Old Maps and Open Data Networks

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Abstract

Old maps are a record of the past, exposing features people might want to tell stories about. Maphub is a Web application that enables them to do so by creating annotations on digitized high-resolution historical maps. By semantically tagging regions on the map, users create associations between their annotations and resources in open Web-based data networks. These associations are leveraged to enable multilingual search and to generate overlays of historical maps on modern mapping applications. Contributed annotations are shared on the Web following the W3C Open Annotation specification. Preliminary studies show general user satisfaction with our approach.

Keywords: historical maps, annotations, linked data, GIS

Introduction

Historic maps reflect geographic information and also the attitudes, perspectives, and beliefs of different times. Their geographic accuracy tells us much about the state of geographic knowledge and technology at the time of their creation. Thousands of maps have already been converted to digital form and made available online and accessible to scholars and the broad public (Rumsey & Williams, 2002).

When viewing digital maps users often have stories to tell. They might know something about the context of a map, might be able to identify places or landmarks, or might have comments that could complement historic maps as records of the past. However, most current map hosting environments don't allow users to contribute their stories.

We believe that allowing annotations on historic maps is a possible way of recording these stories. If we also connect named entities mentioned in these stories with other related resources in open globally connected data networks, such DBpedia (Auer et al., 2007) or GeoNames, we can capture the context of these stories and, through named entity disambiguation, we can connect the stories of different individuals. This user-contributed information, in combination with curated metadata, is a valuable source for search and retrieval or any other data analysis task.

The Maphub prototype[1] is the result of a demonstration experiment carried out as part of the Open Annotation Collaboration (Hunter, Cole, Sanderson, & Van de Sompel, 2010). It showcases how users can annotate historic maps and connect these annotations with resources in open data networks via a function, called semantic tagging. Tagging creates relationships between annotations and Web resources. These relationships are leveraged to supplement user-contributed annotations with additional information from the Web, enabling functions such as multilingual search and retrieval over historic maps. Collected annotation data are contributed back to global data networks by exposing them as dereferenceable Web resources following the W3C Open Annotation[2] specification.

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[1] http://maphub.github.com
[2] http://www.w3.org/community/openannotation/

The Maphub Prototype

The Maphub prototype is a Web portal, primarily based on Ruby on Rails and JavaScript. It allows users to tell their stories about areas of interest by letting them annotate regions on historic maps. A first demo, which has been bootstrapped with approximately 6,000 high-resolution digital maps from the Library of Congress Map Division's catalogue, is available at http://maphub.herokuapp.com/. Users can browse maps or search for topics of their interest. Once a map is selected, the user can explore it by panning and zooming using either the mouse or keyboard. The current release (v0.3) implements two main annotation tools, one for commenting on map regions and one for georeferencing known locations on a map.

Using the commenting tool ("Annotate"), it is possible to draw shapes on the map, such as rectangles, lines and polygons (Fig. 1). These shapes mark a region of interest, and once the user has finished drawing, a popup will ask them to enter their comment and tell their story about that region in a free text field.
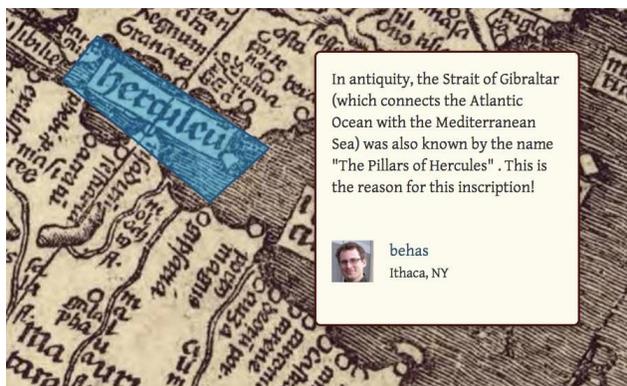

