NATIONAL OPEN UNIVERSITY OF NIGERIA

CIT 742

Multimedia Technology

Module 1

CIT 742 Multimedia Technology Module 1

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Module 1 Introduction to Multimedia

Unit 1 Fundamentals of Multimedia

1.0 Introduction

This unit is designed to introduce you to multimedia basics. It provides an overview of the essential aspects of multimedia. It equally highlights the link between hypertext and hypermedia.

Thus, it is recommended that you go through the entire module systematically to gain some insight of the course.

2.0 Objectives

At the end of this unit, you should be able to:

- outline the development stages of multimedia
- give a concise definition of multimedia
- state typical applications of multimedia
- define the term 'hypermedia'
- identify the difference between multimedia and hypertext.

3.0 Main Content

3.1 History of Multimedia

The term "multimedia" was first coined by Bob Goldstein to promote the July 1966 opening of his "LightWorks at L'Oursin" show at Southampton, Long Island. On August 10, 1966, Richard Albarino borrowed the terminology, reporting: "Brainchild of songscribe-comic". Two years later, in 1968, the term "multimedia" was re-appropriated to describe the work of a political consultant, David Sawyer, the husband of Iris Sawyer—one of Goldstein's producers at L'Oursin.

In the late 1970s the term was used to describe presentations consisting of multi-projector slide shows timed to an audio track. However, by the 1990s 'multimedia' took on its current meaning.

In the 1993 first edition of McGraw-Hill's *Multimedia: Making It Work*, Tay Vaughan declared, "Multimedia is any combination of text, graphic art, sound, animation, and video that is delivered by computer. When you allow the user – the viewer of the project – to control what and when these elements are delivered, it is *interactive multimedia*. When you provide a structure of linked elements through which the user can navigate, interactive multimedia becomes *hypermedia*."

Subsequently, the German language society, Gesellschaft für deutsche Sprache, decided to recognize the word's significance and ubiquitousness in the 1990s by awarding it the title of 'Word of the Year' in 1995. The institute summed up its rationale by stating "[Multimedia] has become a central word in the wonderful new media world".

In common usage, the term multimedia refers to an electronically delivered combination of media including video, still images, audio, text in such a way that can be accessed interactively. Much of the content on the web today falls within this definition as understood by millions. Some computers which were marketed in the 1990s were called "multimedia" computers because they incorporated a CD-ROM drive, which allowed for the delivery of several hundred megabytes of video, picture, and audio data.

3.2 Multimedia and Hypermedia

In order to be effective in this digital age, one needs to understand two key technological terms used virtually in all facets of life - ***multimedia*** and ***hypermedia***. In practical terms, when someone turns on a computer, puts a compact disc (CD) in its CD drive, and listens to her favorite music while she works on a paper, she is experiencing multimedia. Other examples of multimedia usage include looking at pictures taken from a digital camera.

In contrast, surfing the World Wide Web, following links from one site to another, looking for all types of information, is called experiencing hypermedia. The major difference between multimedia and hypermedia is that the user is more actively involved in the hypermedia experience, whereas the multimedia experience is more passive.

3.2.1 What is Multimedia?

Several authors have depicted multimedia in different ways. Essentially, it can be described as the integration of sound, animation, and digitized video with more traditional types of data such as text. It is an application-oriented technology that is used in a variety of ways, for example, to enhance presentations, and is based on the increasing capability of computers to store, transmit, and present many types of information.

A good general definition 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.

3.2.2 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. Some examples of multimedia applications are: business presentations, online newspapers, distance education, and interactive gaming, advertisements, art, entertainment, engineering, medicine, mathematics, business, scientific research and spatial temporal applications.

Other examples of Multimedia Applications include:

- World Wide Web
- Hypermedia courseware
- Video conferencing
- Video-on-demand
- Interactive TV
- Groupware
- Home shopping
- Games
- Virtual reality
- Digital video editing and production systems
- Multimedia Database systems

3.2.3 Hypertext

Typically, a Hypertext refers to a text which contains links to other texts. The term was invented by Ted Nelson around 1965. Hypertext is therefore usually non-linear (as indicated below).

