

# Development of Multimedia

7



**M**ultimedia technology is becoming increasingly popular in the field of education. Interactive multimedia courseware in particular, developed on a CD is adding a new and interesting dimension to both teaching and learning. This new approach can effectively complement the conventional methods of learning and teaching. The multi-sensory input of this media provides possibilities for higher performance ratings and higher retention. With effective feedback, this method makes learning and teaching more meaningful. Students with different learning abilities can work at their own place, time and pace; and with interactivity and self-assessment it can make learning a highly personalized, independent and a rewarding experience. The learner can also set her/his own “view” of the information available to him/her. A significant aspect of multimedia in education is related to authoring or developing multimedia. Multimedia authoring as a form of computing has made it possible for students and teachers to construct knowledge and discover worlds which do not exist in conventional methods of learning or teaching. Above all, this new experience has defined a new concept of edutainment -- a combination of education and entertainment.

## Objectives

At the end of the section, you will be able to

- Design text and graphics according to the principles of text and graphics design;
- Prepare audio and video components using appropriate software and standards for use in multimedia;
- Discuss interactivity in multimedia courseware development; and
- Explain the importance of prototype preparation in multimedia development

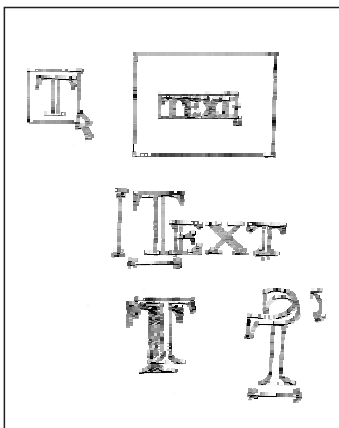
In this section, we will discuss some aspects of the 'how' of developing the multimedia, especially the components of multimedia, and the good practices in preparing text, graphics, audio, video, graphics, etc. for including in a multimedia programme.

## Text in Multimedia

Text is the most common medium of presenting information. It is also used to communicate a concept or an idea. It should effectively complement the other media. Factors that influence the textual communication are typeface, font and style, kerning, antialiasing, animation, special effects, special characters and hypertext. While dealing with text in multimedia it is very important to note that it is not the only means of communication. In multimedia, text is most often used for titles, headlines, menus, navigation and content. Overcrowding of text on a single page should be avoided.

It is recommended that text should be presented in combination with graphics.

**Typeface:** Typefaces are broadly categorized into two types - 'serif' and “sans-serif”. Serif is the small decoration at the end of the letter stroke while sans serif is the letter without a decoration. Serif fonts are commonly used in the body of the text,



## Serif Sans-Serif

**Arial**  
**Times New Roman**  
**Book Antiqua**  
**Comic Sans MS**  
**Bookman Old Style**  
**Courier New**  
**Verdana**

**A** 72 point size

while sans-serif fonts are used for headlines and bold statements.

**Fonts:** A font is a collection of characters of single size belonging to particular typeface family. Style and size are the main attributes of a font. Common font styles are bold and italic. Font sizes are expressed in points. A point is approximately 1/72 of an inch.

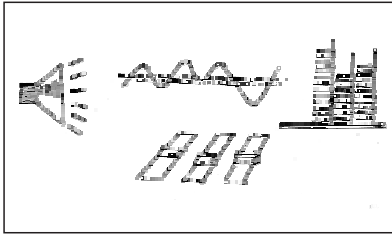
In the usage of fonts, it is recommended to vary as few number fonts as possible on the same page. The style, size and kerning may be adjusted as and when necessary. Anti-aliased text may be used for titles and headlines. Bold text may be more suitable to convey an idea or a concept. Text can be made attractive and pleasing to the eye by choosing the combination of colors for the font and background. Care should be taken for selecting the appropriate type of fonts on menus and buttons, symbols and special characters.

**Text Animation:** Presentation of text can be more fun and interesting through animation. A wide variety of methods are available to animate the text. Some of the methods are: scrolling (vertical and horizontal), zoom-in and zoom-out, fade-in and fade-out, dissolve etc. 3D text also has an impressive look. Care should be taken to introduce animation only at selected places where the presentation is most impressive. Authoring Programmes like Macromedia's Director have built in tools to animate text.

**Kerning:** It refers to adjustment of the space between two characters. Kerning makes certain combinations of letters, such as WA, MW, TA, and VA, look better. Only the most sophisticated word processors and desktop publishing systems perform kerning. Normally, you can activate or deactivate kerning for particular fonts.

**Anti-aliasing:** Aliasing is the well-known effect on computer screens, in fact, on all pixel devices where distortions occur at the edges of letters, in the case of text presentation. Anti-aliasing is the technique of making the edges smooth. Anti-aliased text is often called "grey-scale" text. Certain adaptations of anti-aliasing have enhanced both the legibility and aesthetics of on-screen type.

