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ISO/OSI model and data communication by animations

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Abstract

The main objective of this work was to develop an interactive environment of teaching and learning the data communication taking as a base the ISO/OSI model (International Organization for Standardization/Open System Interconnection) and the HFC net (Hybrid Fiber Coaxial). A theoretical framework was elaborated with basic concepts about communication protocols by using the ISO/OSI model and the active and passive elements that take part in the transmission of a message in a HFC net. Animations were made to allow the student study those concepts in an interactive and dynamic way. An interactive section was developed for the self-evaluation of the student. It was considered each of the process that take part in the treatment of the message, as the encapsulation, the codification of the digital information and the modulation to an analogue sign, as well as each of the elements that apply a treatment to the message inside the HFC net till it reaches its destination.

Keywords: data communication, ISO/OSI model, animations to teach, data communication protocols, transmission of information.

1 Introduction

It is a fact that the utilization of animations in the process of teaching and learning is more frequent. It contributes the improvement of that process, especially, in those themes that require a certain level of abstraction.

The animation is acquiring more and more importance in relationship to the educative contents. This technique, which assures moving images, helps the users visualize process, ideas, or abstract concepts easily [1].



This work will show a methodology to develop didactic animations, using as an example the realization of an animation to explain data communication concepts such as the ISO/OSI model, the communicative protocols of information and the signs transported by HFC nets, describing the treatment that the message receives.

2 Objectives

The general objectives are:

- i) To develop an integrated environment to study the data communication protocols and the signals transported by the HFC nets, describing the treatment that the message receives.
- ii) That the student obtains solid knowledge about theoretical and practical aspects of the data communication using the ISO/OSI model, the available technological easiness and the involved resources.

The specific objectives are:

- i) To study the data communication protocols, precisely, the ISO/OSI model and the treatment that the message receives in the HFC nets.
- ii) To know the points of the HFC nets that takes part in the communicative process.
- iii) To study the concepts related with the HFC nets and the elements and process that take part in the data communication.
- iv) To make, by means of software Flash®, an animated application to describe the ISO/OSI model and the active and passive elements of a HFC net, which allow the students make a self-learning process at his own pace that includes a self-evaluating section to valid his learning.

3 Development methodology

It has started with a compilation of information from various bibliographical sources, including materials for the Teleprocessing and Distributed Systems course (currently Data Communications), books, papers, etc. [2, 3, 4, 5, 6, 7, 8, 9, 10, 11].

Enquiries were carried out to the students to relieve the difficulties encountered in attempting to learn the theoretical content and perform animations relating to these subjects in order to facilitate learning and provide a web questionnaire that will allow learners to self-assess themselves.

This project has been divided into three phases. The first of them applied to the collection and study of data communication protocols, as well as the inclusion (to be used as an example through the animation) of a HFC net. The second is the construction of a website in Flash which integrates the animations to obtain an interactive application to incorporate the theoretical contents studied; it explains the functioning and the sections that contain the application, each of the sections and the corresponding animations are explained in detail. The third phase consists of a web questionnaire, which allows students to perform the process of self-assessment of their programming [12, 13].



3.1 Stage 1

It has consisted in the collection of the theoretical contents that were used as sustenance for the realization of the animations:

- i) Survey of *information*.
- ii) Deepening of the theoretical framework referred to the subject. The sources were documents and tools from the subject, thesis, and specialists in the subjects ISO/OSI model and HFC networks.
- iii) Analysis and evaluation of the most important challenges that are presented in the students to understand the theoretical contents.
- iv) Review and selection of the most important theoretical content to include in the animations.

