

# An Interactive Environment for Learning the Concepts of Electric Energy Generation

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**Abstract** - *There are advantages to use multimedia in the electrical engineering course classroom. One of these is that multimedia stimulates student interest. Thus, this paper describes a multimedia education package namely AINAGENE in order to help the learning process in electrical engineering course which we believe should be one of the best way for learning the late 90s. The key feature of AINAGENE multimedia application is using together text, graphic, image, video with interactions from itself.*

*The case study is presented to the energy generation course of Electrical Engineering Department (EED) from Federal University of Espirito Santo (UFES). This developed multimedia package presents the appropriate contents to the student, instigating his/her reactions and helping the learning process, generating questions to the students and checking his/her knowledge.*

Key-Words: Multimedia, Education

## Introduction

The engineering students of EED at UFES have been using and evaluating AINAGENE multimedia application program materials since 1995. During this period we have used Asymetrix Toolbook authoring system to produce programs for a variety of applications. We are particularly pleased with the quality of the work we have been able to produce using Toolbook as part of the program of electrical engineering courses.

Modern education are require new ways of learning. Notwithstanding, there are no acceptable textbooks in visual print type for the Electrical Energy Generation course, so reference materials in a form of visual programming tool is a necessary today. These materials are built by using class notes, selected technical papers, and some textbooks in print.

The usage of computer as an auxiliary tool in the learning process appeared naturally and the software package appeared as an important and fundamental element in this learning process. Both the computers and software package constitute just a way to get knowledge.

According to Bloom [1], knowledge has many meanings, that is to say, it contains a division in six levels: information, comprehension, application, analysis, synthesis and exam. In the information level, there are properties and characteristics of a study object. In comprehension level, there are the understanding abilities of the subject that is been studying, that is to say, the construction of an image. The application level shows how to use the information. The analysis level consists of identifying the parts of the information and the synthesis level uses the concept to synthesize, that is to say, to produce abstractions. Finally the exam level expresses the capacity of comparison.

The suggestion of this work is to bring the experience acquired during the implementation and along the use of the developed multimedia education package. The main idea is to attend the learning process of the students from electrical engineering course at UFES. Our experience with the electrical energy generation course has incited and indicated the ways to the student in search of information about the subject, through the use of multimedia education package. By the use of this multimedia education package we believe it makes the student to develop his/her own knowledge.

The execution of tasks that is involved through the exercises happens in a moment that the student stops and thinks about the idea shown before. The kind of programming used for the development of education package has been through the paradigm of events or message oriented programming where the responsibility at the disposition of the tasks' execution is a responsibility of the student.

The author hopes that this paper will encourage more engineering professors to explore the use of visual programming tool in the learning process of its engineering subject. The developed multimedia educational package seems to be a highly efficient way of importing knowledge, and of presenting it in an organized and coherent form when that knowledge is retained.

The AINAGENE focus the students' minds on the problem at hand, to awaken an interest in the material and to increase retention. It also can used by student as a review as it is desirable. It is also important to

say that AINAGENE multimedia application was developed taking care at least two crucial elements which it seems to be advantages by itself. First it is use of a popular existing software authoring systems and second it is use a popular MS Windows style.

### The Windows AINAGENE Multimedia Application Package

We understand that the great challenge is to construct educational software which exist in Bloom's taxonomy. Therefore, in order to construct the multimedia education package proposed here, it has tried to consider the ways of getting knowledge according to Bloom, to the effect that this multimedia package can be seen as an educational software.

The proposed multimedia education package is characterized by an interactive windows user interface which the student can handle the information in different levels of abstraction. The user of this multimedia education package can be people who are not students, but who have some interest about the subject.

A key feature of the developed multimedia educational package window user interface is its modular and user-friendly structure [2]. The modularity is assured by a main user interface, which controls the execution of three modules, as well the information exchanging between them. This is naturally implemented when using windows-based interfaces, a message or event oriented architecture.

The user-friendly characteristic means that the education multimedia package exhibits the topics concepts and interact with the user in a friendly way. This is a quite important feature of any graphical interface, and was carefully handled here. This is also naturally achieved by a windows application [3].

