Generating Trust in Collaborative Annotation Environments

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ABSTRACT

The main goal of this work is to create a model of trust which can be considered as a reference for developing applications oriented on collaborative annotation. Such a model includes design parameters inferred from online communities operated on collaborative content. This study aims to create a static model, but it could be dynamic or more than one model depending on the context of an application. An analysis on Genius as a peer production community was done to understand user behaviors. This study characterizes user interactions based on the differentiation between Lightweight Peer Production (LWPP) and Heavyweight Peer Production (HWPP). It was found that more LWPP- interactions take place in the lower levels of this system. As the level in the role system increases, there will be more HWPP-interactions. This can be explained as LWPP-interacions are straightforward, while HWPP-interations demand more agility by the user. These provide more opportunities and therefore attract other users for further interactions.

Keywords

Collaboration; Trust; Annotation; Genius; User Generated Content; Lightweight Peer Production; Heavyweight Peer Production.

1. INTRODUCTION

Annotation tools like Skitch, Pundit or Hypothesis enable users to generate a lot of personal annotations, which are for own use, mostly. Instead of archiving these valuable annotations, it should be shared as public annotations. User should have trust in the annotation before using it, especially, when it is about important information. Usually, annotations are intutive in nature and also understood as comments. This study employs the definition provided by MacMullen that annotation as a concept consists of 1) a process to create and modify an information object, 2) the result (knowledge) of it and 3) the management of that results [21]. A bad annotation is still better than having none at all. Users should be qualified so that they can be given a strong impetus to annotate by using trustworthy systems. Trust is a vital ingredient of successfull computer supported cooperative work (CSCW) [14], on which collaborative environments are based. They allow users groups to connect and collaborate by sharing information through collaborative systems. Wikis and open source software development are examples of such collaborative systems. Other collaborative systems dealing with annotations as cohere, annomation or sugarTube have small groups of known users and they are concerned about quality instead of trust. A special form of collaborative environments are peer production communities such as stackoverflow, wikipedia or Genius, which are common-based peer production and their activity involves a large number of peers that collaborate in a product [6]. According to Golbeck [10], trust is needed on the web as much as it is in the real world and reflects the belief that a producer will create useful information and willingness to invest some time in reading as well as identifying useful content; that includes social trust. Riegelsberger el at. justify the importance of trust consideration by two reasons: 1) increased risk occurs by user interactions, as computer-mediated interaction demands more trust than face-to-face communicaiton and 2) modern communicaiton system users find it heavy to build up trust with other users, whom they cannot see face-to-face [27]. Trust is an important information for users that simplifies the detection of content [19], which leads to prediction of trust between users so they can be able to make decisions and propose for this classification approach. A taxonomy in early development obtains amount of relevant features e.g. user factors and interaction factors, which inferred from user attributes and interactions in the domain of an online community, it should be noted that this is general enough to be adopted in other online communities.

2. BACKGROUND & MOTIVATION

Basic of trust is to be a participant, reader or contributor of an online community. A reader consumes from an online community several times, while a participant generates user content and therby becoming a contributor as well as an active participant. Credibility of a participant is based on the reputation and the contributions to the online community.

In the academic literature, trust is resarched from different perspectives: 1) Trust as a quality [15, 20] in the content of peer production envirnoment e.g. wikipedia, including a reputation system for authors [4, 2], where communication

