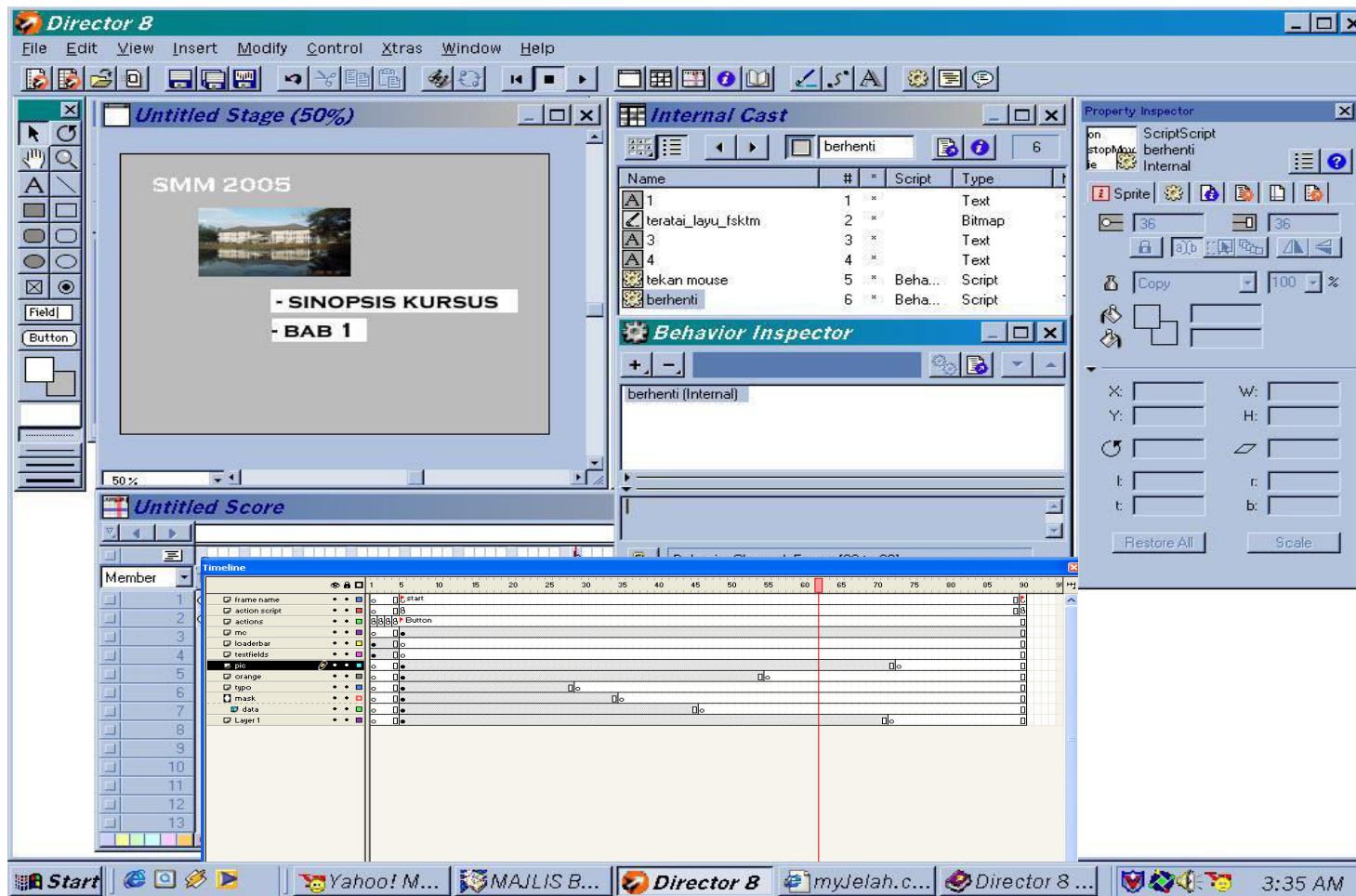
C. Time based tools

- With time frame concept authoring tools, the multimedia elements or events are **presented and organized along a time line**.
- This type of tool helps **users coordinate when each multimedia element** (text, graphics, audio, video or animation) plays.
- In time frame concept authoring tools, a **timeline consists of layers which span several frames**.
- Time based tools are best suited **for a message with a beginning and an end** so that a message can be passed within a stipulated time period.
- Few time based tools facilitate navigation and interactive control. It has the branching technique so that different loops can be formed for different

C. Time based tools

- **Advantages:**
 - These tools are good for creating animation.
 - Branching, user control interactivity.
- **Disadvantages:**
 - Steep learning curve for advance features.
 - Music and sound files embedded in Flash movies increases the file size and increases the download time.
 - Very expensive.
- **Examples of authoring tools**
 - Macromedia Director / Flash (Mac/Windows)

C. Time based tools (Macromedia Director)



6.2 Features of Authoring Tools

- Features of Authoring Tools Features of multimedia authoring tools are as mention below:
 - Editing features
 - Organizing features
 - Programming features
 - Interactive features
 - Performance tuning features
 - Playback features
 - Delivery features
 - Cross-Platform feature
 - Internet Playability

Cont---

Editing features

- image, animation, text, digital audio and MIDI music and video clips need to be created, edited and converted to standard file formats
- the specialized applications Multimedia Systems provide these capabilities.
- Editing tools for these elements, particularly text and still images are often included in your authoring system.

Cont---

Organizing features

- design and production process for multimedia involves storyboarding and flowcharting.
- Some authoring tools provide a visual flowcharting system or overview facility for illustrating your project's structure at a macro level.
- Storyboards or navigation diagrams too can help organize a project.
- Because designing the interactivity and navigation flow of you project often requires a great deal of planning and programming effort, your story board should describe not just graphics of each screen but the interactive elements as well.