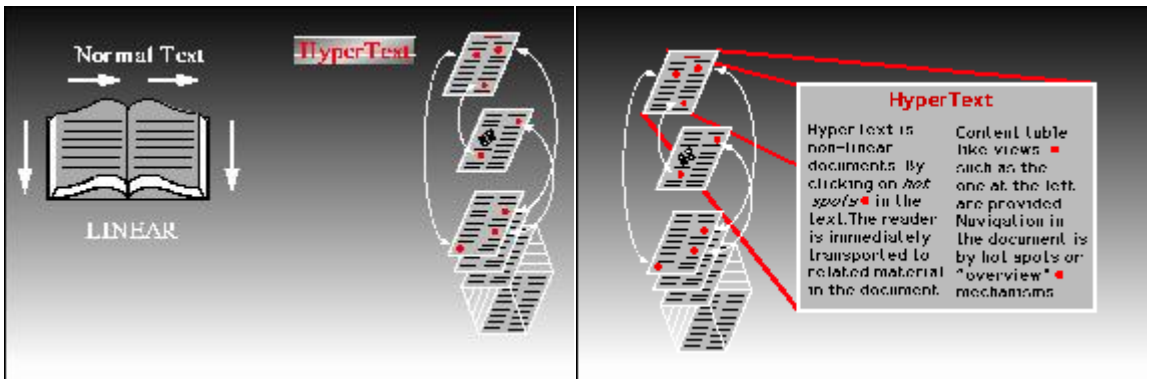
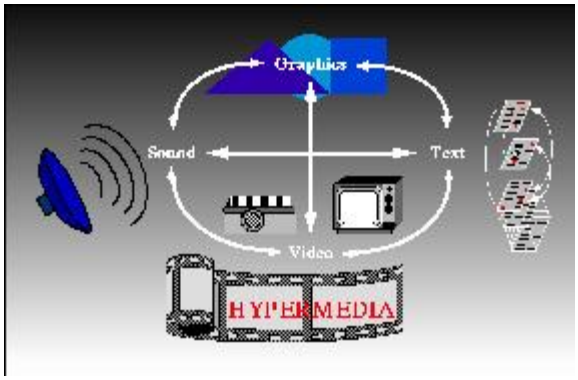


Figure 1.0

3.2.4 Hypermedia

HyperMedia is not constrained to be text-based. It is an enhancement of hypertext, the non-sequential access of text documents, using a multimedia environment and providing users the flexibility to select which document they want to view next, based on their current interests. The path followed to get from document to document changes from user to user and is very dynamic. It can include other media, e.g., graphics, images, and especially the continuous media - sound and video. Apparently, Ted Nelson was also the first to use this term.



The World Wide Web (WWW) is the best example of hypermedia applications.

Self-Assessment Exercise

State the main distinction between multimedia and hypermedia.

4.0 Conclusion

In this unit, we highlighted the development stages of multimedia and described the terms-multimedia, hypertext and hypermedia. We equally considered the multimedia applications as well as the relevance of multimedia and hypermedia.

5.0 Summary

This unit provided an overview of the history of multimedia; description of multimedia, hypertext and hypermedia. Now, let us attempt the questions below.

6.0 Self-Assessment Excises

1. State at least 3 media sources
2. Give a concise definition of multimedia
3. What is a multimedia application?

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Unit 2 Multimedia Systems

1.0 Introduction

In unit 1, we gave an overview of fundamentals of multimedia and multimedia applications. This unit provides information about multimedia systems.

2.0 Objectives

At the end of this unit, you should be able to:

- identify four characteristics of multimedia systems
- outline the components of multimedia systems
- describe the challenges for multimedia systems

3.0 Main Content

3.1 Characteristics of a Multimedia System

Basically, a Multimedia system has four vital 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***.

3.2 Challenges for Multimedia Systems

Multimedia systems may have to render a variety of media at the same instant -- a distinction from normal applications. There is a temporal relationship between many forms of media (**e.g.** Video and Audio). Multimedia systems are often required for:

- Sequencing within the media -- playing frames in correct order/time frame in video
- Synchronization -- inter-media scheduling (e.g. Video and Audio). Lip synchronization is clearly important for humans to watch playback of video and audio and even animation and audio. Ever tried watching an out of (lip) sync film for a long time?

