

LinkedCulture: browsing related Europeana objects while watching a cultural heritage TV programme

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ABSTRACT

This short/demo paper describes LinkedCulture, a Web based application which complements the viewing of a well known Dutch cultural heritage TV program with the ability of viewers to explore art objects from Europeana related to those in the program.

INTRODUCTION

The LinkedTV project (<http://www.linkedtv.eu>) believes future television must embrace new consumption patterns as it moves online if it is to retain relevance in a space increasingly dominated by Web-centric offers. This includes deeper integration with other Web content and multi-screen viewing. LinkedCulture, using cultural heritage content in Dutch made up of episodes of the TV show Tussen Kunst & Kitsch (TKK) from AVROTROS (in collaboration with Sound and Vision), is one of the LinkedTV scenarios implemented in the project. This short/demo paper refers briefly to TV consumption trends and prior related work (Sec. 2) before turning to describe the implemented demo of LinkedCulture (Sec. 3), some of the technical aspects with a focus on how we dealt with describing art objects and using the Europeana API (Sec. 4) before concluding on future work and how demos like LinkedCulture can point to a new way for the public to experience CHO collections like Europeana (Sec. 5).

TRENDS AND RELATED WORK

Households have more and more connected devices and consumers are increasingly using devices in parallel: this is clearest when it comes to viewing audiovisual programming on one device and browsing online content on another. A 2013 published survey [1] backed up earlier UK/US-focused surveys on “second screen” usage¹ that 40% of continental Europeans were using a second device to follow what they were watching on TV, with Google

being first choice to look up related information. As a global trend, it has led to Forbes’ magazine to announce “using a second screen while watching TV is the new normal”². LinkedTV’s own user trial [2] with viewers of TKK confirmed that, even when the viewers were older as is a typical demographic for such a program, there is a significant interest in being able to explore further information beyond what is provided by the program, as long as it is easy enough to access and can be available also after the program has been viewed.

In the commercial domain, there is not yet a widely successful application of second screen TV enrichment due to the excessive cost of annotating TV programming and manually preparing the enrichment. Shazam for TV (<http://www.shazam.com/music/web/productfeatures.html?id=1266>), for example, focuses on a TV program as a whole, e.g. actor information or episode trivia. Some demos have been made with concept-level approaches, e.g. using Mozilla Popcorn (<https://popcorn.webmaker.org/>), linking terms in video subtitles to content shown in other frames alongside the video. These demos suffered from the lack of disambiguation of terms (such as “Paris”) and limited link relevance (typically Wikipedia, a map etc.). LinkedTV provides an automated workflow (cf. Sec 4) with better disambiguation of concepts referred to within audiovisual material as well as richer linking to sets of relevant content from varied online sources. We believe this provides significantly better automated results than any prior work and thus also forms the basis for a usable cost-effective solution by content owners. The rest of this paper will focus on how this approach was used in enriching a cultural heritage TV program.

DEMONSTRATOR FOR CULTURAL HERITAGE

LinkedCulture³ [3] shows the provision of complementary information related to art objects being discussed in the TV program. Trials with viewers [2] validated their interest in being suggested links to other program segments where similar objects are discussed and links to information on

² <http://www.forbes.com/sites/jeffbercovici/2014/07/10/using-a-second-screen-while-watching-tv-is-now-the-norm/>

³ Demo video: <http://vimeo.com/108891238>

similar art objects in digital collections (Europeana), which they can explore while pausing or completing their current viewing, on the same screen or - casting the TV program to another screen (e.g. from tablet to a TV) – alongside viewing. The application allows also for bookmarking so that viewing can continue but the viewer can easily refer back to the content they were interested in afterwards.

