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COMPUTER-AIDED DESIGN OF ELECTRONIC COURSES

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S u m m a r y . The article describes the software model of the system designing of the electronic courses (EC) with minimal impact of the subjective factor (CAD EC). IT uses ontologies of subject domain (SD). Ontology of subject of discipline (SDi) built on basis of SD. Ontology of subject of discipline includes descriptions of concepts, examples, laboratory works, tests. CAD EC converts reference books EC in the corresponding files of Moodle.
K e y w o r d s : architecture, ontology, subject area, integrated information technology, e-course, UML.

INTRODUCTION

Basic directions of informatization include as important component e - learning and upgrading of educational services in e-learning [1]. One of components of e-learning is EC.

Planning EC supposes forming of great numbers of concepts, their descriptions, relations, examples, laboratory works, tests with minimum influence of human factor. Construction indicated higher by hand is a labour intensive process, both at times and on an amount engaged in the process of planning of highly skilled specialists. Understanding of importance of creation of tools of support of planning process EC came practically simultaneously with the acceptance of paradigm of e - learning.

Methodology of planning of ontology of SD, corresponding SDi EC supposes forming of great numbers of concepts, relations, functions of interpretation and axioms.

It is presently known more than one hundred instrumental programmatic systems with the wide spectrum of descriptions and functional possibilities, providing absence of subjectivity of ontology of SD [8-15]. Accumulate ontology on different SD. Use of corresponding ontology at the beginning of planning EC guarantees his good quality.

RESEARCH OBJECT

The programmatic model of the system of computer-aided design electronic courses (CAD EC) design is examined in the article. CAD EC is an application instrumental complex ontological appointment (ICON - IK National Academy of Sciences of Ukraine, Kiev). CAD EC uses subsystems ICON significantly. The design used SD, that corresponds SDi EC, is used. Ontology of SD is the product of work of the original of Instrumental complex with ontological direction (ICON). The basic task of ICON is realization of the integrated information technology of the automated construction of ontology in an arbitrary subject domain. He executes an analysis and treatment of large volumes of the unstructured data, in particular linguistic corps of texts in Ukrainian and Russian language, extraction from them subject knowledge with their subsequent presentation as an ontological structure or ontology of subject domain [2, 16-18] and libraries of information (BSI). CAD EC using ontology of SD and BSI must build EC of corresponding SDi.

RESULTS OF RESEARCH

CAD builds ontology of the discipline in the automated mode from SD, including in the form of handbooks EC explanations of the notions, in the form of examples, in the form of laboratory works, in the form of tests. Informations of Library

includes (by definition) universal knowledge resources in the SD. A description of the ontology and informations of Library gives basic training material EC. Laboratory work and tests are introduced in the choice of appropriate concepts EC manually or from the available electronic libraries. On the basis of the models of adaptive control of quality can be adapted EC to the needs of the student [3].

CAD EC converts reference books EC in the corresponding files of Moodle.

The proposed model of the CAD EC performs the following functions:

1. Reading OWL file description of the ontology and output of ontology of SD on the screen.
2. Providing of the automated selection from ontology of necessary concepts for SDi of educational course.
3. At a click by a mouse on termin from ontology, for a branch is below than concept selected a red color, other tops become semilucent.
4. For a termin on which clicked, in a file writed down name, nearest connections (all contiguous termins). Name of File «Vibrannie.txt». File structure: *< name of concept></name of related concepts></ name of related concepts >… </ name of related concepts >#.
5. The reading the description of the selected concepts from the file «OPIS ONTOLOGY» and write it to a file «LEC.txt.
6. The automated supplement to the concept of the laboratory work and write it to a file «LAB.txt». (Automation provides three options:
   6.1. Import of laboratory of works from the electronic resource.
   6.2. Entering text laboratory work by hand.
   6.3. The lack of laboratory work for this concept).
7. The automated supplement to the concept of the test and write it to a file «TEST.txt». (Automation provides three options:
   7.1. Import test from the electronic resource.
   7.2. Entering text by hand.
   7.3. The lack of tests for a given concept).
8. Ensuring compliance functions for all selected 5, 6, 7 of concepts.
9. Converting files texts of laboratory work in Moodle files.
10. Converting files texts test files in Moodle.

