



African Virtual University

Applied Computer Science: ITI 4106

MULTIMEDIA TOOLS AND APPLICATIONS

Julius Azasoo

Foreword

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This module was developed as part of a diploma and degree program in Applied Computer Science, in collaboration with 18 African partner institutions from 16 countries. A total of 156 modules were developed or translated to ensure availability in English, French and Portuguese. These modules have also been made available as open education resources (OER) on oer.avu.org.

On behalf of the African Virtual University and our patron, our partner institutions, the African Development Bank, I invite you to use this module in your institution, for your own education, to share it as widely as possible and to participate actively in the AVU communities of practice of your interest. We are committed to be on the frontline of developing and sharing Open Educational Resources.

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Course Overview

Welcome to Multimedia tools and applications

The explosion of the Internet has increased the demand of multimedia content. The multimedia applications become constituent parts of the activities on the Internet. Multimedia are media that use various forms of information contents and information processing to communicate concepts or ideas aimed at informing or entertaining the user (eg, text, audio , graphics, animation, video, interactivity). The term also refers to digital technologies that are used to create, manipulate, store and search information .

Prerequisites

A previous knowledge in Principles of Programming and Structured Programming will be an added advantage.

Materials

The materials required to complete this course are:

- Multimedia Laboratory/Hardware
- Internet access
- Tools and software for multimedia content development
- Online resources

Course Goals

This course aims to equipping students with the knowledge and skills to carry out technical and design activities relating to planning projects and multimedia applications systems, with a view to creating solutions to information and communications. In this context, the concepts of Multimedia will be addressed, the benefits of Multimedia applications, types Multimedia applications, development stages in Multimedia projects, Multimedia tools as well as compression and encoding technologies.

Upon completion of this course the learner should be able to:

1. Describe what multimedia entails;
2. Demonstrate an understanding Interactive Multimedia and Hypermedia;
3. Demonstrate a good understanding of Multimedia applications;
4. Develop of Multimedia Internet applications;
5. Explain Multimedia Authoring processes and techniques;
6. List and use tools for developing Multimedia projects;
7. Compare and contrast IT tools for authoring 2D and 3D Drawings;
8. Apply the Multimedia compression technologies to image, audio, animation and video

Units

Unit 0: Introduction and Requirements

This unit introduces the course and discusses the requirements needed to achieve the objectives of this course. It also presents the modules pre-assessment.

Unit 1: Introduction to Multimedia

This unit introduces the students to the concepts of multimedia and examines the elements of multimedia. It concludes by enumerating some multimedia development applications.

Unit 2: Multimedia Authoring

This unit explores the categories of multimedia authoring tools and describes the hypermedia authoring with emphasis on Internet as a hypermedia authoring tool.

Unit 3: Design and development process of Multimedia project and documentation

In this unit, the steps involved in multimedia project management is explored with the aim of equipping the student to create multimedia project.

Unit 4: Paradigms and models of multimedia authoring

The various screen models for multimedia presentations are examined here.

Unit 5: Interactive multimedia applications

The categories of multimedia users are presented here. The unit compares the various categories of multimedia users.

Unit 6 : Compression and encoding techniques and methods for multimedia information

Compression techniques in audio, image, animation and video were explored. The operating principles of methods and compression standard for multimedia information is presented here.

Assessment

Formative assessments, used to check learner progress, are included in each unit.

Summative assessments, such as final tests and assignments, are provided at the end of each module and cover knowledge and skills from the entire module.

Summative assessments are administered at the discretion of the institution offering the course. The suggested assessment plan is as follows:

Schedule

Unit	Activities
1: Introduction to Multimedia	<ol style="list-style-type: none"> 1. Introduction to multimedia 2. Types of multimedia information 3. Characteristics of multimedia systems 4. Multimedia applications 5. Assessment
2: Multimedia Authoring	<ol style="list-style-type: none"> 1. Steps to multimedia authoring 2. Parameters of authoring systems' evaluation 3. Fundamentals of content authoring tools 4. Fundamentals of authoring for sharing 5. Assessment
3: Design and development process of Multimedia project and documentation	<ol style="list-style-type: none"> 1. Multimedia project 2. Multimedia project evaluation process 3. Factors that affect multimedia project management 4. Steps of multimedia project development 5. Assessment
4: Paradigms and models of multimedia authoring	<ol style="list-style-type: none"> 1. Introduction to multimedia design models 2. Screen Model based design 3. Content synchronization based models 4. Assessment
5: Interactive multimedia applications	<ol style="list-style-type: none"> 1. Introduction to media interactivity 2. Classification of multimedia application 3. Distribution of multimedia applications 4. Assessment

Course Overview

6: Compression and encoding techniques and methods for multimedia information	1. Compression and encoding
	a. Image
	b. Animation
	c. Audio
	d. Video
	2. Presentation of digital images
	3. Presentation of digital audio
	4. Presentation of digital video
	5. Assessment

Unit 0. Introduction and Requirements

Unit Introduction

The purpose of this unit is to determine your grasp of knowledge related to this course. The information age has brought with it new paradigms and technological resources that are almost common to any individual or group of individuals. We are all familiar with the Internet, ubiquitous computing, e-business, interactive T.V., 3rd and 4th generation mobile phones with amazing functionalities, etc.

According to the Oxford Dictionary, multimedia involves interactively incorporating audio, video in communication and expressing an idea in different forms . It should be noted that multimedia is more than just combination of colours but still image or motion (video) and audio. In our everyday life, we come across multimedia experiences from living in a world where space and time and our senses provide us with a multimedia experience . The advancement of information and communication technologies have enabled these become almost like reality.

Turning again to the dictionary, interactivity is defined as the process by which two people or things work together to influencing each other. When we refer to the media on the computer they are often described as the situations in which the concept of interaction appears. To give the user an active role and to control the way information is received is key. This way you can control the transfer of information and regulate its flow according to our abilities, interests, requirements and availability.

In effect the ability to combine the various media into multimedia information, allows us to communicate more information than we would have using the individual elements of the multimedia. The Multimedia Tools and Applications module focuses on the introduction and discussion of multimedia concepts associated multimedia technologies and their applications for efficient utilization of content authoring tools in order to maximize its use in organizations.

Unit Objectives

Upon completion of this unit you should be able to:

- What explain the concepts of Multimedia and interactivity
- Critically examine the importance of development of multimedia projects
- Relate multimedia to the information societies

Key Terms

Interactivity: characteristic of multimedia systems that allows users to control how and when the information is presented

Multimodal system: system that stimulates various perceptions (senses) of the human being (sight, hearing, touch, taste or smell) . Also known as multi-sensory system. Multimedia system may be multimodal, interact with only one of perceptions, although having various means (eg, images and video)

Unit Readings and Other Resources

The readings in this unit are to be found at the course-level section "Readings and Other Resources".

Unit 1: Fundamentals of Multimedia

Unit Objectives

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

- Explain what Multimedia entails
- List the elements of Multimedia
- Enumerate the different Multimedia applications
- Describe the stages of development of Multimedia applications.

Unit Introduction

In this unit, content include the introduction of the media, the types of multimedia information, multimedia systems and the creation of media content. The Multimedia designates a technological area that has been progressing very quickly. The development of systems and interactive multimedia applications that take advantage of the media is essential to the integration of technologies to communicate effectively in the context of the current Information Society. The main objective of this book is to present a reasoned introduction, clear, accessible, comprehensive and integrated concepts, methodologies and latest technologies that support the development of multimedia applications and interactive hypermedia and multimedia projects. The text presents a fluid method, the basics, including elementary concepts, techniques and the most current illustrations.

Currently, new media information is emerging on the latest technologies, formats, tools and multimedia applications for the Web and mobile devices. Interactive multimedia applications such as games and game consoles, e-learning, e-books and e-zines, kiosks, augmented reality, computer vision, interactive multi touch exteriors; interactive digital TV and 3D TV, mobile applications on smartphones and tablets, optical media CD, DVD, Blu-ray and holographic. Languages and scripting for the development of Web applications like AJAX, HTML 5, XML, JavaScript, and CSS 3; Web 2.0 (social), Web 3.0 (semantic) and multimedia clouds. Methods and hypermedia authoring tools like Flash and multimedia content such as photos, graphics, digital audio and video.

It is about the development of multimedia technologies resulting from the convergence of computing, telecommunications entertainment.

“All communication technologies are undergoing a junction metamorphosis that can only be understood fully if they are addressed in an integrated way,” Nicholas Negroponte, 1979.

1.1 Multimedia: What is it?

From the etymological analysis of the word, the prefix “Multi” comes from the Latin word “multus” which means “multiple or large Raíz media”. Plural of the word “medium” in Latin means “half” or “center” through multiple intermediaries or multiple means. That is, communication involves various means to convey a message.

Contextualization concept

The context of use as an adjective (Fluckiger 1995), falls:

- Media Market
- Multimedia Product
- Multimedia Application
- Media Service
- Multimedia Technology
- Multimedia Platform
- Multimedia Card
- Media Storage Device
- Media Network

Key Terms

Mass media - Identifies the various intermediaries between producers and the information consumers (EUA 1923); It includes media such as (radio, television, press)

Presentation Media - scope of human-machine interaction; physical means used to present information to humans (monitors CRT, plasma, columns, ...)

Newspapers and magazines – It presents information by various means, such as text and illustrations.

TV - mixing sound, text and moving images.

Video recorder VHS - stores and plays sound and moving images.

According to the given definitions, Digital Multimedia is the area related to the combination, controlled by computer, text, graphics, still and moving images, animations, sounds and any other means by which information can be represented, stored, transmitted and processed in digital form.

Transmission Media - Refers to the physical means through which the information is transmitted; the field of telecommunications (wire harnesses, radio waves, satellites)

Storage Media - physical means of storage such as area computer (magnetic hard drives, optical disks, ...)

Perception Media - refers to the nature of perceivable information to humans. It should be noted that all the meanings attributed to the word averagely converge on the notion of information. Thus, the concept of Multimedia then is reorganized to include: "The number of intermediaries between the sources and the destination, or the various means by which information is stored, transmitted, displayed or perceived. However this concept is too broad, because it forces to classify as Multimedia:

Based on this definition, we can say that:

- A WORD document is a multimedia document provided it includes a text and an image or a graph.
- Difference between digital documents and multimedia documents;

According to Nuno Ribeiro (2004), Fluckiger (1995), Multimedia means the combination, controlled by computer, text, graphics, images, video, audio, animation, and any other means by which the information can be represented, stored, transmitted and processed in digital form, in which there is at least one type of cold media (text, graphics or pictures) and a type of dynamic media (Video, Audio or Animation).

Obviously there are other definitions:

- Fetterman & Gupta (1993), restricts the concept to applications involving interactivity, color and multisensory presentations.
- Vaughan (2001), includes non-interactive applications and even non-digital devices; any combination of text, graphic, sound, animation and video, by any electronic means.
- Chapman & Chapman (2000) - Current Definition of Multimedia: The simulation concept is controlled by a computer that includes a type of static media and a type of dynamic medium (media types see page 6).
- Minoli & Keinath (1994) - define multimedia as a technology that captures the attention of users through videos, graphics, audio and text (non-numeric information).

We can consequently conclude that the concept of multimedia met four stages / different times.