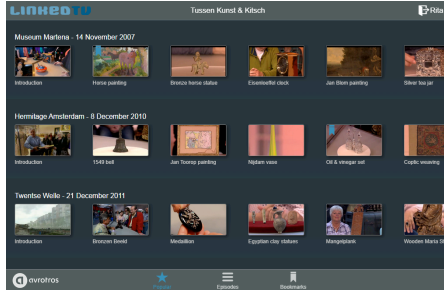


Figure 1. Opening screen of LinkedCulture with the option to start viewing a TKK episode segment⁴

After accessing the LinkedCulture application (Fig. 1) the viewer can explore past episodes (vertically) and for each, select which segment to start viewing (horizontally). Each segment discusses an art object. An example from our demo is a silver Frisian tea jar from the mid-18th century (Fig. 2). Our viewer is very interested in Frisian heritage and the expert in the TV program states that the tea jar is a typical example of Frisian Silver. The viewer didn't even know there was such a thing, and would love to learn more about what sort of other objects exist in this category.



Figure 2. Screenshot of the Frisian silver tea jar (courtesy AVROTROS, Tussen Kunst & Kitsch episode of 14 Nov 2007)

During any segment, the viewer can switch to further information about the art object being discussed such as for the silver Frisian tea jar, the screenshot shows an information card about the location Friesland (Fig. 3).

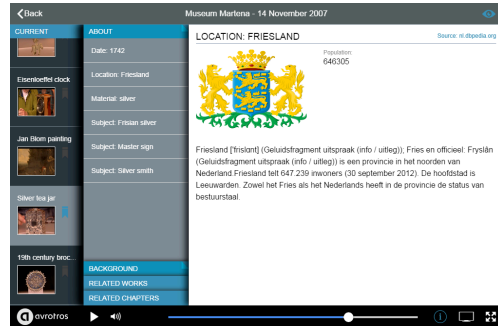


Figure 3. Viewing an information card for a concept

In the next screenshot, other examples of silver tea jars in Dutch collections can be examined (Fig. 4). Providing the most relevant related Europeana Cultural Heritage Objects (CHOs) is the subject of the implementation of a dedicated Europeana API wrapper, discussed in the next section.

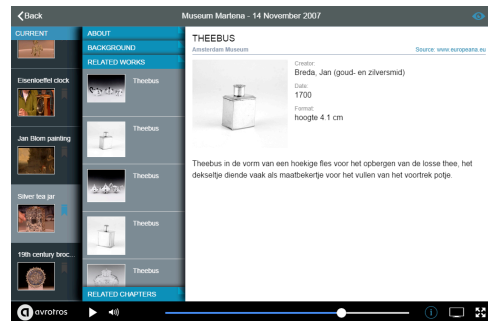


Figure 4. Viewing a related art object from Europeana.

TECHNICAL IMPLEMENTATION OF LINKEDCULTURE

LinkedCulture is built on top of the LinkedTV platform, implementing a dedicated workflow which ingests video, analyses and annotates it and generates links to related Web content (enrichment) (Fig. 5). A Web-based Editor Tool allows editors to view and curate the annotations and enrichments of each episode prior to playback.

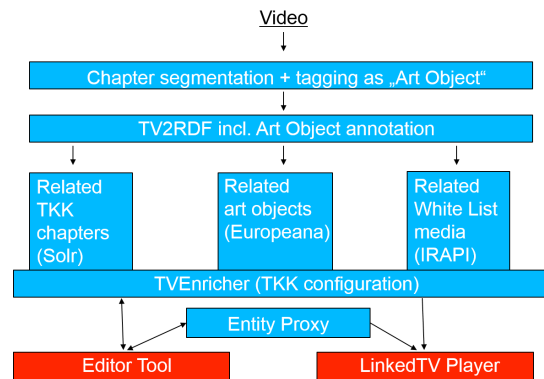


Figure 5. Illustration of the workflow for the enrichment of TKK episodes in the LinkedCulture application.

