Content Interoperability between Digital Libraries for Orthodox Heritage

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Abstract: This paper presents a solution for content interoperability between two digital libraries keeping artefacts and knowledge from the Orthodox heritage domain i.e. Encyclopaedia Slavica Sanctorum Calendar and Bulgarian Iconographical Digital Library. The paper also discusses the specifics of libraries’ content and their descriptive schemas. The federation between libraries is executed by the use of web service technologies.

Key words: Digital Libraries Services, Content Interoperability, Web Services.

INTRODUCTION

Integration between different multimedia information systems in a common domain seems to be easy task because of the content similarity and coherency. However, a deep observation of the problem identifies several challenges such as the heterogeneity of the proposed resources determined by its content (objects and collections), the variety of content descriptions included, the standards and content description schemes used, content offered in different media types, targeted applications or user groups, implicit compatibility for new common usage of the systems, etc.

Obviously, the integration involves interoperability challenge in it different directions: content, user, functionality, policy, quality and architecture [1][2]. Every direction has its own specific issues, but resolving even one or part of them contributes to the overall problem solution.

In this paper we present a solution for content interoperability between two digital libraries keeping artefacts and knowledge from the Orthodox heritage domain i.e. Encyclopaedia Slavica Sanctorum Calendar (ESS, http://www.eslavsanct.net/) [4] and Bulgarian Iconographical Digital Library (BIDL, http://bidl.math.bas.bg) [5]. ESS represents an information system keeping funds of medieval and early modern Bulgarian texts for saints in combination with ethnological data and some visual sources. BIDL is a digital library keeping rare specimens, private collections of Orthodox icons, wall-paintings and other iconographical objects, selected from difficult-to-access storages, distant churches, chapels, and monasteries, objects in a risk environment or unstable conditions. The content of these environments is naturally complementing each other and the proposed content interoperability service aims to provide better access for all of the target users of the digital library (DL) and also to provide mutual content enrichment, i.e. we take one content and metadata from first digital library to second and vice versa – another content and metadata from the second DL to the first digital library. Thus, the user can have the advantage to use more information. And when s/he is operating with the first DL s/he has the content for the first DL as the main content and the content of the second as a “periphery” of the main content. This is a way to present content in a single context. If we want to see the content in another context – in the context of the second DL – we have this opportunity by implementing the content interoperability services. The paper also discusses the specifics of the ESS and BIDL content and its descriptive schemas. It describes the federation between ESS and BIDL based on the web service technologies, which give a flexible approach for integration development between different DL systems.
DIGITAL LIBRARIES FOR ORTHODOX HERITAGE

Encyclopaedia Slavica Sanctorum Calendar includes a wide variety of information materials, such as mediaeval vitae of saints, homilies about saints and feasts, synaxarion readings, offices, prayers (both apocryphal and canonical), calendars with liturgical directions in various liturgical books (Gospels, Acts and Epistles manuscripts, Typika), present-day interviews about personal experience of believers, Church and social rites and rituals and their perception by the members of the communities, intercultural and inter-confessional relations and exchange in respect to sainthood. Figure 1 depicts part of the Encyclopaedia Slavica Sanctorum semantic description model showing the backbone concept class - “Commemoration”.

![Commemoration Diagram]

Figure 1: Class “Commemoration” of the Encyclopaedia Slavica Sanctorum ontology

Bulgarian Iconographical Digital Library is an Internet-based environment - a place where iconographical objects of different kinds and origins were documented, classified, and “exhibited” in order to be widely accessible to both professional researchers and the wide audience. The library provides services for registration, documentation, access and exploration of a practically unlimited number of Orthodox iconographical artefacts and knowledge and the end users can use this rich knowledge base through its interactive preview, objects complex search, selection, and grouping. A complete description of the rich BIDL functionality is included in [5][7]. For the description of the content in the library a domain ontology for the Orthodox iconographical art is developed. In this model the iconographical art world is described by three “thematic entities” (also called levels of knowledge): “Identification” entity (that consists of general data identifying aspects of the iconographical object), “Description” entity (that concerns the descriptive details of the theme and forms of representation, providing a better understanding of the content), and
“Technology” entity (that includes technical information revealing iconographic techniques, base materials, gildings, repousse covers, etc., used in the creation of the iconographical objects, etc.). Figure 2 depicts the “Description” entity, whose concept classes are connected with classes from the ESS ontology in order to provide content interoperability.

