MANAGING BORN-DIGITAL AUDIOVISUAL MEDIA: A CASE STUDY OF SCIENTIFIC VIDEO COLLECTION STEWARDSHIP

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1. Introduction

The German National Library of Science and Technology (TIB) is one of the world's largest specialized libraries in the fields of engineering as well as architecture, chemistry, computer science, mathematics and physics. TIB has established a competence centre for non-textual materials in order to improve the access and the use of audiovisual media, 3D Objects, research data and software.

Audiovisual scientific media are often shared via web portals like YouTube[1] or Vimeo[2], where videos are provided with little or no metadata. Further it is unclear how long content will be archived and how it can be cited consistently. This makes the search for and the re-use of audiovisual media difficult and valuable scientific information remains hidden or gets lost. In order to improve the accessibility, citability and the sustainable use of scientific videos, the German National Library of Science and Technology (TIB) in cooperation with the Hasso Plattner Institute (HPI)[3] has developed the TIB AV-Portal. This paper addresses the workflow TIB has established in order to manage born-digital audiovisual content across its lifecycle. The TIB AV-Portal shows how to overcome the appearing challenges regarding scientific videos.

2. Acquisition

Sharing scientific results via audiovisual media has become an important part of scientific communication. "A video forum has the potential to make the knowledge gained from scientific communication richer and more useful, by providing a deeper understanding of the experiential aspects of the published contributions (Löwgren, 2011)".

The explosive growth in scientific video content was the trigger for us to develop a video portal which was aimed to become a reliable infrastructure for scientific videos.

Because there are so many online video plattforms and channels, for ours to stand out, it is important that we have a unique profile and offer a reliable infrastructure. This not only sets our content apart from other channels, it also ensures that we can make better decisions about what videos we acquire and curate.

The source of inspiration for the content of our AV-Portal comes mainly directly from national and international Universities and Scientific Institutions, which provide e.g.

- Recordings of scientific conferences, lectures, colloquia, panel discussions and other scientific lectures, talks and discussions.
- Recordings of experiments from the area of research and development, presentation of technologies and practices of outstanding scientific importance
- Microscopic images, images taken using special cameras (such as thermal cameras) and other imaging techniques
- Documentation and presentation of research work and results
- Modelling, simulations and presentations of specialised software for certain scientific purposes

1 https://www.youtube.com/ Date Accessed: 2016-12-28.
2 https://vimeo.com/ Date Accessed: 2016-12-28.
3 https://hpi.de/ Date Accessed: 2016-12-28.

- Presentations of scientific organisations, self-portrayals (film clips and slide shows) of research facilities and companies, mainly with a scientific content
- Documentaries, reports and portraits on video (for example, of architects and their buildings)

These videos span the breadth of topics across Technology, Engineering, Architecture, Chemistry, Information Technology, Mathematics and Physics and wherever possible they are published on an open-access basis, the users being free to watch, embed and download.

We also feature a historical film collection, from the former IWF Wissen und Medien gGmbH, which TIB was entrusted with in 2012[4]. The collection comprises around 11,500 analogue and digital scientific films related mainly to technical and scientific subjects, as well as biology and ethnology. Although most of the research films, university teaching films and documentaries were created between the 1950s and 1980s, the collection also contains a number of earlier cinematographic works, some of which date back to the 1910s. The videos are made available step by step to the public via our portal as soon as the rights could be cleared.

A complete new genre in science communication is videoabstracts. A videoabstract is the motion picture equivalent of a written abstract[5]. Typically 3-5 minutes long, this kind of video helps the reader to get a quick overview of a scholarly paper or research article. Authors have the opportunity to provide background information about their research, and to present their research activities to a wider audience. A videoabstract is often directly associated with a scientific paper that has been accepted and published by a journal. Among the journals which already accept videoabstracts are Elsevier[6], Wiley[7], IOP Science[8], IEEE Xplore[9] and the American Chemical Society[10].

TIB cooperates e.g. with the Open Access publishing company Copernicus Publications[11] regarding videoabstracts. Scientists can simply use the TIB AV-Portal to publish video abstracts or supplementary videos to the specialist articles they publish in one of Copernicus' Open Access journals. The cooperation offers the authors the possibility of using videos in a scientifically sound way to reach out to other scientists and beyond, boosting the impact of their work.

Another interesting genre, which fits our profile is conference recordings. Traditionally, the results presented at scientific conferences are published in proceedings. Today, in many cases those talks are also recorded and published after the conference. For us, this means that we harvest videos from conference websites, in many cases even complete series of recordings such as FOSS4G 2016[12], EuroPython [13] 2014 or Free and open Source Software Conference (FrOSCon)[14] (Drees 2016).

4 https://www.tib.eu/en/search-discover/special-collections/iwf-media-collections/ Date Accessed: 2016-12-28.
5 https://en.wikipedia.org/wiki/Video_abstract Date Accessed: 2016-12-28.
6 https://www.elsevier.com/ Date Accessed: 2016-12-28.
7 http://eu.wiley.com/ Date Accessed: 2016-12-28.
8 http://iopscience.iop.org/ Date Accessed: 2016-12-28.
9 http://ieeexplore.ieee.org/Xplore/home.jsp Date Accessed: 2016-12-28.
10 https://www.acs.org/ Date Accessed: 2016-12-28.
11 http://publications.copernicus.org/ Date Accessed: 2016-12-28.
12 https://av.tib.eu/series/253/foss4g+2016+bonn?0 Date Accessed: 2016-12-28.
13 https://av.tib.eu/series/248/europython+2014?53 Date Accessed: 2016-12-28.
14 https://av.tib.eu/series/231/froscon+2015?106 Date Accessed: 2016-12-28.

3. Indexing and digital preservation

Our media asset management system (MAM) professionally indexes the videos. The system has its own transcoders that handle all established codecs and creates statistics. The system's underlying metadata schema on standardised registration of non-textual materials is based on the current DataCite Metadata Schema[15] and has been expanded by a few elements required for the detailed description of an AV medium. The metadata schema is made available to media providers online[16] Metadata is supplied by the content providers via an XML file and describes formal, technical and content-related features of the video. Formal metadata of the video includes, for example, title, author, publisher and licence. Technical metadata are, for example, file size and duration. Content-related metadata are subject area, abstract and keywords.

In light of the rapidly increasing number of digital AV media and the necessity to index them at the segment level, solutions for automatic indexing are needed, because this is not manageable manually (Neumann and Plank, 2013). Therfore, in addition to reliable authoritative metadata (Dublin Core[17]), time-based metadata is generated by automated media analysis. A combination of state-of-the-art multimedia retrieval techniques (Snoek et al, 2007) with semantic analysis allows us to provide content-based access to videos at the segment level and the ability to link data to new knowledge: the spoken language, text overlays and image information contained in the video (Blümel et al, 2012) are automatically analysed and semantically indexed by using subject specific parts of the Integrated Authority File (GND)[18]. This context information enables searches that make use of synonyms, broader and narrower terms. The portal also allows for cross-lingual retrieval (German/English) (Strobel and Plank, 2014). The English identifiers were obtained by mapping GND entities onto data from other standards. These standards include DBpedia[19], Library of Congress Subject Headings (LCSH)[20], mappings from the Multilingual Access to Subjects (MACS) project[21] and the WTI "Technology and Management" thesaurus[22].

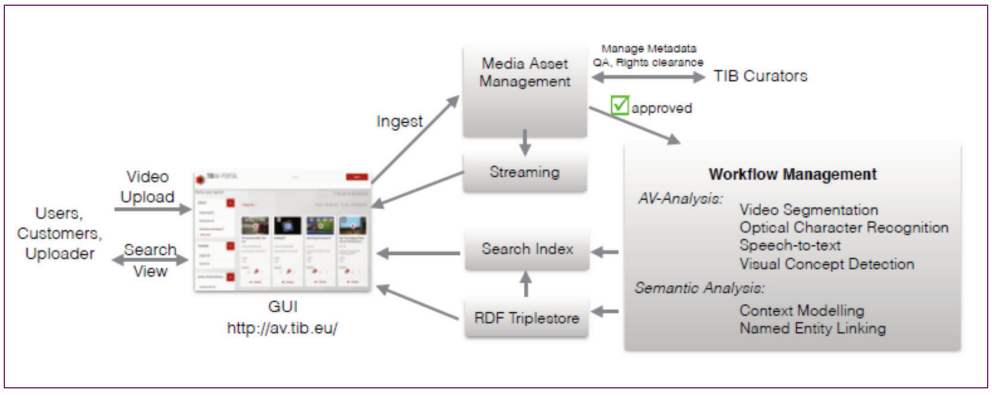

Figure 1. The overall architecture of the TIB AV-Portal (Waitelonis, Plank, Sack 2016).