Figure 1. Polygonal annotation with tooltip

While the user is writing text, the Maphub system analyzes the input and proposes possibly relevant semantic tags. These tags are links to Web resources such as Wikipedia articles and are suggested by querying open data sources such as Wikiminer or GeoNames (Fig. 2).
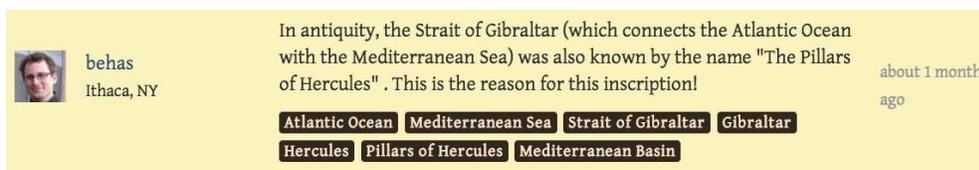

Figure 2. Full annotation with semantic tags shown below the map

To disambiguate the meaning of these tags, each tag carries a short description of its subject, available as a tooltip. Furthermore, we allow the user to accept or reject individual tags before annotations are being saved. In the background, Maphub then dereferences the URIs of accepted semantic tags and adds subsets of the retrieved data representations to the index. This way users can, for example, search for maps in any language supported by Wikipedia.

The georeferencing tool ("Control Point") allows users to associate known locations on a historic map with location resources provided by the GeoNames web service. As soon as we have at least three control points, we can compute a model for translating between the x/y pixel dimension of the digitized historic map image and real-world projections used in modern mapping systems. This allows us to visualize historic map overlays in Google Maps and project maps onto a three-dimensional globe, provided by Google Earth (Fig. 3).

Figure 3. Google Maps (left) and Google Earth (right) overlays

Sharing collected annotation data in an interoperable way was another major goal of this demonstra- tion experiment. Maphub is an early adopter of the Open Annotation model, which is currently specified in the W3C Open Annotation working group. It demonstrates how to apply that model in the context of digitized historic maps. As described in the Maphub API documentation[3], each annotation becomes a first class Web resource that is dereferencable by its URI and therefore easily accessible by any Web client. In that way, while users are annotating maps, Maphub not only consumes data from global data networks—it also contributes data back.

Preliminary Results and Planned Experiments

The focus of the first project phase was on the design and implementation of the previously mentioned annotation functions on a real-world historic map collection. A major goal was to apply the Open Annotation specification and to provide feedback for its further development. The main observations made were that the model can easily be implemented and that is expressive enough to describe map annotations in an open, Web-based, and interoperable way. However, the conceptual simplicity of the supported annotations and the relative technical complexity and verbosity of the resulting annotation serializations raised some concerns on the model's usability.

We conducted first usability tests, which showed that users generally accept and understand the notion of annotations in the context of historic maps. We were able to identify issues to be resolved regarding the usability of the user-interface.[4]

We also prepared the setup for an experiment to study the possible effects of the semantic tagging function on user behavior and therefore also on the outcome of the annotation process. The experiment follows an in-lab within-subject design with varying tagging conditions and will be the main focus of our future work.

Summary and Next Steps

Maphub is a Web-application that allows users to tell stories about regions of interest on historic maps. While they create annotations, the system supports them in associating their annotations with other related Web resources by proposing semantic tags. This contextualizes the stories being told and establishes a source of additional data, which can be used for tasks like multilingual retrieval or enhancements such as map overlays. In that way, annotations are contributed back as data nodes in a global data network.

Currently we are conducting an in-lab, within-subject design experiment, with the goal of learning about the effects of the semantic tagging function compared to other established tagging mechanisms such as free tagging. Afterwards we would like to release a first public version and ask possibly interested users to participate in a first beta-release stage. In parallel to these experiments, we are seeking feedback from users and institutions and will use this as input for further developments.

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[3] http://maphub.github.com/api
[4] https://github.com/maphub/maphub-portal/issues

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