The YUMA Media Annotation Framework

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Abstract. Annotations are a fundamental scholarly practice common across disciplines. They enable scholars to organize, share and exchange knowledge, and collaborate in the interpretation of source material. In this paper, we introduce the YUMA Media Annotation Framework, an ongoing open source effort to provide integrated collaborative annotation functionality for digital library portals and online multimedia collections. YUMA supports image, map, audio and video annotation and follows the OAC annotation model in order to provide data interoperability. A unique feature of YUMA is *semantic enrichment*, a mechanism that allows users to effortlessly augment annotations with links to contextually relevant resources on the Linked Data Web.

Keywords: Annotation, Linked Data, Tagging.

1 Introduction

Annotations are a fundamental scholarly practice common across disciplines [5]. They enable scholars to organize, share and exchange knowledge, and collaborate in the analysis of source material. At the same time, annotations offer additional context. They provide explanations which may help others in the understanding of a particular item [2], or point to related material which may be useful for its interpretation. As institutions are making increasing efforts to digitize their holdings and make them available to the public over the Web [6], the role of annotations is evolving: cultural institutions are discovering the added value of user-contributed knowledge [4]. To users, adding comments, notes or tags to collection items is a convenient way to organize and personalize the information they find; or to share it with others online. To institutions, annotations can serve as a source of additional metadata which can improve search and retrieval, and helps users to discover content they wouldn't have found otherwise.

However, until now no single annotation application that can manage more than one specific media type has been widely adopted. Moreover, if annotation functionality is provided at all, it is usually based on an in-house solution, employing proprietary data models which are not interoperable with those of other

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systems [2]. As a result, annotation data is locked in closed silos, and usable only within the confines of a single system.

In this paper, we present the *YUMA Universal Media Annotator*[1], an ongoing effort to create an open source annotation framework for different types of multimedia content. By exposing annotations according to the principles of *Linked Data* [1], they are pulled out of institutional silos and become interoperable with other systems on the Web. YUMA is being developed in the scope of the Europeana*Connect* project[2] and is currently being showcased as part of the *Europeana ThoughtLab*[3], an online demonstration area for various initiatives carried out by partners of the *Europeana*[4] cultural heritage portal.

2 System Architecture

YUMA is based on a distributed architecture and consists of two core elements: (i) the *Annotation Suite*, a set of browser-based end-user applications for annotating content of specific media types; and (ii) the *Annotation Server*, a common "backend" service used by all of those applications. One of YUMA's key design principles is that it is designed for integration into a host environment - e.g. an online library portal - rather than to function as a standalone application. Consequently, it lacks typical portal features such as user management, and instead foresees appropriate APIs and authentication mechanisms which allow the host environment to use YUMA as an external, loosely-coupled service.

3 Annotation Suite

With the YUMA Annotation Suite the user creates "Post-It"-style annotations on digital media items. Annotations can pertain to the item as a whole, or only a part of it. At present, the suite includes tools for **images** and **digitised maps**. (The map tool is similar to the image tool, but features a "Google-Maps-like" interface for high-resolution content, and adds geographical features such as georeferencing and map-overlay.) In addition, there are prototype implementations for **audio** and **video** annotation.

The user interface offers similar functionality across all of the media types. As an example, a screenshot of the map annotation tool is shown in Fig. 1: a floating window lists existing annotations, and provides GUI elements for creating, editing, and deleting. To facilitate communication and collaboration, it is possible to reply to annotations, and to keep track of discussions around a particular media item or annotation via RSS feeds. For annotating specific areas, the tool

[1] `http://github.com/yuma-annotation`
[2] `http://europeanaconnect.eu`
[3] `http://europeana.eu/portal/thoughtlab.html`, also see `http://dme.ait.ac.at/annotation` for direct access to the annotation demonstrator
[4] `http://www.europeana.eu/`

