
DEVELOPMENT OF A COURSEWARE ON BULGARIAN ICONOGRAPHY FOR UBIQUITOUS ON-DEMAND STUDYING

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Abstract

The present paper presents the general outputs of the team of the Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences (IMI) in the frames of the LOGOS project. An emphasis is put on the development of Bulgarian iconography content for the LOGOS platform. Furthermore, the process of development of two specific courseware objects by domain experts is presented: one considering the Bulgarian iconography from artistic perspective, and another – from theological point of view. The advantages and shortcomings of the LOGOS platform for the development of e-courses are considered and its usability with regard to authors and learners alike is discussed based on the pilot testing.

Introduction

One of the main problems education faces today is how to take advantage of the new technologies without losing the charm of the traditions.

This question becomes of a vital importance in the context of fields such as fine arts and iconography where the effect of studying an object could be reinforced by combining its immediate presence with the option of comparing it with virtual collections of the kind.

Thanks to the rich iconographic sources in Bulgaria the education on the subject has often included visits to monasteries and churches. On one hand this could be considered as the best possible way to study icon painting, but on the other – it involves some serious disadvantages, such as the impossibility of:

- studying an object in details (due to its location or state of preservation);
- getting immediate information about all the details of interest (in terms of style, symbolic meaning, the authorship, etc.)
- putting it in the context of a bigger collection of similar artefacts representing a specific school of art so as to get a better idea of its significance;

In an attempt to answer some of these problems in the case of studying the orthodox iconography a digital library Virtual Encyclopedia of the Bulgarian Iconography has been developed since 2004. Up till now this archive includes approximately one thousand digitized images of Bulgarian iconography by various artists, historical periods and schools. The works presented in the library originate from the twelfth to the beginning of twentieth centuries. Amongst them specimens from the iconographic schools of Bansko-Razlog, Triavna and Samokov, and from the regions Veliko Turnovo, Sozopol, Rila Monastery, Arbanasi have been included. An important knowledge part of the library is the one with the descriptions of iconographic techniques and significant iconographic schools – works and biographies of well-known Bulgarian iconographic artists (Paneva et al, 2005). With its very appearance this library proved to be a significant contribution to exploring the field both by specialists and amateurs.

What was still missing in terms of educational potential was the opportunity to study the artefacts in a guided discovery style, i.e. to provide the users with ubiquitous learning content. The LOGOS project Knowledge-on-Demand for Ubiquitous Learning was launched with the very idea of facing such needs (www.logosproject.com). The project aims at investigating and developing methods and authoring tools enabling a wide range of users to develop, to access and to follow courses by web-based, DVB and mobile devices, thus allowing for practically ubiquitous connectivity. The specific role of the LOGOS IMI team (embracing the authors of this paper) was to design and develop educational electronic courseware based on the content in the digital library Virtual

Encyclopedia of the Bulgarian Iconography and thus to test the usability of the LOGOS platform of author's point of view.

The goal of the LOGOS project has been to design and develop educational platform that would take into account the demands and the needs of the potential learners, rather than adopt a technologically driven approach. With this in mind educational scenarios were designed at the very beginning of the project.

Educational scenarios on iconography: an example

The rationale behind the development of the educational scenarios was that the project partners (both technical ones and content providers) could gain a shared understanding about the purpose of the platform and the methods of its implementation (Pemberton et al., 2007). The variety of the scenarios developed by the project partners identified the potential target group and demonstrated different models of interaction with the LOGOS platform services. The learning scenario Access-on-demand for studying of East-Christian culture and art was developed by the IMI team was targeted to a wide range of users. Furthermore, its design addressed different real-world learning situations and communication channels.