Conclusion

The Activity “Multimedia Fundamentals”, contains the introduction to Multimedia, its context and Interactive Technologies, reference to new technologies, new content authoring tools and multimedia applications and new areas of use of multimedia technologies.

Self-check 1.1

Based on the above, come up with a new definition of multimedia

What types of media is associated with the file extensions .txt, .rtf, .avi, .png, .bmp, and .au?

(Hint: look in the Control Panel)

That application is performed by the Windows operating system, when you click a PDF document. How do you change this setting?

Search the Internet for information about the media type applications: vnd.ms-PowerPoint and video / mpeg. Does it fit into our definition of multimedia?

1.2 Multimedia Information Types

The diverse use of different media, between the transmitter and receiver to the message of the decoder is, simply Multimedia, several types of media which, when combined, produce the multimedia products. In total, there are six media types that are the basis for the creation of systems and multimedia applications. These types of media can be grouped according to their spatial-temporal nature into two groups: static and dynamic.

Types of Media

The systems and multimedia applications combine the following types of medium.

1. Text
2. Graphics
3. Images, also known as bitmaps (bitmap images)
4. Video (moving images)
5. Animation (motion graphics)
6. Audio (sound)

1. Text: The digital text can take many forms:
 - Plain Text - plain text generated by text editors; does not allow different fonts or styles; only the characters;
 - Rich Text - enriched text produced by word processors; They have different fonts, colors, styles, etc. (Used in newspapers, magazines);
 - HyperText - text with links to other documents.

2. Graphics and Images - Analogy: Images are for graphics in multimedia documents and photographs are to the drawings in conventional documents;
 - graphics - vector data (points, lines, circles, squares, etc.); Used in logos, icons, etc.
 - Images - are bitmaps; maps are given by a certain width and height in points (resolution).

3. Digital Video - Digital video can be obtained in several ways:
 - Using digital cameras;
 - Using the analog camcorders, TV, etc.

All these media represented in digital form, are distinguished from each other by interpretation given their binary digits, since it varies depending on the nature of the presentation.

scanning

It is produced directly on the computer using designated technical animation rendering. E.g. is computer animation movie (Shrek, Nemo, Ice Age, etc.).

Synthesizing

Digital animation

- the digital animation sequences differs from the digital video especially for its representation.
- in the digital animation is no information on the displacement or deformation of graphic objects.
- the digital video is only in bitmap image sequences.

Digital Audio

- can be obtained by scanning the analog audio.
- produced by the computer (synthesized). For example via MIDI keyboards and music production applications or synthesizers;
- It is also possible to compose music with digitized sounds alone through samplers applications, and then mounted on sequencers.

Analogy between the media used in multimedia documents and corresponding in conventional documents

Classification of Media Types

a. Synthesized vs. Caught

b. Static vs. Dynamic.

- Captured- imminent from the real world (images, video and audio).
- Synthesized-prepared by a computer (text, graphics, animation).
- Static time-independent - (discrete or distinct), involves only the spatial dimension.
- Dynamic - continuous playback (continuous or temporal), the time part of its semantics, media static, discrete or space.
- only they have the spatial and not temporal; time is not part of its semantics.
- time-independent information elements.
- may vary as regards its dimension in the space, for example the size.

Media dynamic.

- Two dimensions: time and space.
- require continuous playback over time.
- Elements of time-dependent information, i.e., when the order of elements is changed, also the meaning will change the time part of its semantics.

Conclusion

In this subunit, types of Multimedia Information was examined, enumerated the various types of media and according to their respective timeline. Your rating, depending on the nature and origin, with concrete examples was one of the concerns of this activity.

Self-check 1.2

Produce a plain text and a rich text document

Note the difference making type <doc> on the command line

With Paint create a rectangle, a circle and a triangle in the same document

Find out what media was created in step 4: graphic or image?

What types of media is associated with the file extension .txt, .rtf, .avi, .png, .bmp, and .au

That application is performed by the Windows operating system when you click a PDF document. How is the settings changed?

Search the Internet for information about the media type application / vnd.ms-PowerPoint and video / mpeg. Does it fit into our definition of multimedia?

1.3 Characteristics of Multimedia Systems

Multimedia Systems have to be controlled by computer (which implies the existence of a match at least one computer). They are integrated (using fewest possible different devices - one example is to use only one screen to display all kinds of visual information). The information they handle has to be represented digitally. The user interface should allow interactivity (which means that the user has a sense of control over what is going on, unlike what happens when you see a movie in the theater). Whenever, the system allows the end user to control the elements or content that is presented as well as the times when this presentation is presented.

Interactive multimedia application

If furthermore it provides an interconnection structure between elements which can be covered (and navigated)

Hypermedia application

The main features of Multimedia Systems

- the information handled by the multimedia systems is represented in digital form but the media are independent of each other; (All media should be treated separately).
- must combine at least one static medium with a dynamic medium.
- are controlled by computers (At least its presentation to the user, but probably also the authorship);
- Integrated are (Essential aspect, since it requires that the various media can be presented in a unified interface, and handled by a single program or application)
- The systems interface may allow interactivity.

Multimedia terminology

Media Market - set of sectors in which it negotiates multimedia products or services

Multimedia product - commercial packages that supports a multimedia application (e.g. Flash, multimedia authoring package).

Multimedia application - program that controls the user information presentation using multimedia services (e.g. multimedia game, is a multimedia application that controls graphics, sound, image, video ... and that allows the user to interact with the application).

Multimedia service - refers to a function or set of functions that support the provision of a service to the end user through the multimedia application; (In the case of game services to locate and provide access to information).

Multimedia Technology – refers to a set of specific technology areas that support the development of multimedia services. (E.g. audio compression techniques, video and images).

Multimedia platform – It is a specific type and configuration of computer capable of running multimedia applications; (E.g. PC with a sound card and video).

Multimedia Card - hardware that performs multimedia functions; (E.g. video capture card that converts analog video to digital video).

Multimedia storage devices - digital storage devices that suit the multimedia data; (E.g. DVD-ROM, CD-ROM, etc.).

Media Network - Communications network with enough performance to transmit multimedia data.

Reference Model

The technological areas of multimedia systems are:

Applications and Multimedia Content - higher level (closer to the user); It includes content creation and user interaction with applications.

Multimedia Services - used by applications to display content.

Multimedia Systems - support the provision of services; Representation of Information.

Multimedia - lower level (further user); representation of information technologies: digitization, media formats, compression, hardware;

ID	TECHNOLOGICAL AREA	OBJECTIVES	EXAMPLES OF TECHNOLOGIES
1	Representation of multimedia information	Scanning:	Scanning: techniques of representation, compression formats and media codecs multimedia platforms.
		Representation media Hardware for Multimedia	
2	multimedia systems	Processing, storage, presentation and transmission of multimedia information.	storage systems, databases, media servers, programming languages, operating systems and data communication networks.
3	multimedia services	Specific use of the functions provided by the multimedia systems.	Video on demand, video conferencing, content analysis, security, information transfer protocols.
4	Applications and multimedia content	Use of Multimedia: multimedia production, creation of content and applications, Design interactive multimedia interfaces	Types of applications such as: electronic books, kiosks, interactive games, education, training, interactive television and virtual reality application design, authoring tools, interactive technologies for creating interfaces and navigation

Table 1: technological areas of multimedia systems

Conclusion

In Activity 3: We learnt about Multimedia Systems Features addressing to the Multimedia Systems in all its aspects. The multimedia's terminologies, classification of multimedia systems and technologies for multimedia reference model were described and explained, using the examples of multimedia content.

Self-check 1.3

What do we mean by a multimedia system and state the two technologies that create the conditions for the success of these systems.

Mention what characterizes a local multimedia application and what tools you need to develop such an application.

1.4 Multimedia Applications

The areas of use of multimedia technologies are areas of human activity, in which a given type of multimedia application is used.

There are many multimedia applications that are evolving. It has internet technologies like streaming media and podcasting programs that incorporate numerous potential trajectories. The World Wide Web shows that there is a vast area for technologies that support interpersonal connectivity and business services. The base technology to provide sophisticated media consumers is that it ripens quickly. The available multimedia services are very varied. These can be SMS, MMS, streaming media, podcasting, audio, video, video calls.

What is a Hypermedia Application?

Hypermedia (hypertext + multimedia) is a concept for the presentation, access, structure and multimedia documentation storage. It is an application of the concept of hypertext multimedia documents. Hypertext is text with links. Hypertext documents are not strictly sequential. It can contain links, i.e., references to other parts of the same document or other documents. The links are pointers are between documents which contain all the necessary information to access the target document. A hypermedia document is composed of interconnected parts that can be any combination of text, graphics, images, sound and moving images. A hypermedia document must also describe the timing relationships between the various parties. The documents are not necessarily stored on the local system. When a link is activated, the document can come from other external system that can be anywhere in the world. Most interactive multimedia titles are distributed on CD-ROM or CD-I using hypermedia techniques to create an internal logical structure with sufficient flexibility to provide good interactivity and most of the multimedia documents available on servers and accessible via the network, use hypermedia structures.

Multimedia application

First of all, it is important to distinguish between Multimedia Applications and Use Areas of Multimedia Technologies.

- Multimedia applications - are software programs that control the presentation of different media types to the final user, that is, software that performs reproduction combination of various media.
- Use Areas of Multimedia Technologies - are the areas of human activity in which applications are used; (E.g. education, entertainment, business, public information).

For Antonio Manuel Dias (2010), Multimedia application can be understood as an application or software which controls the representation of various types of media content, or the software that performs the combination and reproduction of various media types. Examples: interactive games, virtual reality applications, e-books, training applications and education.

The multimedia applications should include more than mere composition of an arbitrary set of medium. They must comply with the following:

- Facilitating access to content.
- To facilitate the understanding of the information.
- Minimize complexity and consequent disorientation of the user when navigating the information space. It is necessary to note the logical structure of the information, the contents and the temporal and spatial arrangement thereof.

1.5 Multimedia systems versus Multimodal systems

The concept of multimodal is associated with the perception of the human being through various ways. Multimodal systems stimulate more than a human sense, in terms of presentation with the interaction with the user.

A multimedia application is not necessarily multimodal because it can involve only one direction. An application to submit text, images and digital video fits the definition of multimedia, but is not multimodal (only stimulates vision). A multimedia application that presents text, image and audio is also multimodal because it stimulates two senses: sight and hearing.

Classification of Multimedia Applications

Area of use	Examples	Types of applications MM
Education	Education home	electronic books, interactive teaching (CBT computer based education), distance learning (e-learning)
Business	Industry, services	Vocational training (CBT computer based training), interactive sales and marketing, presentations and multimedia communications.
Entertainment and leisure	Home	Magazines and electronic newspapers, interactive games, interactive television, virtual reality, interactive music applications
Public information	public places	multimedia kiosks

Conclusion

When we speak of Multimedia Applications, it refers to a communication directed to the specific objectives of each situation and must be created in a personalized and interactive manner, creating a unique experience for each user, whether an internal or external customer and has always feel involved and motivated. For example the interactive games are a great tool in motivating teams or product development. The Multimedia Applications are part of our lives, on your computer, on your smartphone or tablet, thus, it is one of the best ways to communicate.

