The TIB|AV Portal as a Future Linked Media Ecosystem

Paloma Marín-Arraiza
Competence Centre for Non-Textual Materials
German National Library of Science and Technology
Welfengarten, 1B, 30167 Hannover, Germany
+49 (0)511/762-19839
paloma.marin@tib.uni-hannover.de

Sven Strobel
Competence Centre for Non-Textual Materials
German National Library of Science and Technology
Welfengarten, 1B, 30167 Hannover, Germany
+49 (0)511/762-14229
sven.strobel@tib.uni-hannover.de

ABSTRACT

Various techniques for video analysis, concept mapping, semantic search and metadata management are part of the current features of the TIB|AV Portal as described in this demo. The segment identification and ontology annotation make the portal a good platform to support the Linked Data and Media. Weaving into a machine-readable metadata format will complete this task.

Categories and Subject Descriptors

H.5.1. [**Information Interfaces and Presentation**]: Multimedia Information System – *animations, video*.

General Terms Management

Keywords video platform, scientific videos, semantic search, linked data, metadata, information retrieval, automatic indexing.

1. INTRODUCTION

The Competence Centre for Non-Textual Materials at the German National Library of Science and Technology (TIB) wants to improve access to and use of the rapidly growing collection of non-textual materials in the field of science and technology, including audiovisual media, 3D objects and research data. In this respect, the TIB developed the TIB|AV Portal in cooperation with the Hasso Plattner Institute. The portal is a web-based platform for scientific videos from the realms of science and technology and optimises access to these videos. It was launched in April 2014.

2. FEATURES OF THE TIB|AV PORTAL

The TIB|AV Portal combines multimedia retrieval techniques with semantic analysis allowing users to perform pinpoint searches at the segment level of the video.

2.1 Video analysis and search

All videos hosted in the portal are automatically analysed and indexed. The video segments are annotated with GND subject headings that are semantically associated among each other. Exploiting these semantic relations expands the number of relevant hits [6]. The analysis tools of the portal include scene, speech, text, and image recognition. Due to the connection to further research information via TIB's portal GetInfo, the search space is broadened [2].

2.1.1 Scene, speech, text and image recognition

The scene recognition generates a visual table of contents providing an overview of the video content and enabling access to individual segments when searching. Spoken and written words in the video (e.g. on slides) are transcribed by speech and text analysis. This analysis generates a good quantity of metadata that enable navigation within the video. Searched terms are highlighted, which allows the user to find accurate information in the relevant video segments. Visual features in the video are analysed by image recognition so that the system automatically recognizes whether the displayed image concept is a lecture, an interview or an experiment.

2.1.2 Concept mapping and semantic video search

For the automatic indexing of videos, subject headings from the GND are used. Besides the German-language videos, numerous English-language videos are included in the portal. However, an English indexing vocabulary was initially lacking for the automatic indexing of English-language videos since the GND mainly contains German labels. English labels were gained by mapping the GND subject headings of the TIB|AV Portal knowledgebase onto the DBpedia, LCSH (Library of Congress Subject Headings), MACS (Multilingual Access to Subjects), and WTI thesaurus 'Technology and Management' [6]. These English labels were subsequently used for the automatic indexing of the English-language videos. The automatic indexing of the videos with semantically associated GND terms and English labels improves the traditional keyword-based search by expanding the search results and allows for a cross-lingual retrieval.

2.2 Metadata

The TIB|AV Portal uses the NTM Metadata Schema for the manual metadata to describe and manage its content in a standardised manner [2]. Besides, there are numerous automatic metadata generated from the video analysis of the TIB|AV Portal.

2.2.1 Manual metadata

Manual metadata are provided by the publishers in addition to the video following the above mentioned schema. The manual metadata are coarse-grained in that they describe the whole video document. They are classified in three groups: formal metadata (title, author…), technical metadata (file size…) and content-describing metadata (abstract, keywords…). The provided granularity is coarse, however, these metadata are very reliable and lead to solid search results.

2.2.2 Automatic metadata

Automatic metadata are generated by the various automatic video analyses mentioned above. The automatic

metadata are fine-grained descriptions referring to the individual segments of the video (cf. fig. 1).

Fig. 1 Automatic metadata describing the individual segments of the video

The automatic metadata are not as reliable as the manual ones but they allow pinpoint searches within the video content. Because of their granularity, specific videos (or video contents) can be found, which would otherwise remain hidden.

2.3 Video identification

Each video is identified by a digital object identifier (DOI), which is permanently assigned to it. The DOI can therefore be used for citation and linking purposes. Moreover, the particular segments of the video can be cited since a fragment identifier – attached to the DOI – is displayed for each segment by using the open standard Media Fragment Identifier.

3. WORK IN PROGRESS: SEMANTIC WEB TECHNOLOGIES IN THE PORTAL

The use of semantic technologies and Linked Open Data (LOD) has many advantages. LOD is easier to retrieve and interlink because URIs that define things are more stable than URLs that define addresses. The inter-operability and further use of the data is improved because LOD is based on open web standards, and besides the used data model, RDF, is more flexible and known worldwide by experts from different fields, not just within Library Science [4]. Therefore, our current projects aim to improve the semantic enrichment of the data so that they can be better explored and reused.

3.1 Provide metadata as Linked Open Data

We plan to transfer our metadata into a machine-readable format to make them available for reuse and linking. An analysis of our current data, an analysis of our triple store and an improvement of their quality by following different criteria is necessary to achieve our objective. We want to complete the three groups of metadata identified in [8]: Discovery metadata which allow the discovery of knew relevant content; context metadata which describe the institutions related to each material; and detail metadata which describe a specific area with a high granularity.

The semantic enrichment of our data, that is, adding context metadata by using URIs of authors and institutions from external databases such as ORCID, VIVO or GND, and their open publication will lead to a high visibility. Linking 'things' instead of documents, as suggested by Tim Berners-Lee [1], provides a stable scenario for automatic document annotation and connection between research information resources (repositories, journal databases…). The data retrieval interface will follow W3C Standards as well.

3.2 Apply the principles for Linked Media

Following the principles for Linked Media, enumerated in [3] will be a way to integrate our non-textual media in the Web of Data. These principles refer to temporal and spatial annotation, machine-readability of the media, creation of specific ontologies and differentiation between media fragments. Currently, the TIB|AV Portal offers a segmentation of all stored videos. Even the citation of a single segment is possible. Each segment has its own associated (automatically generated) metadata apart from the manual metadata that describe the whole video document. The weaving into machine-readable formats is one of the current projects. Since the data are already stored in a triple form, this task requires a transformation in the desired format and a further enrichment with contextual information (author or institution identification by URIs). Contextual information may be extracted by using ontologies such as GND. The process may not differ from the concept mapping already done in the portal.

4. FINAL CONSIDERATIONS

Weaving into the Web of Data is the future development of the TIB|AV Portal. Media metadata will adopt a machine-readable format following W3C Standards. Doing so, the metadata will become broadly findable and reusable. The machine-readability will be the basis for further improvements of the video annotation.

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