

# CiteAware: Visual Group Awareness for a Reference Sharing System

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## ABSTRACT

Publication sharing portals, such as CiteULike and BibSonomy are very popular among research community. Users create interest groups, participate in existing groups, share papers and tag contents. With increasing number of groups, members, contributions and tags, it is very difficult to keep track of all the group activities and extract useful knowledge out of user contributions. In this paper, we present our ongoing work on CiteAware – a visual group awareness system for CiteULike. Our system collects most recent activity timestamps of a *user's public groups* or a *group's participating members*, transforming them into an easily *perceivable* holistic visualization. A preliminary user study results are discussed here.

## Author Keywords

Visualization, user interfaces, asynchronous collaborative awareness, social navigation, situational awareness, exploration awareness, user activities, tags.

## ACM Classification Keywords

H.5.m. Information Interfaces and Presentation: Miscellaneous

## INTRODUCTION

Systems for sharing academic references such as CiteULike ([www.citeulike.org](http://www.citeulike.org)), Connotea ([www.connotea.org](http://www.connotea.org)), and BibSonomy ([www.bibsonomy.org](http://www.bibsonomy.org)) are witnessing a rapid growth of popularity among research community. Striving to serve the community better, these systems gradually add more and more features, known to be beneficial for a community of users. Reference sharing systems started as a traditional collaborative tagging system [1]. Similarly to other systems of this group (i.e., Delicious, Flickr), they allowed its user to share and tag academic references and to

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explore the wealth of community-collected references using search, tag clouds, and hyperlinks. More recently, these systems started offering features associated with other kinds of social systems. For example, CiteULike: users now could connect to each other, form groups, hold group discussions, and maintain blogs. Other similar systems follow the same road. At the time of writing, CiteULike and similar systems already integrated features of three major types of Web 2.0 applications: social tagging, networking, and blogs. Is it the end of the road? Is there another group of social features, which could further increase the value of reference sharing systems?

We argue that visual awareness features could be a great addition to reference sharing and other types of Social Web systems. The concepts of visual group awareness have been explored well before the dawn of Web 2.0 in a number of Computer Supported Collaborative Work (CSCW) systems such as Babble [2] and similar systems [3]. While not considered a part of Web 2.0, visual awareness could be really useful in the context of reference sharing. Consider a simple scenario where a researcher is member of four groups. Assume each group has from 4 to 8 members and generate sporadically a reasonable volume of new references. How does she could follow the group activity in this scenario? How frequently should she check the group libraries? How to find easily which group has new activity? What about 16-32 peers in all these groups? Who was active recently and who has not added any new references in a month? What are my groups and peers' current interests? All these questions could be easily answered with a good group awareness system.

To explore the potential of integrating visual group awareness features into reference sharing context, we developed CiteAware system, a visual awareness front-end for CiteULike. CiteAware attempts to produce an easily perceivable *holistic* visualization of group and individual activity for a CiteULike user. Unlike the majority of visual awareness systems, which operate in the context of synchronous real-time collaborative systems, CiteAware is an *asynchronous awareness system* [4]. This paper presents the first version of CiteAware, which supports situational awareness and focuses on *recency* of sharing activities. Next section presents an overview of CiteAware interface.

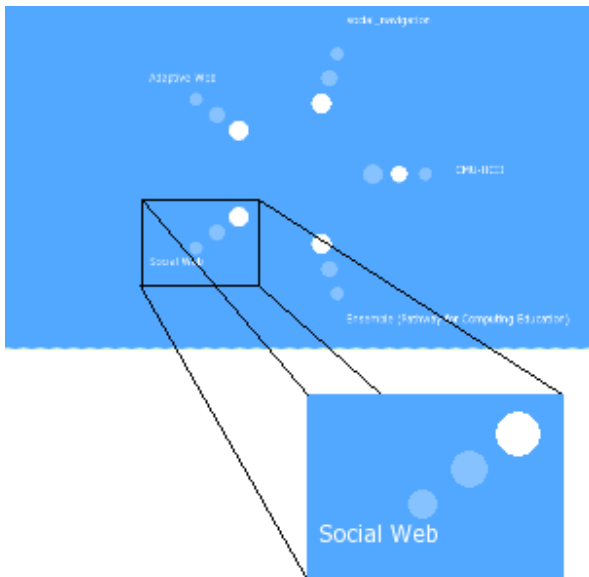
The following sections present the implementation details and review a preliminary study of the system.

**OVERVIEW**

In this section we will navigate through the CiteAware system [5], illustrating and explaining each stage, and arguing how the implemented visualization solves our problems.

**Groups Activity – my.cul.groups**

CiteAware offers a visual front-end for CiteULike. Any valid CiteULike *username* acts as an entry point to the system. Once username is provided, CiteAware crawls all the public groups associated with the submitted username. Subsequently, *most recent activity timestamps* of these groups are extracted and transformed into holistic visualization of group activity (Figure 1). The goal of this visualization is to show which groups were active recently. This information is communicated using radial time bands.