Evaluation

1	What do we mean by a multimedia system and state the two technologies that create the conditions for the success of these systems.
2	Outline 2 reasons for the success of multimedia applications and features a hypermedia application.
3	Mention the features of a multimedia application and submit two types of companies that stand to gain the popularity of these applications.
4	Mention the features of a multimedia application and a hypermedia application and give 2 examples of applications of each type
5	Mention the features of a multimedia network application and the difference between a multimedia application and a hypermedia application
6	Mention the features of a multimedia application network and the components of a multimedia PC

The Media can be used when there is information to be transmitted. The use of multimedia facilitates the transmission of information and improves the retention of information for the end user. This communication approach based on technology, is currently across the Various sectors of society, namely:

- Business: project presentation, marketing, product demonstration (RV), internal training, dissemination.
- Education: distance learning, online courses, educational material in digital form, encyclopedias.
- House: media applications for PC, multimedia equipment (PlayStation, X-Box).
- Commons: information kiosks, information panels in hotels, sports venues.

In this unit, the student learnt the multimedia fundamentals, concepts, types of media, systems and multimedia applications without forgetting the challenges of this important area which is currently one of the technological areas that you have monetized in terms of market / value.

Unit Assessment

Check your understanding!

1. Read Chapter 1 of the book Multimedia and Interactive Technologies, 5th Edition Updated and Enhanced, Nuno Ribeiro, Editor FCA.
2. Solve seven (7) questions of your choice in this chapter.

Evaluation

Heading	Marks
Quality problem execution (clarity, organization, rigor)	5pts
Note the completion of the work	12pts
Additional effort (research, problem solving)	3pts

Additional Reading List

Readings and other features of this unit are in Readings and Other Travel Resources list.

1. Multimedia Tools, UA, <http://homepage.ufp.pt/lmbg/fm04.htm>, accessed on 21 February 2016.
2. Multimedia and Interactive Technologies, Nuno Ribeiro, FCA, 5th Edition. (Chapter 1).
3. Telemedia. Introduction to Multimedia Technologies, University of Minho, 2016.
4. Chapman, Nigel and Chapman, Jeny - Digital Multimedia. 1st Edition New York: While, 2000. ISBN: 0-471-98386-1 (Chapter 1).

[1] Multimedia and Interactive Technologies, 5th Edition Updated and Enhanced Available from:https://www.researchgate.net/publication/232683588_Multimedia_e_Tecnologias_Interactivas_5_Edicao_Atualizada_e_Aumentada [Accessed Feb 23, 2016].

Unit 2: Fundamentals of Multimedia

Unit Objectives

- By the end of this unit, you should be able to:
- List and understand the categories of multimedia authoring tools.
- Know the applications and authoring tools for the production of documents.
- Describe the authoring tool for hypermedia aspects.
- Understand the use of the Internet as hypermedia platform.

Unit Introduction

Today, with the advent of information and communication technologies within contemporary society, information has an importance, an important factor and increasingly indispensable for social and cultural development, making them increasingly ubiquitous in our daily lives.

These technologies (understood also by tools), each with a particular purpose, are increasingly being used within the targeted schools and environments to education and transfer of knowledge. Professionals increasingly trained to use these tools appear momentarily every day, allowing for interactive use to teach and learn with more ease and relaxation. These tools use different media to enrich the entire material, and educational support quality students and teachers, who have a new way of teaching, bypassing the traditional linear method that was widely used until the end of the last century. The development of multimedia applications is a software process that is generally referred to as authoring. Multimedia authoring tools are programs (software) that enable users to develop interactive multimedia programs. This unit contains the study of the tools used for authoring multimedia programs.

The development of multimedia applications requires two types of software: programs for the creation of various types of content (systems and content authoring tools) and programs for their integration (multimedia authoring tool).

2.1 Digital Information and Interactivity

The digital representation of information is a feature of multimedia systems. In general, it involves the use of a computer or set of computers to:

1. Multimedia information production.
2. Presentation.
3. Interaction as a user.

The representation of information in digital form has thus an important role in the realization of multimedia systems.

Digital Information Representation

all media that are part of a multimedia application necessarily exist in digital form. Since the medium are represented by binary sequences, the bits that constitute can be:

- An image
- Sound
- Text.

To obtain a digital representation of the associated information to the media, it is necessary to digitalize, transforming an analog signal to a digital signal.

Advantage of digital representation

- Digital signals are less sensitive to noise transmission than analog signals.
- The signal regeneration process is much simpler.
- Both the detection and correction of transmission errors can be eliminated more easily.
- The encoding or encryption which ensures the confidentiality of information exchange is lowered.

Drawbacks of digital representation

Its biggest disadvantage is the distortion introduced during scanning or A / D conversion.

Digital signals

Sequences values encoded in binary format, depending on the time or the space resulting from the conversion of an analog signal. Has > signal quality and <storage cost and processing time discrete values (batch).

these signals correspond to physical measurements that vary with time and / or space functions being represented by the following types:

Analog signals

Corresponding to a physical value which varies continuously in time and / or space. They are continuous functions and defined in any instant.

Scanning

Scanning is a process that converts an analog signal to digital. It is also referred to as A / D conversion which may be effected in various ways. The most common technique is referred to as PCM (Post Cod Modulation).

Key Benefits Scanning

- Universality of representation since any media type is encoded in a unique manner (bit sequence).
- Storage - allows you to use the same digital storage device for all media. (Storage space varies depending on the media type - storage volume is larger video, audio) (e.g. digital libraries instead of bookshelves).
- Transmission - allows the use of any communications system to transmit multimedia information type (with ability to drive digital information (bits)).
- Information processing - all the information can be manipulated, analyzed, modified, amended and supplemented by computer programs.

Disadvantages

Associated distortion introduced during the digitization or A / D conversion in which the sampling process followed by quantification / coding can introduce distortions and lead to loss of information.

Interactivity

Interaction is understood as a form of mutual communication of the type of action-reaction.

The machines that allow the user to make a request or select an option and logically respond to this action by providing information or other services are called interactive. In essence, interactivity understands the various ways in which it allows the human being is related to the information, and this relationship mediated by computer.

An interactive system supports communication in both directions:

- From the user to the computer;
- From the computer to the user.

Two basic models of presentation of information:

1. Passive mode

linear presentations where the nature and sequence of information follows a predefined schedule; User can stop, or make small local adjustments (brightness, saturation, volume, etc.).

2. Interactive mode

non-linear presentation, which allows you to control several aspects:

1. Instant where presentation begins
2. The order or sequence of the various items of information
3. The speed with which the items are displayed
4. The format of presentation (only in the same multimedia system)

Conclusion

Digital representation or binary information is the most important feature of the multimedia system. It is the aspect that allows you to use the computer as a symbolic processor, as the dynamic and static media are represented digitally in order to be combined in a multimedia application. Thus, it is necessary to understand how the represented information, to understand the operation of a multimedia system or application. These systems process the information about the type of software that operates.

Self-check 2.1

What are the main advantages and disadvantages of scanning the media?

Name two advantages and one disadvantage of scanning, the underlying digital media systems increasingly used across the board.

2.2 Multimedia Authoring phases and parameters of evaluation of an authoring system

The authoring process is a form of multimedia application development that does not involve the need to resort directly to a programming language, so accelerating the implementation of creation (reduced by about a tenth of the time).

Authorship and Multimedia Projects

The process of development of multimedia applications, which are generically referred to as Multimedia Authoring, involves actually two types of software:

- Content Authoring Systems - programs that let you create and edit the various individual average; They are specialized in handling the particular characteristics of the various media.
- Authoring Multimedia Systems - programs that allow you to perform the integration and combination of various media, arranging them in space and time, creating a multimedia presentation;

Phases of Multimedia Authoring

1. Planning: setting goals to achieve.
2. Conception and Design: itemize media types to use, how to combine and navigation options that are relevant. produces is an application script.
3. Production: create content through the content authoring tools and using the script created in the previous phase.
4. Testing: If correct errors and verify whether the objectives for the applications have been achieved, if it works in the target platforms and meets user requirements.
5. Distribution

Evaluation parameter of an Authoring System:

1. Model and paradigm for content organization.
2. Provided content editing tools
3. Allowed programming type: visual programming by using icons and objects; Using a scripting language; using traditional programming languages.
4. Interactivity inclusion mechanisms: must have the ability to introduce the implementation mechanisms of simple deviations, conditional branching and structured decision.
5. Performance of the authoring system.
6. Mode allows you to play the final multimedia application.
7. Application deployment modes that are allowed.
8. Platforms on which to develop a multimedia application.

Conclusion

The purpose of this activity lies primarily in passing a clear idea that talk of authoring and multimedia projects is talking about the same thing, however, involving different authoring systems. Multimedia project phases will be developed in a specific unit, taking into account its importance in the development of applications and multimedia products. One of the basic procedures of an audit system development process relates to the identification of assessment criteria to apply. These parameters will also be developed on a stand-alone unit.

Some of the challenges in the design of a multimedia application including video relate to the enormous wealth of this type of information has a spatio-temporal dimension - for example, the perception of its content and the links and / or video in relation to where and when the links are active, among other things. In the context of a multimedia application for e-learning, with the following characteristics: a) Identify three aspects of perception of links that must be safeguarded. b) sample two ways to increase this perception in each of the three aspects. Refer briefly the advantages of each.

In the context of developing a multimedia project, what stage of Authorship Multimedia details the types of media to be used?

Some of the challenges in the design of a multimedia application including video relate to the enormous wealth of this type of information has a spatio-temporal dimension - for example, the perception of its content and the links and / or video in relation to where and when the links are active, among other things. In the context of a multimedia application for e-learning, with the following characteristics:

a) Identify three aspects of perception of links that must be safeguarded.

b) sample two ways to increase this perception in each of the three aspects. Refer briefly the advantages of each.

2.3 Content Authoring Tools

Hyper video mechanisms are the basic tools for meaningful and rich integration of video with other media. In this context, a model was developed and some tools to support Web hyper video [Chambel, et al. 1999], as extensions to HTML and existing Web tools. They are also being explored new forms of integration and video navigation in hypermedia [Chambel and Guimarães 1999], with a special emphasis on learning support, being developed video annotation tools and the way the different media are related to learning and the characteristics of the hyper video and hypermedia.

Some tools Content Authoring

Photoshop

Adobe Illustrator

Microsoft Word

Adobe Premiere

Sound Forge

Autodesk 3D Studio

Conclusion

The content authoring tools enable the creation of media product. These are in metaphors such as stages and books, where it has a stage where there actions or pages where the information is located.

Self-check 2.3

Explain the concept of content and tool authoring tool. Give three examples and a short description of each.

What characterizes and distinguishes the content authoring tools? Give two examples and a brief description of each.

2.4 Multimedia Authoring Tools And Distribution

Multimedia authoring tools are divided into two major groups:

Closed Applications - Closed applications are typically used to create material such as sound editors, music, images and animation. They are easy to understand tools for presenting graphical interface easy to learn, allowing the developers get it high productivity quickly.

Programming Languages - These tools are based on programming languages, where the application elements are built and modified using specially written for each software product. Programming languages give the developer more flexibility in the creation, but it requires a thorough training, a better understanding of the underlying theory, programming techniques and programming environment used.