Cont---

Programming features

- Authoring tools that offer a very high level language or interpreted scripting environment for navigation control and for enabling user inputs.
- The more commands and functions provided in the scripting language, the more powerful the authoring system.
- In complex projects you may need to program custom extensions of the scripting language for direct access to the computer's operating system.
- Some authoring tools offer direct importing of preformatted text, including facilities, complex text search mechanisms and hyper linkage tools.
- These authoring systems are useful for development of CD-ROM information products online documentation products, online documentation and help systems and sophisticated multimedia enhanced publications.
- Multimedia Systems With script you can perform

Cont---

Interactive features

- Interactivity empowers the end users of your project by letting them control the content and flow of information.
- Authoring tools should provide one or more levels of interactivity:
 - **Simple branching**, which offers the ability to go to another section of the multimedia production.
 - **Conditional branching**, which supports a go-to based on the result of IF-THEN decision or events. A structured language that supports complex programming logic, such as nested IF-THENs, subroutines, event tracking and message passing

Cont---

Performance tuning features

- Performance tuning features Complex multimedia projects require extra synchronization of events.
- Accomplishing synchronization is difficult because performance varies widely among the different computers used for multimedia development and delivery.
- Some authoring tools allow you to **lock a production's playback speed** to specified computer platform, but other provides no ability what so ever to control performance on various systems.

Cont---

Playback features

- When you are developing multimedia project, you will continually assembling elements and testing to see how the assembly looks and performs.
- Your authoring system should let you build a segment or part of your project and then quickly test it as if the user were actually using it.

Cont---

Delivery features

- Delivering your project may require building a run-time version of the project using the multimedia authoring software.
- A run-time version allows your project to play back without requiring the full authoring Multimedia Systems software and all its tools and editors.
- Many times the run time version does not allow user to access or change the content, structure and programming of the project.
- If you are going to distribute your project widely,

Cont---

Cross-Platform feature

- Cross-Platform features It is also increasingly important to use tools that make transfer across platforms easy.
- For many developers, the Macintosh remains the multimedia authoring platform of choice, but 80% of that developer's target market may be Windows platforms.
- If you develop on a Macintosh, look for tools that provide a compatible authoring system for Windows or offer a run-time player for the other platform.

Cont---

Internet Playability

- Due to the Web has become a significant delivery medium for multimedia, authoring systems typically provide a means to convert their output
- so that it can be delivered within the context of HTML or DHTML, either with special plug-in or embedding Java, JavaScript or other code structures in

6.3 Multimedia Authoring tools

- **Macromedia Flash**
 - allows users to create interactive movies by using the score metaphor - a timeline arranged in parallel event sequences, much like a musical score consisting of musical notes.
 - Elements in the movie are called **symbols** in Flash.
 - Symbols are added to a central repository, called a library, and can be added to the movie's timeline. Once the symbols are present at a specific time, they appear on the Stage, which represents what the movie looks like at a certain time, and can be manipulated and moved by the tools built into Flash.

Cont---

- **Macromedia Director**

- uses a movie metaphor to create interactive presentations.
- This powerful program includes a built-in **scripting language, Lingo**, that allows creation of complex interactive movies.
- The "cast" of characters in Director includes bitmapped sprites, scripts, music, sounds, and palettes.
- Director can read many bitmapped file formats. The program itself allows a good deal of interactivity, and Lingo, with its own debugger, allows more control, including **control over external devices**, such as VCRs and videodisc players

Cont---

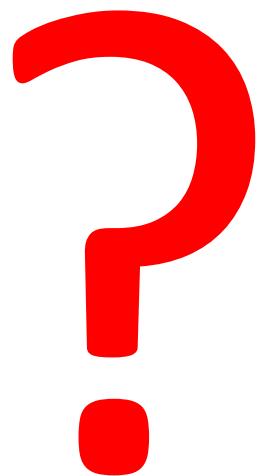
Authorware

- is a mature, well-supported authoring product that has an easy learning curve for computer science students because it is based on the idea of flowcharts (the so-called iconic/flow-control metaphor).
- It allows hyperlinks to link text, digital movies, graphics, and sound.
- It also provides compatibility between files produced in PC and Mac versions.
- Shockwave Authorware applications can incorporate Shockwave files, including Director movies, Flash animations, and audio.

Cont---

- **Quest**

- which uses a type off low charting metaphor, is similar to Authorware in many ways.
- However, the flowchart nodes can encapsulate **information in a more abstract way** (called "frames") than simply subroutine levels.
- As a result, connections between icons are more **conceptual and do not always represent flow of control in the program**.





INTRODUCING PHOTOSHOP

CC 2015

WHAT IS PHOTOSHOP?

- An image editing program used to create and modify digital images
 - What is a digital image?
 - A picture in an electronic form
- Photoshop is photo editing software. It gives a person the ability to produce beautiful pictures with a degree of control and artistry that is not possible in a traditional darkroom. It is also
 - The digital equivalent of a Dark Room.
 - Photo editing lab.
 - Creative tool chest.
 - Translator of formats characteristics.
 - A scanning package.
 - Everything above and more all in one package.

WHAT IS PHOTOSHOP?

- Adobe Photoshop is one of the most powerful software applications for image editing, touch up, color correction, and painting and drawing.
- You can use it to work with images that have been digitized on flatbed or film/slide scanners, or to create original artwork.
- The image files you create in Photoshop can be printed to paper or optimized for use in multimedia presentations, web pages, or animation/video projects.

WHAT CAN PHOTOSHOP BE USED FOR?

- Create original artwork
- Manipulate color images
- Retouch photographs
- Repair damaged images
- Create images for Web pages
- Correct color and tone
- Adjust exposure, shadows, brightness, and contrasts
- Fix red eye
- Retouch spots and blemishes
- Reduce the noise to make the image appear sharper

WHAT CAN PHOTOSHOP BE USED FOR?

- Warp an image by stretching, curling or bending the shape
- Scale, rotate or flip
- Crop an area to change the size's
- Remove, add, combine picture elements
- Add-pre-made snaps
- Apply artistic filters that change the appearance
- Paint some various artistic brushes
- Change the scenery
- Adjust the angle
- Convert to black and white
- Construct an image using different elements such as a background color, text, shapes, and selections from other photographs

KNOWING WHEN TO USE PHOTOSHOP

- Photoshop has so many tools and so much power that it can do an unlimited number of things. The following list describes the most common tasks for which Photoshop is used to help you get an idea of when you may want to use it:
 - **Photo corrections.** Photoshop is able to correct digital images by restoring the original color and lighting, as well as to correct problems introduced by camera lenses.
 - **Photo enhancements.** Photoshop also provides tools that allow you to enhance photos. For example, you can add blur to soften a portrait or use a sharpening filter to remove camera jitter. Photoshop is also great at fixing scratches and dust marks on older images.
 - **Photo compositions.** One of the strengths of Photoshop is the ability to combine multiple images to create a single image or composition. A common use of Photoshop is to take a headshot from one image and place it into another image. Photoshop also enables you to merge photos that were taken at different horizontal angles, from the same spot, and then turn them into a single panoramic image.

