Multimedia and the Web

Avinash Maskey

Introduction

- The term ***multimedia*** refers to any type of application that involves more than one type of media, such as ***text***, ***images***, ***video, animation***, and ***sound***. Multimedia is used in a wide variety of applications, both on and off the Web.
- In other words, 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.
- Multimedia is a media that uses multiple form of information content and information processing.
- A ***multimedia system*** is responsible for developing a multimedia application. A multimedia application is a bundle of different kinds of data.
- A multimedia computer system is one that can create, integrate, store, retrieve delete two or more types of media materials in digital form, such as audio, image, video, and text information.

Characteristics of Multimedia

- A ***multimedia systems*** has four basic characteristics:
  - Multimedia systems must be ***computer controlled***.
  - Multimedia systems are ***integrated***.
  - The information they handle must be ***represented digitally***.
  - The interface to the final presentation of media is ***usually interactive***.

Characteristics of Multimedia (Contd.)

- **Computer Controlled:**
  - ***Producing the content of the information*** e.g. by using the authoring tools, image editor, sound and video editor.
  - ***Storing the information:*** providing large and shared capacity for multimedia information.
  - ***Transmitting the information:*** through the network.
  - ***Presenting the information to the end user:*** make direct use of computer peripheral such as display device (monitor) or sound generator (speaker).

- **Integrated:**
  - All multimedia components (audio, video, text, graphics) used in the system must be somehow integrated.
  - Every device such as microphone and camera is connected to and controlled by a single computer.
  - A single type of digital storage is used for all media type.
  - Video sequence are shown on computer screen instead of TV monitor.

Characteristics of Multimedia (Contd.)

- **Interactivity:**
  - ***Level 1:*** Interactivity strictly on information delivery. Users select the time at which the presentation starts, the order, the speed and the form of the presentation itself.
  - ***Level 2:*** Users can modify or enrich the content of the information, and this modification is recorded.
  - ***Level 3:*** Actual processing of users input and the computer generate genuine result based on the users input.

- **Digitally Represented:**
  - **Digitization:** process involved in transforming an analog signal to digital signal.

Elements of a Multimedia System

- Web sites can contain a variety of multimedia elements. The most common are:
  - Text
  - Images (**GIF**, **PNG**, **JPEG**, **TIFF**)
  - Animation
  - Audio (or **Sound**)
  - Video

Elements of a Multimedia System - Text

- ***Text*** is an important part of virtually all Web sites. It is used to supply basic content, as well as for text-based menus and hyperlinks. It is also frequently added to ***buttons***, ***logos***, ***banners***, and other ***web page images*** as they are being created.
- Text can be displayed in a variety of font faces, colors, sizes, and appearances; a font face or ***typeface*** is a collection of text characters that share a common design, such as the Times New Roman, Cooper Black, Arial, and Dom Casual typefaces illustrated in Figure.
- A wide variety of typefaces are available, and one typeface may convey an entirely different feeling than another typeface. For example, Times New Roman is a traditional, business-like typeface, whereas Dom Casual is more whimsical and fun.
- Consequently, when selecting a typeface to be used on a Web page or in a multimedia element that contains text, it is important to select a typeface that matches the style of the Web site.

Elements of a Multimedia System - Text

- In addition to selecting an appropriate typeface, it is also important to use an appropriate font size. A normal text size is around 11 or 12 points—it is not a good idea to use smaller text because it can be difficult to read. On the other hand, don't make your text too large because it will take up too much space on the screen.

Elements of a Multimedia System - Images

- ***Images*** or ***graphics*** refer to digital representations of photographs, drawings, charts, and other visual objects. Unlike animation or video (discussed shortly), images are static. Images can be created by scanning a photograph or document, taking a picture with a digital camera, or creating or modifying an image in an image editing program.
- They can also be obtained as clip art images (predrawn images) or stock photographs (professional photographs). Clip art is often included with office suite programs and image editing programs; it is also available in collections on CDs and DVDs.
- Both clip art and stock photographs can be downloaded from numerous Web sites (e.g. dreamstime and shutterstock). While downloadable images typically require a fee, some free clip art images are available.
- In addition, many clip art images and stock photographs are royalty free, which means they can be used as often as desired and in as many different documents as needed (such as in several newsletters and on multiple Web pages) without additional payment or permission, once the rights to use the image are purchased and the image is obtained.