Table 1 Main characteristics of the "Access-on-demand for studying of East-Christian culture and art" scenario

Topic area	East-Christian Culture, Bulgarian traditional culture, cultural heritage
Learning background	Good knowledge on East-Christian art, history and culture at undergraduate level
Learning situation	Formal – indirectly, informal
Link to curriculum?	Yes/No
Learning setting (support)	Optional
Learning setting (place)	home/university and focal point for learning (important centres of Bulgarian Iconography and historical sites)
Learning setting (time)	No matter/during the day, Just-in-Time
Device(s)	A multimedia-capable mobile phone and PC connected to Internet
Learner age range	18 and over
Learner background	Student 1 has a good specialized exposure to East-Christian Iconography (methods, techniques and tools for icon creation) at undergraduate level. He has some knowledge on historical periods of icon painting and their special features. Student 2 knows the methodological base of the area and its specialized theological aspects. Student 3 has a good specialized knowledge of Bulgarian traditional culture and history.
Learner role or occupation	Student 1 and student 2 are in the target area. Student 3 is in an area different from the presented, but a closely related one
Learner motivation type	General interest
Learner activity	Capture link information for chosen thematic and periods, browse/search multimedia information
Learning approach	Constructivist/Constructionist
Types of material accessed	Images and text descriptions of specimens of Bulgarian icons
Source(s) of material	LOGOS environment, available through PC connected to the Internet and Smartphone, using multimedia digital libraries "Virtual encyclopaedia of Bulgarian iconography" as a source for creation of digital and learning objects
Specific objective	Preparing a project - an icon on a specific theme. Preparing a master thesis
Interactive functions needed/used by learner	Access-on-demand to LOGOS platform and display individually designed learning materials (digital objects, enriched by educational (LOM) metadata). Browse and read text and graphical materials. Uploading or otherwise acquiring links to relevant learning materials.

The scenario has several versions and for each of them the following components have been specified: topic area, learner profile, learning activities, types of material accessed, specific objectives, learning approach, interactive functions needed/used by learner glossary, etc. (Pavlov and Paneva, 2007). Table 1 includes the values of these characteristics for the scenario under consideration.

This scenario brought to the foreground the specifics to be taken into account when developing the educational content: on one hand – the learner’s demands (even though the authors would typically have only a vague idea of the potential users of their courses), on the other – the domain itself. The domain of the Orthodox iconography proposes two types of approaches towards the educational material – an artistic and a theological one. Thus two experimental courses tuned to the specifics being identified were developed by our team: the first one, focusing on the artistic characteristics of a chosen iconographic school, and the other – on the theological meaning of the icons.

Further we shall present shortly the LOGOS authoring process and then we shall focus on the authoring experience gained in developing and testing these courses.

The LOGOS Authoring Process

The LOGOS authors could follow various styles of courseware development. The simplest and straightforward scenario presented here (Figure 1.) is following the bottom-up approach (referring to the gradual development of higher level objects from lower level ones, starting with the raw media objects).

