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From the editor..

Welcome to the October 2005 issue of Learning Technology.

This issue contains special section on the East European Perspective on Information Technologies in Education, guest edited by Prof. Samvel Shoukourian, Head, Department of Algorithmic Languages, Yerevan State University, Armenia. Prof. Shoukourian is also an Academician of National Academy of Sciences of Republic of Armenia. The articles in this issue are based on the International Workshop on Information Technologies in Education, that took place in Yerevan, Armenia during 13-17 June 2005.

Preparations for The IEEE International Conference on Advanced Learning Technologies (ICALT2006) are now on the track. The ICALT2006 will take place in Kerkrade, The Netherlands during July 5-7, 2006. Please visit the website of the conference for further details:
http://lttf.ieee.org/icalt2006/
or
http://www.ask.iti.gr/icalt/2006/

You are also welcome to complete the FREE MEMBERSHIP FORM for Technical Committee on Learning Technology. Please complete the form at: http://lttf.ieee.org/join.htm.

Besides, if you are involved in research and/or implementation of any aspect of advanced learning technologies, I invite you to contribute your own work in progress, project reports, case studies, and events announcements in this newsletter. For more details, please refer author guidelines at http://lttf.ieee.org/learn_tech/authors.html.

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Ontology-based International Degree Recognition

ABSTRACT

Mutual recognition of courses and degrees is one of the main goals of EU universities according to the Bologna Declaration. International exchange of experience in the training of specialists is one of the most actual problems in the modern open society. None (even the best) of the European universities can provide students with an optimal set of courses. This especially concerns Ukrainian (and other post-USSR) universities because of poor financing of education, the lack of funds for new equipment and facilities, limited mobility of teachers and consequently impossibility to teach courses corresponding to the newest trends and achievements in science.

Nowadays the technology of obtaining the higher education with the best courses from different universities around the world is becoming customary. Following that scheme, a student composes an individual study plan including the most interesting and modern courses from different universities. He can obtain a diploma usually from one of those attended universities when he satisfies all demands for a degree in that university. Most of European universities demand to obtain a minimal amount of credits only. This method allows increasing the efficiency of higher education. This is the way the problem of a transfer of courses, diplomas and degrees is being solved in different foreign universities.

The European Credit Transfer System has been developed in order to facilitate the transfer of credits obtained in different European universities. Most of them successfully use the system. It was developed to solve the problem of recognition of obtained degrees in Europe because national standards and demands of each European country are constantly changing under economical and technological impacts. ECTS isn't a system providing an automatic transfer of courses and diplomas but just a tool for credit transfer. Such system should be developed taking into account the national specific of educational standards. Now the European Community has rather clear transfer methodology. Similarities in EU standards of education and ECTS make the process of recognition feasible and fast for EU students.

Substantial differences between Ukrainian (as well as other post-USSR) and EU standards in higher education make the recognition of courses and degrees a hard, time-demanding process involving valuable human resources. Ukrainian credits are mostly recognized only by those EU universities, which have a long-term cooperation with specific Ukrainian universities and the content of their curricula is well-known due to joint activities.

The main problems are "what can be recognised" and "how it can be transferred". For Ukraine the solution of the second problem – the credit transfer methodology – has been suggested by Kharkov National University of Radioelectronics (KNURE), Ukraine, in consortium of University of Jyväskylä, Finland and Athens University of Business and Finance, Greece, within the Tempus project UM_CP-20560-1999. But the huge problem of determining which courses and degrees can be recognised is still on the agenda.

Transferred courses/degrees should be determined not by the names (or few words annotation) but by the content. For this purpose it is necessary to develop a new technology providing automated determination of semantically similar courses/degrees.

The research is devoted to the development of an intelligent mechanism of management and integration of heterogeneous information based on standardized models of knowledge – ontologies. Modern information systems (including educational) raise essential questions related to the management of information resources and tasks of knowledge accumulation. As statistical methods do not provide the possibility of contextual information processing, tasks of search and analysis in information sources are considerably complicated. The solution of these problems completely depends on the possibility to carry out semantic analysis.

The proposed solution is the methodology and technology for semantic description of different educational information resources (degree standards, curricular, course descriptions, etc.) according to Semantic Web standards of W3C Consortium (http://www.w3.org). The proposed solution is universal in the meaning that it can be used for presentation of educational resources for every university in the world. The main phase of study recognition is the understanding of the content of the study concerned. The automated recognition (and automatic "understanding") can be ensured only by analysing the entire detailed semantic description (ontology) of the study domain, which is shared by administrators of both home and host universities.

The core element of the new information technology is the methodology for ontology-based comparison of higher educational standards. It includes the general framework for integration of higher educational standards (according to the international knowledge management standards of ontology-based management of electronic documents and resources on the Web) and the models of upper ontologies and pilot ontologies to support standardization of educational resources. The models of ontologies are in line with international educational standards and tools being currently established to ensure a higher-level interoperability. This technology will include:

- ontology-based descriptions of topics, courses and degrees;
- methodology of creation and comparison of ontology-based information resources in higher education;
- pilot tool for ontology-based international degree recognition and individual study plan generation;

It's planned to develop a web service that will provide an ontology-based automatic comparison of educational documents using semantic descriptions and determine similarities and differences between them. For instance a web service can provide a student planning to continue the education in a European University with a list of courses eligible to transfer and a list of differences, i.e. the courses which are necessary to learn.

The offered technology will provide:converting of national educational documents to those by European standards; automatic recognition of courses and degrees of different universities; generation of individual study plans for international mobility students; semantic annotation of national information resources in education; evaluation of correspondence of the educational content to the EU standards.

The development of Semantic Web technology is caused by "Information burst" in Internet and necessity of automated data and knowledge processing in the Web. The solution of these problems is the standardization of knowledge-sharing technology and using intelligent tools for human knowledge processing. Semantic Web is the idea of having data on the web defined and linked in a way that can be used by machines not just for display purposes, but for automation, integration and reuse of data across various applications. Following the Semantic Web ideas, all web resources should be semantically annotated by formal machine-readable descriptions, which refer to shared ontologies: Web documents/services/databases as well as Web agents/Internet users and any external resources, especially educational information resources are the subject for semantic. Ontology is a complete formalized specification of a domain (description of objects, concepts, knowledge about them and links between them, inference rules, etc). The goal of educational ontology development is the possibility of total "understanding" of Ukrainian educational standards and documents either by foreign specialists or by programs for their automatic processing. The semantic description of courses, curricula and educational standards should be generated with ontology-based method for correct understanding and transferring in the universities of different countries. Using this approach the problem of intelligent search of the educational resources can be solved (in contrast with a search by keywords). The approach allows also a semantic integration of heterogeneous educational resources if necessary.

For instance, using an automatic procedure of semantic identification one can facilitate the task of internationalization of higher education by comparing semantically annotated international demands and standards with national educational standards. It is also possible to develop an automated system of degree recognition that will compare semantically annotated diplomas of two (or more) universities.

The management and internationalization of education are specific fields, in which advances of semantic web approach can bring essential effect. The work in that direction has been started a few years ago and is actively ongoing as research cooperation between Artificial Intelligence Department of Kharkov National University of Radioelectronics (Ukraine), Industrial Ontologies Group (http://www.cs.jyu.fi/ai/OntoGroup), and the University of Jyväskylä (Finland).

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