Elements of a Multimedia System - Images

- Images are available in many formats, such as **TIF**, **BMP**, **GIF**, **JPEG**, and **PNG**. Scanned images, images used for medical imaging, and images used for desktop publishing are generally saved in the TIF format.
- Images created using Windows Paint and similar painting programs are usually saved in the BMP format. Images created for use on Web pages are usually saved in the GIF, JPEG, or PNG format— all of which can be displayed in virtually all Web browsers without a special plug-in (a free small program that adds additional capabilities to your browser).
- The file format and file size of an image can be changed using an image editing program, which allows the image to be optimized for use on a Web page.

Elements of a Multimedia System - Images

- Types of images used in web or multimedia systems are:

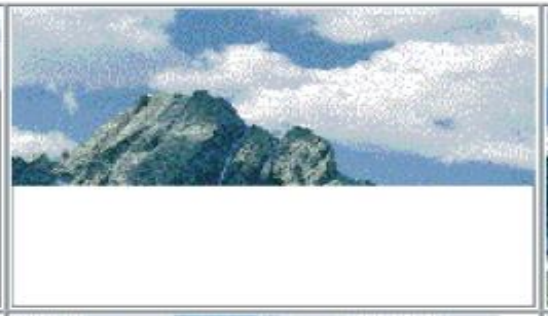
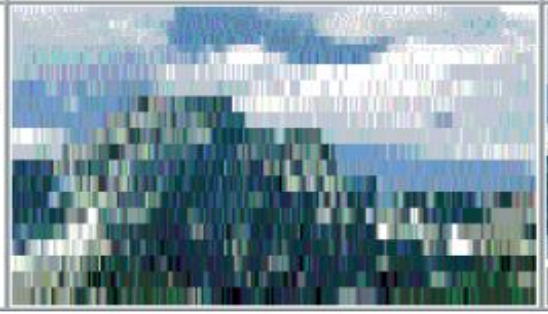
  - **GIF**
    - ❖The **GIF** format (short for **G**raphics **I**nterchange **F**ormat and using the file extension **.gif**) is a standard format for Web page images and is used most often with logos, banners, and other nonphotographic images.
    - ❖It is an efficient, compressed format that uses lossless file compression, so the quality of the image is not decreased when it is saved in the GIF format.
    - ❖GIF images can contain no more than 256 colors; using the smallest color palette size possible helps reduce the file size of the saved image.
    - ❖GIF images are always rectangular, but they can use a transparent background color to make the images appear to be nonrectangular (see Figure).
    - ❖GIF images can also be ***interlaced***, which means that the image is displayed initially at low resolution and its quality is progressively increased until it is displayed at full quality; noninterlaced GIFs are displayed top to bottom at full quality.

Fig: GIF Image

NONTRANSPARENT VS. TRANSPARENT GIFS

Nontransparent GIF (the image's white background is visible on top of the page's yellow background).		Transparent GIF with white specified as the transparent color (the yellow background is visible through the transparent areas of the image so the image appears to be nonrectangular).	

NONINTERLACED VS. INTERLACED GIFS

Noninterlaced GIF (the image is displayed top to bottom).			
Interlaced GIF (the complete image is displayed initially, but the quality is progressively increased).			

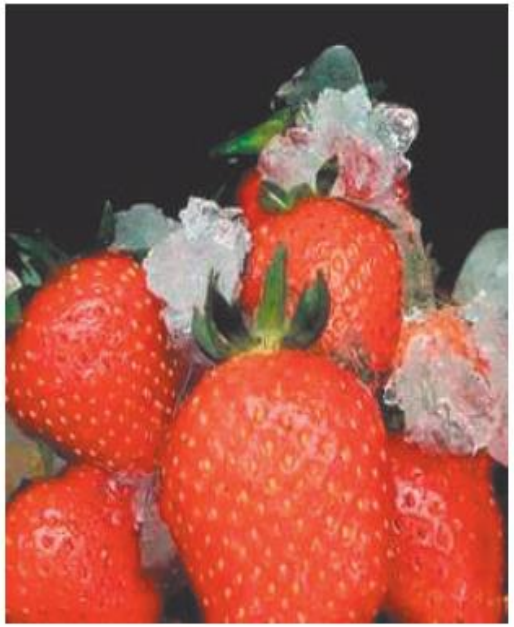
Elements of a Multimedia System - Images

