E-learning Tools for Education in Asynchronous Machines

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Abstract: - This paper presents a series of e-learning applications from the asynchronous machines field. The context in which they have been carried out and their structure are detailed. The way in which such of applications contribute to the increase of the educational process efficiency in the electrical engineering field is emphasized. The conclusions underline the idea that the virtual education has not only future but also present.

Key-Words: - engineering education, e-learning, software, Internet, asynchronous machines

1 Introduction
E-learning represents the interaction between the teaching-learning process and the informational technologies ICT (Information and Communication Technology). This notion covers a wide spectrum of activities, from the computer aided education (a combination between the traditional learning practices and the on-line ones) until the entirely on-line developed education.

A series of researches regarding the extent in which the information met in different contexts is memorized [13] have been carried out In order to emphasize the informational technologies role in education:
- 10 % of what we read (a virtual medium provides a rich reading material);
- 20 % of what we hear (the electronic educational materials can also include sounds);
- 30 % of what we see (such a material provides an attentive visual organization);
- 50 % of what we hear and see (the videoconferences provide the possibility of real time discussions);
- 70 % of what we discuss with other people (the virtual medium provides the possibility for participating in discussions);
- 95 % of what we teach other people (this thing involves a clear understanding and a good organization of what will be taught).

Internet has an ever greater role in the ICT context.

In an opinion poll made by CISCO Company among the Nobel Prize laureates, regarding the Internet contribution in the next twenty years, the most of the interviewed ones have accredited its positive role in the education field (fig. 1).

2 Site e-lee.net
The association called "Association for promotion of e-Learning tools for Electrical Engineering" (e-LEE) has been founded in the year 2004 by starting from the conclusions emphasized before; this association aims to promote and estimate the multimedia didactic means for the engineering education in general and especially for the electrical engineering education.

The Electromechanical Faculty from Craiova is among the founder members.
One of the achievements of this association is the site www.e-lee.net, which has been awarded a prize at national level, site translated in English, French, Romanian and Portuguese (fig. 1).

This site stocks a series of tutorials from four fields of the electrical engineering (fig. 2):
- electric circuits;
- power electronics;
- electrical machines;
- renewable energies.

The Electromechanical Faculty from Craiova has been preoccupied for carrying out some applications in the electrical machines field (fig. 3) and of the asynchronous machine, respectively.

Virtual laboratories are proposed for:
- measurement of the equivalent diagram parameters;
- determining the mechanical characteristics;
- applications of the command methods;
- the influence of the inverter type in vector control;
- the influence of the parameters variation in vector control;
- speed adjustment with Direct Torque Control.

In the section “Realization and operation” (fig. 5) the fundamentals of the manufacturing and operation principle of the asynchronous machine are presented.

Concerning the manufacturing (figs. 6 and 7), the different constitutive elements are presented. The lecture is accomplished by videos and pictures taken during the technological process.

3 Site “Asynchronous machine”
This site (fig. 4) contains information about:
- realization and operation principles;
- general operation equations and equivalent diagrams;
- operation and mechanical characteristics;
- classical command of the drive (starting, speed adjustment and braking);
- vector control;
- Direct Torque Control – DTC.
The lecture concerning the operation of the asynchronous machine presents the principle, the characteristic parameters and the balance of powers (figs. 8 and 9).

The different operation regimes are also detailed: motor (fig. 10), generator (fig. 11) and electromagnetic brake (fig. 12).

Starting from the manufacturing and operation principle of the asynchronous machine, the general operation equations are determined and, on this basis, the equivalent "T" - "π" diagrams (fig. 13) and vectorial diagram (fig. 14).
4 Conclusion
The applications from the asynchronous machines field, installed on the site www.e-lee.net, are of real help for understanding the operation principle, the construction and the equations of this machine. In the future this site will be developed by collaboration between the University of Craiova (Romania), Université Catholique de Louvain (Belgium), Haute Etude d'Ingénieur Lille (France) and Universidad Tecnica de Lisbon (Portugal).

References: