

Enabling Access to Sound Archives through Integration, Enrichment and Retrieval: the EASAIER Project

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ABSTRACT

Many digital sound archives suffer from problems concerning on-line access: sound materials are often held separately from other related media, they are not easily browsed and little opportunity to search the actual audio content of the material is provided.

The EASAIER project aims to alleviate these problems, offering a number of solutions to support sound archive managers and users. EASAIER will enable enhanced access to sound archives, providing multiple methods of retrieval, integration with other media archives, content enrichment and enhanced access tools.

1. INTRODUCTION

A significant problem with prior research into audio processing, sound archive access and semantics is that it has often not taken into account the wealth of user needs studies in this area. Previous work within the digital library community has identified strong demand for specific tools. The EASAIER (Enabling Access to Sound Archives through Integration, Enrichment and Retrieval) project will address already identified user needs for sound archives, as well as recent work [1-3] which provide a systematic study of what end users want from music retrieval systems and the types of queries that they make. Extensive research by the JISC [4-5] also identified key features to enrich sound and music archives.

Most audio archives are also very limited in terms of access and interaction: if on-line listening is available, it is usually in a restricted means constrained not by the material in the corpus, but by the imposed functionality of the interface. EASAIER will remove these barriers, thus allowing the user to choose their means of access and presentation.

Collating the findings from these studies, we have established the following user needs requirements:

- **Choice of interfaces:** a simple web interface may satisfy the needs of a student but not those of a musicologist, therefore different versions of the system's "front end" are required.
- **Search for media fitting a wide variety of metadata:** Including, where possible, semantically meaningful descriptors that are automatically extracted during the archival stage, and the means to search across multiple and sometimes ambiguous selections of metadata.

- **Relevant near neighbour query-by-example searches:** A ranked list of related audio assets which may be similar in musical qualities (timbre, structure, etc.) is desirable. This is to be distinguished from those systems that allow the user to enter an audio sample and find if it exists in a database.
- **Enriched access and interaction tools:** A set of tools that simplify the task of marking points of interests on the audio waveform should be included in the front end. Instruments that allow real-time manipulation of audio during playback, such as time scaling and sound source separation can greatly aid the analysis process.

2. SYSTEM ARCHITECTURE

The deployed EASAIER system exhibits a standard client/server architecture (Figure 1).

All audio assets are stored in a repository in binary format; each file is available both in its original uncompressed format and as a high quality compressed version used for streaming audio to off-site clients.

In most cases the consortium will not deploy the storage component as EASAIER will seamlessly integrate with existing repository.

An archive administration application allows the content managers to enter assets in the archive and to process those that were already stored prior to the deployment of the EASAIER system. The ingestion process extracts musically relevant features, prompting the administrator to enter manual annotation and to edit automatically extracted data that is deemed unreliable or ambiguous by the system's internal metrics.

All metadata generated during the ingestion process is stored in a separate repository as RDF triples; this unit is connected to SPARQL endpoint that provides a suitable query interface in order to access the knowledge held by the system's internal ontology.

Query and access services provide connections to the external world, allowing on-site and off-site end users to access the repository, perform searches and retrieve audio assets.

The end user will be able to access the content of the EASAIER archive by means of an application that can retrieve an audio asset and its associated meta-data using a variety of non-mutually exclusive query methodologies, such as:

- Queries based on general tags: i.e. find material by author/title, genre and year.

- Musical parameters-based queries: i.e. find songs by key, orchestration, tempo range.
- Similarity-based queries: i.e. once a musical audio asset has been retrieved, find other assets that exhibit some degree of similarity in terms of macroscopic structure, timbre and harmonic profile [6].

The EASAIER system offers two types of user interfaces to the end user: a basic web client with functionalities limited to retrieval and playback and an advanced client that provides extended functionality.

The advanced interface (Figure 2) includes visualisation tools that allow the user to explore all time-synchronous metadata contained in the repository, add their own annotations and place markers for playback and looping purposes.

A separate panel in the interface enables the access to real time sound processing algorithms; these tools include a sound restoration and equalisation unit, a time/pitch scale modifier and a sound source separation processor.

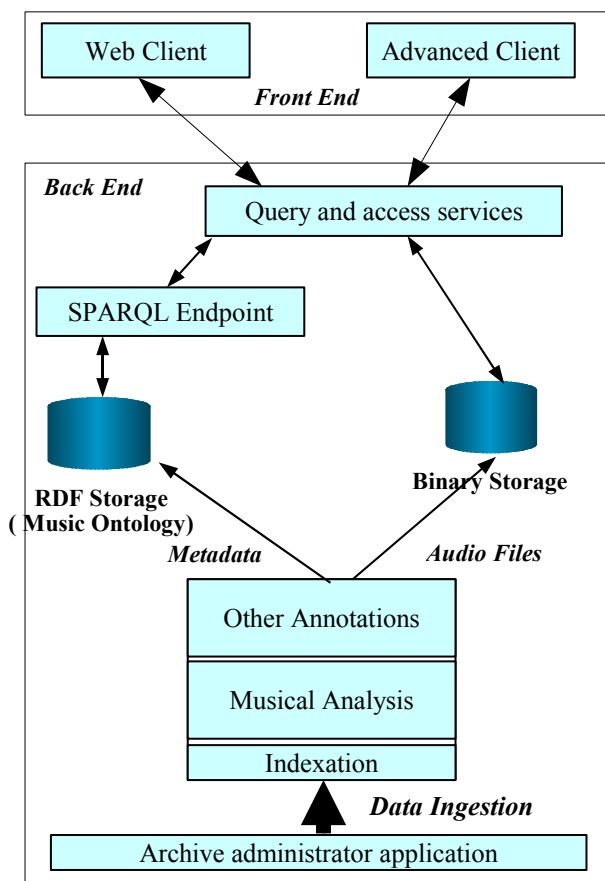


Figure 1. EASAIER System Architecture

3.CONCLUSIONS

The EASAIER project aims to create a state-of-the-art access system for sound archives, incorporating multiple, integrated retrieval systems, and enriched access tools which allow manipulation of the resources. As of this writing, the EASAIER project has developed prototypes of most required functionality, including the music retrieval system and demonstrators of integrated components, such as the metadata extractor and client prototype. The potential user community for sound

archives using EASAIER is large and wide ranging. It is thus hoped that we will be able to deploy the system on a large scale, benefiting sound archives in cultural heritage institutions which until now, have been unable to provide advanced access systems to their users.

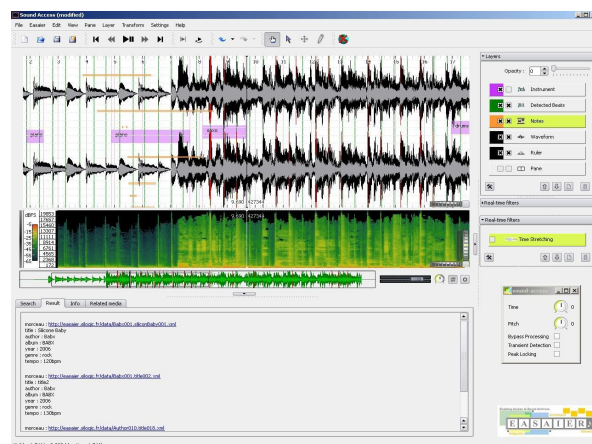


Figure 2. EASAIER Advanced Client

4.ACKNOWLEDGMENTS

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