- **PNG**
  - The **PNG** format (short for **P**ortable **N**etwork **G**raphics and using the file extension **.png**) is a format that was specifically created in 1996 for Web page images in response to patent issues surrounding the GIF format (image editing programs that use the GIF compression algorithm to output GIF images are subject to licensing fees).
  - The PNG format uses lossless compression, similar to GIF, but it can compress more efficiently than the GIF format for many nonphotographic images, which results in slightly smaller file sizes. PNG images can use a specific color palette of ***256 colors*** or ***less*** (like GIF images) or they can use ***true color*** (more than ***16 million colors***, like JPEG images).
  - PNG images can also be ***interlaced*** and ***transparent***.

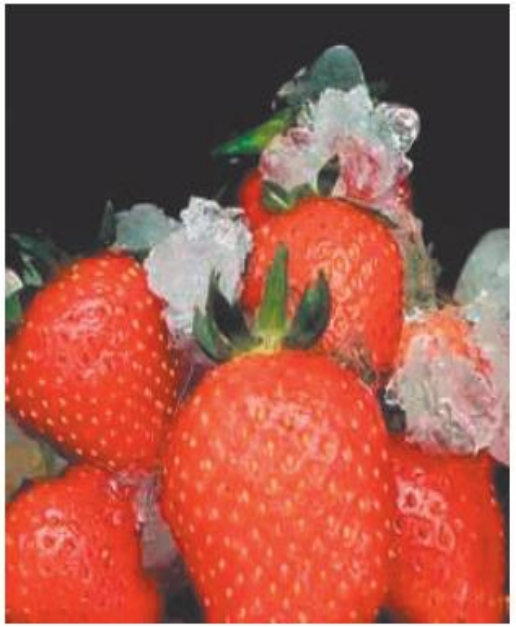
Elements of a Multimedia System - Images

- **JPEG**
  - The **JPEG** format (short for **J**oint **P**hotographic **E**xperts **G**roup and using the file extension **.jpg**) is the standard format for Web page photographs. JPEG images are compressed using lossy file compression, so image quality is lost during the compression process.
  - A compression amount from 0% to 100% is selected when an image is saved in the JPEG format. When a higher compression rate is selected, the file size is smaller but the image quality is reduced, as illustrated in Figure.
  - JPEGs can be designated as progressive, which means that the image is displayed initially in low resolution and the image quality is progressively improved, similar to interlaced GIFs. JPEG images can use true color, and so the JPEG format is typically used for photographs and other images that may require more than 256 colors.

Fig: JPEG



No compression
(37 KB)



40% compression
(13 KB)

80% compression
(7 KB)

100% compression
(3 KB)

Elements of a Multimedia System - Images

- **TIFF**
  - A **TIFF** (**T**agged **I**mage **F**ile **F**ormat) is a large raster file that doesn't lose quality. This file type is known for using "lossless compression," meaning the original image data is maintained regardless of how often you might copy, re-save, or compress the original file.
  - Despite TIFF images' ability to recover their quality after manipulation, you should avoid using this file type on the web - it can take forever to load. TIFF files are also commonly used when saving photographs for print.
  - ***Raster image*** are those images that are produced when scanning or photographing an object.
  - ***Vector image*** are those image that can be made infinitely large or small without losing quality. Common vector file types include **. AI** (Adobe Illustrator), **. EPS** (Encapsulated Postscript), and **. SVG** (Scalable Vector Graphics).