⁴ UI design in Figs. 3, 4 & 5 courtesy Lilia Perez Romero (CWI), cf. LinkedTV D3.5 “Requirements Document LinkedTV User Interfaces (v2)” <http://slideshare.net/linkedtv/requirements-document-for-linkedtv-user-interfaces>

Immediately at the video analysis step at the beginning of the LinkedTV workflow, the program is split into distinct chapters each of which having a different art object as its

focus of discussion between the experts and the audience. The segmentation approach uses the work of [4]. In the TKK case, a set of visual cues have been identified for the beginning of a new section of the TV episode where a new art object is introduced and discussed, such as the repetition of a textual overlay of the name of the expert discussing the object. From a shot with this textual overlay our approach searches for prior and subsequent gradual transitions between shots to fix the chapter boundaries.

Once the “art object” chapters are known, Named Entity Recognition [5] is performed across the transcript of each chapter so that entities (concepts) can be associated to them. In the Editor Tool a specific interface to curators is available to complete the description of the art object in each chapter (Fig. 6). The task of the editor is aided by this extraction of candidate entities from the transcript (i.e. instances of art object characteristics) which then are available as suggestions in the Editor Tool.

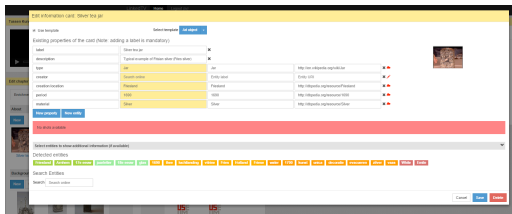


Figure 6. Screenshot of Editor Tool. The editor annotates the chapter in terms of the art object, with entities of different types (colours) suggested below to guide him/her in the task.

Art object descriptions are stored in the LinkedTV platform as RDF metadata. The usage of semantics (uniquely identifying concepts as URIs, following Linked Data principles) allows us to disambiguate the intended meaning and retrieve additional data for each concept. The annotation model focuses on a small set of characteristics of CHOs typically present in Europeana metadata: object type, creator, creation location, time period, material. We followed Dublin Core just as the Europeana Data Model (EDM) but defined more specific properties for location and time:

| | |
|-------------------|---------------------------------------|
| Object type | dc:type |
| Creator | dc:creator |
| Material | dc:medium |
| Creation location | vra:locationCreationSite ⁵ |
| Time period | dct:temporal ⁶ |

⁵ This property was the most specific we found in use in CH vocabularies to capture the sense of location *where a CHO was created*. Europeana does not seem to have a clear approach to this, often only the current location of the CHO is indicated.

⁶ Compared to edm:year which takes a single integer for a calendar year and dct:created which can take an unstructured data

The aggregated annotation is used for the subsequent enrichment. Distinct Web services provide suggested links to Web content based on those annotations. These enrichment services are accessed by a single call to a Web service called TVEnricher which integrates the individual services listed above to a single request/response. A shared service called EntityProxy has also been implemented to provide information cards on all entities selected in the video annotations similar to the Google Knowledge Graph (seen in Fig. 3). We introduce here briefly only the Europeana enrichment service. The goal is to provide, for an art object annotated in the TV program chapter, a set of related art objects from the Europeana collection. Considering the annotation of our silver Frisian tea jar:

| | |
|----------|--------------|
| Type | db:Container |
| Material | db:Silver |
| Location | db:Friesland |
| Period | 1690 TO 1742 |

Since these properties can occur in the Europeana metadata under different fields, we tested different approaches to determine the most effective query. Since we query largely textual metadata, it was immediately clear that we needed to consider two key aspects in a query:

Synonyms and similar terms. Metadata property values are not typed formally in Europeana to a taxonomy so that generalisations or specialisations can be included in results. Thus our query must expand its search terms to relevant synonyms and similar terms.

Language. Metadata is generally textual and in the language of the providing organization. So queries need to express terms in the local language.

To address the above and temporal queries, SPARQL would be complex to model and execute. Thus we focused our experiment on using the Europeana API. Firstly we found the best fields to query for each art object property and then the best approach to expand each field-based query to aim for the best precision in search results. With all queries restricted to “COUNTRY:netherlands”⁷:

Type. “what:container” finds 240 CHOs. In contrast, “skos_concept= <http://vocab.getty.edu/aat/300045611>” is empty, and finds only 2 CHOs in the whole Europeana.