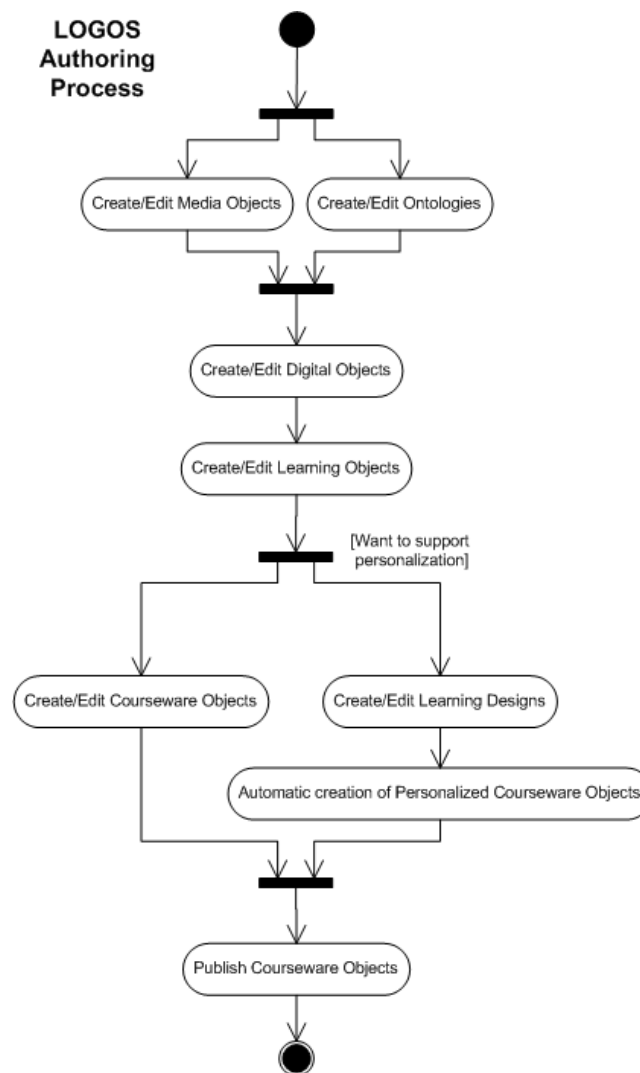


Figure 1: The overall authoring process in LOGOS

The authoring process starts with the preparation of media objects and ontologies (conceptualizations of certain domains). As long as media objects, representing material coming from external content archives, and ontologies are available, it is possible to create digital objects. The latter are media- (or part of media-) objects accompanied by appropriate metadata. The semantic annotation is based on the particular domain ontologies, synchronized with the chosen external content archives. Based on the digital objects created, one can further create learning objects as collections of contextually related digital objects that can be used to accomplish a certain learning objective. Every collection is enriched by educational metadata expressed in IEEE Learning Object Metadata standard. The usage of learning objects in order to create courseware objects can be done in two ways. At first one can statically create courseware objects by defining hierarchies of learning objects and by specifying their sequencing and presentation characteristics. This is the most straightforward option. Another option comes into play when one wants to support personalization. In that case, appropriate learning designs should be defined first. These are abstract educational scenarios that capture the specific characteristics of an educational process without direct reference to the learning objects that can be used to implement this process. The binding of educational activities with the learning objects is done by an automatic mechanism for the development of personalized courseware objects based on information about the user characteristics. The outputs of this automatic process are courseware objects similar to the ones created manually in the case of static courseware development (Arapi et al., 2007). The final activity in the authoring process is the publishing of courseware objects so that they could be accessed by the learners by means of various devices (PCs, mobile devices, digital TV). Publishing a courseware object involves selection of appropriate visualization templates and end devices (Pavlova-Draganova et al., 2007).

Development of a LOGOS Courseware

The process of development of a specific courseware in the field of Bulgarian iconography passes through the following phases:

- Selecting raw media objects from Virtual Encyclopedia of Bulgarian Iconography;
- Developing the domain ontology of Bulgarian Iconographical Objects to be used for annotating the media objects to become LOGOS digital objects;
- Creating specific LOGOS digital objects;
- Building LOGOS learning objects by combining appropriate LOGOS digital objects;
- Building a specific courseware object embracing relevant LOGOS learning objects and selecting delivery channels (i.e. devices and communication spaces);
- Cross-media delivery of the developed courseware object by means of the LOGOS learning management system.

We shall discuss the specifics of these phases for the two experimental courses: *Leading Bulgarian iconographic schools – style and achievements of the Bansko-Razlog iconographic school* (A) and *Introduction to the Theology of Icons through the Iconography of the Holy Mother of God* (B) (<http://logos.eduweb.hu/lms>).

The first phase is carried out by the IMI-team domain specialists on the Bulgarian icon art and culture. They selected appropriate media and knowledge objects from the multimedia digital library Virtual Encyclopedia of Bulgarian Iconography. In the case of the course A these were mainly icons representative for the Bansko-Razlog Iconographic school. Specimens from other famous iconographic schools were also selected for the purpose of comparative analysis. In the case of B a number of icons of the Holy Mother of God (depicting her image or scenes related to her life) were selected as illustrative examples of the theological concepts in iconography. The media objects have been grouped into thematic collections according to their topics. Specific detailed descriptions have been created for each object.