Tools of Authorship: Definition and Examples

An Authoring Tool is a computer program used for the production of digital files, usually including written text, image, sound and video. These programs or software, typically produce files to the Internet, with automation of various steps to facilitate the work of the author. These files can be stored in different media. For its fluid and dynamic nature, they were not produced to be printed on paper, but to be viewed on a computer screen, digitally. These tools provide the necessary structure for the organization and editing of the elements of a project in multimedia. They are used for the development of interactivity and user interface, to present projects on the screen and group the elements of multimedia in a single cohesive design. The authoring tools are classified into three groups:

Titles Authored, Authoring Applications and Sites of Authorship.

2.4.1. Titles Authored

This group is divided into two categories: Linear Title Authors and Titles Authored Hypermedia.

1.1. Authoring Linear Titles

Linear titles authoring tools allow presentations with hand advances such as those used in lectures, or with automatic advances determining the sequential time, as in exhibitions. Among the most used are the Microsoft PowerPoint, guided by slides and Exchange Acrobat, Adobe, driven by online documents.

1.2. Titles Authored Hypermedia

The hypermedia title authoring tools to add multimedia material integration features non-linear navigation features, characteristic of hypertext. Hypertext provides the user through the text of non-sequentially, following the path that suits you and not what is indicated. Among the most used are the Director3 Macromedia.

We must consider the aspects below in an authoring tool for hypermedia:

Authoring Style: Can be interactive or scheduled, ie, the tool uses a visual language where the programmer creates the title by drawing its components interactively, or textual where the programmer creates the title writing instruction in a program to set formatting and navigation product.

Operation Mode: Run mode or Edit mode. The authoring tools typically have a version for editing titles, which is used by the programmer in the creation and maintenance of the securities, and a version for reading the titles, which is used by the end user. Thus, the ideal is that the authoring tool has both versions because the version for reading is key to facilitating the distribution of the legal title to which all users can view it.

Data exchange capacity: It is very important that the authoring tool supports major formats and types of media on the market and allow the import of these formats to be added to the title.

2.4.2. Authoring Applications

2.1. Applications written with multimedia interface

These tools have their construction-based drawing tools and form, using a simple programming language. Some examples are the Toolbook4 of Asymetrix and Visual Basic5, Microsoft.

2.2. Multimedia Applications authored: The multimedia application authoring is based on the development of software products. These applications have interactive graphical interfaces, real-time and its construction is necessary software engineering techniques

3. Sites of Authorship (sites): In an overview, the authorship of sites, or sites as they are widely known, has tied to it hypertext (interactive text), graphics (images) and multimedia (audio and video). It is divided into Sites Authored Dynamic and Static.

3.1. Authorship Sites Static

In Static sites of Authorship, the author is responsible for building all hypertext pages, create all the links between them and still hold the publishing on a server. An example of this tool is FrontPage Editor, Microsoft, and an HTML editor, it contains features that make it easy to link and references to graphics and multimedia materials.

3.2. Sites Authored Dynamic

The Authorship of dynamic sites has a client side and a server side, where the server by programming language, is responsible for the creation of the hypertext page code.

Authoring Tools Multimedia

closed Tools: easy to use (user friendly) and used for the production and editing material, e.g. Microsoft Word.

Programming Tools: uses algorithmic language for production, eg Excel.

Examples Multimedia Tools:

- Macromedia Director Macromedia Flash.
- Macromedia Dreamweaver. Examples Authoring Tools Distribution
- Nero Burning ROM;
- Ulead DVD Workshop;
- Macromedia Flash Player;
- HTML, Quicktime Player.

Conclusion

Currently, some tools have multimedia programming options for use internally in the construction of products. The lines separating the type of multimedia tool are very thin. The definition may depend on the context and objectives.

The building multimedia products with use in programming languages is a complex task and requires advanced programming skills as well as the operating environment where the multimedia product runs, that is, operating system, networking, etc. However, the construction of sophisticated multimedia products can also be made with authoring tools called that offer an intermediate solution between the closed applications and programming languages because they allow direct manipulation of menus, toolboxes controls and even offer resources programming in the form of scripting languages. An advantage of this type of tool is that even allows integration with modules (.dll, .jar) built with other programming languages.

Self-check 2.4

Explain the concept of multimedia and tool authoring tool. Give three examples and a short description of each.

What characterizes and distinguishes the multimedia authoring tools? Give two examples and a brief description of each.

Summary

This unit describes the Multimedia Authoring in society, highlighting its importance in various media and professional areas such as aid organizations and for various purposes. Through examples of each tool discussed, describes the multimedia and multimedia authoring tools have become an ally of organizations, making communication between customers, suppliers, teachers, students, and other players of interactivity.

Unit Assessment

Check your understanding!

1. Give examples of two types of software required by Authorship Multimedia.
2. With regard to the development of multimedia applications distinguish between multimedia authoring tools and authoring tools
3. List 4 examples of applications differentiating between audit multimedia content and audit.

Evaluation

Heading	Marks
Quality problem execution (clarity, organization, rigor)	5pts
Note the completion of the work	12pts
Additional effort (research, problem solving)	3pts

Readings and other features of this unit are in Readings and Other Travel Resources list.

1. Nuno Ribeiro, Multimedia and Interactive Technologies, 5th Edition. FCA - Editora de Informática, Lda, ISBN: 978-972-722-744-0 (Chapter)..
2. Luis Carlos Baradas. 2014 Notes MI. EST-IPCB.
3. Douglas Vaz, Suelen Silva de Andrade. Multimedia Authoring: the use of multimedia tools in the educational field. Cenecista college Osório (FACOS).
4. Chapman, Nigel and Chapman, Jeny - Digital Multimedia. 1st Edition New York: While, 2000. ISBN: 0-471-98386-1 (Chapter 2).

Unit 3: Design and Development of Multimedia Projects / Project Documentation

Unit Objectives

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

- Write the multimedia project development phases.
- Use Multimedia project design phase.
- Use the Multimedia Project Development Phase;
- Implement multimedia project using the Implementation Phase

Unit Introduction

To develop multimedia applications is necessary in order to define a set of criteria to ensure that the applications comply with the objectives outlined. This unit introduces you to the life cycle of a multimedia application.

“A project is a non-repetitive work, planned and carried out according to specifications made in accordance with certain technical specifications, and cost objectives, investments and certain, cost objectives, pre-defined investment and deadlines. A project can also be explained as a pre-defined period. It also defines a project as a considerable amount of work and complexity, which is held with the participation of various departments of a company and possibly with the collaboration of the 3rd company and eventually with third party collaboration” Brown Boveri.

3.1 Factors affecting Multimedia Design and Management

It is important to realize that a product or service well done is always a result of, among other things, a well- managed project. In this activity, we will talk about the multimedia project management context, its definition - according to the terms used by PMI.

The start of the project is to identify and formalize the recognition of the need for the project and the respective allocation of resources. Organizations exist to generate revenue or to serve the public. To remain competitive, organizations must evaluate its competition and customers, systematically looking for new forms of business and more efficient processes to act in order to be preferred by customers. [1] It is usually said that the projects are started due to 6 different types of needs:

1. Market Need - When for example a producer of dairy products is aware that there is a growing demand for products with low fat and low salt. He looks to his offering of such products and can decide to start a project to expand its product portfolio with these characteristics, or may be considered to have the products necessary to meet this market segment, but needs to adapt production lines to the potential increase in demand.

2. Business Need - When for example following the results of a survey on customer satisfaction senses organization that needs to reformulate its customer service center in order to reduce the waiting time and reduce to 5% withdrawal in contact attempts.

3. Customer request - Customers may be external or internal to the organization. Typically this type of projects begins when the organization establishes a contract with a client to be executed requires some kind of internal change. For example, if your company provides hardware maintenance services. Obtaining a maintenance contract with a major customer may require an extension of its power in the form of facilities to respond, within the contracted service levels, expected to flow equipment to repair.

4. Technological progress - technological changes, for example the growing success of PDAs, will lead the business development of software to change the profile of knowledge and its products. In the case of the Portuguese banking system, the success of PDA's and Smartphones has led all banks to develop banking specific internet applications for these platforms.

5. Legal requirement - Changes in legal requirements are becoming more frequent and in certain highly regulated activity sectors represent a large share of ongoing projects. The adequacy of billing processes and accounting to European standards or issues related to food quality requirements and consumer information are examples of areas where legal requirements have evolved rapidly.

6. Social Need - The last question referred by PMI to initiate a project is related to the emergence of social needs. For example the danger of an outbreak of influenza associated with a more aggressive than usual viruses led European governments to prepare a massive vaccination plan.

The projects are the ideal vehicle to convert new ideas into concrete actions, so the product life cycle and project are intertwined.

What is a project?

There are several project settings. "A design can be defined as a sequence of activities or events having defined start and end driven by persons who are intended to achieve a certain goal within cost parameters, time, resources and quality."

"A project is a finite activity whose goal is to deliver a single product. Something has finite order, i.e. a project does not last forever and must deliver a unique product. "Frederico Azevedo Spider

"A project is a temporary endeavor undertaken with the goal of creating a product or a specific service" Guide to the Project Management Body of Knowledge (PMBOK®), PMI

A project is a coordinated effort by combining human, technical, administrative and financial, in order to achieve a specific objective within a specific period of time. The "goal" is "specific" if it is clear and measurable.

Multimedia project

Multimedia products are common in education and education system these days. An application or program and based on the media always has a variety of sources of information (media type information) for its operation. There are sufficient settings for multimedia and multimedia education because it is very difficult to find consensus among various theorists. Schwier and Misanchuk (1993) provide a definition compatible with a project that focuses on the process and not the hardware, that as a requirement for the operation of the program. It can be understood as a set of activities that allow you to plan, design, produce and test an interactive multimedia application.

Project Identification

Project's goal

The project objectives should be:

S - Specific (Specific)

M - Measurable (Measurable)

A - Attainable (Achievable)

R - Realistic (Realistic)

T - Time-related

The projects can be classified in different ways for different purposes: By area of activity; dimension; risk, etc. There are, however, two attributes that warrant particular relevance.

- The type of product or service resulting from Project.
- The type of work that you need to perform to achieve the goal.

Multimedia projects - Guidelines for conducting projects

A number of aspects should be taken into consideration when carrying out a project with resources to multimedia technologies. This is to ensure the success and implementation of the project, positively taking advantage of multimedia resources.

Overview of aspects to take into consideration (Luis M. Gouveia, 2004):

Decide the users (audience).

Decide the subject of the project and what not (scope).

Decide how the subject to users (presentation strategy) will be displayed.

To make the project easy to navigate (ease of use).

Introduce people to the project (sensitization).

Integrate the different user media such as text with graphics and sound (synchronization).

Plan how to incorporate successive design changes (evolution).

Test early, test often and take into account the project reviewers (test).

Finally, check the project one last time (recapitulate and learn!).

Success factors Multimedia projects (The Standish Group, "Extreme CHAOS" (2001))

- Support the executive level
- Involvement of users
- Project Manager with experience
- clear business objectives
- well-defined scope
- Standard Software Infrastructure
- well-defined essential requirements
- Existence of a formal methodology
- Reliable estimates
- other criteria, such as goal setting, proper planning, competent staff and the existence of an owner.