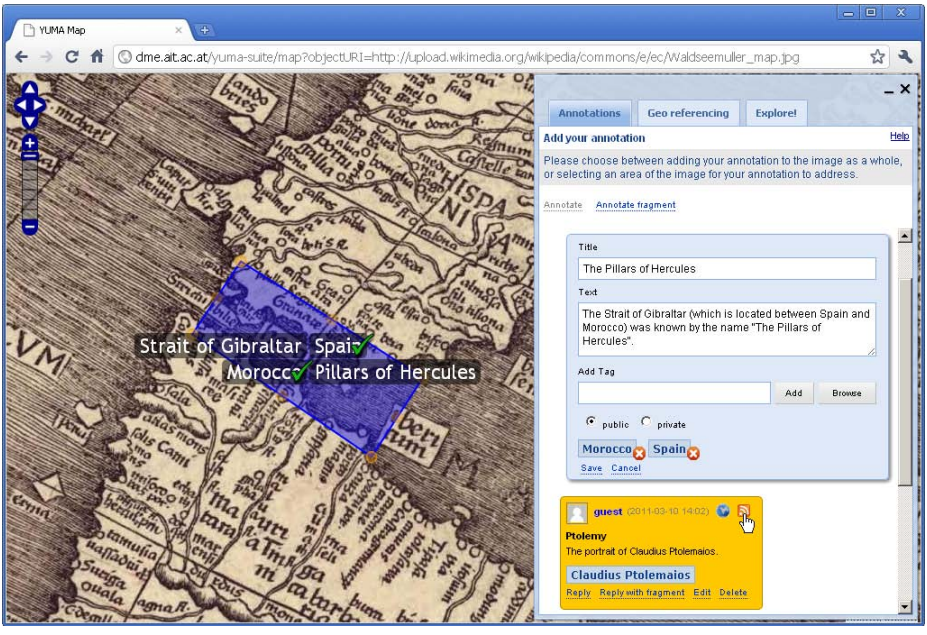

Fig. 1. YUMA Map Annotation Tool Screenshot

provides the option to mark a location or draw a polygon shape on the map. (The image tool provides the same functionality. The audio tool allows selection of a specific time range; the video tool supports both time range selection and shape drawing.)

In addition to free-text annotation, YUMA supports the notion of *semantic enrichment* of annotations by means of tags that represent resources on the Web. In contrast to free-form tags, which can be any arbitrary keyword, semantic tags are chosen from a controlled vocabulary. Besides enforcing a more coherent tagging structure, this has two added benefits. Firstly, a link to a semantic resource is not ambiguous - which is particularly valuable in the context of search and retrieval. Secondly, semantic resources can contain (or link to) more relevant information - such as descriptive text abstracts, synonymous name variants, names in different languages, or, in the case of tags referring to places, geographic coordinates. This information may not only be of interest to the user, it can also be exploited to complement traditional metadata and facilitate advanced search functionalities such as multilingual, synonym, or geographical search [3].

While it is possible to configure YUMA to work with a dedicated institutional vocabulary, YUMA's primary approach to semantic tagging is based on Linked Data: using Named Entity Recognition, the system will attempt to identify mentions of e.g. place or person names in the annotation, and suggest appropriate tags that represent resources in a Linked Data set[5]. The map annotation tool

[5] The current prototype relies on *DBpedia Spotlight* (`http://dbpedia.org/spotlight`) for this step.

also suggests tags for geographic entities inside the annotated area [4]. These suggestions are presented in the form of a tag cloud. The user can accept a suggestion by clicking on the tag, as shown in Fig. 1.

4 Annotation Server

The Annotation Server is the storage and administration backend of the YUMA Annotation Framework. It can be deployed with different relational database systems (such as MySQL or PostgreSQL). The different applications in the Suite access, store, update, and delete annotations through a REST API. The Server also offers search (through a GUI as well as through an API) and basic administration features, and provides the infrastructure for the RSS feed syndication.

Furthermore, the Annotation Server exposes annotations to the outside world as Linked Data. Each annotation is assigned a unique URI, which returns an RDF representation when resolved. To provide data interoperability, the tool relies on the OAC[6] model. OAC is an emerging ontology for describing scholarly annotations of Web-accessible information resources; and YUMA is among the first annotation solutions to implement it.

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[6] `http://www.openannotation.org/spec`