The Ontology of Bulgarian Iconographical Objects (OBIO), (the output of the second phase of the courseware development) concerns religious art objects of the Christian Orthodox Church created from the end of the twelfth to the beginning of the twentieth centuries by Bulgarian iconographers and located on the present territory of Bulgaria. The ontology considers objects of art (icons, wall-paintings, etc.) registered within the Virtual Encyclopaedia of the Bulgarian Iconography. The Bulgarian iconographical objects ontology is used for the semantic annotation and search of digital objects for the LOGOS learning materials (Staykova et al., 2007).

The third phase (creating specific LOGOS digital objects) was performed by means of the Content Description Tool developed at the French institute Institut National de l'Audiovisuel. The Tool is used by the annotators to logically segment and describe the media objects (based on the OBIO and several description templates). The selected media objects have been distributed in eight thematic groups. These groups determine several pattern graphs for the following digital objects: Icon, Wall-painting, Plastic, Iconographer, Iconographic School, Manuscript Book, Miniature and Part of the Image. Every graph uses different ontological concepts, relations, individuals, rules, etc. (cf. Figure 2).

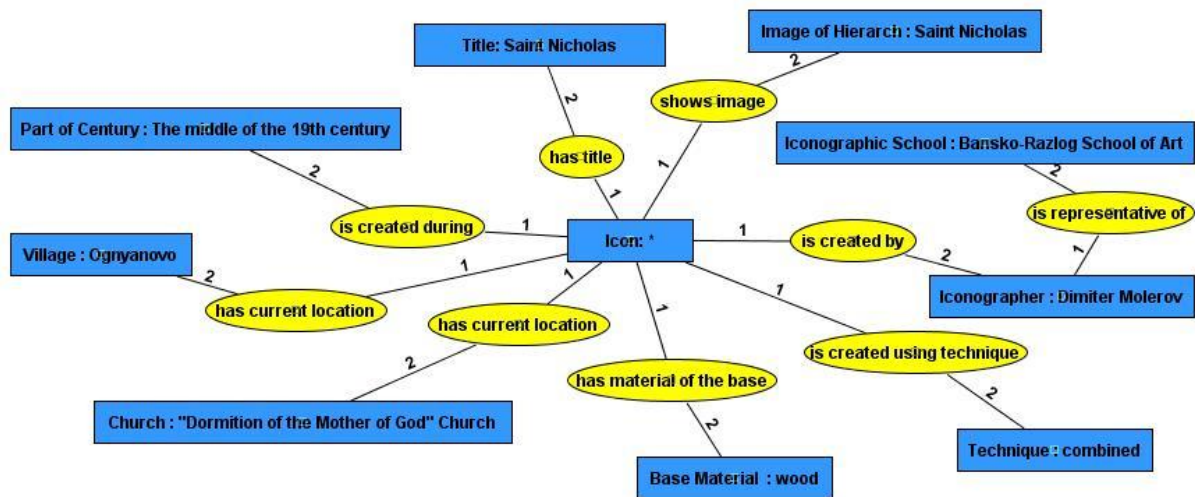


Figure 2: A pattern annotation graph of the digital object Saint Nicholas character painted by Dimiter Molerov from Bansko-Razlog School of Art

The technical metadata includes data for the digitized objects such as its title, creator, institution that keeps the copyrights, dimensions, etc. as required by the MPEG-7 standard. All the digital objects are being managed in a digital objects repository.

During the fourth phase LOGOS learning objects have been built by means of the Description Tool for Learning Objects, developed at the Institute for Information Technologies at the Bulgarian Academy of Sciences. The input includes one or more digital objects and the output represents learning object being a combination of digital objects and Learning object Metadata (LOM) description (Marinchev et al., 2007) (cf. Figure 3). In general, the tool takes input from the digital object repository and submits its output to the learning object repository.