This two features were the key for deciding to program a windows-based user interface. As a consequence, the proposed windows user interface also allows the user to work in a non-sequential way.

There are three modules in the package architecture developed up to now: the module CEC (Conventional Electrical Central), the module CNC (Not Conventional Electrical Central), and the module GER (Synchronous Machine). They can be run by the group of programs called Generation of Energy, and the general appearance of the windows AINAGENE user interface is showed in figure 1. These tree modules are fully integrated, so that the user can alternate from one to other module in an easy way.

Figure 1 - The AINAGENE Interface

The module CEC is constructed by six topics including whole the contents of the subject. The module CNC is constituted by four topics. The module GER contains just one topic The different kinds of knowledge are shown in different modules, i. e., as topics, but they have similar characteristics in their presentation. The flexibility of this package can be seen through the existing easiness in doing

additional changes in its modules.

The presentation subject is almost the same in each one of these modules. The subjects are divided in topics which are represented by one page and it is in a clear and logical sequence.

### The Module CEC

The figure 2 shows the main interface in the module CEC. As it can be observed all the topics can be run directly, that is, the navigation along the package is flexible, and makes use of several multimedia resources as hypertexts, hotwords, and buttons.

The module CEC treats of conventional electrical central and it means the all type of hydroelectric plant considering that in Brazil the majority of these units are hydroelectric one. Besides, This module presents the more important elements, types more used, and necessary conditions to the built the hydroelectric plants.

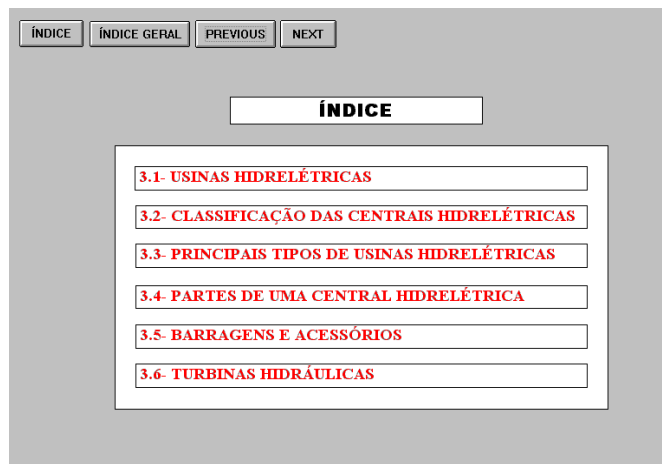
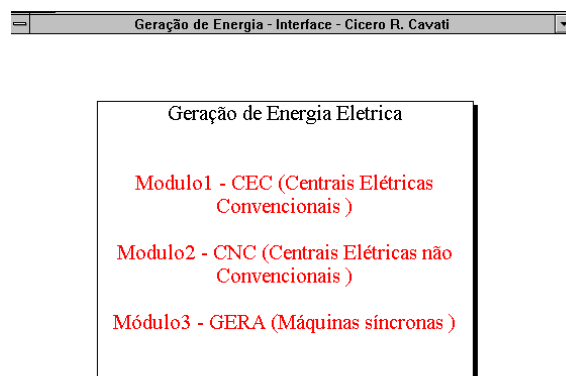


Fig.2 - The main interface of the module CEC



### The Module CNC

The figure 3 shows the main interface in the module CEN. As it can also be observed all the topics can be

run directly, that is, the navigation along the package is flexible, and makes use of several multimedia resources as hypertexts, hotwords, and buttons.

This module treats of no conventional electrical central. Here it is described: a) the thermal plant that using coal, diesel and gas as a combustible; b) the thermal nuclear plant; c) the ocean-motors plant, and d) wind plant.



Fig. 3 – The Main interface of the module CEN



Fig. 4 – The Various types of CEN

### The Module GER

The figure 5 shows the main interface in the module GER. As it can be observed all the topics can also be run directly, that is, the navigation along the package is flexible, and makes use of several multimedia resources as hypertexts, hotwords, and buttons.

