MEANINFUL RECEPTION LEARNING IN A MULTIMEDIA CONTEXT: COLOURFUL COGNITION IN ACTION

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INTRODUCTION: THE EXPOSITION DIMENSION

After having introduced the "Full-Hypermedia Systems Design Model" (FHSDM) in previous works (García 2001), it is about time to present in more detail one of the cornerstones of the model: the Exposition Dimension.

Briefly, the FHSDM considers the learning process and the design one as composed by two clearly separated dimensions: the Structural Dimension and the Exposition Dimension. The former is related to the hypertextual characteristics of the system, and its goal is to convey Structural Knowledge. The latter deals with the presentation of concepts, and allows for the exposition of Declarative Knowledge.

In this paper we intend to have the pedagogical grounds for the Exposition Dimension more fully explained. But our main goal is to present the technical research in which we have been looking for the most effective way of implementing Docuschemas, the multimedia presentation conceptual device we have developed in order to maximise cognitive efficacy.

Watching, not reading: Docuschema's principles

According to our dimensional model, every node in a hypermedia network is intended to present a considerable amount of information: they are the place where explanations of concepts and their relationships are given. Thus, we have chosen the Meaningful Reception Learning (Ausubel 1978)

principles as the pedagogical grounds for the design of each node.

We will consider a node in a hypermedia system as a small classroom, being the lecturer role taken on multimedia resources in the system. We base our development on two basic ideas:

· As in a real classroom, text cannot be the main information vehicle.

· We intend to find a cognitively effective way of presenting a relatively large and difficult amount of Declarative Knowledge.

According to Ausubel's recommendations, a sound way to begin any teaching exposition is by using an Advance Organizer (Ausubel 1960). As we have decided to "eliminate" textual explanations, our advance organizer will be an image, typically a graphical schema[1]. What's more, images make learning easier, generally, rather than text (Lehman 2000), and that fact is bound to increase (Reyes 2000).

But that is not enough if what we pursue is cognitive impact. We have to encourage student's interest. And a way of getting this is by "impacting" her perception with a visually attractive (even spectacular) image, big and colourful.

Anyway, we want to convey contents, a subject-matter, and this catching graphical schema is only an advance organizer, not the contents themselves. We need a way to include in our node the "big information". Audio is the answer: a voice will explain the meaning and contents under the schema.

On the other hand, it makes no sense a long audio explanation with a single static image on the screen: more visual stimulus must be included. Video, animations,… all of them will be welcomed. The final challenge would be to create a presentation as accurate as a textbook and a schema, but also as catching as a documentary: a "Docuschema".

Once the student gets the node, the initial schema is kept on the screen for a few seconds, for the student to familiarize with it. Afterwards, audio begins the explanation of the general ideas in the schema, and introduces the exposition of the first important concept. Then that concept is fully explained by means of a several minutes long video or animation, and the sequence begins again: another audio segment, linking the end of this partial exposition with the beginning of the next one, followed by a video or animation. When all the concepts in the schema have been explained, the presentation is over.

Let's conclude this brief summary of the docuschema's principles with a list of its main cognitive advantages:

· It is both, a schema/summary of the contents and the contents themselves, at the same time.

· Conveys a clear structure in the declarative information, facilitating its recording in the student's memory.

· Stimulates the perceptive system of the learner, emphasizing the

important concepts.

· Contributes to increase student's motivation and interest.

An example of docuschema can be found in (García 2001).

TECHNICAL SOLUTIONS FOR A TECHNICAL CHALLENGE

We need is to demonstrate the technological feasibility of our model: how it can be implemented using state-of-the-art multimedia technology. In order to do so, we have, first of all, identified the technical requirements needed to make the docuschema work. Afterwards, we have studied three different technologies widely used in multimedia, in order to test their suitability in this case. Notice this has been mainly a practical work, as we have developed several prototypes, one with each of the technologies to be evaluated. Finally, we have created our own, customized, solution, based on the conclusions obtained from the study (the complete work can be found in (Caudeli 2001)).

Our solution must be able to:

· Situate pictures, text and video at any place of the screen.

· Import multimedia resources from third-party applications.

· Play audio and video elements, user-controlled.

· Synchronize multimedia resources properly.

· Offer to the user the possibility of interacting with some elements of the presentation.

· Provide facilities for the creation of multimedia presentations.

We must also evaluate the use of docuschemas within the Internet, from a technical point of view, as Internet is probably the best way to distribute docuschemas, once the bandwidth problem is solved.

The following paragraphs describe the three technologies studied in this work.

SMIL ("Synchronized Multimedia Integration Language") is a mark-up language based on XML. It allows the description of multimedia presentations in a very easy way, and stores the results in a simple ASCII file. It is also possible to manage not only the visual aspects, but also the time synchronization. The main problem of SMIL is that its specification does not explain how to display the contents described in the SMIL file, so the final aspect of a multimedia presentation depends on the specific player.

Macromedia Flash is an authoring tool whose purpose is to build professional multimedia presentations, specially oriented for the Internet. It is a very powerful tool that allows the creation of complex and sophisticated presentations. But Flash presents some drawbacks, too: first,

its high learning curve; second, the problems encountered to include video clips into the presentation. Other important disadvantage is the obligation of creating the visual aspects of the presentations in a drag-and-drop way, making it impossible the construction of a template to create docuschemas.

Finally, Java is a high-level, general-purpose programming language that allows to make virtually everything. The basic libraries included with the JSDK are too simple to manage multimedia resources efficiently, but this problem is attenuated by the Java Media Framework (JMF) libraries: a powerful set of tools to handle multimedia elements in an easy and flexible way. The construction of a prototype using this language automatically led us to the use of a single template to describe docuschemas, hiding the complexity of Java to the author.

THE TECHNICAL MIX: A CUSTOMIZED SOLUTION

After presenting the three alternatives, we must compare them and build a solution that matches the requirements of the docuschema model. This solution will combine the main advantages of the three: the versatility of Java, the simplicity of SMIL and the sophistication of Flash.

Thus, the solution adopted consists on writing a customized player for docuschemas using Java. This player (an applet, to facilitate the distribution and viewing over the Internet) must reflect the generic behaviour and characteristics of docuschemas. It reads the information regarding a particular presentation from a file containing the necessary description. This file is written using an XML-based language similar to, but simpler than, SMIL.

This solution includes a second tool that automatically generates the describing files associated to the presentations. This application asks the user for the characteristics of the docuschema to be created and uses this information to write the XML file.

Finally, Flash should be one of the third-party applications used to create the multimedia partial presentations associated to each concept, exported to some common video format.

CONCLUSIONS

We firmly believe that any technological development related to education must be preceded by a careful pedagogical and cognitive analysis. In this case, the conclusion of that analysis has been the docuschema, a sound way of presenting declarative knowledge by means of multimedia information..

Afterwards, it is necessary to “bring into life” the promises of our model. And the first step is to carefully select and combine the most suitable technologies.

A careful design of a learning model, based on cognitive and pedagogical principles, followed by a comprehensive analysis of the different technological alternatives to implement it, will lead us to the development of really sound and useful technological tools for learning.

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[1] This could be considered as an "extreme case" of the widespread recommendation of limiting the amount of text in a hypermedia node, as reading on the screen is annoying and even unhealthy (Dunlop 2001).