15 https://www.datacite.org/ Date Accessed: 2016-12-28.
16 https://av.tib.eu/about Date Accessed: 2016-12-28.
17 http://dublincore.org/ Date Accessed: 2016-12-28.
18 http://www.dnb.de/EN/Standardisierung/GND/gnd.html Date Accessed: 2016-12-28.
19 http://wiki.dbpedia.org/ Date Accessed: 2016-12-28.
20 http://id.loc.gov/authorities/subjects.html Date Accessed: 2016-12-28.
21 http://www.dnb.de/DE/Wir/Kooperation/MACS/macs_node.html Date Accessed: 2016-12-28.
22 https://www.wti-frankfurt.de/images/themenpakete/english/en-tema.pdf Date Accessed: 2016-12-28.

All videos is allocated a unique citation link (DOI name) in order to make them citable on a permanent basis[23]. DataCite[24] registers the DOI via the API interface. Additionally the AV Portal offers a time-based citation link. Using the open standard Media Fragment Identifier (MFID)[25], a citable DOI is displayed for each video segment.

Non-textual materials are digitally preserved if they are particularly important for science and teaching and of appropriate technical quality. TIB operates a professional digital preservation system called "Rosetta"[26], which is jointly used by the German National Library of Medicine (ZB MED)[27] and the Leibniz Information Centre for Economics (ZBW)[28].

4. Licencing

By concluding a license agreement, the content providers specify the terms and conditions of use, and grant us permission to provide the audiovisual media via our portal.
If the content providers do not own the necessary rights, they are asked to first contact the originators or other rightholders of the films before placing the audiovisual media at TIB's disposal.

If the content providers are the originator of the audiovisual media or if the rights have been transferred to them, they can choose between an open access licence and a declaration of consent, enabling them to decide how they wish to place the material at TIB's disposal.

4.1 Open Access Licence

With an open access licence, the content providers grant users as many rights as possible to the extent provided by law, and permit the diverse use of their film, fostering scientific exchange in the digital environment. We recommend the "CC-Namensnennung – Deutschland 3.0" licence, which ensures that the originator is acknowledged and permits the comprehensive use of audiovisual media in research and teaching.

4.2 Declaration of Consent

TIB is granted a simple right of use of the audiovisual media, which it is permitted to make available via its portals. Users may watch the film online or download it. However – in contrast to all CC licences – users may not forward it to third parties or make it available online themselves.

If the specified types of licensing do not suffice, TIB will endeavour to find an individual licensing solution.

23 https://www.tib.eu/en/publishing-archiving/doi-service/ Date Accessed: 2016-12-28.
24 https://mds.datacite.org/static/apidoc?lang=de Date Accessed: 2016-12-28.
25 https://www.w3.org/TR/media-frags/ Date Accessed: 2016-12-28.
26 https://www.tib.eu/en/publishing-archiving/digital-preservation/ Date Accessed: 2016-12-28.
27 http://www.zbmed.de/ Date Accessed: 2016-12-28.
28 http://www.zbw.eu/de/ Date Accessed: 2016-12-28.

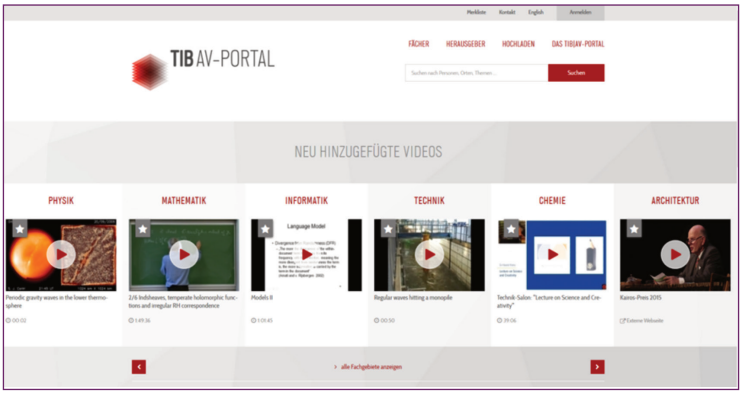

Figure 2: TIB AV-Portal: Landing page (av.tib.eu).

5. Access

The AV-Portal was created in a joint project of TIB together with the Hasso Plattner Institute (HPI). In 2011, a semi-functional prototype of the AV Portal was developed; in 2012-2013, the system was further developed and the beta version was created. Since spring 2014, the system has been fully operational at TIB. Our portal currently contains around 5,000 videos from the field of science and technology, as well as some 2,400 film credits with external links to other websites.