Figure 2: Description entity of the ontology of the Orthodox Iconographical art

INTEGRATION BETWEEN ENCYCLOPÆDIA SLAVICA SANCTORUM CALENDAR AND THE BULGARIAN ICONOGRAPHICAL DIGITAL LIBRARY

The Bulgarian Iconographical Digital Library and the Encyclopaedia Slavica Sanctorum being in the same domain and supplementing each other in the content level could be integrated in order to extend the knowledge about their common objects or to exchange data.

The following class diagram (figure 3) shows the conceptual relationship between the ESS and BIDL entities.
By now, two relationships are defined between the systems. The first relationship describes the connection between the ESS object with the Characters from the Iconographical objects. The second connection is between the ESS object and the Iconographical scenes of an Iconographical object.

A commemoration (e.g. event) is mapped to an iconographical scene, because every iconographical scene from BIDL is in relation with an event from ESS.

The object of type “Saint” from ESS (also commemoration) is mapped with a object of type “Character” from BIDL.

The UML class diagrams presented include only entity classes with no operations and a limited set of attributes. The aim is to keep the attention on the content and the content’s interaction between the different systems.

Another use case scenario adds a third digital library in the federation. In this case a folklore digital library with its folklore artifacts has relations with the object “Folklore texts” from the ESS. Thus we plan to implement implicit relationship between Bulgarian Iconographical Digital Library and Folklore Digital Library using the Encyclopaedia Slavica Sanctorum as an intermediator.

In other words, when the user views an object in one digital library, s/he can be suggested to get more specific information from the second or even third, forth, etc. digital library with implicit relationships between them.

The Web Service Interfaces are implemented using the Simple Object Access Protocol (SOAP) and the Web Service Definition Language (WSDL). These very popular standards on the Web can guarantee better interoperability between our two integrating digital library systems. The implemented Web services are available for all Internet users and can be used according to the WSDL specification. Having in mind that WSDL can describe an operation independently of the program language used, i.e. no matter if we write a function with PHP, C, Java or any other programming language, we describe our integrating operations in WSDL.

The following listing in WSDL shows the operation returning an array of BIDL objects which have a specific characteristic (e.g. objects which contain certain iconographical scenes, or objects containing certain iconographical characters). The code is a simple example of the web services methods definitions. It is really useful when one wants to create relationship between their digital library and the digital library which provides the interoperability functionality. This definition can be used by every system (which has sufficient privileges) and this fact makes it powerful technology for development of the digital libraries and growth of the digital library content.
The future work on the integration between the selected digital libraries will be concentrated on other interoperability issues such as user interoperability, policy interoperability and functionality interoperability. Figure 4 illustrates an UML deployment diagram of the service interfaces which will implement the integration between the selected digital libraries on user level. The User Profile interface aims to synchronize user profiles and to manage user authentication and authorization among the two DLs.
CONCLUSIONS AND FUTURE WORK

One of the definitions of the interoperability is proposed by IEEE Standard Computer Dictionary and states that this is “the ability of two or more systems or components to exchange information and to use the information that has been exchanged” [3]. Following this idea in this paper we proposed a solution for content interoperability between two digital libraries keeping Orthodox heritage knowledge. As future work we plan to join the Bulgarian folklore digital library (http://folknow.cc.bas.bg/) to the federation in order to provide cross-platform delivery of folk knowledge, interpretations, traditions and customs information related to the Orthodox worship. Moreover, the work will be concentrated on implementation of other types of interoperability possibilities although it is a proper challenge.

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REFERENCES


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