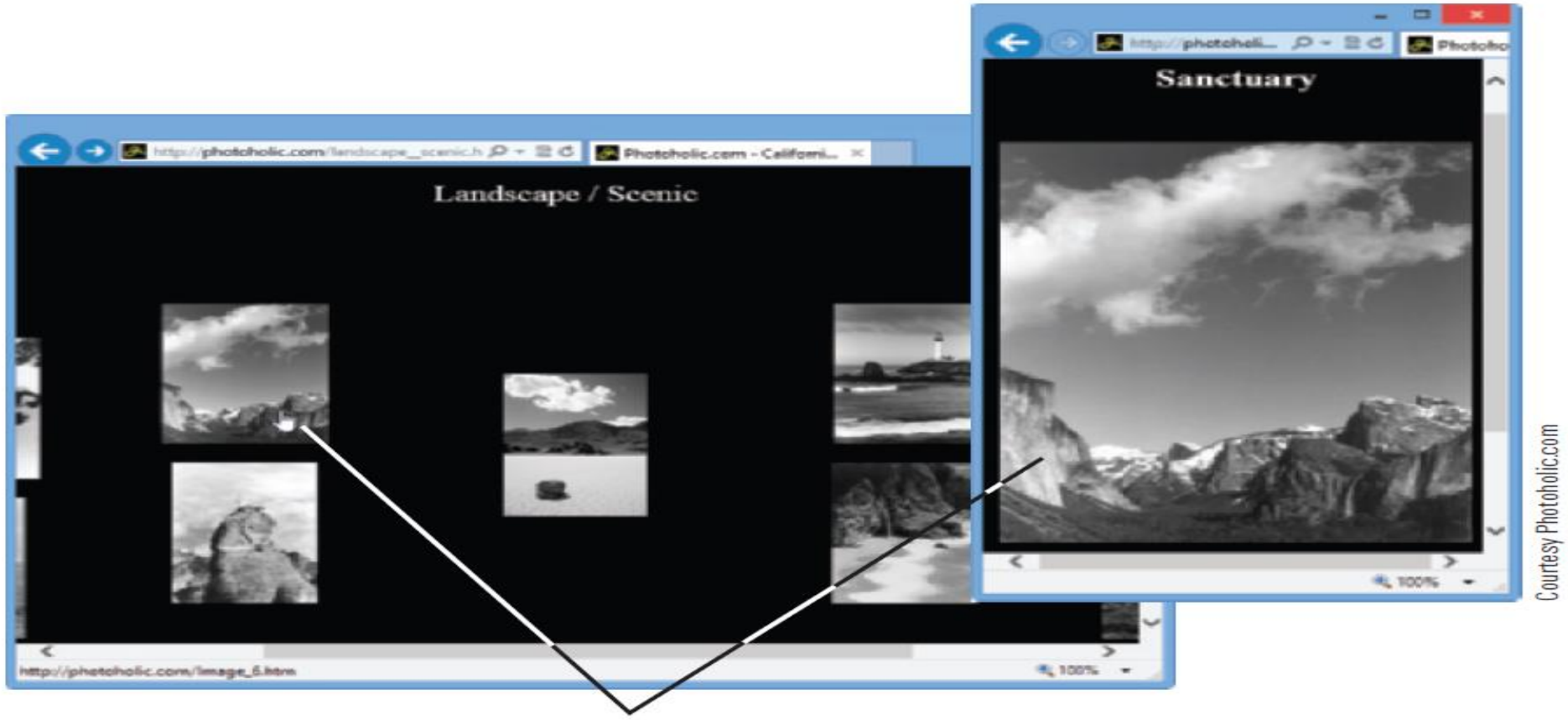
Elements of a Multimedia System - Images

- **Choosing a Graphic/Image Format:**
  - ❖When creating an image for use on a Web page, it is important to use the most appropriate graphic format and choose the appropriate settings to have as small a file size as possible (while retaining an acceptable level of quality) in order to reduce loading time.
  - ❖The GIF or PNG format is usually selected for line art (such as clip art, logos, navigation buttons, and so forth) because using these formats with line art images typically results in better quality images with smaller file sizes than using the JPEG format.
  - ❖With photographs, however, the JPEG format usually results in a higher quality image at a smaller file size than if the GIF or PNG format was used.
  - ❖It is also important to realize that the physical size of the image can greatly affect file size. Therefore, Web page images should be sized to their appropriate display size in an image editing program and saved before being inserted into a Web page.

Elements of a Multimedia System - Images

- When a Web page requires a very large image (such as to better show a product, home for sale, or featured piece of art), a thumbnail image can be used. Thumbnail images are small versions of images that are linked to a corresponding full-sized image; when a thumbnail image is clicked, the full-sized image is displayed (see Figure).
- Because the file size of a thumbnail image is very small, the use of thumbnail images doesn't significantly increase the page loading time for all users but still allows the users who want to view the full-sized image to do so.

Fig: Thumbnail Images



Clicking a thumbnail image displays the full-sized image.

