

Endangered Cultural Heritage: Problems and Solutions

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Abstract. *The access to old music manuscripts has to be rather restricted: original materials being fragile and perishable are hardly assessable for research and almost inaccessible for general public. Nevertheless it is a rich and unique source for scholars studying the development of manuscripts, illuminations and musical notations, musicologists and hobbyists interested in early music transposition and performance, as well as general public whose interest in early music and spirit of times mentioned is growing continuously.*

The problems of digital acquisition, archiving, delivery of early music manuscripts as multimedia objects (including professional descriptions of items, their images, audio records of corresponding music) to a general audience and ways of access to it to scholars for research purposes, the intellectual rights management are discussed in this paper.

INTRODUCTION

The original manuscripts of early music written in medieval scriptoria, adorned with illuminations and used in monasteries and churches represents a valuable part of cultural heritage in many countries. They demonstrate a common cultural heritage of Europe and its common roots in music, which is a basic heritage of mankind in spite of differences in languages and cultural traditions. Unfortunately, these manuscripts are dispersed in a number of libraries or church archives, occasionally forgotten or still undiscovered. Old musical manuscripts make up a very valuable part of the written documentary heritage, which becomes increasingly interesting to the researchers. Musicians look for the content of these documents, music historians are interested in the development of genres and history of performance, researchers of cultural history pay attention to the origin and ownership of the documents, researchers of art are interested in their decoration.

The project **Musicalia** provides a possibility to be acquainted with the musical manuscripts stored in the repositories of the Manuscripts Department of the Library of the Lithuanian Academy of Sciences. Today there are more than one thousand different musical manuscripts preserved in the Library of the Lithuanian Academy of Sciences. These manuscripts belong to the period of 14-20th century and geographically reflect the musical life of Lithuania, Poland, Byelorussia, Russia, Ukraine, Germany, and the Netherlands. Musical manuscripts are stored in several collections and archives. According to the content, they comprise music of Lithuanian authors, transcripts of classical music, and old musical manuscripts. According to the performance of musical compositions, these include the pieces of vocal, scenic and instrumental music. For a long time musical manuscripts have been accessible only for a small group of scientists, some of these manuscripts are already well known for Lithuanian and foreign researchers, other musical compositions are still waiting for their researchers.

THE AIMS

The aim was to investigate and design novel methods of most effective introduction of early European music heritage to a general audience and making it accessible to scholars for research by creating a unified digital archive for European countries involved into **ECH:TOPICC** – (Endangered Cultural Heritage: Tools for Preservation, Investigation and Copyright Clearance) project, which includes **Musicalia** as an essential part. Created multimedia database (MDB) contains:

- (i) high quality images of the musical manuscripts (sheets) and prints (12-18th centuries);
- (ii) contemporary and old music recordings (audio and video if available);
- (iii) related items such as: texts, book covers and illustrations, all this providing insights into the daily life of the times.

Multimedia tools and interactive information system empowers scholars exploring effectively documents from different countries through created interface to compare different notations or versions of one work and analyze development of styles or genre. A general user could benefit as well from an attractive presentation of a digital collection.

Let us imagine a general virtual user which could place himself in the persona of early time inhabiting, for example, a 16th century monastery somewhere in Europe. Imagine the virtual central hall of the monastery giving access to the Library, the Church, the Scriptorium and to the Study. The central hall displays the musical instruments of the period – a visitor can try to play any of them and hear sound. He can find here also the information desk for the digital archive, the site map of digital space, the glossary of terms, the guided tour. From the central hall the door would lead to the virtual Library, where a visitor finds manuscripts, maps and “equipment“ to listen to the music or be instructed by virtual “local monk” if having problems. Turning to the Church a visitor can listen the Georgian chant. In the Scriptorium the early writing styles and music notations can be explored and text samples printed in chosen style on user’s demand. The study would contain references, quotations and thoughts of outstanding people of the time or known composers. Through the windows of the virtual monastery a visitor would be able to watch rural scenes or celebrations and dances on festive occasions. By choosing any country on the interactive old map in the Library, a visitor would find himself in the environment of that country, arranged according to the available content of early music of that area. Each country could provide musical manuscript pictures, excerpts from corresponding musical recordings, several video records if available, pictures of old musical instruments, book illustrations – as many items related to the theme as available. Nowadays such exciting story is not only a visionary dream.