Hence, the key issues multimedia systems need to deal with here are:

- How to represent and store temporal information.
- How to strictly maintain the temporal relationships on play back/retrieval
- What are the processes involved in tackling these issues?

Another challenge is that the initial forms of data have to be represented ***digitally, i.e.*** translated from the analog source to the digital representation. The will involve scanning (graphics, still images), sampling (audio/video) although digital cameras now exist for direct scene to digital capture of images and video.

3.3 Desirable Features for a Multimedia System

Haven discovered the challenges that have to be surmounted in using multimedia systems; the following features are desirable for a Multimedia System:

, design and develop applications, deliver media. **Very High Processing Power:** This is a requirement for dealing with large data processing and real time delivery of media.

Multimedia Capable File System: This feature is essential for delivering real-time media - ***e.g.*** Video/Audio Streaming. Special Hardware/Software needed ***e.g.*** RAID technology.

Data Representations/File Formats that support multimedia: Data representations/file formats should be easy to handle yet allow for compression/decompression in real-time.

Efficient and High I/O: Input and output to the file subsystem needs to be efficient and fast. It is necessary to allow for real-time recording as well as playback of data. ***e.g.*** Direct to Disk recording systems.

Special Operating System: A special operating system is required to provide access to file system and process data efficiently and quickly. Consequently, the multimedia system needs to support direct transfers to disk, real-time scheduling, fast interrupt processing, I/O streaming *etc.*

Storage and Memory: Large storage units (of the order of 50 -100 Gb or more) and large memory (50 -100 Mb or more). Large Caches also required and frequently of Level 2 and 3 hierarchy for efficient management.

Network Support: Client-server systems commonly known as distributed systems.

Software Tools: User friendly tools are needed to handle media

3.4 Components of a Multimedia System

We can now consider the core components 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 disks, CD-ROMs, Jaz/Zip drives, DVD, *etc*

-Communication Networks

-- Ethernet, Token Ring, FDDI, ATM, Intranets, Internets.

-Computer Systems

-- Multimedia Desktop machines, Workstations, MPEG/VIDEO/DSP Hardware

-Display Devices

-- CD-quality speakers, HDTV,SVGA, Hi-Res monitors, Colour printers *etc.*

Self-Assessment Exercise

Identify four vital characteristics of multimedia systems

4.0 Conclusion

From our studies in this unit, it is important to remember that there are four vital characteristics of multimedia systems. It is equally pertinent to note the core components of multimedia systems as well as the challenges for multimedia systems.

5.0 Summary

In this unit, we looked at the fundamental characteristics and components of multimedia systems. We equally considered the challenges for multimedia systems. We hope you found the unit enlightening. To assess your comprehension, attempt the questions below.

6.0 Self-Assessment Exercise

1. Outline the components of multimedia systems

2. Describe the challenges for multimedia systems

7.0 References/Further Readings

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Unit 3 Multimedia Authoring Systems

1.0 Introduction

The initial task we have in this unit is to explain the concept of multimedia authoring system and authoring paradigm. You might be tempted to think you're never going to get to grips with these terms. But don't worries - after a few lessons, things will start to feel familiar.

2.0 Objectives

At the end of this unit, you should be able to:

- describe the concept of an authoring system
- state the significance of an authoring system
- explain the term 'authoring paradigm'
- list the main authoring paradigms
- give the authoring paradigm best suited for rapid prototyping
- state the correlation between iconic/flow control and frame authoring paradigm.

3.1 Main Content

3.1 Authoring System

An Authoring System simply refers to a program which has pre-programmed elements for the development of interactive multimedia software titles. Authoring systems vary widely in orientation, capabilities, and learning curve. There is no such thing (at this time) as a completely point-and-click automated authoring system; some knowledge of heuristic thinking and algorithm design is necessary.

Whether you realize it or not, authoring is actually just a speeded-up form of programming; you don't need to know the intricacies of a programming language, or worse, an API, but you do need to understand how programs work.

3.2 Significance of an Authoring System

It generally takes about 1/8th the time to develop an interactive multimedia project, such as a CBT (Computer Based Training) program, in an authoring system as opposed to programming it in compiled code. This means 1/8 the cost of programmer time and likely increased re-use of code (assuming that you pass this project's code to the next CBT project, and they use a similar or identical authoring system).