KNOWING WHEN TO USE PHOTOSHOP

- **Painting.** Photoshop has always been a good painting application, but with the addition of the wet brush capability in CS5 as well as erodible and airbrush tips in CS6, Photoshop is now one of the best applications available to create digital paintings. What puts Photoshop ahead of the competition is that many powerful features, such as layers and masks, are also available for use with the painting tools.
- **Creating vector artwork.** Photoshop is also an excellent application to use when creating vector artwork. The path tools allow you to quickly create and manipulate vector artwork, and add vector artwork to raster images.
- **Adding text to images.** Photoshop provides tools that allow you to add text to images. You can resize, warp, and adjust the text to create some stunning visual effects.
- **Creating web images.** Another area where Photoshop excels is in preparing images for the web. Photoshop provides utilities that allow you to quickly format images with the appropriate size, file format, and colors for use in web pages. Photoshop also provides some tools you can use to slice an image into clickable sections and provides the HTML code necessary to use the slices in a web page.

KNOWING WHEN TO USE PHOTOSHOP

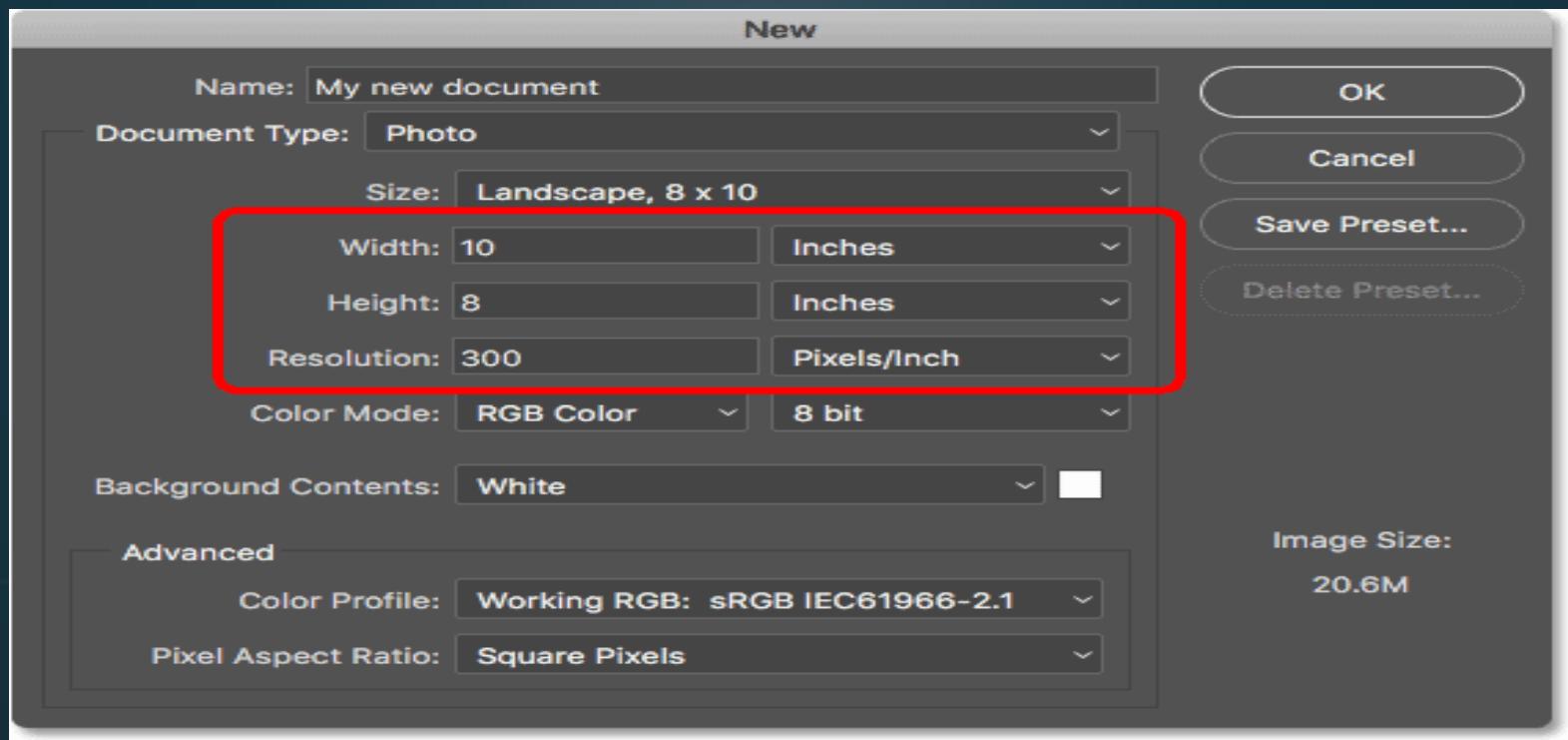
- **Print preparation.** Photoshop is often used to prepare images for printing by converting the color mode to CMYK, adding spot colors, and creating color separations.
- **Creating 3D objects.** The 3D tools in Photoshop just get better and better. Photoshop has the capability to create and manipulate 3D objects so you can incorporate them into 2-D images or video.
- **Adding textures to 3D objects.** Photoshop has a big advantage over other 3D applications when applying textures to 3D objects. With the Photoshop filter and painting capabilities, you can edit the textures of your 3D objects in ways that you may not have thought possible.
- **Artistic effects.** One of the most enjoyable features of Photoshop is the ability to use different filters and warping tools to apply artistic effects to images. The combination of numerous tools and filters in Photoshop means that the only limitation you have when adding artistic effects is your own creativity.

LIST OF PROFESSIONS

- List of professions that would use Photoshop to complete their work
 - Web designer
 - Photographer
 - Graphic artist

SETTING UP THE DOCUMENT

- Setting up your document correctly from the start will make your job much easier as you work through your project.
- This will require some advanced planning. For example, if your final output will be a brochure, you may need to set up your document to be horizontal and double-sided.
- To create a new document, click File > New. This will open the Document Setup dialog box (Figure 2).