This module contains the concepts related to the synchronous machine and its related topics.

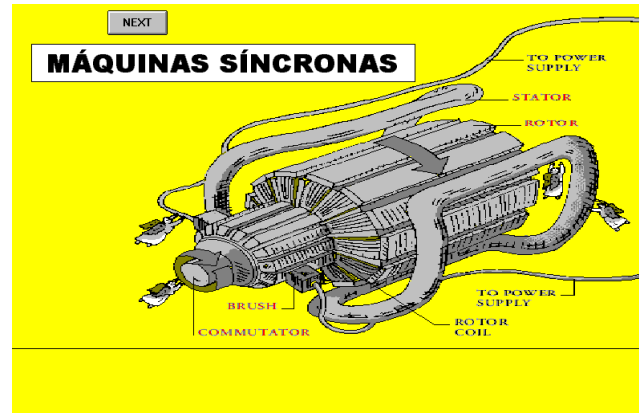


Fig. 5 - The main interface of the module GER

### The Programming

The Characteristic of the programming utilized is the messages or events oriented programming where: the system is constituted by a set of objects which react to the specific events; for each object there are zero or more kinds of associated events; the signaling of the event is done through messages sent to the associated object and the reaction because the events is dealt with handlers, which are similar to programs from conventional programming. The architecture of the language used can be described by: category of elementary objects (field, pictures, texts, buttons and key words); constructors of group (group, page, background and book); hierarchy of groups; events and property by kind of object (button- handlers and picture- co-ordinate, color and size), and operations with property (change of color and position).

All the interaction between the user and the package can be summarized by: the action of the user motives the sending of a message towards an object. It means for example that, when the user press the button of the mouse, on an object called button, happens the sending of two messages: button down and button up. However, in order to the object answers with a message is necessary to have a handler joined. A handler has the following structure: heading, body and end. The heading specifies the name of the handler, the body specifies which command or message must be executed and the end stipulates the end of the handler. The key feature of AINAGENE multimedia application is using together text, graphic, image, video with interactions from itself, and also its modular and user-friendly structure. The authors believes that the AINAGENE multimedia application will give more flexibility and interest when it for possible to do interactions by internet

### The Author' Experience

The author has taught the same graduate course several times and significant improvement in the multimedia educational package was done.

The author's subjective impression is that students really learn and retain more the course topics when a visual programming tool is used as a auxiliary tool. The author also guess that student always try the package before taking class and they have a opportunity to discuss more deeply the material, and it is observed as student ask its questions during the class. So, this type of education package seems to be one of the better way of visualization and learn the whole materials.

The students are being excited in learn their subject by using multimedia packages and this fact increase their understanding of the subject. Some complex topic are better understood than by traditional way of learning. The learning happens through a interaction process among the teacher, student and package. The modules are available through the set of computers of windows NT class. The students can run these modules anytime according to his/her availability finding out the respective contents, before, in the course of it and after the respective presentation in the classroom. In short the process happens in three stages basically. In the first stage is shown the contents of the course which will be studied as the tasks which will be done. In the second one, the students run the corresponding module, and finally in the third stage it is used the classroom to explain any doubt obviously, and to complements as well, when it is necessary.

## Conclusion

A windows-based user interface conceived to support concepts of electric energy generation is here described. It is named interactive environment for the learning of concepts of electric energy generation subject (AINAGENE). The learning of concepts of electrical energy generation by using AINAGENE becomes a practical and not complicated task.

The education package presented in this paper permits a natural conception of its structure easily. The used structure permits its maintenance easily and its extension according to other similar systems used for the learning based in home page from the internet. In all the modules, it could be observed that the students learn better when there are illustrations which are associated to the concepts.

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This type of multimedia package can be used to stimulate the students with the solution of new problems. Because this, it is necessary clarity with the formulating of problems. This education multimedia package is supposed to be contributing to the construction of knowledge and this new culture can become normal in proportion to both teachers and

students become familiar with it. Finally, the developed multimedia education package can be seen as an entry point to introduce students to other related subject that in a traditional classroom is not possible to reach this goal.

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