Personalized Nichesourcing: Acquisition of Qualitative Annotations from Niche Communities

Chris Dijkshoorn[1], Mieke Leyssen[2], Archana Nottamkandath[1], Jasper Oosterman[3], Myriam Traub[2], Lora Aroyo[1], Wan Fokkink[1], Geert-Jan Houben[3]

[1] The Network Institute, VU University, Amsterdam, the Netherlands
{c.r.dijkshoorn, a.nottamkandath, lora.aroyo, w.j.fokkink}@vu.nl
[2] Centrum Wiskunde en Informatica, Amsterdam, the Netherlands
{leyssen, traub}@cwi.nl
[3] Web Information Systems, Delft University of Technology, the Netherlands
{j.e.g.oosterman, g.j.p.m.houben}@tudelft.nl

Abstract. Diversity and profundity of the topics in cultural heritage institutions' collections make experts from outside the institution indispensable for acquiring qualitative annotations. We define the concept of nichesourcing and present challenges in the process of obtaining qualitative annotations from people in these niches. We believe that experts provide better annotations if this process is personalized. We present a framework, called Accurator, that allows to realize and evaluate strategies and applications for personalized nichesourcing.

Keywords: cultural heritage, nichesourcing, annotation framework, qualitative annotations

1 Introduction

For the enrichment of cultural heritage collections, the acquisition of qualitative annotations is a significant effort for museums and heritage institutions. In our research we approach the challenge to acquire qualitative annotations from communities in the crowd of people, i.e. people that are external to the institution. For this objective, we turn to personalised niche sourcing, where we aim to identify the niche communities and the ways to adapt the annotation task to them.

In this paper, we shortly describe the motivation behind the approach and the project in which the investigations take place, we present the four main research challenges that drive the detailed investigations, and we present the main aspects of the implementation.

2 Motivation

Access and retrieval mechanisms for archives and museums typically rely on a rich description of the collection. Most cultural heritage institutions employ professional experts to describe their collections by manually compiling metadata

for each item. The subject matter of collection items can be very diverse, think for example of historic figures, animals, plants and buildings. Additionally, these aspects often carry a symbolic meaning. To adequately describe items in large and diverse collections, the knowledge of experts from other domains is indispensable. Cultural heritage institutions therefore seek to understand whether and how they can make use of external users, i.e. crowd users, to produce these annotations.

The work in this research aims at understanding which strategies and techniques lead to high-quality annotations by (crowds of) users that are external to the museum. For this, the detailed investigations are organised in terms of four connected challenges, that we will detail further in the next section. The first challenge in the project is to identify and model the niche of relevant experts and to motivate them to contribute to the annotation of collection items. Next, personalization mechanisms must make sure that the annotation task is adapted to the experts such that they are shown items that correspond to their expertise. The quality of the annotations and annotators is to be evaluated using algorithms considering trust. As a final challenge, all these aspects must be presented in an appropriate interface.

In order to perform the detailed investigations, and conduct the detailed studies and evaluations of our hypotheses, we develop a framework to support crowd annotation processes, called Accurator. It is employed in studies within the SEALINCMedia research project, for example in a use case with Rijksmuseum Amsterdam, as we will see in the example later.

3 Research Challenges

The overall objective of understanding which strategies and techniques lead to high-quality annotations by (crowds of) external users, is in our studies and evaluations within this project approached through four connected challenges, that all use the Accurator framework.

One of the four main challenges of nichesourcing is finding candidate annotators that are able to produce high quality annotations for collection items. We believe that people participating in a topical community have an active interest in that topic and might be willing to help and share knowledge related it. We refer to these topical communities as *niches* and focus on their manifestation, among others, on the social web. We analyze social data and perform user studies using the Accurator tool to understand what identifies a niche community, what indicates that a person is part of such a community and which properties identify a good candidate to provide qualitative annotations.

The challenge for recommender strategies in Accurator is twofold: keep the expertise needed to annotate the item in the range of the experts' knowledge and yet diversify the suggestions to get high quality annotations for as many distinct items as possible. Our aim is to develop recommender strategies that use content patterns from the Linked Data cloud, resulting in a list of recommendations

consisting of diverse items. We hypothesize that encountering diverse items to annotate will help keep the expert motivated.

We address issues of determining trust in the expert users and their contributed annotations by modeling the user reputation and tracking their expertise across various topics over time. We believe subjective logic is suitable to model the reputation of users and semantic similarity measures to track and update the users' expertise. Since there is no gold standard for evaluating the annotations, we must rely on a peer reviewing process and other mechanisms such as provenance of the annotation process.