SETTING UP THE DOCUMENT

- Page Size and Orientation
 - Change the page size by typing in new values for width and height. Page size represents the final size you want after bleeds or trimming other marks outside the page. In the Preset dropdown menu you can find such common compatibilities as Photo, Web, etc. Typing in exact values for Height and Width gives you more control over the size and orientation of your page.
- Resolution
 - Resolution is the number of pixels on a printed area of an image. The higher the resolution, the more pixels there are on the page, the better the quality of the image. However, high resolution increases the size of the file. The standard recommended resolution for printed images is 150-300, for Web images it is 72.
- Color Mode
 - Choose a color mode that will best fit your project. For example, when making a graphic for a web site, choose RGB. When making an image for print choose CMYK.
- Background Contents
 - Choose the background: white, color or transparent. When you have entered all of your document settings, click Ok.

THE PHOTOSHOP INTERFACE

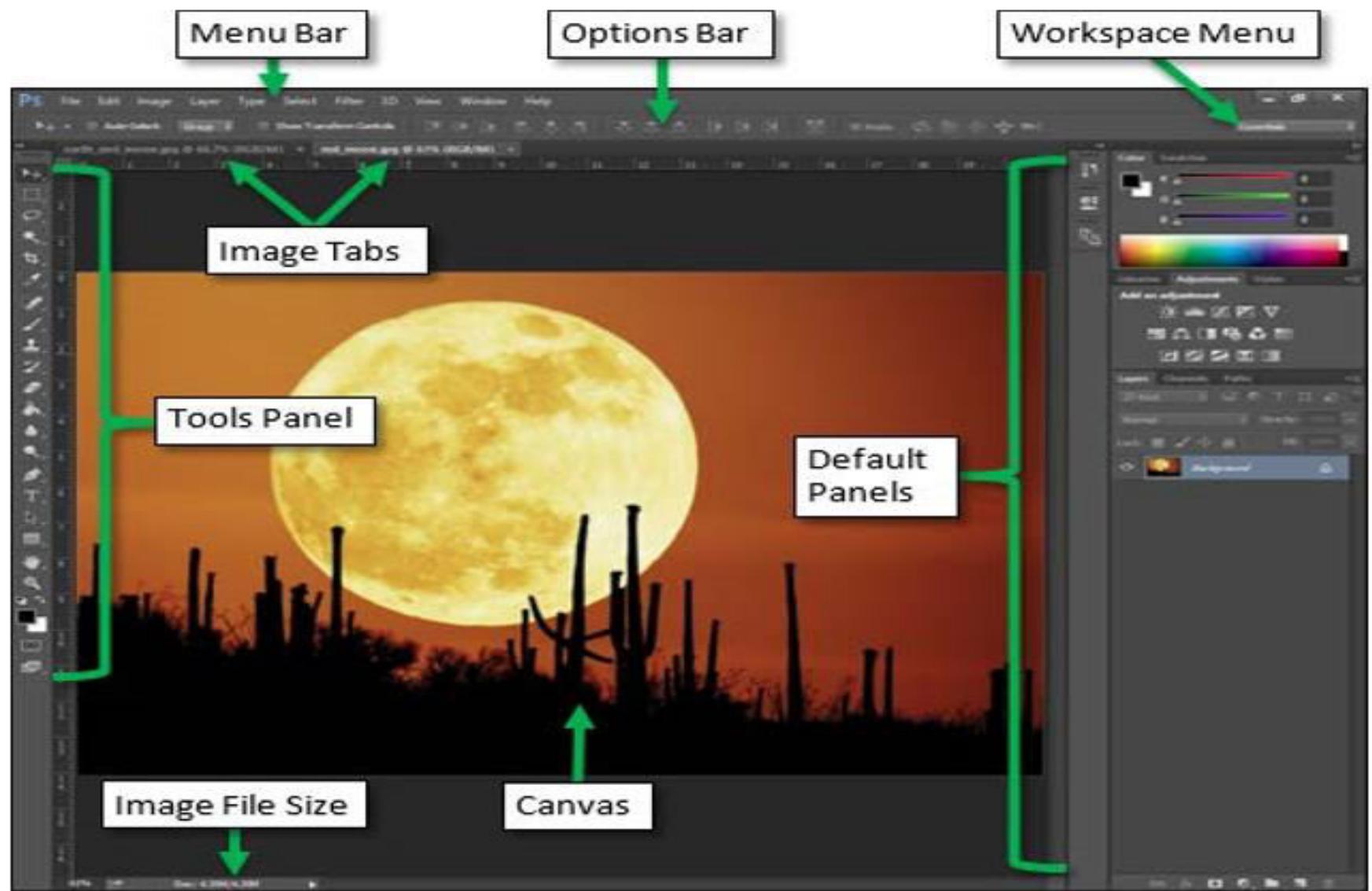


Figure 2 – Photoshop CC 2015 Default Workspace

BASIC ELEMENTS

- **Workspace**

- The workspace is the area that will be printed when the work is published. Images **are placed on the workspace.**

- **Workspace menu**

- The workspace presets offer quick ways to change the layout of the panels and tools in Photoshop, depending on the task you are performing. This preset displays icons for panels with new features in Photoshop, such as the new 3D tools , paintbrushes, paragraph and character settings, and layer options.

- **Menu Bar**

- A bar at the top of the windows that contains menus that organize types of tasks such as File, Edit, Image, Layer, Select, Filter, View, Window and Help. give you access to most of the features in Photoshop.

- **Palettes**

- Palettes are the things that you see sitting over on the right side of your screen. They make it easy for you to navigate through your document, add adjustments, switch ,color layers, modes, and other things

- **The Toolbar(Tools panel)(Tool box)**

- The Toolbox provides easy access to all of the tools in Photoshop that require mouse or stylus interaction with the document. The Toolbox includes selection tools, painting tools, erasing tools, and much more with layers.

- **Options bar**

- The Options bar displays different options depending upon the tool being applied.

Workspace menu

- This preset displays icons for panels with new features in Photoshop, such as the new 3D tools, paintbrushes, paragraph and character settings, and layer options.
 - **Essentials.** This preset gives you full access to the most commonly used panels in Photoshop, including the Navigation, Swatches, and Layers panels. It is the default workspace.
 - **Design.** This preset displays the most common graphic design panels, such as the Swatches, Character, and Paragraph panels.
 - **Painting.** This preset makes the paintbrush and brush presets readily available.
 - **Photography.** This preset provides the Histogram and Adjustments panels that make it easy to apply adjustments to photographs.
 - **3D.** This preset displays the 3D, Mask, and Layers panels that are often used when working with 3D objects.
 - **Motion.** This preset displays the Timeline panel and Clone Source panel, which are frequently used in animation.

