Applying Linked Data to Media Fragments and Annotations

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Abstract. The Web applications today have been enriched with various multimedia resources and annotations. However, there is still a lack of semantic interlinking between media fragments and annotations, which leads to the insufficient index of inside content of multimedia resources. This paper shows a demo of applying linked data principles in media fragments and annotations to improve the index of multimedia resources. Using linked data a media fragment can be universally identified by a URI and linked to annotations or other media fragments in the linked data cloud. The demo is based on the UK Parliament Debate scenario. The RDF file containing media fragments and annotations of the debate video has been published in Sindice semantic web index and linked to other resources in the linked data cloud.

Keywords: annotation, linked data, media fragment, semantic Web

1 Introduction

The Web applications today have been enriched with various multimedia resources and annotations. The success of multimedia storage and sharing applications has proved that, instead of plain text resources, multimedia resources are being raised to the first class citizen of the Web. The term "media fragment" usually refers to the temporal, spatial and track dimensions of a multimedia resource. Some research has been devoted to address media fragments and semantic multimedia annotations, such as MPEG-7[1] and Core Ontology of Multimedia (COMM) [1]. However, there is still a lack of semantic interlinking between media fragments and annotations, which leads to the insufficient index of inside content of multimedia resources. Thus most search results for multimedia resources in major search engines stay on the whole multimedia resource level.

The Linked Data principles [2] offer guidelines of publishing linked data on the Web so that data can be better connected to each other and explored by machines. Applying linked data principles to media fragments and annotations is a relatively new topic. Currently, some initial work has been done by M.Hausenblas

[1] http://www.chiariglione.org/mpeg/standards/mpeg-7/mpeg-7.htm

et al. [3]. Using linked data, a media fragment can be universally identified by a URI and linked to annotations or other media fragments in the linked data cloud, which will result in a better index of multimedia resources.

In [4], three research questions have been identified regarding applying linked data into media fragments and annotations. They are:

Q1 How to choose URI to identify media resources, especially media fragments
Q2 How to return appropriate representations when dereferencing the URIs of media fragments in different contexts
Q3 How to tackle problems of ontology alignment related to media fragments and annotations

This paper presents a demo of how media fragments could be linked to various datasets in linked data cloud. The demo is based on the UK Parliament Debate scenario and all the data, which has been linked together, are free to access.

2 The Demo

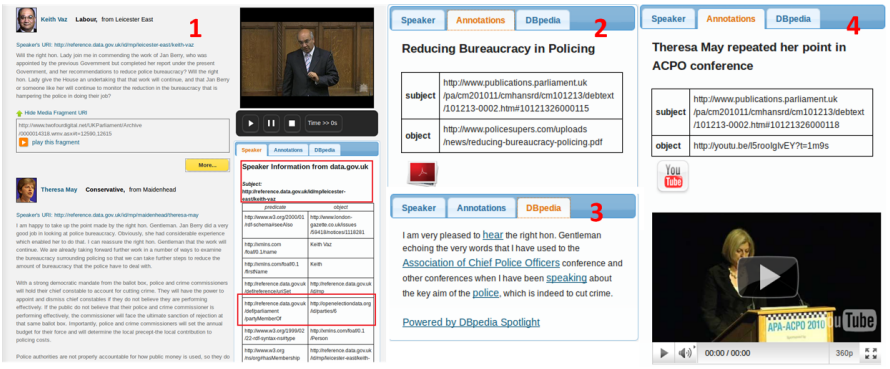

Fig. 1. Screenshot of the demo

The main data source of this demo is from TheyWorkForYou.com[2], which exposes the debate videos and transcripts through REST API. Unfortunately, the API does not provide the synchronisation points, so we have to manually synchronise the speeches with the debate videos and save the time points locally. Except for that, the demo does not host anything else. All the linked data publishing and consuming are carried out at runtime. We choose a sample debate about the bill presentation of police reform on 13th Dec, 2010 for the demo.

