

Exploration of Grateful Dead Concerts and Memorabilia on the Semantic Web

Thomas Wilmering, Florian Thalmann, and Mark B. Sandler

Centre for Digital Music (C4DM), School of Computer Science and Electronic Engineering, Queen Mary University of London, London, UK
{t.wilmering, f.thalmann, mark.sandler}@qmul.ac.uk

Abstract. With the increasing importance attributed to intangible cultural heritage, of which music performance is an important part, public archive collections contain a growing proportion of audio and video material. Currently used models have only limited capabilities for their representation. This demo illustrates our proposal for a unified ontological model of live music recordings and associated tangible artefacts with a Web application for the exploration of live music events of the Grateful Dead.

Keywords: live music · cultural heritage · multimedia · Grateful Dead.

1 Overview

With the ubiquitous and immediate availability of recorded music on streaming services and internet platforms, live music events are becoming increasingly central to the music world, due to the unique and physical musical experience delivered to the audience [7]. For many decades, music fans have been documenting such events and accumulating artefacts and memorabilia, many of which are now being transferred to public archives and often digitised [3]. The use of Semantic Web technologies presents an opportunity for linking the numerous archives online. However, commonly used conceptual models for this purpose lack a consistent representation of sound and multimedia objects [4, 5]. In [8] we propose a data model for a unified representation of cultural artefacts of time-based and non-time-based nature, which allows their alignment along a hierarchy of timelines. This demo introduces a web application¹ based on this model for the exploration of Grateful Dead concerts through digitised artefacts and audio recordings. A particular focus is placed on semantic audio analysis and thus enabled functionality.

2 Data Model

The Web application is based on an application-based ontological model that conceptualises different types of live music events and their relationships based

¹ <https://grateful-dead-live.github.io> (in development)

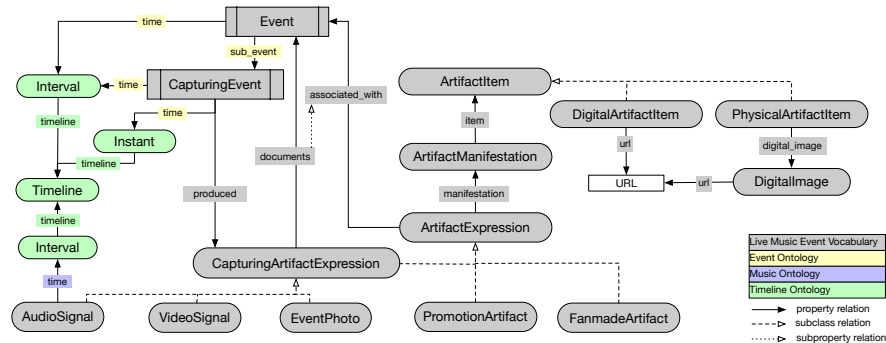


Fig. 1: Data model for associating artefacts with the live music event and its timeline with examples of artefact expressions.

on the Event Ontology² and live-music related artefacts including musical and non-musical ones. We relate artefacts with events at any scale, e.g. tours, festivals, or concerts, and place them in a hierarchy of timelines associated with the events, using the timeline ontology³. The ontology allows connecting any event to Music Ontology⁴ concepts such as artists, groups, compositions, etc. An overview of the data model for artefacts is given in Figure 1. In [8] we propose mappings to concepts of the Music Ontology and FRBRoo⁵, facilitating the mediation and interchange of music-related, bibliographic and museum information, based on the Group 1 entities of the Functional Requirements for Bibliographic Records (FRBR) entity-relationship model [6].

3 Web Application

The Web application focuses on live concerts of the band *Grateful Dead*. The band’s history continues to garner interest by both fans and scholars, both with respect to their music and their cultural impact [2]. The application combines information collected from existing Web resources combined with automatic semantic analysis of audio content to infer higher-level musical information, allowing users to explore the band’s concert history with an audiovisual experience.