Elements of a Multimedia System - Animation

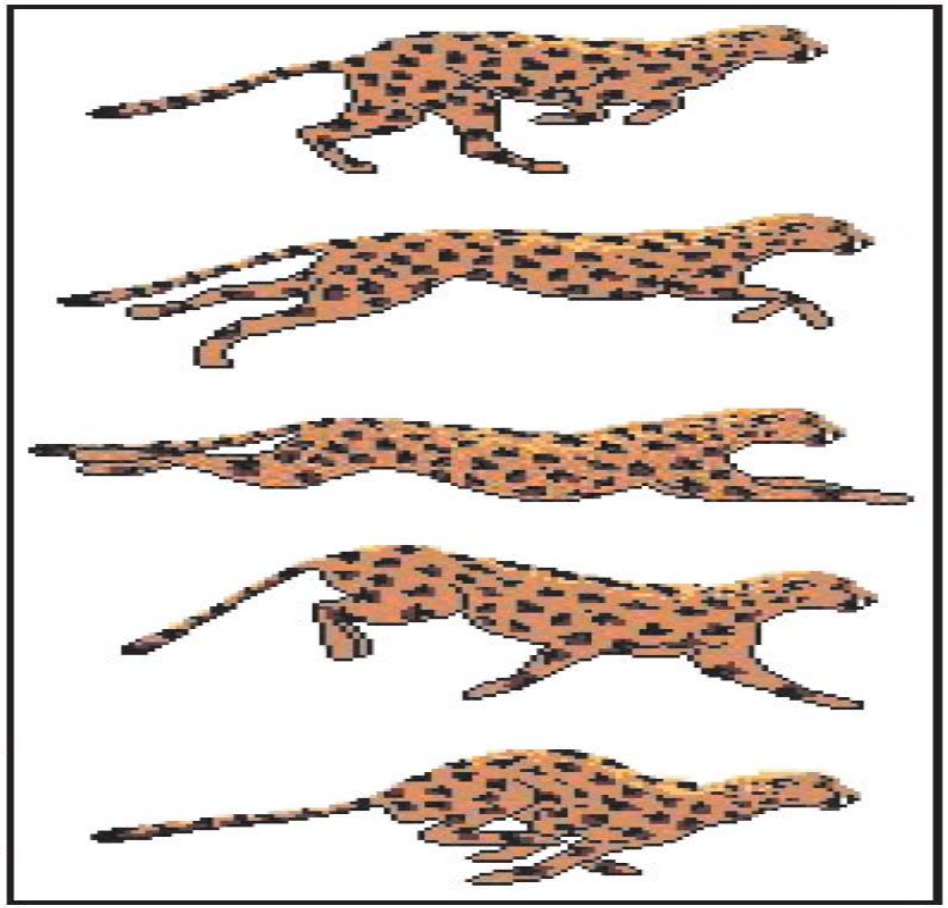
- ***Animation*** is the term used to describe a series of images that are displayed one after the other to simulate movement. To add simple animation to a Web page, Java applets and animated GIFs are frequently used.
- A Java applet is a small program inserted into a Web page that performs a specific task, such as changing the values in a stock portfolio or scrolling text and/or images across the screen.
- An ***animated GIF*** is a group of GIF images stored in a special animated GIF file that is inserted in a Web page, similar to any other image.
- The individual images contained in the animated GIF file (such as the ones shown in Figure) display one after another to simulate movement. Animated GIFs are often used to change the images displayed in an on-screen advertising banner.

Elements of a Multimedia System - Animation

- Web pages can also have more complex animations or interactivity, such as having text or an image change as a button on a menu or navigation bar is pointed to or having an animation sequence play when a button is clicked.
- These animations are often created using JavaScript or another scripting language, or they are created using animation development tools such as ***Flash*** or ***Silverlight***.
- To view many animations found on Web pages, you need to have JavaScript enabled in your browser or have the appropriate browser plug-in (such as Adobe Flash Player, Java, or Adobe Shockwave Player).

Fig: Animated GIFs

- **Animated GIFs:** When the images in the animated GIF shown below are displayed one after the other, it appears that the leopard is running.



Elements of a Multimedia System - Audio

- ***Audio*** includes all types of sound, such as music, spoken voice, and sound effects. Sound is commonly found on Web sites in the form of background music and downloadable music and podcasts, and as part of games, tutorials, videos, and other multimedia elements.
- Audio can be recorded using a microphone or **MIDI** (**M**usical **I**nstrument **D**igital **I**nterface) instrument; it can also be captured from CDs or downloaded from the Internet (some music and sound effect files are available for free; others require a fee to download and use).
- Audio files can be very large, so compression methods—such as the MP3 format—are frequently used to reduce their file size.
- To speed up delivery, audio files on Web pages are often in the form of streaming audio. With a streaming audio file, only a small portion of the audio file is initially downloaded and buffered (placed in memory or temporarily stored on the hard drive); this allows the audio file to begin playing while the remainder of the file downloads simultaneously.