However, the content creation (graphics, text, video, audio, animation, etc.) is not generally affected by the choice of an authoring system; any production time gains here result from

accelerated prototyping, not from the choice of an authoring system over a compiled language.

3.3 Multimedia Authoring Paradigms

The ***authoring paradigm*** is a term used to describe the methodology by which the authoring system accomplishes its task.

There are various paradigms, including:

3.3.1 Scripting Language

The Scripting paradigm is the authoring method closest in form to traditional programming. The paradigm is that of a programming language, which specifies (by filename) multimedia elements, sequencing, hotspots, synchronization, etc. A powerful, object-oriented scripting language is usually the centerpiece of such a system; in-program editing of elements (still graphics, video, audio, etc.) tends to be minimal or non-existent. Scripting languages do vary; check out how much the language is object-based or object-oriented. The scripting paradigm tends to be longer in development time (it takes longer to code an individual interaction), but generally more powerful interactivity is possible. Since most Scripting languages are interpreted, instead of compiled, the runtime speed gains over other authoring methods are minimal. The media handling can vary widely; check out your system with your contributing package formats carefully. The Apple's HyperTalk for HyperCard, Assymetrix's OpenScript for ToolBook and Lingo scripting language of Macromedia Director are examples of a Multimedia scripting language.

Here is an example lingo script to jump to a frame

```
global gNavSprite

on exit Frame

go the frame

play sprite gNavSprite

end
```

3.3.2 Iconic/Flow Control

This tends to be the speediest (in development time) authoring style; it is best suited for rapid prototyping and short-development time projects. Many of these tools are also optimized for developing Computer-Based Training (CBT). The core of the paradigm is the Icon Palette, containing the possible functions/interactions of a program, and the Flow Line, which shows the actual links between the icons. These programs tend to be the slowest runtimes, because each interaction carries with it all of its possible permutations; the higher end packages, such as Authorware (Fig. 2.1)or IconAuthor, are extremely powerful and suffer least from runtime speed problems.

