

A DEMONSTRATION OF THE PROBADO MUSIC SYSTEM

David Damm *

Christian Fremerey †

Verena Thomas

Michael Clausen

Computer Science III

University of Bonn, Germany

{damm, fremerey, thomas, clausen}@iai.uni-bonn.de

ABSTRACT

The objective of the PROBADO project is the development of prototypical digital library systems for non-textual documents.¹ As two examples of such non-textual documents, architectural 3D models and music documents are being considered. Besides user interfaces providing sophisticated interaction with non-textual documents, content-based search methods were developed and integrated. In this contribution we want to give a demonstration of the PROBADO Music System that is currently prepared for online access at the Bavarian State Library.

1. INTRODUCTION

More and more efforts to digitize music documents stored in archives or libraries can be observed. One reason for the increasing digitization is long term preservation. At the same time this development presents the possibility of offering online-access to those collections (see, e.g., the Petrucci Music Library,² Chopin Early Editions³ or the Neue Mozart Ausgabe⁴). However, the presentation of the documents is mostly rather rudimentary. If for a piece of music several documents (e.g., sheet music and an audio recording) are available, the user has no possibility of easily accessing them simultaneously. The collections are usually managed on a document level rather than on a piece of music level. When dealing with music collections, another issue to be addressed is document search. Rather than the commonly

* Is now with Fraunhofer Institute for Communication, Information Processing and Ergonomics (FKIE), Wachtberg.

† Is now with Steinberg Media Technologies GmbH, Hamburg.

¹ See www.probado.de for further details on the PROBADO project and information on the participating institutions.

² <http://imslp.org>

³ <http://chopin.lib.uchicago.edu>

⁴ <http://www.nma.at>

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applied metadata search, a content-based search seems more appropriate. Some systems already provide content-based search to some extent but usually the occurrence positions within the documents are not made available (see, e.g., [2,5] and the melody search of the Petrucci Music Library⁵). The presented system contributes towards the elimination of these shortcomings.

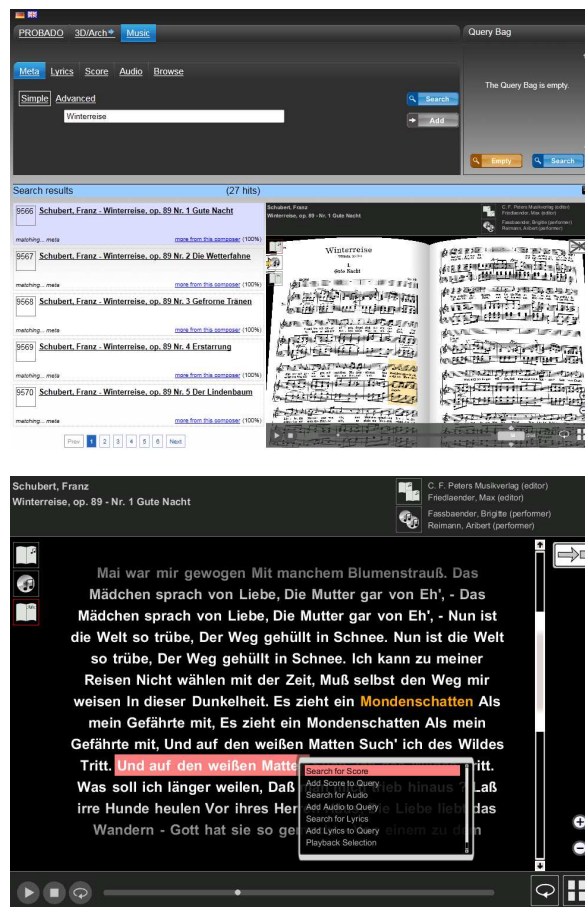


Figure 1. User interface of the PROBADO Music System. Top: The web interface for query formulation and result presentation. On the bottom right, the document viewer allows access to music documents. Bottom: Lyrics visualization of the document viewer.

⁵ http://imslp.org/wiki/IMSLP:Search_by_Melody

2. SYSTEM OVERVIEW

When developing a digital library system, two key challenges have to be addressed. First, how can a growing document collection be managed time-efficiently and second, how can users be enabled to access this collection intuitively.

The two document types considered in the PROBADO Music System are scans of sheet music and audio recordings. In addition, for pieces containing vocal parts, the lyrics are extracted from the score scans. Using music synchronization techniques, those different music representations are automatically being linked amongst each other [4]. For each document type, the PROBADO Music System offers an appropriate visualization (see Fig. 1). Due to the pre-calculated linking structures, the current playback position in the selected audio recording is highlighted in every visualization. Besides intuitive score-following, this allows for score-based and lyrics-based navigation in an audio recording. In addition to presenting a document containing the same piece of music for each modality, the system offers the possibility of easily switching within one document type, while maintaining the musical position in the piece of music. Therefore, the user can change the audio recording during playback and thus easily compare different interpretations. Equally, the presented score edition can be changed.

Content-based search methods for each modality enhance the exploration capabilities of the system. Following the query-by-example paradigm, the user can select an excerpt in each visualization and trigger querying in all modalities (see Fig. 1). Furthermore, a multimodal search is possible by combining queries from different modalities. For content-based queries, matching positions within the documents are highlighted to allow for an easy access and a detailed analysis of the query results.

To realize the presented library access system, a full-fledged, widely automated processing chain for the preparation of digital music collections was developed. After digitization, the music documents are indexed, annotated and prepared for access. In addition, the alignment structures as well as the indexes (score, audio and lyrics) are calculated. To ease the task of annotation, automatic segmentation methods are provided. The applied alignment methods calculate a synchronization on measure level and are therefore rather tolerant w.r.t. errors made by the incorporated Optical Music Recognition system (OMR). However, there exist some error types that can strongly influence the quality of the synchronization results (e.g., incorrectly detected repeats, transposing instruments). Although some techniques for automated error correction are integrated into the system (see [3, 7]), those might fail to detect all errors. Therefore, user interfaces for the convenient, manual correction of these influential OMR errors are provided.

As the goal of the PROBADO Music System is a holistic

music experience, providing access to further music document types is architecturally realizable. For example, we showed in a feasibility study the potential of adding music videos [6]. Amongst others, this new document type would allow for convenient performance analysis (e.g., costumes, stage setting, conducting techniques).

For a more detailed introduction of the PROBADO Music System, we refer to [1].

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