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and rating between peers are not used. For trust algorithms, analytical tools [29] or frameworks [25] are developed to compute quantitative values [3]. This approach helps to predict vandalism more than trust itself. 2) Content is classified as more or less trustfull and measured by surveys [17, 18], in which the collected recognition is very bound to time and location and the participants number can be controlled [16] or limited [8], in this case, this should be used as complement or confirmation of findings. 3) Trust researched as a relationship between users with transivity characteristic [11, 28] and selected knowledge [24]; can I trust c? Find b, whom I trust and b trusts c, then I can trust c (a trust b $\wedge$ b trust c $\rightarrow$ a trust c). b could be something that I share with c e.g. location [31]. b can be always found, if each participant is either directly known, or through a third participant. This is not really an open collaborative environment and this is the criticism of the approach. 4) Trust as a dilemma game [7] (daytrader, Prisoner's dilemma) which assumes risk, or is viewed as trust in systems and machines [9]. This view is not relevant to collaborative environment; the whole system will be judged based on a part of it. Trust takes in this case only the values {0%, 100%}. You trust your car and drive it if its brake system is fully functional, nothing else. 5) Trust is based on user's behaviors and content [14, 30] e.g. Q&A [5, 26] to address trust prediction. This approch demands experience and research by truster to judge content specially when a reference is missed. An annotation is related to an original content and this is the reference. The work of Abdul-Rahman and Hails [1] and Marsh [22] are most closely related to this study, which aims to infer trust in online communities by creating a model of trust and mapping it over annotations in the academic domain. This work is directed to understand and identify which factors present a high number of simple users attention to overcome a decisive boundary for dealing with content (annotation) provided by others. This activiy can be done before trust is defined which can be a personality trait or a social dilemma.

3. RESEARCH GOALS

Annotations are units that provide support for distant communication. Marshall focuses in her study on the form and function of annotations but she also examined that annotating students learn better through critical thinking about the content and context of the annotation [23]. Annotations provide the basis for active reading, and offer an essential template for collective intelligence. Readers integrate notes, comments or footnotes as clues for their thoughts in the media. This is done so that other readers can better understand the thought process of the author [13]. Thus, annotation is an important area of scientific research. Collaborative environments operate on trust and annotations will be ineffectual without it. Readers are inspired by an annotation, which should be trusted. Even contributors with good experience make mistakes, and therefore trust is not only person-based, but it is also reputation-based. Trust is required for active reading of annotation. Thus, it is important to find out the elements that leads to trust -if available- in annotation. The research questions considered for this study are:

- How can new knowledge be generated from annotations?
- To which extent do readers trust annotations provided by others? And what leads to such trust?

To effectively reuse annotations provided by humans or machines, collaborative platforms will be studied to find out which design parameters are fundamental to create a model of trust. Based on these design parameters, a classification would be developed that allows further definitions of possible design parameters by inference. A set of case studies from different disciplines (such as history of science and computer linguistics) will allow for applying and evaluating the theoretical derived design parameters. As previously agreed upon, trust is essential for annotation. It is an important piece of information for users in an online community, and relying on such information can assist the users making decisions [19]. We aim in this work to reuse annotations to generate new knowledge about trust in annotation and to research to which extent trust is available and which parameters guide us to such trust in annotations. The goal of the study is to find out the ways to improve knowledge work based on annotations especially in the scientific context. This will be a significant foundation for a successful development of systems as well as for research oriented towards generating annotation and reusing them.

4. RESEARCH METHODOLOGY

Social Media (SM) has become an additional channel of content sharing variety that enables annotation of User-Generated-Content (UGC). Genius as a part of SM follows its modern way strategy that allows user to create and collaboratively modify UGC to support annotating, which makes Genius an online platform for annotations. This allows users to collaboratively create and modify any form of texts, especially music lyrics as well as literature. This is possible by breaking down text with line-by-line annotations to provide interpretations of texts. Participation on this platform can be described by certain activities. These activities are connected to specific user's rights (i.e. roles) on the platform. A user can have one of the following roles: Whitehat, Artist, Editor, Mediator, Moderator or Staff. The ordering of the roles represents the permissions of a role. Based on these permissions, a user can carry out specific activities. For example, a Whitehat is not allowed to edit a text page, as opposed to an Editor who can even delete it. Genius provides a service called Firehose, which pushes notifications about activities of the members. It is a starting point for this study for collection of data on Genius. This mechanism documents and records action of members. Firehose includes filters to select specific notification languages and topics. An activity at Firehose consists of contributor's name, type, subject, symbol of type and time stamp as overview. This study employs Firehose as a channel to be notified about user activities on Genius.