3.2 Stage 2

It has consisted in the selection of the tools used to process, debug, and implement all necessary treatment for the development of the animations. Once the animations were developed, it was made the construction of a website in Flash to integrate these animations to obtain an interactive application. The methodology used for the development of the Flash application, it was divided into sub-stages:

- i) *Sub-step 1: Analysis of the system:*
 - a) Collection of information relating to the data communication protocols and the theoretical content of the topics covered in stage one to include in the application; b) Feasibility Analysis: the scope of the system and its capabilities were defined to delimit existing technological limitations; c) System Requirements Specification: the required capabilities, interfaces, and the benefits were explained in detail to be hosted on a web server; d) Documentation Review of tools and work environment; e) Tool Selection: to develop this application, certain tools were used to make animation, assemble application, edit images, audio, and text to include them in the animations, and to create 3D objects we used the following programs, Adobe Flash, Adobe Photoshop, Adobe Illustrator, Swift 3D, Loquendo, audacity, and the programming language Action Scripts.
- ii) *Sub-step 2: System Design:*
 - a) Designing of the prototype of animations; b) Creation of pictures, videos, graphics; c) Writing the script of the animations; d) Animations representing each of the topics.
- iii) *Sub-step 3: The development of the system:*
 - a) Selection, correction, and debugging of external images which would be included in the animations through Photoshop and Illustrator tools; b) Creation of images and diagrams on the ISO/OSI model and the HFC networks through Photoshop and Illustrator tools; c) Creation of 3D objects to include in the animations through the SWIFT 3D tool; d) Development of animations with the Flash tool; e) Creation of the texts and subsequent export of the audios to include in the animations through the Loquendo software, and its treatment with the audacity tool; f) Testing and validation of the animations according to the expected results; g) Designing of interfaces; and h) Initial development of the application.



iv) *Sub-step 4: Implementation:* The implementation of feedback provided information that allowed us to refine the system to achieve the expected results:

- a) Testing and validation of the initial application according to expected results;
- b) Settings and redefinition of the designing according to results observed;
- c) Final deployment of the application.

3.3 Stage 3

This stage is the complement to the other two stages; to complete the process of self-learning we have created a web questionnaire in PHP with MYSQL database that allows the student to self-assess himself by answering a set of questions for each topic. It consists of the study and requirements analysis, system needs, applicability of necessary resources, selection of the tool, and possible programming languages.

i) *Sub-step 1: Analysis of the system:*

a) Feasibility analysis: we will define the scope of the system and its capabilities to delimit them to existing technological limitations, b) System Requirements Specification. Detailing the required capabilities, interfaces, and the performance that must be obtained to be hosted on a web server; c) Documentation Review of tools and work environment; d) Selection of the theoretical content to include in the questionnaire (themes, questions, and answers); e) Selection of tools. Tools were used for the creation of the use cases, database, local server, etc. We used the following programs: Dreamweaver, XAMMP packages, MySQL, PHPMyadmin, StarUML, and the following programming languages PHP, CSS, and Javascripts; f) Use Case Diagram: used to understand the use of the system, it shows a set of cases and actors (an actor can be both a system such as a person) and their relations, that is, it shows who can do that and the relationships that exist between actions (use cases).

ii) *Sub-step 2: System design:*

a) Data model; b) Definition of users; c) Design of interfaces.

iii) *Sub-step 3: The development of the system:*

a) Designing and development of the web application for the self-assessment questionnaire; b) User interface development; c) Development of the application.

iv) *Sub-step 4: Implementation:* The implementation of feedback provided information that allowed us to refine the system to achieve the expected results:

- a) Testing and validation of the initial application according to expected results;
- b) Settings and redefinition of the design according to the results observed;
- c) Final deployment of the application.

4 Results

In this section, it is explained and discussed the animations made to represent the ISO/OSI model [2], as well as the Flash application and the web questionnaire for self-evaluation. Described in visual form, the process of encapsulation of data messages when they are transmitted; the animations in this process are shown and while, is performed a more detailed description of the same, in audio, as a complement to the displayed.



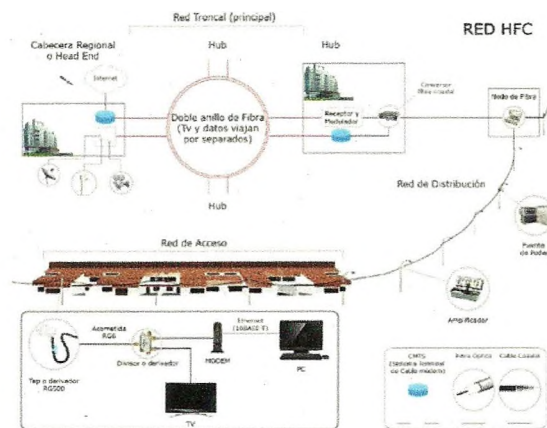


Figure 1: HFC net.