Knowledge Acquisition and Architecture The Grateful Dead collection of the Live Music Archive (LMA)⁶ consists, at the time of writing, of more than 12,000 concert recordings recorded on over 2,000 dates spanning the years 1965 to 1995. The audio material is accompanied by basic unstructured metadata covering information such as dates, venues, set lists and recording lineage. The recordings are digital transfers of fan-made audience recordings encouraged by

² <http://motools.sourceforge.net/event/event.html>

³ <http://motools.sourceforge.net/timeline/timeline.html>

⁴ <http://musicontology.com/>

⁵ <https://www.ifa.org/publications/node/11240>

⁶ <https://archive.org/details/GratefulDead>

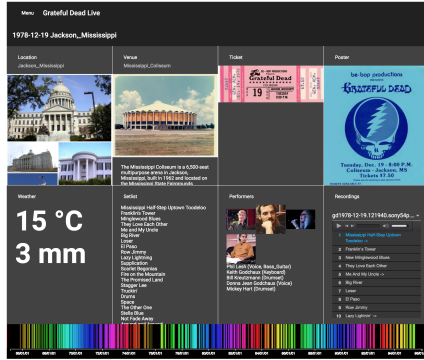


Fig. 2: GUI of the Web application.

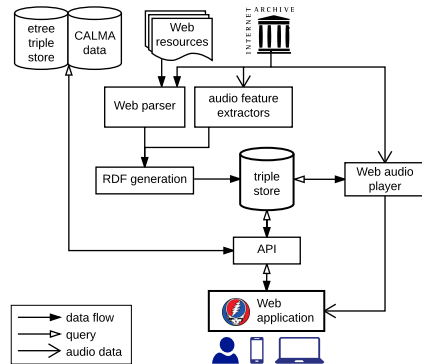


Fig. 3: System architecture of the Web application.

the band for non-commercial use, and recordings taken from the audio engineers’ mixing desks. The application combines audio recordings with data from several Semantic Web resources, including Live Music Archive Linked Data⁷ and DBpedia⁸, for information about venues, cities, artists, etc. Data taken from other Web resources related to Grateful Dead concerts includes scans of artefacts such as tickets and posters, and setlist and lineup details. Data from these sites has been aggregated using dedicated scripts which parse information and automatically generate RDF data. Audio feature extraction results are accessible via links to the Computational Analysis of the Live Music Archive (CALMA) dataset [1]. These features are for instance used for constructing a reference timeline for the alignment of different recordings of a given concert, which the archive provides as separate files with inconsistent segment boundaries and completeness, sourced from tape recordings of varying speeds. Figure 3 illustrates the system architecture and a high-level representation of the linking process. The Web application uses its own API accepting SPARQL queries, as well as a Web Audio player which recombines and streams audio from the LMA.

Functionality and Frontend Figure 2 shows a screenshot of the prototype with a view of a particular concert, which juxtaposes the information, artefacts, and recordings available for that particular date. Users can listen to the recordings, read about the venue, location, setlist, the musicians, etc, and find images and historical weather data. Via links at each of the concepts and the timeline of the band’s career, related concerts can be reached and explored. For example, users can find any concert where a particular song was played directly through such links. Additionally, a search function allows users to find more specific information which is then compiled and visually presented. Enabled by the audio

⁷ <http://etree.linkedmusic.org/about/>

⁸ <https://wiki.dbpedia.org/>

features stored in the graph, users will also be able to look for similar versions of songs, compare aligned different recordings of the same concert, as well as create playlists and audible collages based on particular search results.

Further Development Future work includes the evaluation of the application with a user-study conducted in collaboration with the Internet Archive⁹. The study will consist of automated analysis of user-behaviour, as well as surveys for the assessment of aspects of the user experience. We are currently working on improving the functionality based on audio features extracted from live music recordings, as well as exploring new possibilities of interacting with the audio archive, continuing the work discussed in [9], implementing immersive audio applications using different recordings of a given concert. Further work on the data model will lead to an extension to the Music Ontology covering live music events and associated artefacts.

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⁹ <https://archive.org/>