In order a dream become like a true, we do need not only software tools but also investigate Intellectual Property Rights (IPR) matters what often are different in various countries. Therefore it is vital to investigate and to use existing software systems (survey by Schnepf M., 2000) for intellectual property rights clearance in this context called MultiMedia Rights Clearance (MMRC). Therefore we have to follow the steps:

- (i) To develop new generation of tools – software for filling and searching Internet-integrated MDB and copyrights trading environment in one-step marketing and management of multimedia products and rights capable of operating on European basis.
- (ii) To create an MMRC value chain that links object creation, marketing, customer and access management, distribution and use.
- (iii) To create an MDB prototype using as entries multimedia musical heritage items (MMHI), based on early European musical heritage data (the images of musical manuscripts, audio-video music records, related pictures, texts).

Currently the prototype created on the base of musical manuscripts preserved in the Library of the Lithuanian Academy of Sciences, demonstrates MDB operability on digital acquisition and archiving, transfer and presentation of unique multimedia items as well as prove the benefits of interactive delivery.

The main goal of such project is to create a consolidated approach and MDB on a trans-regional, European basis – it can be reached by setting up the framework bridging together content owners-providers (libraries, cultural institutions), know-how partners (advanced multimedia technology institutions) and producers. The research work in advanced databases management, data mining and IT methods is necessary in order to process in future a huge amount of digital information, representing the highest-quality pictures, sounds and video records, and to create a fully explorable digital archive connected to Internet. Metadata creation and integration with content become an important task in such repository (Cherry, 2002, DC-dot and other). The interactive delivery of results also require innovative solutions and research.

THE START OF THE DIGITISATION PROJECT

The need to present the valuable collections to a wider public appeared together with increasing interest in cultural heritage of different nations. The newest digital technologies and the collaboration between musicologist, researches from the Library and computer specialists from the Institute of Mathematics and Informatics, UNESCO Chair in Informatics for the Humanities provide a possibility to save an original document and to present a high quality digital copy of sound and image. **Musicalia** multimedia database is intended to be an informational system convenient for users and specialists.

That is why the prototype version includes a small number of old musical manuscripts of different genres (book of songs, Gregorian chant, Heirmologion, tablature of instrumental, scenic and vocal music, as well as the oldest record of Lithuanian folk tune). These manuscripts were owned by Lithuanian and Byelorussian monasteries or preserved in the Library of Königsberg University, Königsberg City Library, and in Prussia State Archive.



Fig.1. The cover and one of the folios from the 16th century Hymnal, Vilnius Bernardin's Monastery, Lithuania. Now it is in the Repository of the Library Lithuanian Ac. of Sciences.

Up to the end of 2004 there were 20 musical manuscripts described, represented by zoom able images, accessible online www.musicalia.lt. Some of them have sound and video records added. Selected documents cover the period of 14th - 19th centuries. Only the documents of very good, good or satisfactory condition were selected; some of them have been restored or managed by restorers.

For the convenience of users, there is a list of all presented musical manuscripts given on the index page. It is possible to search for documents according to different criteria: title, author, language, genre, period, and signature.