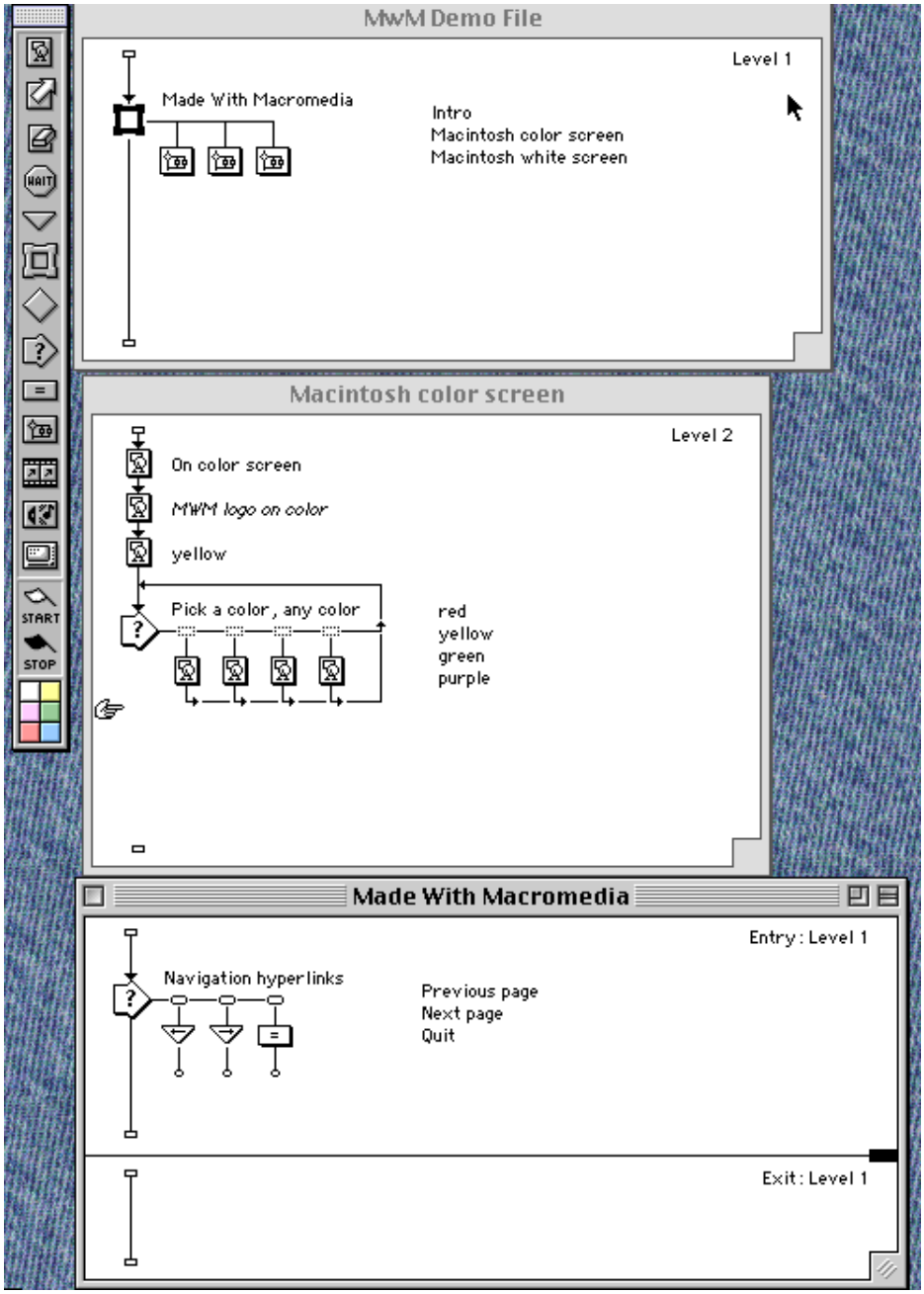

Figure 1.Macromedia Authorware Iconic/Flow Control Examples

3.3.3 Frame

The Frame paradigm is similar to the Iconic/Flow Control paradigm in that it usually incorporates an icon palette; however, the links drawn between icons are conceptual and do not always represent the actual flow of the program. This is a very fast development system, but requires a good auto-debugging function, as it is visually un-debuggable. The best of these have bundled compiled-language scripting, such as Quest (whose scripting language is C) or Apple Media Kit.

3.3.4 Card/Scripting

power (via the incorporated scripting language) but suffers from the index-card structure. It is excellently suited for Hypertext applications, and supremely suited for navigation intensive (a la Cyan's "MYST" game) applications. Such programs are easily extensible via XCMDs and DLLs; they are widely used for shareware applications. The best applications allow all objects (including individual graphic elements) to be scripted; many entertainment applications are prototyped in a card/scripting system prior to compiled-language coding.

3.3.5 Cast/Score/Scripting

The Cast/Score/Scripting paradigm uses a music score as its primary authoring metaphor; the synchronous elements are shown in various horizontal ***tracks*** with simultaneity shown via the vertical columns. The true power of this metaphor lies in the ability to script the behavior of each of the cast members. The most popular member of this paradigm is Director, which is used in the creation of many commercial applications. These programs are best suited for animation-intensive or synchronized media applications; they are easily extensible to handle other functions (such as hypertext) via XOBJs, XCMDs, and DLLs.

Self-Assessment Exercise

What is the significance of an authoring system?

4.0 Conclusion

In sum, an Authoring System refers to a program which has pre-programmed elements for the development of interactive multimedia software titles. It generally takes about 1/8th the time to develop an interactive multimedia project, in an authoring system as opposed to programming it in compiled codes. The term ***authoring paradigm*** describes the methodology by which the authoring system accomplishes its task.

5.0 Summary

In this unit, we considered authoring systems and authoring paradigms. We equally looked at the specific applications of the different authoring paradigms. Hoping that you understood the topics discussed, you may now attempt the questions below.

6.0 Self-Assessment Exercise

1. Explain the term ‘authoring paradigm’
2. List the main authoring paradigms
3. Give the authoring paradigm best suited for rapid prototyping
4. State the relationship between iconic/flow control and frame authoring paradigm

7.0 References/Further Reading

Lowe and W. Hall, J. (1999). Hypermedia and the Web: An Engineering Approach, 1999 (ISBN 0-471-98312-8).

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