Project Team

- the project team includes the project manager and the group of individuals acting together in the project work execution to achieve its goals.
- This team is composed of people from different groups (different units of the organization) and knowledge or specific skills for project execution.

Guide for the development of multimedia project?

1. Who will be using your Project?

Will they share many characteristics? (What are these?) Were they varied widely? Describe a typical user (describe two, if your audience has extremes).

- Previous experience

Computers, software and hardware both subject matter expertise.

- Context in Which user will be using the Project: alone,

with other software, with other hardware, over the network as part of the training class.

- Special markets:

International considerations (and for Which countries) disability Audiences (and for Which disabilities).

2. What's your subject matter?

- What's the general purpose of your Project? (In brief)

What will your Project cover?

What will not it cover?

How much space do you have to work with? (High-density disk? hard disk? what size?

1CD-ROM disk (656 megabytes), other (list possibilities ...).

- What resources do you have to build it with?

time developers, graphic designers, sound composers, other money machines and equipment.

What is the specific purpose of your Project Given the subject matter's scope, size, space limitations, and your development resources of time, people and money? Be detailed and explicit.

3. How is it most Appropriate to present the subject matter to these users?

- What natural section does your project divide into?
- What functions must it perform?
- What's the Project's style?
- What presentation method seems best for these users and this subject matter?

Demo, with rolling continuous animation

Training piece, structured and guided

Desktop presentation, to use while giving a talk game

Tool, application, or utility other (specify ...)

- To the user, will the project be identifiable as SuperCard? Will the Project's bear a resemblance to the Macintosh interface? Will it simulate another kind of software for training purposes? Will it have a completely unique look?
- Is there an overall real-world metaphor that describes the project? List the things your Project can do.

look at that list; is there some real-world object that can also do those things? (Examples: Slide projector, movie, and television with channels, supermarket, and bank).

- Is your Project easy to navigate?
- Does your Project have a proper introduction?
- Graphics
- writing
- Sound
- Testing
- Checking your Project

Multimedia Project Documentation

In any project, the documentation is always very important. This serves as a record for future projects. There are two types of (main) documentation:

- Project documentation
- User Documentation

The project documentation applies to all information on the development of the project, including costs, risks, project management process groups and all other requirements, functional and non-functional. Some important information that should be included in the user documentation is presented below.

The documentation is quite critical to the end-user multimedia content. In developing the documentation of multimedia applications, the following information must be accurate:

- The instructions and steps for installation of the application
- Information about the installation files
- necessary computational requirements
- important information on possible "extension conflicts"
- Content Development Acknowledgment
- Copyright
- Notes for the trainer if it is a CBT application
- Navigation instructions in the program
- Contacts (email) to send comments and suggestions

This information can be provided to the user in the Read Me file format, which is a read-only document and very specific and contained in the application itself. The alternative is to develop a printed User's Guide with information for the user or link to the User Guide page.

Conclusion

This activity make a literature review on the various project management approaches, and the identification feature of the projects and its most important aspects. The nature, the focus is on multimedia projects. When developing a multimedia project, its authors and managers should look for a set of elements - critical, aiming to reach the end and project success.

Self-check 3.1

Identify any multimedia project

Justify your choice, featuring the resulting product or service and the nature of the work required

Indicate the main purpose of using the SMART format

3.2 Multimedia Project Development Phases

Any project to succeed will require a number of prior conditions. These conditions include good planning, affectations time / clear activities and safeguard strategies, have organized and appropriate fashion design, problem definition, per phase, feasibility study and design well executed plan risks, have estimates that are realistic.

According to the PMBOK Guide, there are 5 process management groups:

- Initial Process
- Process Planning
- Running Processes
- Monitoring and Process Control
- Closing Process (includes acceptance processes)

1. Analysis and Planning

Sessions of brainstorming, sorting ideas and topics, schedule tasks, skills and resource planning, cost estimation. It is produced by the project plan.

Planning the necessary skills (writing, graphic, music publishing, video production and animation); plan tasks and estimate the time (PERT and Gantt charts); prepare budget; plan creative graphics and navigation method and structure for the application; create a prototype. Determine clearly "what story you want to tell."

2. Design

application design, detailing navigation schemes, content and compositions. Produce the script of the application and a prototype. Create script that clearly defines:

2.1. Design of multimedia structure - navigation scheme): create navigation map that illustrates the links between each page (linear structure, hierarchical, non-linear and composed

2.2. **Design of the multimedia application screens** - with the contents to be displayed and its format and quality: create storyboards detailing each content to use, its location and the interactive elements that facilitate navigation and attributes of each content such as setting, format, etc.

2.3. **User interface design** - which results from the combination of content and interactive elements that implement the navigation scheme: simple and accessible interfaces, based on known user elements.

Style of interaction and interactive elements:

1. Command Line
2. Menus
3. Natural Language
4. Dialogue based on question response
5. Form filling
6. Dialogue based on windows, icons, menus and pointers (WIMP)

2.4. Technical Design

It aims to ensure the graphic description of the application structure in particular specification of screens, validations, configuration, and administration.

Production

content authoring, application authoring. It produces a full version of the application. It is content development and developing the application code.

3.1. **Alpha Cycle** - Full implementation of the application script, starting authoring of content and the application.

3.2. **Beta cycle** - Process all necessary changes in functionality, content and user interface and final version of the application script.

3.3. **Cycle range** - End both authoring processes

Testing and validation

It produces the final version of the application.

4.1. Features and priorities of errors

Priorities of errors:

1. Severity of the error
2. Bug Dark
3. Correction Difficulty

4.2. Types of tests

1. Testes of software modules
2. Software integration tests
3. Compatibility Test
4. Ease of use of the interface by the user.
5. Distribution and Maintenance

the final package in the embodiment chosen support or supports

Multimedia project management alternative methodologies

Managing a project presupposes the existence of a clear methodology. The choice of a project management methodology is an advantage, allowing different project stakeholders effecting joint actions, organized and clear manner. Agile methods for project management do not apply to all organizations and projects, nor are they an alternative to more structured methods for project management.

In fact there is no dichotomy agile versus structured methods. What exists is a range of methods ranging from the more structured, such as PMBOK, to the more nimble, like SCRUM. Instead of an alternative, agile methods are another tool available to project managers who know how to use them, and that is very useful if used in the right projects with the right project team and clients and / or organizations are open to such use. [2]

Multimedia Project Creation

For management of a multimedia project, McDaniel & Liu (1996) suggests: "To manage multimedia projects successfully, one should not only have a general knowledge of instructional development (ID) project management, but also should have a good understanding of the current practices by multimedia companies "(p.3). However, project management is not necessarily something the person will train for or be trained for. Often, in education, an organization will bid on the project and, if successful, have to quickly assemble the manager and the team to fulfill the obligation. Existing staff on-site that have some familiarity with the portion of the project may be selected to lead it. "Project management know-how is conveyed informally, managers learn to carry out projects by working on them" (Frame 1987: 70). Parda (1996) asserts, "Effectively managing projects and the dynamics of change is critical to success - the challenge for many organizations is, while their people are functionally Competent, They have had little, if any, experience managing projects" (p: 6). As Suggested by Greer (1992), "Most people who manage ID projects have had either formal or informal exposure to the field of instructional development. Many who manage ID projects do not consider themselves professional managers" (p.xvi). The obvious difficulty is to take an inexperienced project manager and enable him / her to produce a quality product within given timelines. Perhaps Mark Twain said it best when he stated, "A round man cannot be expected to fit into the square hole right away. He must have time to modify his shape."

Conclusion

This activity treated the wrapped outlines of multimedia project management. According to IPM - PMBOX, processes and phases they entail and above the skills and knowledge that all projects holds, should be uniform. But the management of Multimedia Projects has peculiarities in relation to other projects related to the area of Information Technology. For example, the technical design and distribution assume important roles for the multi-media products as par excellence, interactive content.

Self-check 3.2

Set a Multimedia Project using your own words.

From the list of the phases of the project, what is the process / priority face group?

Choose a design development phase of your choice. Summarize it, using the examples of multimedia applications.

Summary

In the previous unit we went through the entire multimedia authoring, i.e., the multimedia application development process, specifying and combining contents, creating links between contents, involving software contents and multimedia authoring systems. But the development of these applications and other multimedia-oriented initiatives should be based on good computer / multimedia projects development practices. Hence, the need to look into, how to identify a project, which is a media project, its phases that constitute it (goal setting, script production, content creation and its necessary integration, detection and error correction and, finally, their distribution), the most relevant aspects to be taken into account and the multimedia project development guide and, not least, the project team.

In short, in this unit, the student learns to plan a project of a multimedia application, identify the type of responsibilities allocated to each working group to implement an interactive multimedia design, allowing the application and integration of various elements of multimedia matrix already studied (text, video, audio, animation, graphics and image).

Case Study.

Go to this link: <https://brasil.pmi.org/brazil/KnowledgeCenter/~/>

- 1 - Enter the main objective of the SMART way Project (Specific Measurable, Attainable, Realistic, and Time-Related).
- 2 - Analyze the benefits and the risks assumed by VW Mexico as "winner" pain project.
- 3 - Who is (a) responsible for the success of the project and what kind of change is achieved with the project?

According to [3] PMBOK (PMI), project management can be structured according to five process groups (Initiation, Planning, Execution, Monitoring and Control; Clasp). Analyze the critical point of view, each of this process within the project developed by VW Mexico.

Evaluation

Heading	Marks
Quality problem execution (clarity, organization, rigor)	5pts
Note the completion of the work	12pts
Additional effort (research, problem solving)	3pts

Readings and other resource

Readings and other features of this unit are in Readings and Other Travel Resources list.

1. Chapman, Nigel and Chapman, Jeny - Digital Multimedia. 1st Edition New York: While, 2000. ISBN: 0-471-98386-1 (Chapter 2).
2. © 2013 Project Management Institute. Knowledge, A Guide to the Project Management (PMBOK® Guide) - 5th Edition
3. Nuno Ribeiro, Multimedia and Interactive Technologies, 5th Edition. FCA - ISBN: 978-972-722-744-0 (Chapter 3).
4. http://pm2all.blogspot.co.ke/p/pmbok_06.html it was accessed on 25 February 2016.
5. Nuno Ribeiro, Multimedia and Interactive Technologies, 5th Edition. FCA - ISBN: 978-972-722-744-0 (Chapter 3).

[1] <http://pm2all.blogspot.co.ke/2011/05/iniciar-o-projeto.html> accessed on February 25, 2016

[2] <http://pm2all.blogspot.co.ke/search?q=metodologias+de+gest%C3%A3o+de+projetos> accessed on 25 February 2016.

[3] The Project Management Body of Knowledge Guide is a set of practices in project management organized by the PMI Institute and is considered the basis of knowledge of project management for professionals.

Unit 4: Paradigms and Models of authorships

Unit Objectives

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

- Understand the models of existing authoring paradigms.
- compare different models and paradigms.
- Differentiate the evaluation parameters of an authoring system

Unit Introduction

This unit is aimed at a professional character of preparation, allowing students know the various approaches related to multimedia authorship.