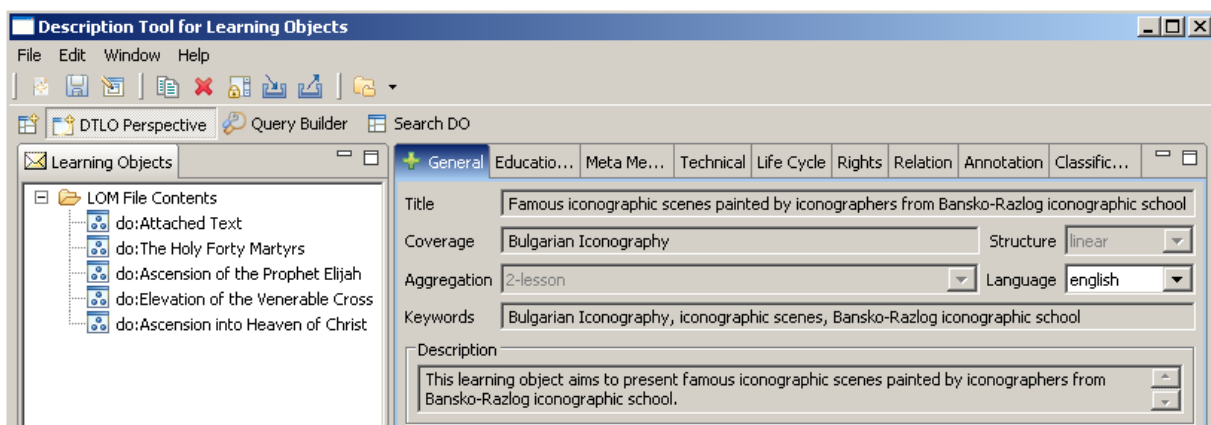


Figure 3: The structure of the digital objects and the LOM general metadata of the LOGOS learning object Famous iconographic scenes painted by iconographers from Bansko-Razlog iconographic school

The fifth phase (Building a specific courseware object) is also carried out by educationalists by means of LOGOS Courseware Object Editor, developed at EduWeb, Hungary. This Editor provides means for description of newly

created courseware objects according to the SCORM (Sharable Content Object Reference Model) and LOM standards. Courseware objects are built on the hierarchy of selected set of learning objects or other courseware objects (cf. Figure 4).

