Mapping Audiovisual Metadata Formats Using Formal Semantics

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Abstract. Audiovisual archives hold enormous amounts of valuable content. However, many of these archives are difficult to access, as their holdings are documented using a range of different metadata formats. Being able to exchange metadata is the key to ensuring access to these collections and to establish interoperability among audiovisual collections, between audiovisual collections and other cultural heritage institutions as well as portals such as Europeana. In this work we attempt to model mappings between metadata formats based on a high-level intermediate concept representation in order to avoid hand-crafted one-to-one mappings between metadata formats. In addition, we define mapping templates on data type level, from which the code for mapping instructions between a pair of formats can be derived. The high-level intermediate concept representation is based on the existing meon ontology and the resulting mapping instructions are expressed using XSLT. As a proof of concept, mappings between two metadata formats are formalized and integrated in a web based prototype application.

1 Introduction

There are millions of hours of audiovisual content in collections of dedicated audiovisual archives, other archives, libraries and museums. Preserving digital audiovisual content means keeping it accessible and usable for a long time, including the metadata describing it. This requires migrating metadata to models currently in use and enabling metadata mapping to formats used in the systems which need to retrieve, deliver, display and process archived content. Being able to exchange metadata is the key to ensuring access to audiovisual collections, establishing interoperability among audiovisual collections, and between audiovisual collections and other cultural heritage institutions. Metadata exchange is often hindered by the diversity of metadata formats and standards that exist in the media production process and in different communities.

The work described in this paper builds on an existing multimedia ontology used for mapping metadata concepts in audiovisual media production workflows. The contributions of this paper are the extension of this ontology to include format-specific concepts and the support for data type conversions in the mapping system.
The rest of this paper is organized as follows. The remainder of this section discusses the motivation for developing a novel mapping approach and analyzes the problem and the resulting requirements. Section 2 discusses related work. In Section 3 we propose our approach for mapping and demonstrate a prototype implementation in Section 4. Section 5 concludes the paper.

1.1 Motivation

There is a number of use cases in the audiovisual archive domain that require metadata mapping. On one side these use cases include in-house scenarios such as the conversion of legacy technical metadata as part of preservation processes, access to legacy content descriptions in order to map between material and editorial entities, or the extraction metadata embedded in file headers and convert it to the data structures needed for import into a preservation system. On the other side there are use cases across institutions, such as content exchange with other cultural heritage institutions, content provision to access portals (e.g. Europeana), and outsourcing of annotation and access services, with potentially different data models between the archive’s and service provider’s infrastructure.

Tools for metadata mapping are needed to overcome the existing interoperability issues on both syntactic and semantic level. However, with formats existing in a given environment, we need in the worst case $O(n^2)$ mappings if we go for a simple approach considering only pair-wise mappings. Chaining mappings is also not a useful approach, as transitivity of relations cannot be ensured due to the incompleteness of mappings. We thus propose an approach that uses a high-level intermediate representation, together with mapping templates on data type level, from which the code for a mapping problem between a pair of standards can be derived. This would ideally allow us to solve the problem with $O(2n)$ definitions.

1.2 Mapping Problem and Resulting Requirements

The metadata formats encountered across the audiovisual archive domain differ in various aspects.

**Coverage.** MPEG-7 [10] for example aims to be domain independent while TV Anytime [7] focuses on broadcast metadata for consumers.

**Comprehensiveness.** For example, MPEG-7 aims to provide comprehensive descriptions of multimedia content ranging from low-level features that can be extracted automatically to fine-grained semantic description of a scene, while the Dublin Core Element Set [2] provides a simple list of general annotation elements.

**Complexity.** Metadata formats also differ in the complexity of their description syntax. For example, the Dublin Core `dc:creator` element is a simple name or an URI identifying an agent whereas the creator’s name in MPEG-7 is

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1 [http://www.europeana.eu](http://www.europeana.eu)