Every aspect of a musical manuscript is presented on a separate page. It contains an archival description of the item (title, identification, name of the author, document language and place of origin, physical description). Additional information contains a short annotation of the document and/or pages of which digital images are available below. History contains available information on the history of the writing of the document, the way in which it reached the Library of the Lithuanian Academy of Sciences. The information of the discography, publications and bibliography of the musical composition is given in the end. Evaluations and research of the musical manuscripts available on the website, is prepared by the project consultant musicologist habil. dr. Jūratė Trilupaitienė, who is the senior researcher at the Culture, Philosophy and Arts Institute. Selected by the scientific consultant, images of the musical manuscripts show more important musical pieces, document decorations, binding etc. Small images are accessible by clicking the icon on the left side of the description (second from top); the image can be enlarged by clicking on the small image. There are some video and sound recordings available at the **Musicalia** database and related to the presented manuscript. User can watch the video recording of the early musical composition or listen to a recording of the musical composition. High quality digital copies of the documents can be accessed at the Manuscripts

Department of the Library of the Lithuanian Academy of Sciences. Readers and publishers may obtain the digital copies on CD of selected items according to a special agreement. For this novel service, called CD-ROM-on-demand, a special software has been developed. The opportunities of detailed investigation of any manuscript can be seen in Fig. 2

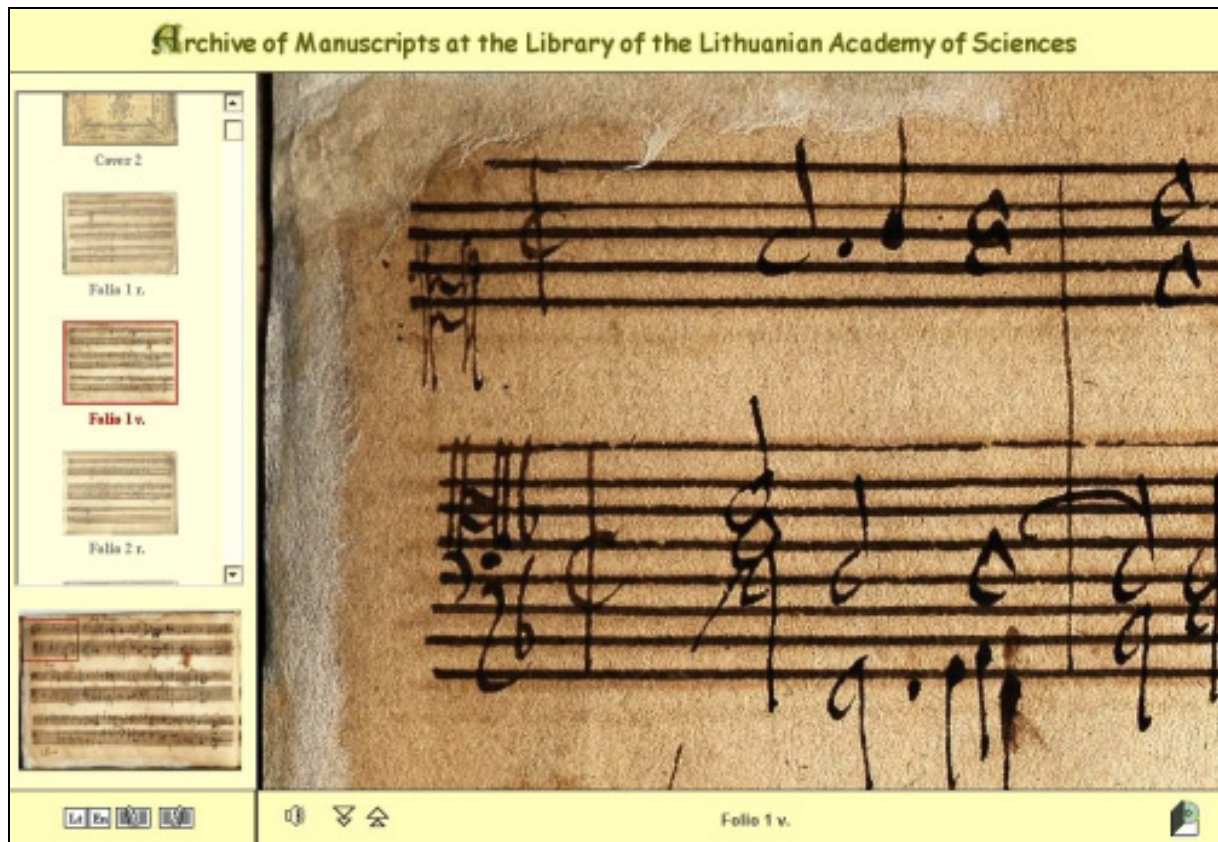


Fig. 2. Working area for detailed investigation of any place on the manuscript. The menu on the left enables to move over folios, the bottom menu enables to switch on/off a music record, to zoom in and out the image, to read a bibliographical description of manuscript under investigation.