MENUS

- Most of what you'll find in Photoshop's menus can be found using the previously discussed tools. Nonetheless, we're going to take a quick look at some notable items in each of the menus.

- **File**

- File, as usual, handles opening, saving, and closing operations. Towards the end of these lessons we'll be taking a look at your different saving options (namely *Save for Web*).

- **Edit**

- Edit, as usual, brings you copy, cut, and paste. In Photoshop, it's also where you transform layers and set your color spaces.

- **Image**

- Image brings you canvas and image adjustments, including destructive effects that you'll also find in your adjustments palette. Options in this menu are designed to affect the image as a whole, although many adjustments are applied to only a single layer.

- **Layer**

- Layer lets you do all of the things you can do in the layer palette with a few more options. This menu also lets you create adjustment layers and smart objects (a group of layers treated as a single object).

- **Select**

- While the marquee and lasso tools will be your main means of selecting things, the select menu can help you refine that selection or create entirely new selections based on certain criteria (such as color range and luminosity).

MENUS

- **Filter**

- Filter brings you a wealth of built-in (and, if installed, third-party) Photoshop filters that can blur, sharpen, distort, and alter your image (or layers of the image) in many different and unique ways. The best way to get acquainted with these filters is to try them all. That can take a little time, but it's fun to play around with them and see what they do. We'll be getting into the specifics in subsequent lessons, but only looking at a few commonly useful filters.

- **Analysis**

- Analysis provides you with measurement tools. There will be times when you need them to make accurate alterations to your images. We will not be covering anything in this menu in these basic lessons.

- **3D**

- As previously noted, we're not covering 3D. If you decide to learn more about 3D later, you may want to explore this menu on your own at some point.

- **View**

- View provides you with various view options, lets you hide and show line guides you've created (see video for an example), and make Photoshop snap (or not snap) to corners, edges, and to the grid on the canvas. Viewing of this invisible grid can also be turned on and off in the View menu.

- **Window**

- Window lets you hide and show certain windows and palettes. You can also arrange your Photoshop windows and palettes however you want and save them as a window preset.

THE TOOLS PANEL

- holds tools for creating and editing images
- The Toolbox provides easy access to all of the tools in Photoshop that require mouse or stylus interaction with the document.

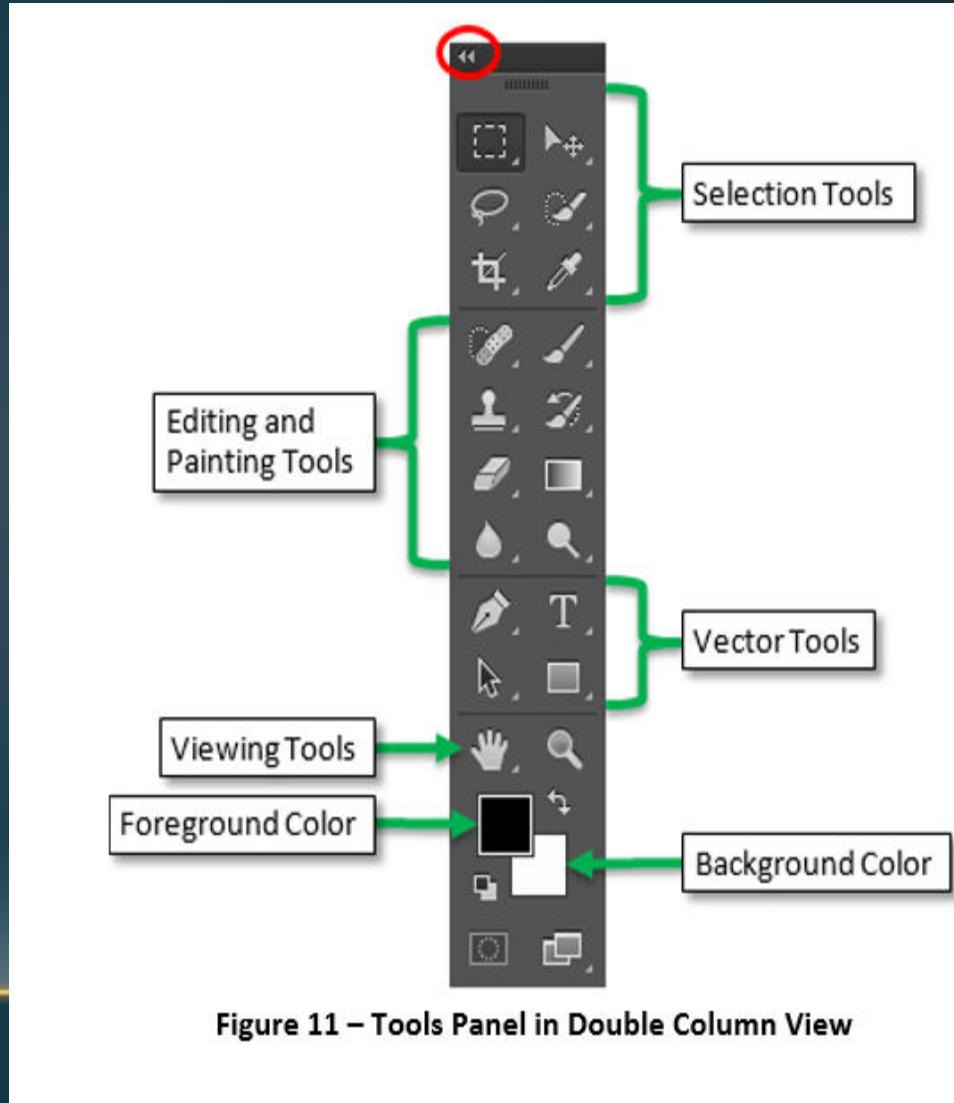


Figure 11 – Tools Panel in Double Column View

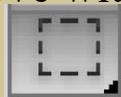
SELECTION TOOLS

- Move Tool (Keyboard: V)



- The move tool simply lets you move objects in a given layer around the Photoshop canvas. To use it, click anywhere on the canvas and drag. As you drag, the Photoshop layer will move with your mouse.

- Marquee (Keyboard: M)



- The marquee lets you select part of the canvas in a specific shape. By default you get a rectangular (or perfect square if you hold down shift while selecting), but you can also select in the shape of an ellipse (or a perfect circle if you hold down shift while selecting).