The multimedia authoring templates determine the starting point for organizing the contents. It is possible to focus on the development around the space layout, using the hypermedia model, or from the temporal organization of the contents, using in this case, the model based on the synchronization.

There are two distinct models for the composition of media content, namely:

1. Model-based screens: based on the arrangement of the content on the screen as the images on the pages of a book. Dynamic content that contain buttons for user interaction if they contain links are referred to as hypermedia (e.g. WWW).
2. Model-based content synchronization: based on the provision of content along a timeline as a presentation or movie.

Each of these models will be expanded as separately in subunits.

4.1 Paradigm Associated with model based on screens

As explained in the introduction above, the paradigm based on screens, inspired by the traditional paper-based medium, focuses on the organization of content on a space infrastructure. The screens are content containers. For medium-sized dynamic, you can add interactive elements (buttons, icons). The screens may be combined so as to allow navigation by using the link mechanism (hypermedia systems). The use of scripting adds temporal organization to model based on screens (e.g. event generated by a button, a timer).

Key features

draws on traditional models based on Paper (books, magazines), focusing the organization of content on a two-dimensional space-based (2D).

- The screens are the container for the content.
- Dynamic media content (videos, animations, audio) include the screen as images, occupying a clearly defined area.
- Allows you to add interactive elements in dynamic content such as buttons or icons that let you start or stop their reproduction.

Can be structured so as to allow navigation hyperlinks (these multimedia applications are called hypermedia e.g. WWW);

The use of scripts allows you to temporal organization. It is possible that the author develop small programs that trigger actions such as the passage of a certain time, the end of a video stream, etc.

4.1.1. Paradigm based on pages and scripting languages: development of screens or cards that have predefined interactive behaviors and use scripting languages to add other types of interactivity that are not defined (Toolbox Instructor / HyperCard); suitable for sequential or websites presentations.

In short, this paradigm:

Express screens and interactivity through icons (representing actions and content compositions) and icons of interconnection diagrams (representing the flow of information);

- As soon as the project structure is set passes to the addition of content (text, images, audio, etc.), enables refine the application by editing and modifying its logical structure as well as changing the properties of each icon.
- Accelerate application development so more oriented towards rapid prototyping and to develop smaller projects.
- Its disadvantage is that the application execution is slower as each interaction brings with it all possible permutations.
- Centralizes the authoring process in the development of screens (cards) that have pre-defined interactive behaviors and use script language to add interactivity.
- Suitable for applications involving intensive navigation by an information space and hypermedia applications or websites;
- The content and interactive elements are arranged in p. books or a pile of cargoes. It is therefore more suitable for applications in which the content is presented in a sequence.
- The drawback is imposed by the page's structure.
- Allows you to define buttons or icons to jump to any page of a sequence (through scripts that combine a set of behaviors whenever the user interacts).
- Examples: Macromedia Author ware, HyperCard, Tool book Instructor

4.1.2. Paradigm based on icons and flow control: Express screens and interactivity through icons that represent actions and content compositions and icons of interconnection diagrams for the presentation flow control (Macromedia Author ware, Icon Author, Quest).

In short, this paradigm:

- provides an authoring that is based on visual programming, both the organization and the production of content.
- The author begins by defining the structure of events, tasks and decision points by dragging icons to the Flow window. It follows the phase of inclusion of content / text, image and video), application of refining them.

4.1.3. Paradigm based on languages marks for hypermedia: is based on insertion of tags in text files (HTML).

In short, this paradigm:

- focuses the authoring process in specifying interconnections among the various units of content (screens) through the use of markup language such as HTML for example, WWW.
- It is based on insertion of tag (tags) in text files to establish the link (links) that provide interactivity and to integrate different media elements (animation, audio clips, video-clip. It can be presented using the help applications in the form of plug-ins for any web browser from playing – examples, Quick time Apple and Macromedia Flash);
- Hyperlinks can be embedded in a web page, they are simple and unidirectional and utilize the notion of URL and more recently URI to identify the destinations;
- The HTML code writing can be done in any text editor or through a visual tool, following the WYSIWYG principle (ex .: Macromedia Dreamweaver or Front page) which enables the author just to focus on content and their disposal. These tools allow you to view the page in two ways (HTML and how it displays the page) so that you can make the necessary adjustments and facilitate the creation of web pages.

4.1.4. Paradigm of hierarchical objects: represent applications visually through hierarchies of objects (MediaForge, mTropolis, AppleMedia Tool). In short, this paradigm:

- represent applications visually by means of hierarchies of objects, which are embedded in each other and through iconic properties.
- Messages are passed between the elements of this hierarchy allowing transmit orders to the objects that perform according to the properties and modifiers assigned to it.
- It allows the construction of very complex applications but their use is not trivial to learn.
- useful for the development of multimedia games
- Examples Media Forge, mTropol

Conclusion

As the paradigms is associated with the model based on screens, it is clear that these tend to accelerate the development of multimedia applications. All of these paradigms (paradigm of hierarchical objects, Paradigm based on languages marks for hypermedia, Paradigm icon-based and flow control and paradigm based on pages and scripting languages) are inspired by the traditional medium paper-based, focusing the organization content in a space infrastructure. The screens are content containers. For medium-sized dynamic, you can add interactive elements (buttons, icons). The screens may be combined so as to allow navigation by using the link mechanism (hypermedia systems).

Self-check 4.1

Consider the model authoring screen / page. What characterizes this model?

Consider the model authoring screen / page. In this model, which characterizes the paradigms iconic authoring / flow control mark and languages for hypermedia? Take an example of a tool each.

4.2 Paradigm Associates to model based on the synchronization of content / time

This paradigm has time its fundamental principle for content organization, inspired by the methods used in film production, allowing make up content based on time. The various elements are arranged along a timeline (example, slides sequence). Then, transitions between the elements are added along the line. It also allows combination of contents in parallel. It allows simultaneous viewing content (example: a video with a bitmap image as the background). Elements can also be synchronized (e.g.. a text only appears while a video is playing). One can also use script.

Main features:

- draws on the methods used in the production of films.
- the composition of the content is made based on time: the various elements are arranged on a time line, obtaining a sequence which resembles a slide show.
- Allows you to add transitions that make the transition from one content to another;
- The contents can also be combined in parallel for example to present a video sequence for a background bitmap image, an audio clip, and a set of text paragraphs. These elements can be synchronized in which the author can for example set to the background image and will be displayed only 5sec and / or text is only displayed during the video sequence.
- Enables the addition of interactivity with script elements.

2.1 Paradigm cast / score / scripting: it is based on the metaphor of producing a film in which actors have (cast, multimedia content) and a script (score) that is organized along a timeline.

In short, this paradigm has the following features:

- Based on films that disposes actors (cast) corresponding to multimedia contents, scenes matching the screens and scripts (storyboards) which uses a time line (score) to specify the time instants comes into play and for a period.
- The timeline is like a musical score and the various contents are added to the application through their disposal. There are several layers (layers) which may contain different contents.
- Synchronization is set to display the various contents (simultaneity - way synchronization) and is displayed.
- The use of scripts allows you to add a behavior to each cast (content).
- The elements and events arranged along the timeline can be organized with resolutions that reach 1/50 second being easy to convey messages with beginning, middle and end.
- Playback is sequentially arranged at a speed and can be set by the author;
- able to be connected to any location within a sequence allowing addition of controlling the level of navigation and interaction.
- Allows you to add external plug-ins to extend other features.
- Useful for applications with intensive animations and multimedia content dynamic type that needs to be synchronized.

2.2 Paradigm based on brands languages: it is based on the creation of text files with tag (tags) to synchronize the media along a timeline; using the SMIL language, which is an international standard, is an XML document.

In short, this paradigm has the following features:

- For Specificity of the temporal structure of a multimedia document you can use the SMIL allowing you to create text files containing tags that specify the temporal arrangement of the content. These texts can be created from text editors or through authoring tools (e.g. Grins is SMIL or Player) with a timeline to synchronize the media (the author can see 2 ways as in HTML);
- SMIL is an international standard to allow the distribution of multimedia applications on the WWW using URLs to identify the various contents and their respective temporal and spatial disposition.

Paradigm based on Brand Language for the Time Synchronization - SMIL is defined as a type of XML document:

Conclusion

Regarding the models and paradigms for Multimedia Authoring, those beam in sync content inspired by the model used in the production of films, taking the time as a fundamental principle for the organization of content. They make the content composition based on time. Several elements arranged along a timeline, with a sequence similar to a slide show, allowing: add transitions, combine contents in parallel, synchronizing elements and add interactivity using scripts.

Self-check 4.2

Consider the temporal synchronization of authorship model. What characterizes this model?

Consider the temporal synchronization of authorship model. In this model, which features the authoring paradigms cast / score / scripting languages and marks for time synchronization? Take an example of a tool each.

PARAMETERS FOR EVALUATING AN AUDIT SYSTEM.

1. Model and paradigm for content organization.
2. Provided content editing tools.
3. Allowed programming type: visual programming by using icons and objects, using a scripting language, and using traditional programming languages.
4. Interactivity inclusion mechanisms: must have the ability to introduce the implementation mechanisms of simple deviations, conditional branching and structured decision.
5. Performance of the authoring system.
6. Mode allows you to play the final multimedia application.
7. Application deployment modes that are allowed.
8. Platforms on which to develop a multimedia application.

Summary

The Associated paradigm of the model based on the synchronization of content / time and the paradigm Associated with screen-based model allows the definition of spatial compositions and time but in different perspectives and support levels are distinguished only by the principle of leaving for the organization content:

- Model based on eras of the spatial layout and lack the temporal organization that is compensated by the use of scripts;
- Model-based synchronization temporally part of the temporal arrangement of content and lack the spatial organization which must be added by the author.

Both paradigms allow you to add interactivity scripts. A number of variants which define different paradigms or metaphors (authoring paradigms) for each model paradigms of authorship, designates the specific method or approach provided by a given multimedia authoring tool for the combination and arrangement of media content) .

Unit Assessment

Check your understanding!

Questions

Review the following excerpt from SMIL code:

```
<Seq>
<Switch>
<Audio src = "aud-lo.aiff" system Bitrate = "14400" dur = "10s" />
<Audio src = "aud-hi.aiff" system Bitrate = "28800" dur = "10s" />
</ Switch>
<Audio src = "aud2.aiff" begin = "2s" dur = "20s" />
<Par endsync = "videos">
<Img id = "btn_a" src = "... / btn_a.jpg" region = "a" />
```



```
<Img id = "btn_b" src = "... / btn_b.jpg" region = "b" />
<Excl id = "videos">
  <Video src = "... / video1.mpg" region = "c"
    begin = "btn_a.activeEvent" />
  <Video src = "... / video2.mpg" region = "c"
    begin = "btn_b.activeEvent">
  <Area id = "a1" begin = "100s" end = "200s" />
  <Area id = "a2" begin = "250s" end = "270S"
    coords = "25%, 25%, 100%, 100%"
    href = "# a1" />
</ Video>
</ Excl>
</ Par>
</ Seq>
How will this multimedia document be presented?
```

Review the following SMIL code:

```
<Par>
<Seq>
<Img src = "img1.jpg" region = "a" dur = "10s" />
<Img src = "img2.jpg" region = "to" begin = "2s" dur = "5s" />
<Seq>
<Video src = "movie.divx" region = "b">
<Area id = "a1" begin = "20s" end = "25s" />
<Area id = "a2" begin = "110s" end = "130s"
      coords = "0%, 0%, 25%, 25%"
      href = "# a1" />
</ Video>
<Switch>
<Audio src = "movie-aud-pt.rm" systemLanguage = "en"
systemOverdubOrCaption = "overdub" />
<Audio src = "movie-aud-en.rm" />
</ Switch>
</ Par>
```

a) How will this multimedia document be presented?

b) What kind of model (s) synchronization is (are) used? Justify.