Need to investigate how to provide the functions above.

For example, function 1 can be provided with a software module for output ontology graphically on the screen (fig. 1).

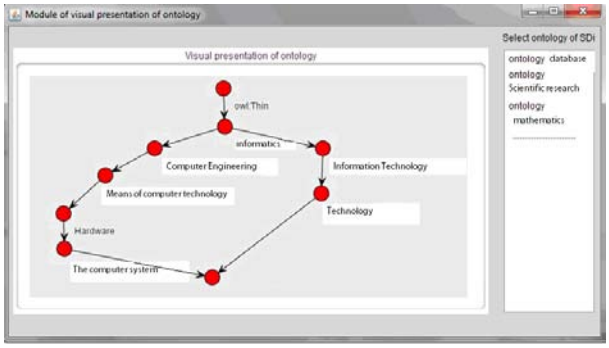

Fig. 1. Window of the module visualization ontology

To investigate the possibility of providing these functions, need to build a functional model.

For planning of functional models (functional design) of software and different sort of technologies in information it is known row of the generally accepted standard methodologies and functional simulation languages, such as IDEF, DFD, UML.

UML (Unified Modeling Language) is a language of graphic description of the objective modeling in area of software development [4]. UML is a widely used standard de facto the object-oriented visual simulation language [5, 6].

Stopped up in the language of UML potential possibilities can be used not only for the object-oriented design of the systems but also for representation of knowledges in the intellectual systems which, essentially, there are perspective difficult programmable technological complexes. Having regard to all advantages of language of UML, a functional model CAD EC was projected on his basis.

Functional model CAD EC is a set of diagrams.

We consider the diagram:

- diagram of variants of the use (fig. 2);
- diagram of activity (fig. 3).

Essence of diagram of variants consists of the following: the system that developed appears as a great number of essences or actors, that co-operate with the system by means of the so-called variants of the use. Thus an actor or acting person is name any entity, interactive with the system from outside. It can be man, program or any other system which can serve as an source affecting the designed system. In turn, the use case is used to describe the services that the system provides to the actor.