**Hypertext:** The function of hypertext is to build links and generate an index of words. The index helps to find and group words as per user's search criteria. Hypertext systems are very useful in multimedia interactive education courseware. Hypertext systems provide both unidirectional and bi-directional navigation. Navigations can be through buttons or through simple, plain text. The simple and easy navigation is through linear hypertext where information is organized in linear fashion. Non-linear hypertext, however, is the ultimate goal of effective navigation.



## Audio in Multimedia

Audio is another vital media in a multimedia presentation. Audio is available in different file formats and the appropriate file format is chosen to maximize its performance. Sound editors play an important role for converting file formats and also for enhancing the quality of sound. In most cases sound files are imported and edited for a multimedia application.

**Digital Audio:** The Sound recorded on an audio tape through a microphone or from other sources is in an analog (continuous) form. The analog format must be converted to a digital format for storage in a computer. This process is called 'Digitizing'. The method used for digitizing sound is called sampling.

**Sampling Rate:** Sampling rate is defined as the number of times the analog sound is sampled during each period and converted into digital information. Sampling rates are measured in Hertz (HZ or Kilo HZ). The most common sampling rates used in multimedia applications are 44.1KHZ, 22.05KHZ and 11.025KHZ. Higher rates of 192KHZ will probably be the professional DVD standards in future. Higher the sampling rate, higher is the quality of sound. A higher sampling rate however occupies more disk space. One can convert from a higher sampling rate to a lower rate (Down Sampling) when required.

**Sound Bit Depth:** Sampling rate and sound bit depth are the audio equivalent of resolution and color depth of a graphic image. Bit depth depends on the amount of space in bytes used for storing a given piece of audio information. Higher the number of bytes higher is the quality of sound. Multimedia sound comes in 8-bit, 16-bit, 32-bit and 64-bit formats. An 8-bit has 28 or 256 possible values; a 16-bit has 216 or 65,536 possible values. A single bit rate and single sampling rate are recommended throughout the work. An audio file size can be calculated with the simple formula:

File Size in Disk = (length in seconds) x (sample rate) x (bit depth / 8 bits per byte).

**Mono or Stereo:** Opting for mono may be a good choice as the file size is doubled for stereo. However stereo may be used only at those places where the requirement is a must.

**Digital Recording:** Digital sound can be recorded through microphone, keyboard or synthesizer or DAT (Digital Audio Tape) .Recording through a microphone connected to a sound card directly is not recommended as it is difficult to control the recording consistency and also to avoid amplification of noise. A better practice would be to record on a tape recorder after making all the changes required and then record it through sound card.

**Sound Editors:** Sound editors are very useful in creating sound, transforming file formats, and enhancing the quality of sound by cutting the noise. There are 3 sound editors used very frequently for multimedia applications. *Sound Forge*, *Cool Edit* and *Sound Edit 16*. Sound Forge for PC is regarded as probably the best software for audio recording and editing. Cool Edit, a low cost software, is easy to use giving a fairly good quality of sound. Sound Edit 16 allows you to record, edit and transform digital audio easily and quickly. It can be used to produce a variety of digital speech, sound effects and music clips.

**Sound File Formats:** The most common sound file formats are:

- WAV Window wave format
- AIFF Audio Interchange File Format -(wave form for use on MAC)
- AU Wave format developed by SUN Microsystems
- MP3 Compressed file format using MPEG1 Layer3 compression
- QT Digital audio quick time movies that contain only audio can be used in multimedia applications.
- SWA Shock Wave audio files compressed up to a ratio 176:1

The choice of the right format to use depends upon the file size, the nature of application and the operating system.

## Video in Multimedia

Video in multimedia is an extremely useful communication tool for presentations. It illustrates ideas and concepts besides capturing real world events. Video files occupy enormous space and so there are two choices to recommend:

- 1) Use very short video clips (not exceeding a minute or two)
- 2) Use highly compressed video files like MPEG. AVI files that can be transformed to MPEG files.

**Digital Video:** Digital video provides a superior means of communicating images and sounds of real world. Digital video has many more controls than digital audio, although both of them deal with time-based medium in the midst of a frame based medium.

**Frame Rate:** It is the number of frames per second that are displayed on the screen. A rate of 15 frames per second (fps) is recommended for most computers, although it cannot match the high quality of 30 fps.



### **iMovie**

Apples iMovie for MAC is regarded as the most powerful and also extremely easy to use making it the right choice for both amateurs and professionals. The output of iMovie is a fast creation of quick time video. The software also includes a number of special effects.