- Lasso (Keyboard: L)



- The lasso is a free-form selection tool that lets you drag around the canvas and select anything the lasso'd area covers. Within this tool you also have access to the polygonal lasso, which lets you create a selection by clicking around on the canvas and creating points, and the magnetic lasso, which works the same as the regular lasso but attempts to detect edges for you and automatically snap to them.

- Magic Wand (Keyboard: W)



- Clicking an area with the magic wand will tell Photoshop to select the spot you clicked on and anything around it that's similar. This tool can be used as a crude way to remove backgrounds from photos.

SELECTION TOOLS

- Crop Tool (Keyboard: C) 
 - The crop tool is used to (surprise!) crop your pictures. You can specify the exact size and constrain the crop tool to those proportions, or you can just crop to any size you please.
- Eyedropper (Keyboard: I) 
 - The eyedropper tool lets you click on any part of the canvas and sample the color at that exact point. The eyedropper will change your foreground color to whatever color it sampled from the canvas.

ALTERATION (EDITING AND PAINTING)TOOLS

- Healing Brush (Keyboard: J)



- The healing brush lets you sample part of the photograph and use it to paint over another part. Once you're finished, Photoshop will examine surrounding areas and try to blend what you painted in with the rest of the picture.

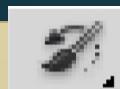
- Paintbrush and Pencil (Keyboard: B)



- The paintbrush is a tool that emulates a paintbrush and the pencil is a tool that emulates a pencil. The paintbrush, however, can be set to many different kinds of brushes. You can paint with standard paintbrush and airbrush styles, or even paint with leaves and other shapes as well.

ALTERATION (EDITING AND PAINTING)TOOLS

- History Brush (Keyboard: Y)



- The history brush lets you paint back in time. Photoshop keeps track of all the moves you make (well, 50 by default) and the history brush lets you paint the past back into the current photo. Say you brightened up the entire photo but you wanted to make a certain area look like it did before you brightened it, you can take the history brush and paint that area to bring back the previous darkness.

- Eraser Tool (Keyboard: E)



- The erase tool is almost identical to the paintbrush, except it erases instead of paints.

- Paint Can and Gradient Tools (Keyboard: G)



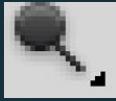
- The paint can tool lets you fill in a specific area with the current foreground color. The gradient tool will, by default, create a gradient that blends the foreground and background tool (though you can load and create preset gradients as well, some of which use more than two colors).



- Blur, Sharpen, and Smudge Tools (Keyboard: None)

- All three of these tools act like paintbrushes, but each has a different impact on your picture. The blur tool will blur the area where you paint, the sharpen tool will sharpen it, and the smudge tool will smudge the area all around the canvas. The smudge tool is very useful in drawing for creating nicely blended colors or for creating wisps and smoke that you can add to your photos.

ALTERATION (EDITING AND PAINTING)TOOLS

- Burn, Dodge, and Sponge Tools (Keyboard: O)
 - The burn, dodge, and sponge tools are paintbrush-like tools that manipulate light and color intensity. The burn tool can make areas in your photo darker. The dodge tool can make them lighter. The sponge tool can saturate or desaturate color in the area you paint with it. These are all very useful tools for photo touch ups.

VECTOR TOOLS(DRAWING AND SELECTION)

- Pen Tool (Keyboard: P) 
 - The pen tool is used for drawing vector graphics. It can also be used to create paths that can be used for various things that we'll discuss in a later lesson (although if you watch the video you can see a type path being created).
- Type Tool (Keyboard: T) 
 - The type tool lets you type horizontally. Tools hidden beneath the horizontal type tool will let you type vertically and also create horizontal and vertical text masks.
- Path Tool (Keyboard: A) 
 - The path tool lets you move any created paths around. It's like the move tool, but for paths
- Shape Tool (Keyboard: U) 
 - The shape tool lets you create vector rectangles, rounded rectangles, circles, polygons, lines, and custom shapes. These tools are very useful when designing or when creating shape masks for photos.

VIEWING TOOLS

- Hand Tool (Keyboard: H) 
 - The hand tool allows you to click and drag around the Photoshop canvas. If the entire canvas currently fits on the screen, this tool won't do anything. This tool is for easily navigating around when you're zoomed in, or a picture is simple too big to fit on the screen at 100%.
- Zoom Tool (Keyboard: Z) 
 - The zoom tool lets you zoom in and out of the Photoshop canvas by clicking on a given area. By default, the zoom tool only zooms in. To zoom out, hold down the option key and use the zoom tool as you normally would.

FOREGROUND AND BACKGROUND SELECTOR

- Color Selection Tools (Keyboard: D for defaults, X to switch foreground and background colors)
 - These tools let you manage the colors you're using. The color on top is the foreground color and the color in back is the background color. The foreground color is what your brushes will use. The background color is what will be used if you delete something from the background or extend it (although now, Photoshop CS5 will give you the option for using your foreground color instead in some circumstances). The two smaller icons up top are shortcut functions.
 - The left one, showing a black square on a white square, will set your foreground and background colors to the defaults (Keyboard: D). The double-headed curved arrow will swap your foreground and background color (Keyboard: X). Clicking on either the foreground or background color will bring up a color picker so you can set them to precisely the color you want.



PALETTES

- Palettes are the things that you see sitting over on the right side of your screen. They make it easy for you to navigate through your document, add adjustments, switch modes, and other things.
- Common palettes include:
 - Adjustments
 - Color Channels
 - Color Picker
 - Color Swatches
 - History
 - Text
 - Layers

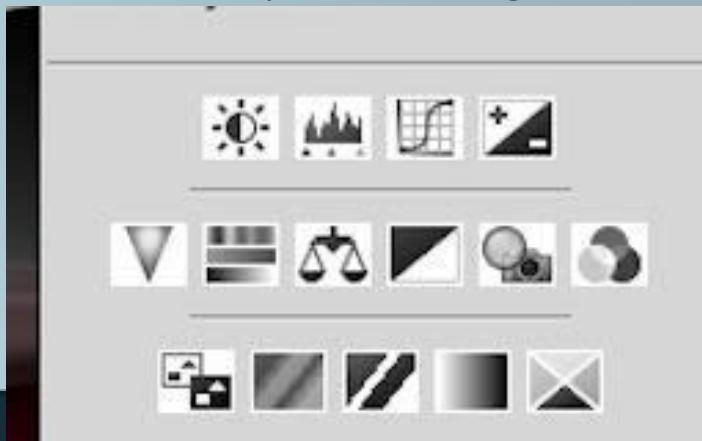
Palettes

- Control behavior of its tools
- Windows menu displays a list of available palettes
- When selected, the palette will appear as a floating window on the opened workspace
- To activate a palette click on its tab

PALETTES

- **Adjustments**

- Your adjustments panel is where you can easily create and edit adjustment layers. Adjustment layers are non-destructive image alterations that affect all the layers below them and can easily be turned on and off.
- Their most common use is for color correction (namely the Levels and Curves adjustments, but there are many different kinds of adjustments you can perform that can dramatically alter the look of your image.