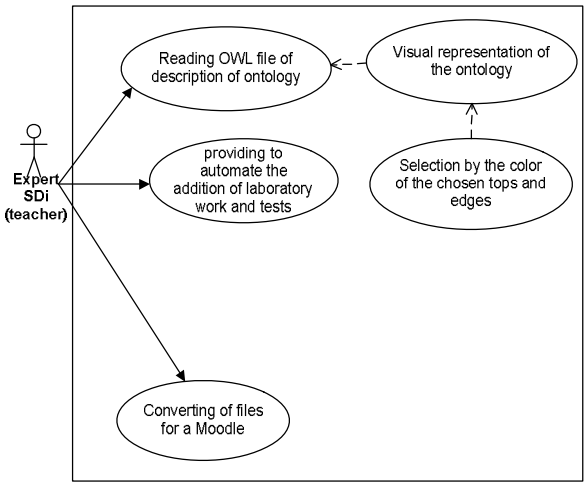

Fig. 2. Diagram of variants of the use for basic functions CAD EC

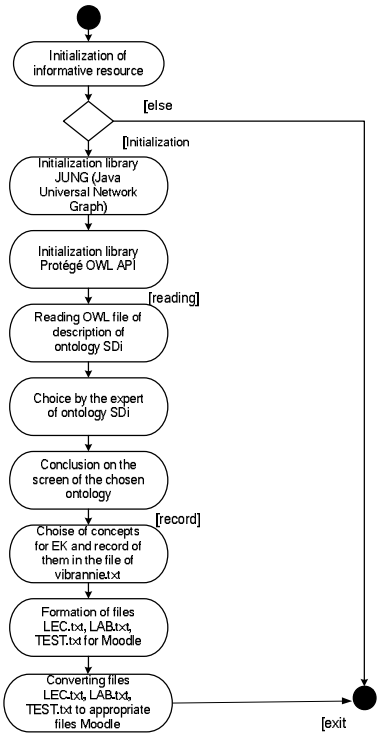

Fig. 3. UML- diagram of activity CAD EC

By the diagram of activity (fig. 3) it is possible to study a conduct CAD EC with the use of models of flow of data and stream management. The diagram of activity represents some algorithm, describing the life cycle of object the condition of which can change. Diagram of activity unlike a flow-chart, has more wide notation. For example, on it is possible to specify the states of objects.

By basic data for the system CAD EC there are OWL-files containing description of ontology of subject domain (SD). The structure of file of OWL of description of ontology following:

```
<owl:Ontology rdf:about=""/>
  <owl:Class rdf:ID="Imya top level 1 ">
    <rdfs:subClassOf>
      <owl:Class rdf:ID="Imya top level 0"/>
    </ Rdfs: subClassOf>
  </ Owl: Class>
  <owl:Class rdf:ID=" name top level 2">
    <rdfs:subClassOf rdf:resource="# name top level 1"/>
  </ Owl: Class>
  <owl:Class rdf:ID=" name top level 2">
```

A visual representation of the ontology in figure 4.

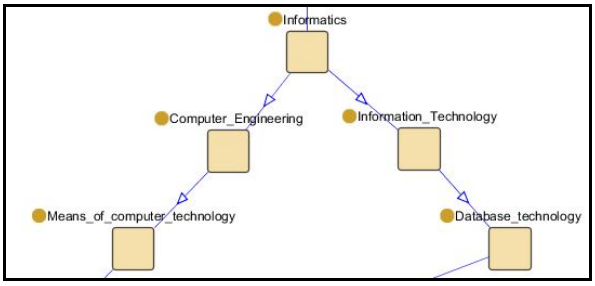

Fig. 4. Fragment ontology SD DATA BASE

Programmatic realization uses the platform of Java Swing Framework. Unlike other platforms, it not only gives the interface of development on the basis of template of MVC but also is realized on his basis. Representation is a class – heir of class Frame.

Owing to organization of model of Java [7] on interfaces, a comptroller is a set of anonymous of classes of processing of the events. As well as other platforms, Swing leaves for a programmer making of model.

CONCLUSIONS

The paper presents the software model CAD EC that uses the the original tool set ontological destination (ICON). In the automated mode is construction of the ontology discipline SDi on SD based, which includes a description of the concepts of SDi, examples, laboratory works, tests.

Library ICON are universally valid resources of knowledge in a given SDi and in this sense they are invariant under the adaptation and optimization of the of system to the target application, in particular, to adapt to the problem of automating the development of e-learning courses (EC) by the subject discipline (SDi). The proposed model perform production the universally valid of e-courses with minimal impact of the subjective

factor, with reducing of the laboriousness of the process, both in time and in quantity involved in the process of design of highly qualified specialists.