Extension of this work builds on the differentiation lightweight peer production (LWPP) and heavyweight peer production (HWPP) presented by Haythornthwaite, which are used to refer to participant contributions. LWPP involves interactions targeted to simple and independent contribution without initiation relationships among participants. Its power is its simplicity that allows numerousness of participations, in contrast to HWPP that implies extensive and time-consuming contributions and involves also more information about contribution and contributor [12].

An approach model is being developed for that, it holds

a couple of operation steps: (a) getting activity notification, that includes meta data as author name, activity object and different links, (b) extracting available links, non relevant links are not going to be used, such author's profile picture (c) fetching objects like author, song page or annotation, which are provoided in JSON format and can be requested using an activity id by Genius API (d) identifying and classifiying the gathered information in author, activity, annotation, song page etc. and (i) forwarding obtained findings into PostgreSQL database. Obvouisly, trusting is an intuitive process; this proposed method enables us to understand the users mental model of interpretations, which are very close to our annotations comprehension. The differntiation between LWPP and HWPP helps us to identify from which activities we can exract specific information. That will assist the relevant parameters for supporting users to trust and then to deal with provided annotations. The used role-system will give us a good indication for the necessity of such a system in an collaborative annotation environment in the academic context, due to the variety of scholar degrees.

5. RESULTS

Data from Genius over an observation period of five weeks (from Nov 2015) resulted in 1,306,560 activities by 162,747 users on 77,806 unique pages. These activities were aggregated and are described in a subject-predicate-object format, into so-called activity types.

Besides, the characterization based on the formal role system, participation on Genius can be characterized by user's commitment, production and user engagement and the significance of the participation [12]. This study use these features to differentiate LWPP and HWPP on Genius. Table 1 illustrates such classification. By uploading text, users can begin to collaborate on the created page. The collaboration process can then include "upvote a description", which can be described as a lightweight collaborative activity, since it is just "a click". The activity "create a description" which is a form of heavyweight collaborative activity, since it is more complex and time-consuming for the participant.

First, a general overview on possible activities on Genius has been showcased. Secondly, a classification of the userÕs activities in terms of their formal roles as well as their light and heavyweight collaborative activity is performed. For example, Artists and Staffs are the roles with the most generated content, as shown in Figure 1 and in Table 2.

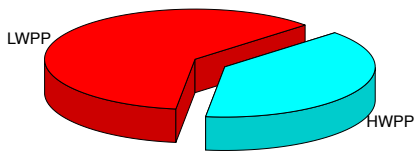

Figure 1: LWPP and HWPP Interactions

This diagram illustrates an overview of the interactions of Genius collaboration according to LWPP and HWPP

The first version of this taxonomy involves that an application should have an approach of user classes known as layer model including at least three layers (reader, actor and leader) similar to the role system of Genius. This differentiation is necessary, since users are cautious of content provided by contributors at higher levels and they are more ready to interact with their content. Even if there is no concrete definition of trust that is used in this study, but this willingness to interact is a sign of trust by the author. For the same format of layer model, offered activities should be allocated in at least two classifications according to LWPP and HWPP. The contributions should have a layout standard like a formatted template, where users can view the references about content as well as author.

Table 1: Collaboration Interactions

	Predicate	Object
Lightweight	cosigned marked accepted archived deleted downvoted incorporated moved gave access registration rejected upvoted un-/pinned un-/locked verified	annotation comment description Song Page suggestion user comment
	followed	Song Page user
	pyonged	description annotation Song Page
Heavyweight	created edited merged integrated mentioned posted replied	annotation description Song Page meta data
	proposed added	reply suggestion edit comment

This table illustrates the predicates of collaboration design on Genius, which are classified into LWPP and HWPP. Each predicate can form an activity with each object from it's group. Groups are separated by a horizontal line.

Table 2: Generated Annotation Activities by Roles

Role	Users count	Annotation activity	Annotation activity per day
Whitehat	466,448	54,438	8.56
Editor	139,505	1,869	74.64
Moderator	82,968	679	122.19
Staff	50,060	177	282.82
Artist	20,185	39	517.56
Mediator	3,685	19	193.94

This table shows the association roles to generated annotation activities based on the period of analysis

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