DESCRIPTION OF TECHNOLOGICAL DEVELOPMENT: PROBLEMS AND SOLUTIONS

Work with an endangered cultural heritage in multimedia environment is unique. Not only are advances facilitating new methods for creating, preserving and sharing information, but also they are also dramatically increasing the inter-relatedness among activities previously perceived as separate. Issues of digital acquisition, image and audio/video processing, archiving and multi-medial presentation of collections are very complicated, wide in scope and require research in many fields (Smolka, 2001).

Considered project aims to develop and enhance the following technologies: (1) multimedia tools, (2) databases for hypermedia, (3) the integration of multimedia-Internet-offline tools.

The development of software for Internet-integrated MDB (from text to sound and images) management and interactive delivery involves:

- Creation of original software for filling MDB online with MMHI;
- Managing MDB and running it on an Internet server for an output delivery online;
- Research in advanced data bases mining and knowledge discovery;

- Research of innovative methods for processing a huge amount of digital information representing the highest-quality pictures, sound and video records
- Creating websites as one of multilingual information and distribution channels, representing early music and its context by means of interesting pictures, descriptions, and examples of music.

The following issues from (A) to (E) are of specific interest, they contain almost all problems what has to be solved for effective work of the system developed.

(A) Acquisition and MMHI processing issues:

- Acquiring a digital copy of an image requires, among other things: providing proper illumination, choosing the digitizing device according to object characteristics, preparing the object for the information acquisition process;
- Correction of artefacts introduced in the process of image acquisition can be divided into: correction of geometric distortions from object surface distortion and picture channel imperfections, colour calibration and initial image processing;
- Comparison of direct and indirect method of image acquisition quality and development of compensation procedures for errors specific to the indirect method;
- Image and audio signal analysis for feature extraction;
- Analysis of the best encryption and watermarking tools for efficient protection of digital objects, the best available protection of music-sheets distribution over the Internet.

(B) Issues of archiving, transfer and presentation of acquired MMHI include:

- Storage of information acquired: choice of image file format, media, and problems of data migration and conversion to new standards with special emphasis on automation of those processes;
- Determination of objective quality coefficients which requires establishing a standard for compressed MMHI quality assessment;
- Choice of the optimal compression method;
- Creation of data indexing system and metadata structures related to MMHI acquired.

(C) Image quality enhancement. Experience gained in area of image quality enhancement leads to further studies of algorithms efficiency in document image quality enhancement. This issue has great importance because properly conducted initial filtering enhances visual value of image and makes analysis and feature extraction much easier. Moreover, proper artefact correction in the image greatly improves results of lossy compression of information contained.

(D) Creating MDB warehousing and copyright trading environment for one-step marketing and management of multimedia products and rights capable of operating on European basis. The technology for implementing the warehouse both in terms of hardware, software, identifier and watermarking standards necessary for its physical operation and the operation of the rights clearance has to be applied. Issues such as pricing structure have to be addressed relating to differential pricing according to the user (commercial, educational or private individual, regional variations). This could be considered as an alternative to the Open Access Initiative (OAI, Chan & Kirsop, 2001)

(E) Developing methods of automatic compilation and generation of personalized interactive CD-ROMs in an attractive form. This is a completely new area. Innovation is needed, but full automation of process hardly can be expected.

MARKET APPLICATION & EXPLOITATION

Marketability of any product is a necessary component in contemporary economical environment, it must include the following features:

- (i) ensure a wide international market by featuring significant European content,
- (ii) cover the needs of users where networks are narrowband or too expensive,
- (iii) save the end-user time and effort when licensing.