The animations have been carried out with the Flash program, in which there were effects of movement and animation.

It has been worked with the program Photoshop and Illustrator to edit images, modify sizes, improve the quality, etc., adjusts the weight of the images according to the use of Flash on the internet. The Swift 3D program was used to generate the 3D objects that were embedded in Flash. For the generation of speech it was used the Loquendo software and for audio editing it was used the audacity program. It represented the entire contents of the animations inside an executable file in Flash, while the survey was taken in PHP by using the program Dreamweaver.

When you start the application it represents a real-life situation in which it is situated the HFC network (see Figure 1) together with its components in a city, from the onslaught of the user up to the bedside of the service provider, this helps to put the student in a specific type of network with its own characteristics and to better understand all the treatment it receives the message with that configuration.

It allows the user to navigate through various options and thus be able to understand the operation of the various parts that compose the HFC network more precisely and to learn about the operation of the ISO/OSI model which is the main theme of this application. Start Section: it is the main part of the application, it represents the HFC network in real life, and there you can navigate and know its components (see Figure2).

In addition, you can access the test to complete the teaching-learning process, by answering a questionnaire on the content of everything developed. In this screen, the user (depending on the level of access you have) can access the administration panel of the questionnaire, or to the questionnaire itself. If the user enters their data it becomes administrator, then you may enter to the panel with full access, to add, edit, and delete any of the options.

If the user is teaching, then you can access the administration panel but you can only manage the issues and options of your subject. Finally, if you access a



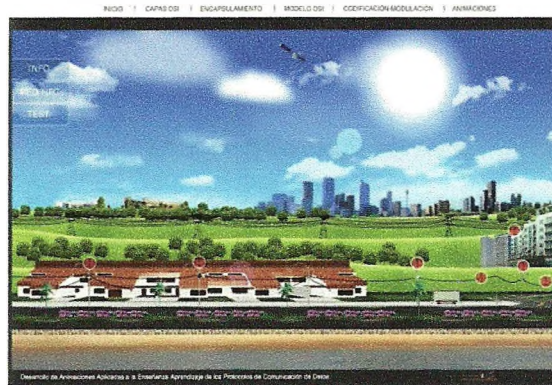


Figure 2: Main screen of the application.



Figure 3: Encapsulation screen section.

user with level student, this may access the questionnaire, which provides the possibility of making a self-assessment of what has been learned, by answering a set of questions selected at random on the themes developed.

This allows students to detect flaws in their knowledge, transferring it to the corresponding theoretical contents.

OSI Layers section: you can select each layer of the ISO/OSI model and get a description of the same. Encapsulation Section: you can learn the operation of the ISO/OSI model, the process of encapsulation where the message each layer adds its own control information until you reach the physical layer, and then to be sent through the network (see Figure 3).

Section OSI model: How it arises and evolves the OSI model; it is an introduction to the reference model from its inception.

Section Codification-Modulation: you can see the process by which the message that leaves from the application layer is transformed into frame and changes of state, the digital data of the frame are encoded, modulated, and converted into an analog signal to be transmitted through the network.



Section Animations: Allows you to navigate through the various animations on the various topics; also provides a complete animation of all the treatment that you receive a message when a PC sends an e-mail to another. The animations represent this communication from the inside of the computer, from the instruction of “send,” passing by the “encapsulated” in which each layer adds its own set of control data. A “robot” is responsible for adding to the “message,” each header of each protocol layer to form the data to be sent through the physical layer. The animation shows how we pass from layer to layer and when it is ready to be sent over the network. It shows how in reality is visualization data, i.e., through voltage pulses, will be showing in a table in order to better understand what is actually being sent, strings of 0 and 1. The data are sent through the transmission medium in where there are other packages within the network that travel to your own destiny. After the frame arrives at its destination, shown the reverse process, i.e., as the “robot” within the destination machine disassembles the frames, and removes each header of the corresponding layer, as well until you can show the message in the application layer.