### **Studio DV**

PC counterpart of iMovie is studio DV of Pinnacle systems. This edition is also good for beginners and the package includes a video capture card. It auto detects and capture individual scenes within a video tape. The final movie can be exported to Quick time.

### **Adobe Premiere**

Premiere is often referred to as a best video editing option for PC. It has a highly customizable interface with a precise timeline editor and with great special effects tools. The package includes a Total Training CDROM. The output movie can be exported to a variety of video formats including windows media player

**Video Formats:** The most commonly used video formats are:

AVI

File format developed by Microsoft for windows. It is also known as video for windows (VFW).

MOV, MOOV, QT

Files belong to Apple Quick Time Movie. Flattened quick time video clips can be viewed on Unix workstations and on IBM compatible PC with media players.

MPEG,MPG

MPEG files use the MPEG-1 video compression routine. MPEG video clips can be viewed with IBM compatible PC and on Unix workstations.

**Colour Depth for Digital Video:** Digital video set at 24-bit are recommended for windows for an 8-bit or 16-bit images video performances through video editing.

**Video Compression:** As digital video files occupy a large bandwidth and extremely large space as compared to audio and graphics file formats, reducing the file size is of utmost importance. A number of CODEC methods are available to meet this requirement. The MPEG format for example uses inter-frame compression to get compression up to 200:1. This large compression is achieved at the expense of the quality of video. The inter-frame compression involves cutting out the visual information that is not noticeable to the human eye.

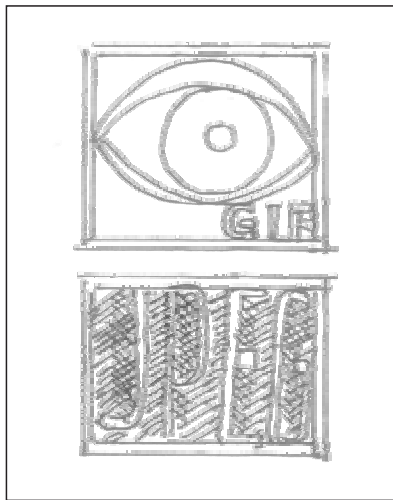
**Video Editors:** The popular softwares for video editing are Adobe Premiere 6.0, Pinnacle systems, Studio DV, Apple's Movie 2.0.1 and CoolEdit. For editing the analog video is first digitized through a video capture and then the appropriate software is used for editing. If a DV camcorder is used for video shooting then the video can be transferred to PC directly for editing. It is very important to note that video takes enormous disk space as much as 200MB per minute. So preview of the video and editing are done separately to suit one's requirement. The safest rule is to keep the video file size to absolute minimum.

The PC must be adequately equipped with a minimum of 20GB hard disk and a minimum of 128 MB RAM and with a good AGP card with 32 MB VRAM.

## **Graphics in Multimedia**

Graphics is the most commonly used element of multimedia. The richness of multimedia and the effective communication are through graphic presentations. The attributes of color, texture, pattern and animation enrich a multimedia presentation.

**Types of graphics:** The two approaches in designing graphics are: a) Raster graphics; and b) Vector graphics. Raster graphics, commonly known as bitmap images are based on a grid of pixels; vector graphics are based on mathematical formulas. Bitmap images are associated with 'paint' or 'photo'. Vector graphics occupy lesser memory and are easily 'scalable' i.e there is no loss of resolution when the image size is changed. Vector graphics are associated with 'drawing' or 'illustration'.

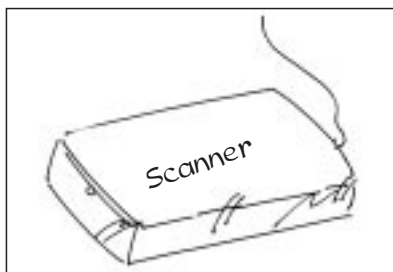


**Graphics formats:** Some of the commonly used graphic formats are:

**GIF** GIF stands for Graphics Interchange Format. GIF images are very small in size and so load faster than other formats. GIF make the file size small without losing or blurring any part of the image (lossless compression). GIF also supports transparency i.e they can be pasted on the top of a background image. GIF further supports animation. GIF supports only up to 256 colours.

**JPEG** JPEG stands for Joint Photographic Experts Group. This format is used to display photographic images. The advantage of using JPEG over GIF is that JPEG can display up to 16 million colors (True-color). Main disadvantage of JPEG is the loss of quality. JPEG does not support transparency or animation.

**PNG** PNG stands for Portable Network Graphics. It was designed to be an alternative to GIF file format. PNG formats are of two types: PNG-8 format holding 8 bits of color information (Similar to GIF) and PNG-24 format which holds 24 bits of color (similar to JPEG). PNG 24 is loss less. PNG also support transparency, but not animation.