PALETTES

Color Channels

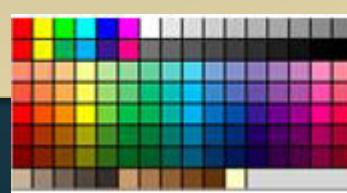
- *The color channels palette will let you look at the specific colors that make up your picture. If you're in RGB mode you'll get red, green, and blue. These color channels will differ if you're in a different color space (such as CMYK or LAB). When you choose a specific color, you'll notice you'll be shown your image in different versions of black and white.*
- *This is because each color channel is simply a monochromatic images representing the light in each channel (e.g. the red channel is just a look at the red light in your photo). Switching between these different channels is useful for making color channel-specific touch ups, overall contrast enhancements, and also for converting your photo to black and white in a compelling way. This will be discussed in greater detail in a later lesson about color correction and photo enhancements.*

Color Picker

- *This palette will let you easily alter your foreground and background colors using sliders.*

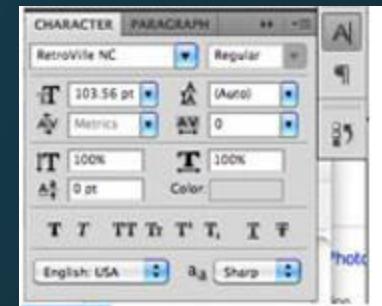
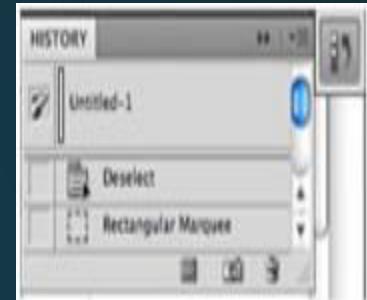
Color Swatches

- *The color swatches palette is a set of pre-defined colors you can quickly choose from. You can load in several other pre-made swatch collections or create your own, too.*



PALETTES

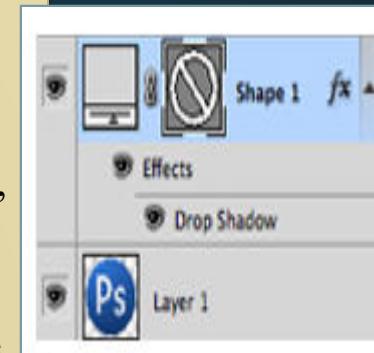
- History
 - The history palette lets you go back in time to undo any previous alterations. The standard undo command (in the edit menu) will simply toggle between undoing and redoing the latest action performed on your image. The history panel is where you can go back much further (50 actions by default).
- Text
 - The text palette, and the paragraph palette below it, let you make all sorts of adjustments to any text you create with the type tool. These options are very similar to what you'll find in a word processing, but you can also specify things like character width and spacing which are more useful in design.



PALETTES

- Layers

- The layers palette lets you see all the layers in your document. As you start getting to know Photoshop, you'll find yourself in this palette more than any other. Every Photoshop CC 2015 document contains at least one layer. Creating multiple layers lets you easily control how your artwork is printed, displayed, and edited. It'll let you organize and arrange your layers, set blending modes, set visibility and opacity of layers, group and merge layers, and a bunch of other neat things we'll learn about in future lessons.
 - **Layer Blending Mode** -Defines how the layer's pixels blend with underlying pixels in the image. By choosing a particular blending mode from the drop-down menu you can create a variety of special effects.
 - **Fill** -By typing in a value or dragging the slider you can specify the transparency.
 - **Opacity** -By typing in a value or dragging the slider, you can specify the transparency of the entire layer.
 - **Layer Mask** -Allows you to hide certain parts of the layer, which can then be revealed by using the paintbrush and the white paint color to expose portions of the layer.
 - **Adjustment Layer** -Have the same opacity and blending mode options as image layers and can be rearranged, deleted, hidden and duplicated in the same manner as image layers..



BLENDING MODES

- A tool that controls the way pixels on one layer blend with pixels in underlying layers.
- Blending modes affect how the color pixels on one layer blend with pixels on the layers beneath them. The default blending mode, Normal, hides pixels beneath the top layer unless the top layer is partially or completely transparent. Each of the other blending modes let you control the way the pixels in the layers interact with each other.
- The following blending modes often come in handy, and can be a good place to start your experimentation:
 - **Multiply** does just what the name implies: it multiplies the color in the underlying colors with the color in the top layer.
 - **Lighten** replaces pixels in the underlying layers with those in the top layer whenever the pixels in the top layer are lighter.
 - **Overlay** multiplies either the colors or the inverse of the colors, depending on the colors in the underlying layers. Patterns or colors overlay the existing pixels while preserving the highlights and shadows of the underlying layers.
 - **Luminosity** replaces only the luminance of the underlying colors with that of the top layer.
 - **Difference** subtracts darker colors from lighter ones.