Link awareness (perception of links) is a challenge in hyper video. Why is this? At what levels? Give examples of design options for each level, discussing its advantages and disadvantages as a solution.

Consider multimedia authoring language SMIL. a) What are the model and the underlying paradigm of authorship?

Evaluation

Heading	Marks
Quality problem execution (clarity, organization, rigor)	5pts
Note the completion of the work	12pts
Additional effort (research, problem solving)	3pts

Readings and other resource

Readings and other features of this unit are in Readings and Other Travel Resources list.

1. Chapman, Nigel and Chapman, Jeny - Digital Multimedia. 1st Edition New York: While, 2000. ISBN: 0-471-98386-1 (Chapter 2).
2. Nuno Ribeiro, Multimedia and Interactive Technologies, 5th Edition. FCA - Editora de Informática, Lda, ISBN: 978-972-722-744-0 (Chapter 3)..
3. Multimedia Systems - notes. Open University, 2010 António Manuel Dias.
4. <http://aprendermultimedia.webnode.pt/tema3/> accessed on 26 February 2016.

Unit 5: Paradigms and Models of authorships

Unit Objectives

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

- Understand the digital representation of the image, audio and video formats
- List the Modes and Compression Categories
- Use the Data Compression Techniques
- Explain the Techniques of Entropy Coding
- Explain the Technique of suppressing repetitive sequences

statistical coding techniques

Unit Introduction

The coding and representation of multimedia information technology is a growing area. Multimedia applications combine content belonging to types of digital information heterogeneous nature (also known as media types), including text, vector graphics, bitmap images, digital video, digital audio and animation (Ribeiro, 2004). In recent years, encode format and representation of these types of media information have evolved in terms of techniques which use to allow the respective use in multimedia applications. Many of these formats have also given rise to international standards.

When considering the use of multimedia information types it is necessary to consider the storage resources and / or bandwidth that will be consumed, since both are treated finite and limited resources. Thus, the use of medium types such as audio and video requires, first, that the information is compressed, and, on the other, which is preserved as much as possible the quality of the original information, that is, causing the information that is lost during the compression process is one that is irrelevant of the human user's point of view (Ribeiro & Torres, 2009).

5.1 Multimedia Compression

Compression in particular audio, digital image and video is necessary for two main reasons:

- To limit the storage space consumed by multimedia content;
- To enable the transfer of multimedia communications over networks using transfer rates, also called torques or speeds bit rates, presently existing.

To better understand the need for multimedia information compression methods examine the following examples.

Consider first the amount of data contained in a bitmap image corresponding to a video frame

PAL (Phase Alternating Line) integral (Ribeiro

2004). For example, to store an image with a resolution of 768×576 pixels

(VGA) and a color depth of 24 bits per pixel (RGB coding with 8 bits per component) need about 1,296 Kbytes, i.e. 1,265 Mbytes since:

Number of pixels = $768 \times 576 = 442368$ pixels

If we consider that each of these images is effectively a frame of a digital video sequence PAL, you can determine the bandwidth required to transmit a continuous stream of these video frames at 25 FPS on a network as and 253.125 Mbit / s, already what:

If we consider the storage requirements for this digital video sequence full PAL, for example a DVD-ROM (capacity 4,377 Gigabytes), you can determine that an optical disc would store only 141.65 second from this video sequence (approximately 2 minutes), since:

Thus, using a magnetic hard drive, and assuming that this digital video sequence corresponds to a movie with 90 minutes, you can determine which would need 166 Gigabytes of disk storage space to store this movie because:

$32400 \text{Kbytes} \times 90 \text{min} \times 60 \text{s} = 174960000 \text{Kbytes} = 166,85 \text{Gbytes}$

These calculations can easily be repeated to determine the storage and bandwidth consumed by other types of media. For example, if we consider the scanning of a photograph of 35 mm color via a scanner with an average resolution of 2000×2000 , this corresponds to retain only 4 million of the 20 million pixels constituting the original analog photography. This scan results in generation of a file of approximately 10 Mbytes. Clearly, if scanning resolution is increased, any 35mm photography can easily take 50 Mbytes of storage space. This is true, for example, in medical applications used in a hospital where there is a need to store and available for consultation tens of millions of X-ray scanning (Fluckiger, 1995).

From the above, it is clear the need to reduce the amount of data involved in digital audio playback, bitmap images or digital video. In this context, information compression allows:

- To reduce the storage space required by multimedia content;
- Increase speed access to multimedia content.

It is therefore possible to conclude that the compression is presented as the only available way to achieve store, provide and transmit large amounts of multimedia data required by, for example, to allow manipulating and displaying digital video on a PC.

Compression Fundamentals

- compression
- When only eliminate the redundancy of a signal
- No loss of information
- Lossless compression

- Can be used for any signal, but are generally used in text or binary files

Compression:

- When there is reduction of data, there is information loss
- Some techniques are used in specific signals, such as image, audio and video
- perceptually lossless compression
- Humans do not realize.
- Ex .: MP3 audio

Data compression refers to a process by which converts an input stream of data (original data stream) into another data stream containing compressed data occupying less storage space. In this context, a data stream may be either a file as a memory buffer. When decompressing the stream of compressed data, yields an output data stream, which is decompressed and may or may not be identical to the data contained in the original data stream as it is a compression technique lossless or losses, as discussed below. Figure 1 illustrates a block diagram of a generic compression scheme. The compression schemes can also be designated by compression techniques.

As shown, the compression is performed by an encoder and decompression decoder; the encoder output codes found (also called codewords) corresponding to the compressed information (Ribeiro & Torres, 2009).

The performance of a compression scheme can be measured, or above, in terms of the compression ratio which provides.

The compression ratio is a quantity which can be obtained in various ways (Salomon, 2004).

In terms of the compression ratio which provides the compression ratio is a quantity which can be obtained in various ways (Salomon, 2004). However, the most common form of compression ratio obtained by dividing the storage space occupied by the original data stream through the space consumed by the compressed data stream or codes (Bhaskaran & Konstantinides, 1997):

Being "Input B" the number of bits corresponding to the original data stream (before compression), and "output B" the number of bits corresponding to the compressed data stream

(Code), it can be seen that the greater the value of the compression ratio, the shorter the length of the data stream compressed, that is, the lower the storage space consumed by the data flow tablets, or the smaller the width bandwidth required for transmission on a computer network.

Modes and Compression Categories

As to how to compress information compression techniques can be classified as:

The lossless compression techniques (lossless);

The lossy compression techniques (lossy).

Technical lossless compression (lossless)

Also called lossless compression, bit-preserving or reversible compression, the information is retrieved without any change after the process of decompression. That is, the decompressed bit stream is identical to the original bit stream (prior to compression).

Examples:

These techniques are used for compression of textual data and numbers or compression programs / applications, of course, should not undergo any change due to the compression process.

However, it should be noted that in lossy compression, the fact that the decompressed information is different from the original information does not necessarily imply that the perception of the user is different. This essential aspect of the lossy compression techniques will be detailed later and is associated with the particular characteristics of the human senses.

As to how the information is viewed by compression scheme, data compression techniques may be grouped into two broad categories:

The entropy coding techniques (entropy encoding);

The source coding techniques (source encoding).

Table 1 illustrates the main characteristics of these categories.

Category	Main Feature	Compression Mode
	Independence of features	lossless compression
Entropy Encoding	the data stream to be compressed	
Source encoding	takes into account the semantics of the data stream to be compressed lossless	lossy compression

It is important to note that one should not confuse the use of the term “coding” in the context of compression with encryption performed as a stage of the scanning process (Ribeiro, 2004). Similarly, it is important to note that the techniques of entropy and source encoding are not mutually exclusive. This means that the formats and audio coding standards, image and video generally use combinations of techniques of the two categories in order to obtain the highest compression rate or ratio possible, which is the main goal of any compression technique.

Entropy coding technique

The concept of entropy encoding is a generic term that refers to encoding and compression techniques that do not take into account the nature of the information being compressed.

In other words, the compression techniques based on entropy treat all data as bit sequences, without trying to optimize the compression through the knowledge of the type of information that is compressing. Therefore, we say that the compression techniques based on entropy ignore the semantics of information to compress.

In addition, all entropy coding techniques always provide a lossless compression mode.

For example, consider the substitution of a series of successive 10 bytes, each with the value zero (0), by a special character followed by the number 10, yielding for example <! 10>. This is a typical example of an entropy encoding technique, since when performing this type of operation are not make any assumption as to the significance of this set of successive zeros.

The entropy coding techniques can be further divided into three main types:

Technical ü suppression of repetitive sequences;

The statistical coding techniques

The techniques based on dictionaries.

Technical suppression of repetitive sequences

The technique of suppression of repetitive sequences is the first type of methods that will analyze, since it is one of the simplest compression techniques and the oldest in Computer Science. This technique is based on producing fixed length codes and operates in two steps:

1. Detection of repetitive sequences of bits or bytes.
2. Consequent replacement of these sequences by their number of occurrences.

This method can take one of two possible forms, which will be discussed below:

- Techniques for suppression of zeros or spaces;
- Run-Length Encoding Technique (RLE).

Zero suppression or space

In this way, the method of suppression of repetitive sequences assumes that only a character (byte) is predetermined and is frequently repeated. This character can be zero in numeric data or space in textual data. Consequently, a series of n spaces or zeros successive will be replaced by a special character (or character designated by flag meth) immediately followed by the number of occurrences (n) of that character.

For example, consider the following string of numeric characters wherein each character (in this case, each digit) is encoded with one byte: 742000000000005. using the technique of zero suppression, and setting the status flag as "!" it is possible to obtain the following compressed sequence: 742 125, since there is a sequence of 12 consecutive zeros in the original data stream.

In the context of this example it is pertinent to make two observations. Firstly it is noted that the number 12 following the flag should be coded with a byte, so as to avoid confusion with the character 5 below. Secondly, noting that broke of a sequence of 16 bytes and there was obtained a compressed sequence with a length of 6 bytes, it is possible to determine the compression ratio obtained as follows:

This means that could compress 2.66 units of the original information data stream into a single information unit in the compressed data stream.

Run-Length Encoding Technique (RLE).

In RLE way, the repetitive sequence suppression method allows any sequence of repeated characters can be replaced by a short form. This means that the RLE to compress technique allows any character that appears repetitively, in addition to the zeros and spaces.

The algorithm RLE technique is to substitute a series of n characters "c" row by own character "c" preceded by a special character (a flag or escape character) which, in turn, is followed by the number n of character instances repeated (Fluckiger, 1995). This set of 3 characters replacing the repeated sequence is designated by token, and is as follows: $\langle n \rangle \langle c \rangle$.