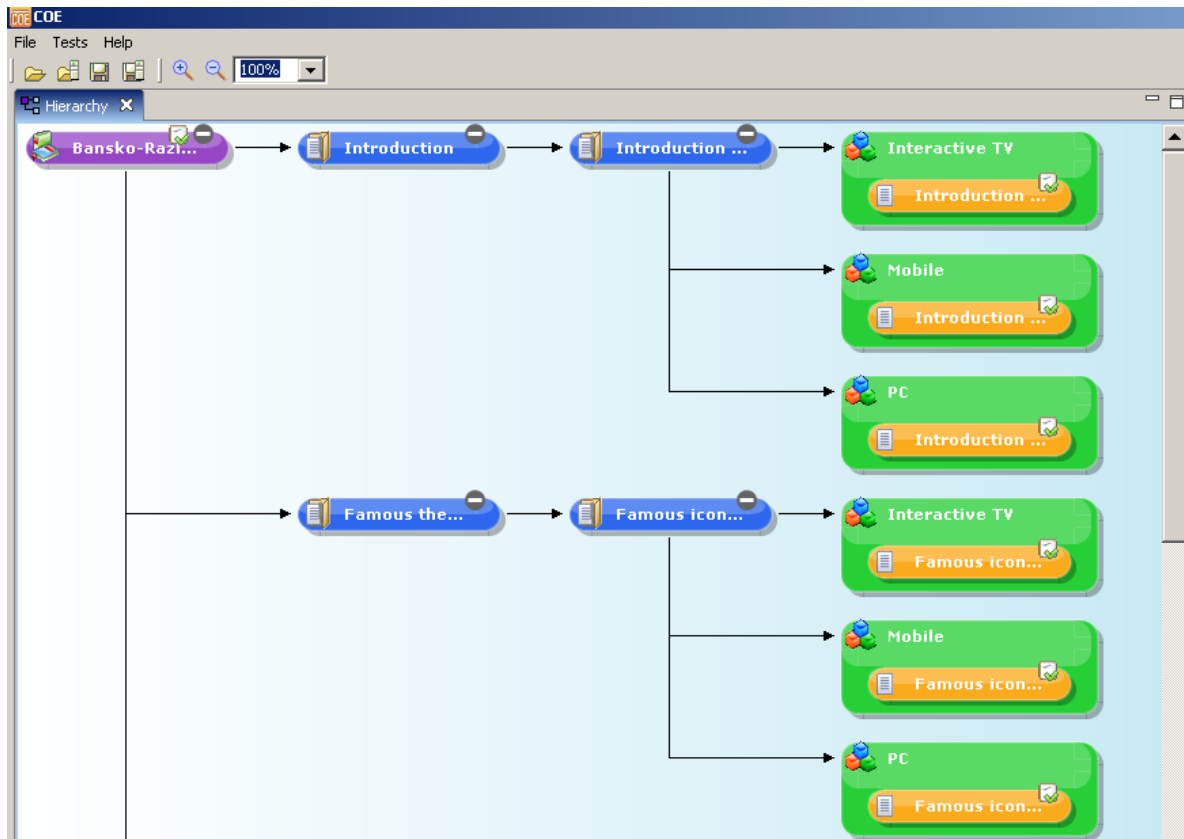


Figure 4: A screenshot representing a part of the hierarchical structure of the courseware object Leading Bulgarian iconographic schools – style and achievements of the Bansko-Razlog iconographic school.

The courseware author indicates the appropriate end-device for the courseware delivery (interactive TV, mobile or PC delivery).

Developing two courses on iconography as a usability test – the first impressions

As suggested by the outputs of the LOGOS scenario developed by the IMI team it seemed reasonable to start with two courses reflecting different possible approaches to the iconography domain – an artistic and a theological one.

As expected, the LOGOS platform provided rich opportunities for studying the iconographic objects for both approaches. From artistic perspective, the focus was on observing the details so that the learner could grasp the specifics of a given painting style. The learning objects are following the natural move of the learning process: introduction to the iconographic school as a whole, presentation of the images of characters famous for this iconographic school, presentation of iconographical scenes that are representative of this iconographic school, and orientation between the various styles of representation of one and the same scene or character in the different iconographic schools.

The emphasis in the theological context was on covering a large enough collection of iconographic objects for the learner to reach their deep intransitive meaning – the testimony to the incarnation of Christ. Some basic concepts about the theological meaning of the icons in the Orthodoxy in general were presented following, as an example, the iconographic depiction of the Holy Mother of God.

The pilot testing aimed at evaluating the LOGOS platform usability from the point of view of the two types of end-users being envisaged – authors and learners. The first impressions of the pilot users were expressed at the focus group meeting at the end of the testing (details could be found in the final report of the LOGOS project to be published on its Website).

The end-users in the authoring role shared that they were attracted by the idea for ubiquitous delivery of learning materials. According to them such a platform could lead to a radically new teaching/learning experience, especially bearing in mind the specifics of their own domain. The opportunity to integrate the emotional impact of the original works with the practically unlimited access to virtual information resources through mobile devices was characterized by the courseware authors as a rather innovative educational approach. In their opinion such an approach overcomes the basic shortcomings of the current educational methods in their domain: either studying a limited number of real objects (on the account of the opportunities for a comparative analysis that the virtual resources offer), or examining a big enough sample of virtual objects sacrificing the distinctive atmosphere of worship icons create when in their natural environment. They also expressed their willingness to continue the explorations with the LOGOS platform and to try to implement it in their actual work with students in Iconography and Fine Arts.

As for the end-users in the learner role they also expressed their satisfaction related to the potential of a technology enabling the learners to access educational materials whenever and wherever they wish.