European countries are rich in contents (words and pictures, sounds and images), but the European market needs new products, services and distribution channels to exploit this wealth in the burgeoning market for electronic publishing, interactive media, the Internet and WWW. The transition from conventional print media and linear structures to interactive media demands provide employment opportunities for youth to digitize cultural holdings and related resources for use in MDB and display on the WWW, more than powerful computers and software tools alone. A new order of production skills and business models is required to produce attractive, viable products for this dynamic new market. Many people do not yet appreciate the commercial and personal potential of these new media and methods. In particular, many small and medium-sized enterprises do not perceive the value of multimedia computers and networked communications. This is reflection both of the lack of practical information and of useful and cost-effective products and services. Such project has to foster a close cooperation between content owners or providers, scholars, multimedia producers, service providers (marketing, distribution channels) and end-users. The cooperative trans-national network, mainly of industry, should be developed as a result of the project and create pan-European multimedia business nodes.

Cultural heritage institutions have a chance to maintain their collections: a high-quality digital copies of multimedia objects or licenses can be sold to publishers, the musical industry, collectors of cultural values while the original collections safeguarded better. In this way, multimedia technologies open the door to new multimedia business (Tonta, 2002).

Economic exploitation of communication channels resources would be one of the important features of such project: CD-ROM-on-demand technology saves networking costs and provides a product of the highest quality exactly to the interested user. Currently not all European homes have broadband access to the Internet, and this service will improve accessibility. Each partner can issue online and offline products, taking advantage of the international market, and adapt them to a local user, developing and adding a local-language version.

Target Audience: scholars researching manuscripts, musicologists, educators; business (publishers, musical industry managers, right holders, intermediate and final users of rights); general audience (particularly for musical education, self-development, life-long education, music lovers), amateurs and collectors' societies.

International Market. A huge demand for multimedia contents is emerging: the European multimedia industry, from small sized developer's teams that still have to be discovered for the market up to big, renowned enterprises. The results of the *Musicalia* currently available in English and Lithuanian, other participating countries could join their content in English and their national language. The provision of multilingual and cross-cultural information guarantees a wide international market. Each partner country have the opportunity to localize and publish CD-ROMs on-demand; therefore delivery costs would be minimized.

Follow-Up Actions. Presentations of multimedia digital collections to general audiences, workshops for specialists interested in this topic, organization of "*Forgotten Music*" concerts. A natural extension of this project is to include more and more European countries. MDB software can be used for any other topic as well. Such clearly foreseen MDB market application topics are: digital archives of folklore collections, what were recorded on old-fashioned devices, virtual museums collections physically located worldwide but brought together in cyberspace.

Deliverables. The digital European MMHI archive based on early European music established using the latest technologies, with a projected life of at least 10 years, would be ready to be replicated and to evolve following the technology development. Evolving multilingual multimedia applications based on the content of the digital archive has to be developed:

- (i) MDB mining and the online service for legal acquisition of image/text/sound digital record;
- (ii) personalized multilingual interactive CD-ROM-on-demand service;
- (iii) project web portal in English and web sites in the local languages of project partners.

CONCLUSIONS

1. Multimedia technologies open the door to new multimedia business and cultural heritage institutions have a chance to maintain better their collections: a high-quality digital copies of multimedia objects or licenses can be sold to publishers, the musical industry, collectors of cultural values while the original collections safeguarded better. But many of these institutions are yet not ready to use such new opportunities.
2. Multimedia technologies provide new powerful tools for scholars researching manuscripts, musicologists, educators but only a few of them are aware of this challenge and able to use them – a specific training on new information processing technologies for the needs of the humanities was in great need. In order to cover this gap the Institute of Mathematics and Informatics initiated the *Courseware* (see the references below) accessible online.
3. The MMRC value chain probably is the weakest point in such activities because intellectual rights protection for digital objects is under permanent development in many countries and rather complicated to manage.

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OAI – Open Archives Initiative, online <http://www.openarchives.org/>

OAI Metadata Harvesting Protocol. Online <http://www.Openarchives.org/OAI/openarchivesprotocol.htm>

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