To date, our AV-Portal has had over 150.000 visitors. About 70% of our audience is from Germany, about 20% from other European countries and about 5% from the US. We have a wide geographical range with a total of 300.000 page impressions. Our viewers come from 154 different countries around the world including even Antarctica. Producers of scientific films can simply upload their videos via an online form or FTP (file transfer protocol) to the portal free of charge.

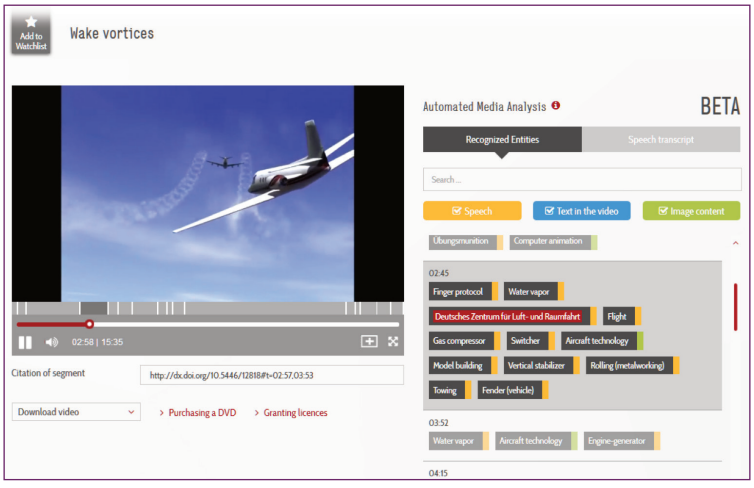

Figure 3: TIB AV Portal: Detail page. http://dx.doi.org/10.5446/12818#t=02:59,03:53.

Thanks to automated, semantic video analysis our portal offers access at the segment level, improving keyword-based search by tagging materials with entities. This leads to better and more precise search results. In addition, the search results of the AV Portal can also be specified thanks to content-based faceted navigation. The AV Portal contains facets for subject area, publisher, year of publication, licence, terms found in the video, images and organisations.

Reaching a wide audience is part of our strategy so we like to put our content where people are and make it available beyond the AV Portal itself. Therefore TIB has made the metadata and preview files it has licensed available to partners such as EUROPEANA[29], the Deutsche Digitale Bibliothek[30] and the Filmarchives Online[31], as well as to many other institutions. Further expansion of cooperative activities is underway.

6. Linked Open Data Service

Recently, TIB has started to publish authoritative as well as time-based, automatically generated metadata and thumbnails of videos, for which a use has been agreed under the CC0 1.0 Universal licence[32], as linked open data for further use in the standard RDF format (Waitelonis, Plank, Sack 2016). In the future, the datasets will be updated quarterly. In addition, users can attend a tutorial on our website[33], providing a brief overview of the structures of the datasets of TIB's AV Portal. The tutorial explains how datasets can be imported into an RDF database and searched via SPARQL (Marin Arraiza and Strobel 2015).

7. Conclusion

Today's researchers move beyond text as their publications are enhanced by a variety of digital assets such as research data, video, graphics, models and even software code. However, only a negligible proportion of those digital assets are accessible at present, whilst scientific texts are, in principle, sufficiently well-documented and available. This can lead to serious problems when it comes to verify, reproduce and reuse the research results.

This paper summarizes the current status from the efforts undertaken by TIB to ensure the longterm provision of scientific videos, video abstracts and video supplements in a legally sound manner. The video hosting arrangement includes indexing according to international standards, semantically enhancement, transcription, digital preservation and finally the allocation of a DOI name. Scientific videos from the TIB core subjects such as Technology, Engineering, Architecture, Chemistry, Information Technology, Mathematics and Physics are constantly acquired. In order to optimise the material's discoverability the TIB AV-Portal - a web-based platform featuring state-of-the-art multimedia retrieval technology and semantic video analysis - was developed.

Thus this library-operated service infrastructure underlines the way that the output of researchers is understood today: a combination of journal article, data sets, and model code, as well as video, a conference recording, animation supplements – all linked to each other through Digital Object Identifiers.

29 http://www.europeana.eu/portal/ Date Accessed: 2016-12-28.
30 https://www.deutsche-digitale-bibliothek.de/ Date Accessed: 2016-12-28.
31 http://www.filmarchives-online.eu/ Date Accessed: 2016-12-28.
32 https://creativecommons.org/publicdomain/zero/1.0/ Date Accessed: 2016-12-28.
33 https://av.tib.eu/opendata Date Accessed: 2016-12-28.

8. References

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