BASIC CONCEPTS-TERMINOLOGY

- The following list of photo editing terms will help you become familiar with some of the basic concepts in photo editing to help you get started with your project.
 - History** – Complete list of tasks performed. Allows multiple step undoes or the deletion of a previous step followed by the remaining steps.
 - Burn:** Darken a selected area of a photo
 - Crop :** A method to change the shape of the photo.
 - Dodge :** Lighten a selected area of a photo
 - Duotone:** A photo that appears to be black and white, with one color added.
 - Feather:** A method of softening the edge of a selected area. To make the selection less noticeable or smoother.
 - Grayscale:** A black and white photo.
 - Highlights:** The bright, and often white areas of a photo. An area where light is reflected off a surface.
 - Histogram :** A measure of the highlights (bright), middle and dark (shadow) tones in the image.
 - A graph that shows the number of pixels for each color and tone in an image
 - Levels :** A way to adjust the dark, middle and bright tones of a photo in Photoshop

BASIC CONCEPTS-TERMINOLOGY

- The following list of photo editing terms will help you become familiar with some of the basic concepts in photo editing to help you get started with your project.
- **Overexposed :** Too much light allowed to reach the camera's recording chip. The photo appears to be too bright.
- **Pixel :** Picture element. The smallest thing in a digital image.
- **Resolution :** A measure of how much information is in your image. More info equals a higher quality image. **Resolution** is the image quality produced by a [printer](#) or displayed on a [monitor](#). With monitors, the resolution is measured by the number of [pixels](#) horizontal by pixels vertically as shown in the picture. Printers also have a measure of resolution called [DPI](#)(dots per inch).
- **RGB:** is a method of creating colors from the colors of red, green, and blue.
- **CMYK :** Short for **Cyan Magenta Yellow and Key**, is the four-color model used for printing standard colors. The image is an example of colors created when variations of the original three are mixed
- **Toning :** A vague term that means making changes to the image's color, saturation and contrast, etc.
- **Underexposed:** Not enough light allowed to reach the camera's recording chip. The photo appears to be too dark.

BASIC CONCEPTS-TERMINOLOGY

- The following list of photo editing terms will help you become familiar with some of the basic concepts in photo editing to help you get started with your project.
 - **Opaque:** The inability to see through layer.
 - **Opacity:** The level of transparency of a layer.
 - **blending modes:** A tool that controls the way pixels on one layer blend with pixels in underlying layers.
 - **Hue:** The color of an image.
 - **Saturation:** The intensity of the color of an image.
 - **Marquee:** A dotted line that shows the area that is selected.
 - **Mask:** A feature that hides specific areas of an image.
 - **Retouch:** To fix a photograph.
 - **Clone:** To copy a range of pixels and paste the pixels into another location.
 - **Flatten:** To merge all layers into one.
 - **Filter:** A tool that can create effects such as distortions, texture, blurs, and others.
 - **Megapixel:** A unit that contains over one million pixels.
 - **optical zoom:** A camera feature that uses lenses to magnify the image.

Photoshop short cut keys

X	Path selection tool	cmd (Ctrl PC) + A	Select all	Press & hold shift + click	Select multiple layers
B	Brush tool	cmd (Ctrl PC) + C	Copy	Press & hold shift + click or drag	Add to selection (<i>with marquee tools active</i>)
C	Crop tool	cmd (Ctrl PC) + D	Deselect selection	Press & hold shift + click & drag	Scale selection (<i>with marquee tool active</i>)
D	Set colours to default [Black & White]	cmd (Ctrl PC) + G	Group layers	Press & hold shift + click & drag	Scale object (<i>with free transform tool active</i>)
E	Eraser tool	cmd (Ctrl PC) + J	Duplicate layer	Press & hold shift + click & drag	Rotate in increments of 15° <i>(with free transform tool active)</i>
F	Full screen	cmd (Ctrl PC) + N	New document	Press & hold shift + click	Draw straight line (<i>with brush tool active</i>)
G	Paint bucket tool	cmd (Ctrl PC) + R	Show Rulers	Press & hold shift + click + drag	Draw straight line (<i>with line shape tool active</i>)
I	Eyedropper tool	cmd (Ctrl PC) + S	Save document		
L	Lasso tool	cmd (Ctrl PC) + T	Free transform		
R	Rotate canvas	cmd (Ctrl PC) + V	Paste		
T	Type tool	cmd (Ctrl PC) + W	Close document	Press & hold alt + click	Zoom out (<i>with zoom tool active</i>)
V	Move tool	cmd (Ctrl PC) + X	Cut	Press & hold alt + click & drag	Quick duplicate object (<i>with selection tool active</i>)
W	Magic wand tool	cmd (Ctrl PC) + Z	Undo	Press & hold alt + click & drag	Scale object (<i>with free transform tool active</i>)
X	Swap foreground & background colour	cmd (Ctrl PC) + 0	Zoom to fit document to workspace area	Press & hold alt + shift + click & drag	Scale object (<i>with free transform tool active</i>)
Z	Zoom tool	cmd (Ctrl PC) + 1	Zoom to 100%	Press & hold alt + click or drag	Remove from selection (<i>with marquee tools active</i>)
		cmd (Ctrl PC) + ;	Show guides		
		cmd (Ctrl PC) + '	Show grid		
		cmd (Ctrl PC) + shift + N	New layer	Tab	Toggle visibility of interface panels
		cmd (Ctrl PC) + shift + I	Invert selection	Press & hold spacebar + click & drag	Maneuver around document
		cmd (Ctrl PC) + alt + Z	Undo multiple steps	Press & hold cmd (Ctrl PC) + Shift + V	Paste in place
		cmd (Ctrl PC) + alt + I	Image size	Press & hold cmd (Ctrl PC) + click layer thumbnail	Select layer outline
		cmd (Ctrl PC) + D + press enter	Deselect type (<i>with type tool active</i>)	Press ' [' to increase brush size, press '] ' to decrease brush size	Toggle brush size (<i>with brush tool active</i>)
		cmd (Ctrl PC) + click	Select multiple individual layers	Press ' [' to increase brush size, press '] ' to decrease brush size	Toggle brush size (<i>with eraser tool active</i>)
		cmd (Ctrl PC) + click & drag	Distort transform <i>(with free transform tool active)</i>		

PRACTICAL - BASIC EDITING(LAB SESSIONS)

- Selections- An Introduction
- Cropping
- Automatic Color and Levels Correction
- Flawless Faces- Beauty and Skin Retouching
- Removing Unwanted Objects with Content-Aware Fill

PRACTICAL - BASIC EDITING(LAB SESSIONS)

- *Using Polygonal Lasso selection and blur tool to give focus for specific image area*
- *The Magic Eraser- One-Click Background Removal*
- *Layers- An Introduction*
- *Non-destructive Editing with Adjustment Layers*
- *Layer Masks, the Key to Flawless Retouching -*
- *Removing a Background with Quick Selection and Refine Edge*

PRACTICAL - BASIC EDITING(LAB SESSIONS)

- Working with a type tool
- Masks on Type Layers to crate text from images
- Blending a text
- Using shapes
- Saving a file or exporting