REFERENCES

1. **Eduard Zharikov, 2010.:** Topical questions of implementation of information ser-vices in a network of University, TEKA Kom. Mot. I Energ. Roln. - OL PAN, 2010, 10B, 331-337
2. **Palagin AV, 2012.:** Ontological methods and means of processing the subject-tion of knowledge / A. Palagin, SL Kryvy, NG Petrenko. - [Monograph] - Kiev: Izd VNU them. Dahl, 2012. - 323 p.
3. **Vladimir Tkach, 2010.:** The adaptive control of higher education process quality of a university on a "teacher-student" level, TEKA Kom. Mot. I Energ. Roln. - OL PAN, 2010, 10B, 241-246.
4. **C. Marshall, 2000.:** Enterprise Modelling with UML, ISBN 0-201 - 43313-3, Addison-Wesley, Reading, MA, 2000.
5. **Booch G., J. Rumbaugh, I. Jacobson, 1999.:** The Unified Modeling Language User Guide, Addison-Wesley, Reading, MA, 1999.
6. **Quatrani T., 1998.:** Visual Modeling with Rational Rose and UML, Addison-Wesley, Reading, MA, 1998.
7. Java Standard Edition Access mode: http://www.oracle.com/technetwork/java/javase/ downloads/index.html - Date of access: 11/05/2012
8. Maedche A., Staab S. Tutorial on Ontologies: Representation, Engineering, Learning and Application // ISWC'2002.
9. **Farquhar A., Fikes R., Rice J., 1997.:** The Ontolingua server: A tool for collaborative ontology construction // International Journal of Human-Computer Studies, 46(6), pages 707–728,
10. **Musen, M. 1998.:** Domain Ontologies in Software Engineering: Use of Protege with the EON Architecture // Methods of Inform. in Medicine, P. 540-550.
11. **OKBC: A. 1998.:** Programmatic Foundation for Knowledge Base Interoperability. V. Chaudhri, A. Farquhar, R. Fikes P. Karp J. Rice // Fifteenth National Conf. on Artificial Intelligence. AAAIPres/The MIT Press, Madison, P.600-607, 1998.
12. Creating Semantic Web Contents with Protege-2000. N. Noy, M. Sintek, S. Decker, M. Crubezy, R. Fergerson, M. Musen // IEEE Intelligent Systems, March/April pages 60-71, 2001.
13. OntoEdit: Collaborative ontology development for the Semantic Web. Y. Sure, M. Erdmann, J. Angele, S. Staab, R. Studer, D. Wenke // In Proc. of the Inter. Semantic Web Conference (ISWC 2002), Sardinia, Italia, June 2002.
14. **Bechhofer S., Horrocks I., Goble C., Stevens R. 2001.:** OilEd: A Reason-able Ontology Editor for the Semantic Web // Joint German/Austrian conf. on Artificial Intelligence (KI'01). Lecture Notes in Artificial Intelligence LNAI 2174, Springer-Verlag, Berlin, P. 396-408.
15. **Domingue J. 1998.:** Tadzebao and WebOnto: Discussing, Browsing, and Editing Ontologies on the Web // Proc. of the Eleventh Workshop on Knowledge Acquisition, Modeling and Management, KAW'98, Banff, Canada.
16. **Motta E. 1997.:** Reusable Components for Knowledge Modelling // Ph.D. Thesis. The Open University.
17. **MacGregor R., 1991.:** Inside the LOOM classifier // SIGART bulletin, Vol.3, No.2, P. 70-76.
18. **Fernandez M, Gomez-Perez A., Pazos J. 1999.:** A Building a Chemical Ontology Using Methondology and the Ontology Design Environment // IEEE Intelligent Systems, Jan./Feb. P. 37-46.

СИСТЕМА АВТОМАТИЗИРОВАННОГО ПРОЕКТИРОВАНИЯ ЭЛЕКТРОННЫХ КУРСОВ

Юрий Тихонов, Виталий Семенков, Геннадий Могильный

Аннотация. В статье описана программная модель системы автоматизации проектирования общезначимых, с минимальным влиянием субъективного фактора электронных курсов (САПР ЭК). САПР ЭК использует онтологию предметной области (ПдО). В автоматизированном режиме из ПдО строится онтология предметной дисциплины (ПдД), включающая в виде справочников ЭК описания понятий ПдД, примеры, лабораторные работы, тесты. В конце работы САПР ЭК конвертирует справочники ЭК в соответствующие файлы Moodle.

Ключевые слова: архитектура, онтология, предметная область, интегрированная информационная технология, предметная дисциплина, электронный курс, UML.