Elements of a Multimedia System - Audio

- Audio files on Web pages are commonly played using an appropriate media player (such as Windows Media Player, Apple QuickTime Player, or RealPlayer) installed on the user's computer.
- Some of the most widely used audio file formats are listed below:
  - **Waveform (.wav)**—uncompressed format used for most music CDs; usually results in large file sizes.
  - **Moving Picture Experts Group Audio Layer 3 (.mp3)**—used to create very efficient, high quality compressed audio files. Waveform files can be converted to MP3 files to reduce their size.
  - **Audio Interchange Format File (.aiff)—**used for uncompressed files created with Apple Mac computers; a compressed version is AIFF-Compressed.
  - **Advanced Audio Coding (.aac or .m4a)—**used to encode audio data using the Moving Picture Experts Group 4 (.mp4) standard; a newer alternative to MP3 for both fixed and mobile Web applications.

Elements of a Multimedia System - Video

- While ***animation*** consists of ***individual images*** that are displayed ***one after another to look like they occur in that sequence***, ***video*** begins as a ***continuous stream*** of visual information that is broken into separate images or frames when the video is recorded.
- When the frames are projected—typically at a rate of 30 frames per second—they look like the original continuous stream of information. As you might imagine, at 30 images per second, even standard video files can become extremely large; HD and the emerging 4K (also called Ultra HD) video files are even larger.
- Consequently, video data—like audio data—is often compressed.

Elements of a Multimedia System - Video

- Some of the most common video file formats are listed below; like audio files, most can be played using a standard media player.
  - ❖**Audio-Video Interleave (.avi)**—a standard video file format developed by Microsoft.
  - ❖**Flash Video Format (.flv)**—a video file format designed to be played with the Adobe Flash Player; one of the most common Web video formats today.
  - ❖**Moving Picture Experts Group 2 (.mp2)**—a high-quality, compressed video file format.
  - ❖**Moving Picture Experts Group 4 (.mp4)**—a versatile format designed for media delivered via the Web; can include still and audio data, but frequently used for video as well.
  - ❖**QuickTime (.mov)**—a versatile video format developed by Apple and widely used to distribute video over the Web.
  - ❖**Windows Media Video (.wmv)**—a video format developed by Microsoft for use with Windows Media Player.

What Is Web Based Multimedia?

- While ***multimedia*** refers to the integration of a variety of media, ***Web-based multimedia*** (also called rich media) refers to multimedia—typically sound, video, or animation, in addition to text and images—located on Web pages.
- Multimedia Web pages are interactive, displaying information as requested by the Web page visitor via hyperlinks. In addition, multimedia Web sites often contain other interactive elements that the user interacts with directly, such as playing or pausing a video clip, controlling a 3D object, or playing a game.
- In the past, Web-based multimedia was very limited because computers and Internet connections were too slow to support it. Today's fast computers and broadband Internet connections, however, have made Web-based multimedia the norm.
- In fact, the vast majority of Web sites today include multimedia—for instance, it is often used in Web page advertisements (such as photos and video clips in banner ads), as regular Web site content (such as TV shows and photos posted on TV network Web sites or podcasts and product videos available via company Web sites), or as user-generated content uploaded to Web sites (such as videos uploaded to YouTube or photos uploaded to Facebook).

The Future Of Web Based Multimedia

- Although no one knows exactly what types of multimedia will be available in the future, it is a safe bet that they will be even more exciting and more embedded into everyday events than at present.
- Web-based content, cloud services, and home entertainment devices will likely continue to converge to allow seamless access to the desired content on the user's device of choice (TV, computer, smartphone, and so forth), regardless of where that content is located.
- Technology will continue to evolve to support the growing desire for mobile multimedia; the use of multimedia applications that are tied to a geographical location or current status and that involve user-generated content will also likely continue to grow.