Since external users are not familiar with professional classification schemes and expert knowledge the institutions target, a fourth main challenge is breaking down the annotation process into facile tasks that can be solved with little effort and without this kind of professional knowledge. We believe that the interface for such a system has to present the task in a straightforward way while motivating the users to spend the time contributing their knowledge. We investigate which design aspects and underlying mechanisms are responsible for the quality and quantity of tags added by users and how to visualize trust and personalization aspects.

4 Accurator framework

The Accurator framework is developed to support and implement the detailed strategies and techniques to approach these challenges we mentioned above and evaluate our hypotheses. We explicitly design the framework so that it allows us to easily test different strategies on various collections. In this section, we present the main system aspects.

Our main assumption is that making use of personalized nichesourcing increases the quality of annotations. We believe that we can automatically identify niche candidate users and create relevant user profiles to support their annotation task. Based on this knowledge about the candidate experts, we can then recommend them relevant annotation tasks and apply trust mechanisms to improve the recommendation and annotation strategies. Figure 1 shows the corresponding Accurator workflow.

The process starts (see Figure 1a) with searching the social web for user-generated content that is relevant for a specific topic. We calculate the relevance of the content creators with respect to the topic and exploit social relations to identify a topical niche and candidate experts from that niche. When a person starts using Accurator, a user profile (see Figure 1b) is maintained based on available data.

Next (see Figure 1c) is the recommendation of collection items for a user to annotate. The recommendation strategy is based on specific patterns in the data, the user profile, and the current annotation quality of an item. Accurator allows to easily change between different strategies to cater for users' diversity. In the process of personalising the annotation recommendations, the choice of recommended items will subsequently affect the calculated interest of that user.

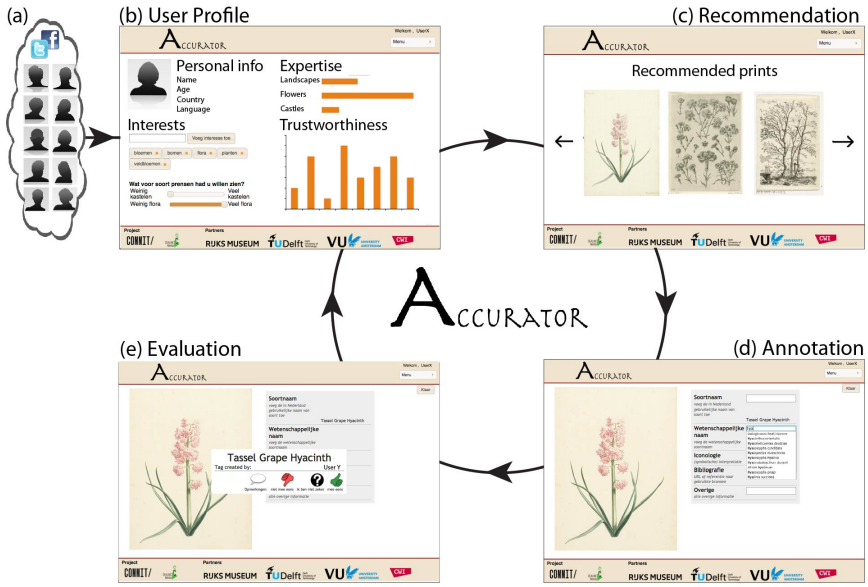

Fig. 1. Accurator personalized nichesourcing workflow

Figure 1d shows the interface where users add their annotations to an item. The presented fields depend on the topic and the user's expertise on that topic. Accurator can be configured to use domain vocabularies to support the user. Figure 1e shows the interface in which users can evaluate and review the annotations of other users. This task is only available to users who are trustworthy and have a certain level of expertise. The result of a review affects 1) the quality of an annotation, 2) the expertise level of the user, and 3) the trustworthiness of another user.

The Accurator prototype is built using Cliopatria[4] to store RDF, Google Web Toolkit[5] for the user interface, and Google App Engine[6] for hosting. Accurator is now used for example for experimentation with artwork data from the Rijksmuseum Amsterdam and a demo of that is available at `http://rma-accurator.appspot.com`.

Acknowledgements. This publication is supported by the Dutch national program COMMIT. We like to thank the members of the SEALINCMedia worktable and in particular the Rijksmuseum for their support.

[4] `http://cliopatria.swi-prolog.org/`
[5] `https://developers.google.com/web-toolkit/`
[6] `https://developers.google.com/appengine/`