Material. “proxy_dc_format:silver” finds 448 CHOs. Note the use of the Dutch *silver*, the string *silver* returns no matches in Dutch collections. In contrast, “what:silver” finds 10256 CHOs as often the material is referenced in the object type or in subject categories.

string, this property takes as value a dct:PeriodOfTime which is modelled with a distinct start and end date-time.

⁷ API query results from 28 January 2015

Location. No metadata property clearly refers to creation location, not even `dc:source`. “`proxy_dc_source:Friesland`” is empty. “`location:Friesland`” returns 1271 CHOs and “`where:Friesland`” returns 49 556 CHOs, yet both seem to draw from the value of ‘geographical coverage’

Period. Temporal period queries are well supported, e.g. “`YEAR:[1690+TO+1742]`” (60 440 CHOs)

Creator. While not annotated for this object, the API offers the “`who:`” field over the metadata property of creator.

Our approach was to expand the query to capture all possible variations of characteristic values in the metadata and focus on finding the Europeana CHOs closest in relevance by matching on at least 3 characteristics. Expansion is important since, e.g. **type** lacks a formal type system and thus requires us to consider synonyms and related types in the query, or the spelling and formatting of **creator** names can vary in the metadata while the API tries to make an exact string match. Combining the queries, no CHO matches on all four characteristics. We do find 4 CHOs for the combination of `Frisian+silver+”from 1690 to 1742”` and 4 CHOs for the combination of `silver+container+”from 1690 to 1742”` (if `container` is expanded to also query on synonyms). Combining just two characteristics in the query, result sets varied from 6 to 1 287 CHOs, and thus often provided too many options on CHOs which were only weakly related to the original.

To handle this for any arbitrary art object annotated in TKK episodes we implemented a Europeana API wrapper which follows the above approach. Since English DBpedia is used in annotation, we follow `owl:sameAs` property links to the Dutch DBpedia to get a Dutch label, while the `dbo:wikiPageRedirects` property can indicate alternative spellings and synonyms. For creators, the `foaf:name` property usually provides alternative forms. For locations, this is the values of the `dbo:alternativeName` property, while `dbo:isPartOf` and `dbo:part` link to locations which supersume or subsume this location. The value of this approach is clear by simple introspection, e.g. if the editor annotates the object’s creation location as the city of Franeker, which is quite correct, then the query on `Franeker+silver+”from 1690 to 1742”` is empty, but since in DBpedia the concept Franeker `dbo:isPartOf` Friesland, the query can be expanded and the 4 relevant CHOs found.

FUTURE WORK AND CONCLUSION

The implementation of the described Europeana API wrapper and the semantic annotation of art objects it draws on has enabled the LinkedCulture application to semi-automatically enrich TKK episodes with related art objects from Europeana collections. Simple introspection can show the benefits of the approach. Even for a single art object example, we show how a numerically restricted set of most related art objects can be found via Europeana metadata

overcoming problems of multilingualism and inconsistency in the terms used. The final LinkedCulture application will use the annotations of ca. 35 art objects in 6 TKK episodes and be trialed with TKK viewers to measure satisfaction with the suggested related Europeana CHOs.

Europeana as an online portal to digitized collections of Europe’s cultural heritage is confronted with the problem that the general public do not search in `europa.eu` when interested in exploring CHOs. Rather, applications are needed which can push relevant content from the portal to people when appropriate. Additionally, exploration is made difficult by the complexity of the domain – even when turning to Google while watching TV, how does the viewer seek other examples of silver Frisian tea jars? What happens when they are interested in a painting they see but missed the artist’s name? While not so apparent to the viewer, we must add to this list the inconsistency in the Europeana metadata. Until there is a more significant amount of semantic annotation of CHOs, our approach successfully uses domain knowledge to expand queries and address issues of term ambiguity, alternative spelling, synonyms and multilingualism. LinkedCulture is a step towards eased entry for the public into Europeana’s rich and deep collection of digital objects tied to the trending activity of “second screen” usage with television.

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