**Scanning:** The basic purpose of scanning an image is to digitize it i.e convert it from an analog form into a digital form. Images are typically scanned at resolutions between 50 to 1200 Dots per Inch (DPI). Image resolution refers to number of Pixels per Square Inch. This is commonly called "dots per inch" or "dpi". In general, high resolution results in better image quality. While image resolution can always be reduced after scanning, increasing resolution after scanning will not improve image quality.

**Image Editing:** Digitized images can be edited by any image editing software like Adobe Photoshop or JASC's Paint Shop programme. The software can be used to enhance the image quality, and do several manipulations like crop, duplicate, fill, rotate and flip the image. Deleting and adding images to another image is also one of the interesting manipulations of the editing software.

## Animation in Multimedia

A very popular and a chief element of multimedia is animation. Animation is designed as a simulation of movement created by displaying a series of pictures or frames. Animation strictly is a visual illusion. It builds dynamism, energy and motion to inanimate objects. It also adds the dimension of time to graphics. Computer animation is relevant to multimedia as all the presentations are developed on the computer. The key concepts of computer animation are: key frames and tweening.

### Director

Macromedia Director is a leading multimedia software package, specially suited for animation. Director is regarded by many as the first choice for multimedia course development. It has several built in tools for animation. It also includes a programming language called Lingo which enhances the performance of the presentations.

### Flash

Earlier known as animator, Flash is based on vector graphics. It is a very popular package with its main attribute -- scalability. Flash uses multiple instances of the same object moving simultaneously in different points and directories to create impressive effects in the minimum bandwidth. Flash graphics have a pleasing softness and finish. Over all animation requires the combination of several tools blended creatively for maximizing the performance.

**Key frames:** Major frames of animation are created first. These frames define the key frames in which many changes take place. They are the 'key' points of animation. Key frames are specified to show how the moving objects will behave with time.

**Tweening:** Tweening is the process of generating intermediate frames between two images to give the appearance that the first image evolves smoothly into the second image. Tweening is a key process in computer animation. A software programme can automatically generate the in between frames.

**Software Tools:** Software used for animation determines the quality of computer animation produced. Some very popular animation software packages for windows are 3D Studio Max, Adobe Premiere, SoftImage, Animator Studio, Flash, etc. Software packages for Mac include Adobe Premiere, Elastic Reality, Strata Studio pro, etc.

**Animation File Formats:** The file formats for animation depends on the nature of software used. Based on this, you will have .dir (for Director), .fla (for flash), .max (for 3d studio max), .dcr (for shockwave animation file), etc.

## Interactivity

Interactivity can be understood as interplay between different elements of an environment. In human context, interaction can be between people to people or between people to objects. Multimedia itself is not inherently Interactive. It can be made interactive through authoring software. In interactive multimedia, it is the user's interaction with the programme that is explored. According to Crawford (1990) a good program establishes an interaction circuit through which the user and the computer are apparently in a continuous communication. Researches into learning styles show that students learn better through specific modalities such as visual, oral and kinetic. The goal of interactive multimedia is to provide to the student the choice of these modalities in a learning environment. Rhodes and Azbell (1985) have identified three levels of interactivity:

- **Reactive**     There is little learner control of content structure
- **Coactive**    Providing learner control for sequence, pace and style
- **Proactive**    Learner controls both structure and content

## Prototyping

A prototype is a miniature version of the final product. It is an incomplete product with either a reduced functionality or with a reduced set of features or both. Prototyping is a well established technique for arriving at a high quality finished product. Prototype is just the subsystem of the whole system. At any given time different subsystems are in different stages of production.

**Prototype design:** Prototyping forms a part of user-centered design in which the user is involved at all stages of system development process of requirements specification, design, evaluation and revision. Solution is arrived at by successive approximation and iterative design. For multimedia development, some of the components of the multimedia lesson are prepared to integrate them and demonstrate a prototype of what the final product would look like. It is at this stage that suggestions and critical feedback are received to improve the design of the programme in terms of interactivity and instructional design.

The development of multimedia courseware is a complex process of Integration and Interaction. It is an integration of a technology with learning; it is an interaction of the technology with the learner and the teacher. Both integration and interaction require planning, design and implementation. Planning involves the identification of goals, the end users and the available resources. In this section we have discussed the various components of multimedia, and have given some tips on how to prepare them, especially about their types and quality in multimedia programmes.

The multimedia technology is changing rapidly -- increasing in performance and decreasing in price. With better design of prototypes and with new or improved insights into the learning process the role of multimedia in education becomes more relevant and exciting.

In the next section we discuss how multimedia can be delivered to the learners.