Media Fragment URI 1.0 and Ontolgoy of Media Resource 1.0 (namespace "maont") are chosen to represent media fragments and semantically describe the

[2] http://www.theyworkforyou.com

debate video. Linking Open Descriptions of Events[3] (LODE) and DOLCE+DnS Ultralite[4] (DUL) are used to generally model the debate events, such as who is the involvedAgent (involvedAgent property in LODE) of a speech and a speech is illustrated ("illustrate" property in LODE) by some media fragment. User generated annotations are modelled by Open Annotation Collaboration ontology[5] (OAC). Server-side programmes are developed to get the debate information from TheyWorkForYou API, including the URIs for the debate video, the speakers, each paragraph of transcripts. Then the server-side also constructs the URIs for media fragments and related events based on the synchronisation points. All these information are encoded in XML and sent back as response when replaying the debate.

On the client side, the XML response is parsed by javascript and all the information about the debate video, speakers and speeches are displayed in a synchronised manner (part 1 in Figure 1). URIs for different resources are related to each other via media fragments and the vocabularies introduced earlier.

The visualization of media fragments are represented by the behaviour that the clicking on the speech will invoke the embedded player on the Web page to play from the start time the media fragment denotes. Actually, each speech paragraph annotates a media fragment and the client-side javascript programme directly calls the player's api to change the current playing time.

In order to show that media fragments can be linked to other datasets, the demo implements some runtime mashups. One is to retrieve speaker's information from the UK Parliament datasets[6]. A javascript programme is used to send the DESCRIBE SPARQL query to find the speaker's information by his or her name. As part 1 in Figure 1 shows, through lode:involvedAgent (the speaker is the "lode:involvedAgent" of a transcript) and lode:illustrate (a media fragment "lode:illustrate" the transcript), media fragment URIs are linked to the speaker and further linked to the party and region he or she represents. Another mashup is using DBpedia spotlight to automatic annotate the speech text (part 3 in Figure 1). Through this annotation, the media fragment is linked to the URI representing ACPO in DBpedia. This demo also shows how media fragment

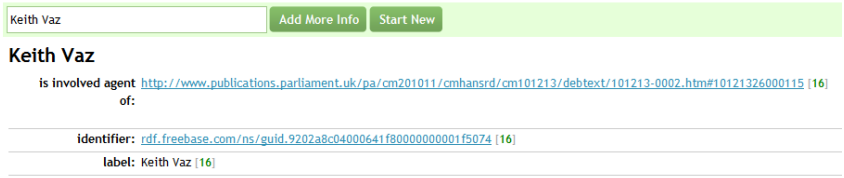

Fig. 2. Index of the RDF file from Sindice

[3] http://linkedevents.org/ontology
[4] http://www.loa-cnr.it/ontologies/DUL.owl
[5] http://www.openannotation.org/ns/
[6] http://www.data.gov.uk

URIs could link to arbitrary resources on the Web by user randomly generated annotations. The annotation in part 2 of Figure 1 illustrates that the user is willing to link the speech about "Reducing Bureaucracy in Policing" to a related pdf document online. The annotation in part 4 of Figure 1 links the Theresa May's speech to another media fragment in Youtube, because she repeated her point in that video. These speeches are all part of the debate session, thus the media fragments, which these speeches annotates, are able to link to remote resources via these generated annotations.

The RDF graph about media fragments, speeches, speakers and annotations are embedded into the web page using javascript as RDFa. We dumped the RDFa into a RDF file, put it on a server[7] and index it in Sindice[8]. Figure 2 shows part of the search results of the term "Keith Vaz", who is a speaker in the demo speech. Sindice has resolved that Keith Vaz has a URI from freebase[9] and he is related to a speech in this debate session by lode:involvedAgent predicate. His speech is identified by a URI from the UK's office Parliament website http://www.publications.parliament.uk. The speech URI is related to the media fragment URI, which represents the video clip containing this speech, via lode:illustrate predicate.

3 Conclusion

This demo shows a example of applying linked data principles in media fragments and annotations. The RDF file containing media fragments and annotations of the debate video is indexed in Sindice semantic web index and linked to other resources in the linked data cloud. In the future, advanced operations, such as media fragment searching and reasoning, can be performed based on the published media fragments. The screencast of this demo is available at http://youtu.be/KkWI-DHLD_M.

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[7] http://users.ecs.soton.ac.uk/yl2/parliament4u_demo.rdf
[8] http://www.sindice.com
[9] http://www.freebase.com