Analyzing the mode of operation described, it can be concluded that this method should not be used in cases where a character appears only twice repeated since rise to a longer sequence than the original sequence. Likewise, their use to replace three successive strings would not bring any advantage. Thus, it can be concluded that the replacement must be performed only if the number of successive occurrences of a character is equal to or greater than four.

The shape of the RLE method that has just been described is the simplest form and is used only for textual content. However, there are other variations of this method can be found, for example, recommended in literature (Nelson and Gailly, 1995; Salomon, 2004; Li & Drew, 2004).

To illustrate the operation of the RLE technique, consider the following string: ABCCCCCABCABC. However, the RLE method replaces redundant data streams by tokens, whereby using RLE encoding can compress the repetitive sequence "C" using a specific flag such as the character "!".

Thus, the compressed form of the original string could take the following expression: AB6CABCABC!.

In this case, the achieved compression ratio can be determined.

Conclusion

This activity summarizes the need of resorting to compression techniques to represent information related to types of non-structured medium such as digital audio, digital video and bitmap image. Then it introduced into the generic format for digital information compression schemes and defined the concept compression ratio. Then featured are two compression modes: with and without loss and can be applied by the compression technique. It also addresses are several types of entropy coding techniques.

Self-check 5.1

Consider the following string of numeric characters wherein each character (in this case, each digit) is encoded with one byte: 7420000000000005. Using the technique of zero suppression, obtain the compressed sequence.

Consider the following string: ABCCCCCABCABC using RLE encoding, determine the compressed form of the original string. Determine the achieved compression ratio of the previous chain.

Consider the following bit string: 00000001111111110000011 using RLE encoding, determine the compressed form of the original string. Determine the achieved compression ratio of the previous chain.

5.2 Compression and Image Format

Taking a pixel (picture element) any of a picture, probably the color of that pixel is equal to the neighboring elements or another nearby region in the image, because there is a high probability they all belong to the same object of the image.

The resources required to store and transmit images are immense, which makes it attractive to image compression. The image compression is based on removing redundant information existing in images. There are two image compression categories:

- non-destructive - it is possible to reconstruct the original image EXACTLY before having the compression was performed
- Destructive - in the compression process are lost characteristics of the images, which allows to obtain higher degrees of compression.

There are three types of redundancy in images that are exploited by compression mechanisms:

Encoding - The way the image is represented (encoded) introduces redundancy

Inter-pixel - The image shows repeats of pixel patterns.

Psycho-visual - This includes information visually is not relevant.

Compression Techniques (coding)

- RLE description of sets of consecutive pixels (TIFF, BMP, PCX, Photoshop);
- LZW;
- predictive or differential compression;
- transformed based compression (JPEG)

Types of Image Compression

Compression without preda:

- Simple techniques RLE;
- Sophisticated techniques
- art variable length coding of Huffman coding
- Based on LZ77 dictionary, LZ78 (PNG, WinZip), LZW (TIFF, GIF, PDF)
- Elimination of irrelevant information from the point of view of human perception;
- compression techniques based transforms (DCT), JPEG;
- high compression ratios

Image Formats

Information contained in image formats:

- the type of file identifier;
- Data on encoding (kind of composing., Dimensions, natural resolution, prof. Color)
- Color Table, CLUT (when necessary)
- Information on color (aspect) of each pixel.

Standard JPEG

Lately there has been widespread effort to improve the development of new compression schemes based transform coding, vector quantization, wavelet and fratais.

Conclusion

However, recent advances in lossy compression techniques include various methods such as discrete cosine transform (DCT), quantization vector wavelet transform, neural networks, and fractal coding and other techniques for transformed.

Self-check 5.2

Explain how does the data interlacing in standard JPEG, referring to the data unit notions and minimum coding unit.

JPEG standard supports two modes of compression: lossless and lossy. Indicate, and characterize briefly compression methods which are defined in the standard for each of these modes.

Indicate, justifying the requirements that governed the development of standard JPEG

5.3 Compression and Digital Audio Format

The human voice makes sounds ranging from 500 Hz to 20 KHz. The lower frequencies are produced by the sounds of vowels and low, and the higher frequencies produced by the consonants. This table illustrates the three main types of frequency ranges and their effects in humans.

WAVE TYPE	NOISE EMISSION SOURCE	FREQUENCY RANGE	EFFECTS ON HUMAN
	Thunderstorms, earthquakes, bridges, rockets, vehicles engines		Nausea, seizure
AUDIBLE SOUND	Audible sound source	16 Hz - 20 kHz	It depends on its amplitude in decibels (dB)
WAVES	Ultrasonic such as remote controls, alarm systems	Above 20 KHz	Potentially dangerous, since the respective actual range is not audible

The medium comprising a multimedia application necessarily exist in digital format. To obtain a digital representation of the associated information to the media, it is necessary to digitization. The digitization of information is defined as the process by which it becomes an analog signal to a digital signal.

Audio

Disturbance occurs in air pressure and reaches the human auditory system.

Psychoacoustics

Physiological study of hearing helps with understanding how sounds reach the ear and are processed by the ear and the brain to give the listener useful information about the world around them.

Band Frequency of Human Hearing

The human ear was sounds whenever the frequency of these sounds are located from 20 cycles per second, i.e., 20Hz. The frequency of a sound is a physical measure of a disturbance that makes the human being evoke a certain tone. The frequency band (frequency range) to human hearing ranges from 20Hz to about 20kHz.

[1] Until the emergence of audio compression, information (data) high-quality digital audio consumed a ridiculous amount of disk space.

Consider this example: you want to copy your favorite song to your computer. How do you want the quality is like that of a CD, you must save it in the 44.1 kHz, stereo (2-channel) with 16 bits per sample.

44,100 Hz means that you have 44,100 values (samples) per second coming from your sound card (or your input device). Multiply that by 2 since we want to stereo (2-channel). Multiply again by 2 (bytes) since you will have 2 bytes per sample (which means 16 bits) .Then, the music will: samples bytes s 44,100 ----- X 2 X 2 channels ----- X - 60 --- s sample min equivalent to about 10 MBytes of space used on your hard disk per minute of audio stored. If you want to download it from the Internet, say for a connection to modem 56Kb / s (actual 44.000 Kb / s), will take about 10 million bytes x 8 bits / byte / (44000 bits / s) / (60 s / min) ~ 30 minutes.

There are two basic parameters to control the quality and bit rate (bit rate) of a digital signal:

Ø sampling frequency (sampling rate)

Ø measurement resolution (bits per sample No audio).

Audio compression techniques most commonly used high-fidelity:

The algorithms defined in the various MPEG-Audio standards.

The AC audio compression algorithms developed by Dolby Laboratories.

MPEG-Audio techniques and Dolby AC-3

Do not start from assumptions about the shape of the input signal and can be applied effectively to both the voice type audio and high-fidelity audio. The compression is obtained through two sequential processes:

- The transformation of the input signal to the frequency domain.
- The use psychoacoustic methods to remove irrelevant information from the perceptive point of view.

This approach reduces the number of samples required for a given length of audio, permanently reducing the size of the corresponding audio file.

Audio compression standards

The standards encompassed in this category Audio

MPEG-1 Audio;

standard Dolby AC-3

MPEG-2 Audio

MPEG-4

Main features of speech coding standards and generic audio

Conclusion

The activity begins with an analysis of psychoacoustics, which focuses on the interaction between physical stimuli and the human nervous system, introducing and characterizing the frequency band of concepts and intensity of human hearing. There are a number of advantages associated with the digital audio representation. The discussion focused on generic audio compression and high-fidelity, developing an individualized analysis of the specific compression techniques used in audio coding parts of international standards MPEG-1, Dolby AC-3, MPEG-2 MPEG-4.

The first digital video formats representing information without any compression. Even though great advantages afforded:

- Storage Possibility of data servers;
- Ability to make copies without loss of quality;
- Possibility of digital filtering to eliminate noise;
- Direct access easier editing.

Analog video

- The image consists of horizontal lines that are displayed progressively.
- The scan these lines can be progressive or interlaced. With this last option can be fewer flickers.

Digital video

- YUV components
- TV Issue
- Compression is more efficient
- Digital video versions are "scaled" and offset the YUV system - called YCbCr (CCIR-601) - 8 bits for each component in the intervals
- C - [16, 240]

Compression

A frame occupies 1 Megabyte

- $720 * 486 * 3 \text{ bytes} = 1,049,760 \text{ bytes} \approx 1 \text{ Megabyte}$

1 second of video (PAL) $\approx 25 \text{ Megabytes}$

1 Minute video (PAL) $\approx 1.5 \text{ Gigabytes}$

1 hour of video (PAL) $\approx 90 \text{ Gigabytes}$

To handle uncompressed video -

Storage with terabytes (DVD 4.7Gbytes)

the bandwidth of the order of 200 Mbit / sec

$\S 25 \text{ Mbytes} * 8 = 200 \text{ Megabits.}$

Reduction of spatial redundancy (image) allows you to reduce the size of frames and image compression (lossy encoding). When reducing the temporal redundancy, permits: two consecutive frames (in scenes with little motion) are not significantly different; using predictive encoding; use of motion detectors.

Compressed Video Standards

MPEG-1 (1991)

1,2 to 1.5Mbps

the 352×240 at 30fps (or 352×288 at 25fps)

Quality VHS

MPEG-2

352×240 From the 30fps (or 352×288 at 25fps)

Until high definition 1920×1250 -60 fps

TV and HDTV

MPEG-4

H.261, H.263 and H.263 +

Conclusion

In this activity was an introduction to digital video and digital video compression fundamentals, enumerating the reduction techniques of temporal redundancy of a video sequence. It presented the digital video concepts, its main parameters such as spatial resolution, frames rate and aspect ratio. It was introducing the YCrCb color model and formats / codex used by most digital videos.

Summary

The first unit of this module addresses the types of multimedia information. In this fifth and final unit, we analyze first the importance and motivation for the compression of the types of unstructured multimedia information, methods and techniques applied. However, compression is used to reduce the amount of information to be transmitted or to reduce the bandwidth required for data transmission.

This unit is divided into four activities, and at first we discuss the multimedia compression fundamentals. Then we study the bitmap images - compression techniques associated and its main formats. In the third activity, digital audio, made a brief introduction to the motivations and the importance of coding and have listed the algorithms associated with the compression methods of this multimedia information, this, without forgetting to list your formats / codecs.

Unit Assessment

Check your understanding!

Evaluation

Heading	Marks
Quality problem execution (clarity, organization, rigor)	5pts
Note the completion of the work	12pts
Additional effort (research, problem solving)	3pts

Readings and other resource

Readings and other features of this unit are in Readings and Other Travel Resources list.

1. Chapman, Nigel and Chapman, Jeny - Digital Multimedia. 1st Edition New York: While, 2000. ISBN: 0-471-98386-1 (Chapter 2).
2. Nuno Ribeiro, Multimedia and Interactive Technologies, 5th Edition. FCA - Editora de Informática, Lda, ISBN: 978-972-722-744-0 (Chapter 3)..
3. Multimedia Systems - notes. Open University, 2010 António Manuel Dias.
4. <http://aprendermultimedia.webnode.pt/tema3/> accessed on 26 February 2016.

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