Multimedia In Business

- Since multimedia is such an integral component of the Web today, it is important for businesses and individuals to understand the characteristics of the various types of multimedia elements and the impact of adding them to a Web site—both for the business or individual creating the Web site and for the visitors accessing the content.
- For instance, video is widely used on Web sites today. Before adding video to a Web site, however, the business or individual associated with the Web site needs to consider the cost of creating or obtaining the video, the cost associated with the ***bandwidth*** required to enable visitors to access the video, whether or not their intended audience is technically able to view the video with their access device of choice, and the ***file format*** the video should use.
- Individuals uploading video to YouTube or sending photos or video clips to others via their smartphones also need to understand file format and bandwidth limitations to ensure the content will be able to be viewed by the recipient and will not create a bandwidth issue for the recipient.
- Individuals choosing to view movie trailers, TV shows, and other video content via a Web site need to ensure the bandwidth required to access that content will not create problems for themselves, such as an unexpected expense for mobile users with a ***limited data plan*** or interruption of service for home broadband users with a ***bandwidth cap***.

Application or Uses of Multimedia

- **Multimedia in Advertising:**
  - Advertising has changed a lot over the past couple of decades, and this is mainly due to the increased use of the internet in business.
  - Multimedia plays a great and a vital role in the field of advertising. As whatever it is whether print or electronic advertisement, they first are prepared on the computer by using professionals' software's and then it is brought in front of the target audiences.
  - Some of different types of advertising are:
    - ❖Print advertising
    - ❖Radio (audio) advertising
    - ❖Television (video) advertising
    - ❖Digital advertising
    - ❖Display Ads
    - ❖Mobile advertising

Application or Uses of Multimedia (Contd.)

- **Multimedia in Education:**
  - In the area of education too, the multimedia has a great importance. Talking particularly about the schools, their usage has a significant role to play for children also. It is broadly used in the field of education and training. We used audio for imparting education even in traditional method, where charts, models etc. were used.
  - Nowadays the classroom need is not limited to that traditional method rather it needs audio and visual media. With the use of multimedia everything can be integrated into one system.
  - As an education aid the PC contains a high-quality display with mic option. This all has promoted the development of a wide range of computer-based training.

Application or Uses of Multimedia (Contd.)

- **Multimedia in Mass Media:**
  - It is used in the field of mass media i.e. ***journalism***, in various magazines and newspapers that are published periodically. The use of multimedia plays a vital role in a publishing house as there are many works of newspaper designing and other stuff also. Nowadays it's not only the text that we can see in the newspaper, but we can also see photographs in newspaper, this not only makes newspaper a perfect example but will also explain the worthiness of hypermedia.

- **Multimedia in Gaming Industry:**
  - One of the most exciting applications of multimedia is games. Nowadays, the live internet is used to play gaming with multiple players has become popular. In fact, the first application of multimedia system was in the field of entertainment and that too in the video game industry. The integrated audio and video effects make various types of games more entertaining.

Application or Uses of Multimedia (Contd.)

- **Multimedia in Science and Technology:**
  - Multimedia had a wide application in the field of science and technology. It is capable of transferring audio, sending message and formatted multimedia documents. At the same time, it also helps in live interaction through audio messages and it is only possible with the hypermedia. It reduces the time and cost can be arranged at any moment even in emergencies.
  - At the same time, it is useful for surgeons as they can use images created from imaging scans of human body to practice complicated procedures such as brain removal and reconstructive surgery. The plans can be made in a better way to reduce the costs and complications.

- **Multimedia in Fine Arts:**
  - In fine arts, there are multimedia artists, who blend techniques using different media that in some way incorporates interaction with the viewer. One of the famous artists is Peter Greenaway who is blending cinema with opera with the help of all sorts of digital media.

Application or Uses of Multimedia (Contd.)

- **Multimedia in Engineering:**
  - Software engineers often use multimedia in computer simulations for anything such as military or industrial training. It is also used for software interfaces which are done as collaboration between creative professionals and software engineers.
- **Multimedia in Research:**
  - In the area of mathematical and scientific research, multimedia is primarily used for modeling and simulation. For example, looking at a molecular model by a scientist of a particular substance and manipulate it to arrive at a new substance.
- **Multimedia in Medicine:**
  - The use of multimedia in medicine is increasing rapidly. In medicine, doctors can be trained by looking at a virtual surgery (Simulators). Using multimedia, they can simulate how the human body is affected by diseases spread by viruses and bacteria and then develop techniques to develop it.

THANK YOU!