5 Conclusions

The various tools have been integrated very satisfactorily during the realization of this work. It provided a very good visualization of the animated content in order to understand better the scope of the ISO/OSI model and the details of the data transmission. In addition, it has been including a self-evaluation method where student can assess their knowledge by means of questionnaires, on the content shown in the animations.

This mechanism allows the student detects flaws in their knowledge, transferring it to the corresponding theoretical contents. In this work, it has been chosen a type-specific configuration, as an example it has been used a HFC network, a NRZ encoding, an amplitude modulation, a type of modem, and a transmission type guided tour. The methodology developed is translatable to other knowledge areas, giving them a more practical approach and more profound of their respective contents to achieve a better process of learning for the students.

The questionnaire module is translatable to other knowledge areas, allowing any responsible for a chair manage their own students and the questions with their respective answers, everything from the administration interface.

5.1 Future lines

It will continue on working, improving, and expanding the animations and new mechanisms for self-evaluation to provide better methods of self-learning. It considers the possibility of adding mechanisms that allow us to obtain statistics on the results of the questionnaire, for information on the degree of difficulty of the questions, the amount of access, etc., and consider alternatives to improve learning in the subjects that are more challenging for the students. It is forecast to produce an English version of the developed environment.



References

- [1] Diboos – Federación de Animación. *Libro Blanco del Sector de la Animación en España*. España,2012.
- [2] W. Stallings, *Comunicaciones y Redes de Computadores*. Séptima Edición. Pearson Educación. España,2004.ISBN 84-205-4110-9.
- [3] A.S. Tanenbaum, *Redes de Computadoras*. Cuarta Edición. Pearson Educación. México,2003. ISBN 970-260-162-2.
- [4] A.S. Tanenbaum, M. Van Steen, *Sistemas Distribuidos. Principios y Paradigmas*. Segunda Edición. Pearson Educación. México,2008. ISBN 978-970-26-1280-3.
- [5] D.E. Comer, R.E. Droms, *Computer Networks and Internets, with Internet Applications*. Cuarta Edición. Prentice Hall. USA,2003. ISBN 0-13-143351-2.
- [6] D.E. Comer, *Internetworking with TCP/IP Vol. I: Principles, Protocols, and Architecture*. Cuarta Edición. Prentice Hall International. USA,2000. ISBN 0-13-018380-6.
- [7] D.E. Comer, D.L. Stevens, *Internetworking with TCP/IP Vol. II: ANSI C Version: Design, Implementation, and Internals*. Tercera Edición. Prentice Hall. USA.1999.ISBN 0-13-973843-6.
- [8] J.M. Huidobro, *Tecnologías Avanzadas de Telecomunicaciones*. Primera Edición. Thomson Paraninfo. España,2003. ISBN 84-283-2853-6.
- [9] M. Schwartz, *Redes de Telecomunicaciones: Protocolos, Modelado y Análisis*. Primera Edición. Addison-Wesley Iberoamericana. México,1994. ISBN 0-201-62924-0.
- [10] P. Izaguirre Zúñiga, *Estudio de las distorsiones en la señal sobre redes HFC*. Ciudad Universitaria Rodrigo Facio. Escuela de Ingeniería Eléctrica. Facultad de Ingeniería. Universidad de Costa Rica. Costa Rica. July 2010.
- [11] O.R.A. Palacios, *Análisis de ruido en la señal transmitida en un cable coaxial*. Trabajo de Graduación. Escuela de Ingeniería Mecánica Eléctrica. Facultad de Ingeniería. Universidad de San Carlos de Guatemala. Guatemala. October 2006.
- [12] M.S. Sánchez, *El e-Learning aplicado al ciclo de desarrollo del software*. Trabajo Final de Aplicación. Facultad de Ciencias Exactas, Naturales y Agrimensura. Universidad Nacional del Nordeste. Corrientes, Argentina,2009.
- [13] J.M. Keller, Strategies for stimulating the motivation to learn. *Performance and Instruction*,**26(8)**, pp. 1–7, October 1987.