Of course, at this stage a number of indications of discomfort on behalf of both users' groups have been observed. The shortcomings the authors referred to were related to the final layout of the courseware objects and the restrictions imposed by the templates provided. The learners, on the other hand, expressed their requirements for a better visualization and for more opportunities for interactivity – with other learners and the authors, alike.

In a nut shell, the overall impressions of the pilot testing participants make us optimists with regard to the original goals of the LOGOS project: to develop an integrated e-learning platform enabling the authoring of learning content, drawn from large-scale repositories and allowing a wide range of learners to access and to follow courses whenever and wherever they would like.

The recommendations of the pilot testers could be achieved in further refined and enriched versions of the platform.

In conclusion, the authors of this paper express their firm belief that the LOGOS project has demonstrated examples of meaningful synergy between the new technologies and good traditions in an educational context, and could be successfully disseminated in practice.

References

1. ARAPI, P., MOUMOUTZIS, N., MYLONAKIS, M., STYLIANAKIS, G., THEODORAKIS, G. (2007). *Supporting Personalized Learning Experiences within the LOGOS Cross-Media Learning Platform* In the Proceedings of the LOGOS Open Workshop "Cross-Media and Personalized Learning Applications on top of Digital Libraries" (LADL 2007) in conj. with the 11th European Conference on Research and Advanced Technology for Digital Libraries (ECDL 2007), 16-21 September, Budapest, Hungary (pp. 5-18)
2. MARINCHEV, I., HRISTOV, I. (2007). *Managing learning objects in large scale courseware authoring studio* In: Proceedings of the First LOGOS Open Workshop "Cross-Media and Personalized Learning Applications on top of Digital Libraries" 20 September 2007, Budapest, Hungary (pp. 101-109)
3. PAVLOV R., PANEVA, D. (2007). *Toward Ubiquitous Learning Application of Digital Libraries with Multimedia Content* In Cybernetics and Information Technologies, vol. 6, № 3 (pp. 51-62).
4. PAVLOVA-DRAGANOVA, L., PANEVA, D., DRAGANOV, L. (2007). *Knowledge Technologies for Description of the Semantics of the Bulgarian Iconographical Artefacts* In the Proceedings of the HUBUSKA Open Workshop „Knowledge Technologies and Applications”, 31 May – 1 June, 2007, Kosice, Slovakia (pp. 41-46).

5. PAVLOVA-DRAGANOVA L., GEORGIEV, V., DRAGANOV, L. (2006). *Virtual Encyclopaedia of Bulgarian Iconography* In the Proceedings of the Modern (e-)Learning'06 Conference, Varna, Bulgaria (pp. 165-170).
6. PEMBERTON, L., FALIAHKHAIR, S., GRIFITS, R., KANERVA, M., FEHER, G. (2007). *Combining Learning Affordances in Cross Platform Learning Environments* In the Proceedings of the EDEN 2007 Annual Conference, Naples (pp. 13-14).
7. PANEVA D, PAVLOVA-DRAGANOVA, L., DRAGANOV, L. (2005). *Digital Libraries for Presentation and Preservation of East-Christian Heritage* In the Proceedigns of the HUBUSKA Open Workshop "Generic Issues of Knowledge Technologies", Budapest, Hungary (pp. 75-83).
8. STAYKOVA, K., DOCHEV, D., PANEVA, D., PAVLOVA-DRAGANOVA, L., SARAYDAROVA, V. (2007). *Development of Domain Ontology, Targeted at the Creation of Learning Materials From Digital Archives* In the Proceedings of the LOGOS Open Workshop "Cross-Media and Personalized Learning Applications on top of Digital Libraries" (LADL 2007) in conj. with the 11th European Conference on Research and Advanced Technology for Digital Libraries (ECDL 2007), 16-21 September, Budapest, Hungary (pp. 91-100).
9. www.logosproject.com (February 19, 2009)
10. <http://logos.eduweb.hu/lms> (February 19, 2009)