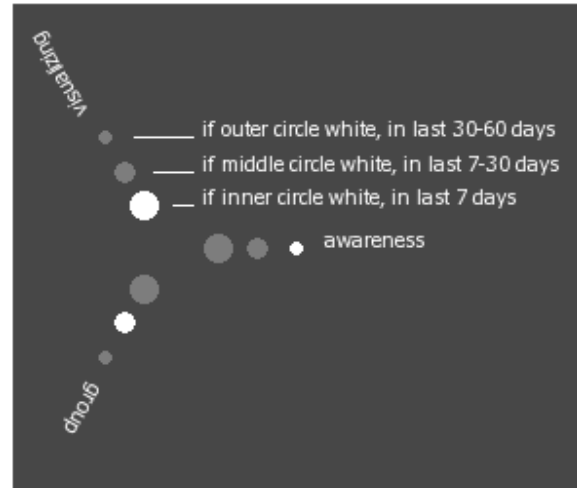
**Figure 1. Groups' activity visualization.**

**Radial Time Bands**

The idea of radial time bands is very simple: to show visually in which time period the most recent activity of each group falls. Circular bands indicate time periods and most recent activity is shown as a bright circle in one of these bands. Figure 2, illustrates the meaning of circular cues in the radial bands. CiteULike focuses on last 60 days of user work (current day is considered as 0th day), which are divided into the following three time bands:

Innermost Band, (0, 7] days: Any activity timestamps in last 7 days will fall in this band. Middle Band, (7, 30] days: Any activity in last 7 - 30 days will fall in this band. Outermost Band, (30, 60] days: Any activity timestamps in last 30-60 days will fall in this band.

CiteAware scans through the activity timestamps of each group, user or tags and matches timestamps values with time band ranges. A positive match converts a cue into a brighter cue (figure 3). It is important to note that in case of multiple matches, only the recent most activity is depicted.



**Figure 2. Radial Time Bands and Visual Cues.**



**Figure 3. A bright cue represents most recent activity in corresponding time band.**

For example, in Figure 1, all five groups were active in the last 60 days. Four groups reports recent activity in last 7 days, and the group named 'CMU-HCII' reported most recent activity in last 7-30 days. Thus, user would expect least new activity in that group.

**Group Members' Activity – my.cul.peers**

To examine peer activity within each group, users could select a group from the displayed list and navigate to my.cul.peers screen. CiteAware crawls all registered members associated with the selected group. *Most recent activity timestamps* of these members are extracted and transformed into time-band holistic visualization (Figure 4).

In figure 4, nineteen members of the group 'social\_navigation' are distributed along the periphery. A quick glance at figure 4, tells that at least two members have made some activity in last 7 days. Thus, visiting these two-group member's libraries could provide more current information. Another set of three members reports recent activity in last 7 – 30 days. Whereas, 10 out of 19 group members have contributed nothing in last 60 days. This visualization is a good answer to the question “how active are my group peers?”

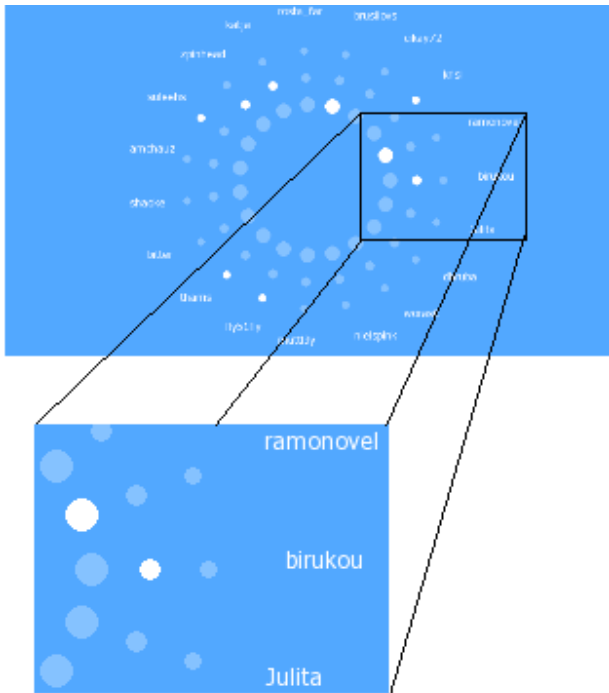


Figure 4. Group members' activity visualization.

**Group's Current Interests – my.cul.grouptags**

An alternative way to analyze user activity in a group is by its focus, i.e., not who contributed recently, but what recent contributions are about. In social tagging systems, tags are very useful in expressing a group or user's current interest. CiteAware allow users to *Switch Views* between group members' activity and group tag activities.

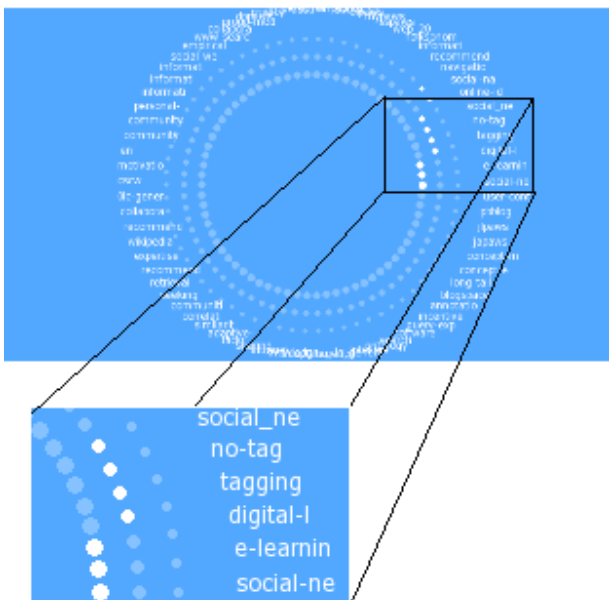


Figure 5. Group tag activities of recent 50 papers.

CiteAware crawls through the tag associated with most

recent 50 papers contributed by the selected group. Extracted timestamps and tags are transformed into another time-band holistic visualization (Figure 5). The my.cul.grouptags screen shown in Figure 5 shows group's tag activities for recent 50 papers. This visualization helps to answer the question “what are my group’s current interests?”

**Peer's Current Interests – my.peers.tags**

To move to a finer level of details, users can select a member from the displayed list of group members and navigate to my.peers.tags screen (Figure 6). To build this visualization, CiteAware crawls through the tags activities associated with the selected member. Maintaining consistency with previous data, CiteAware crawls through recent 50 papers only.

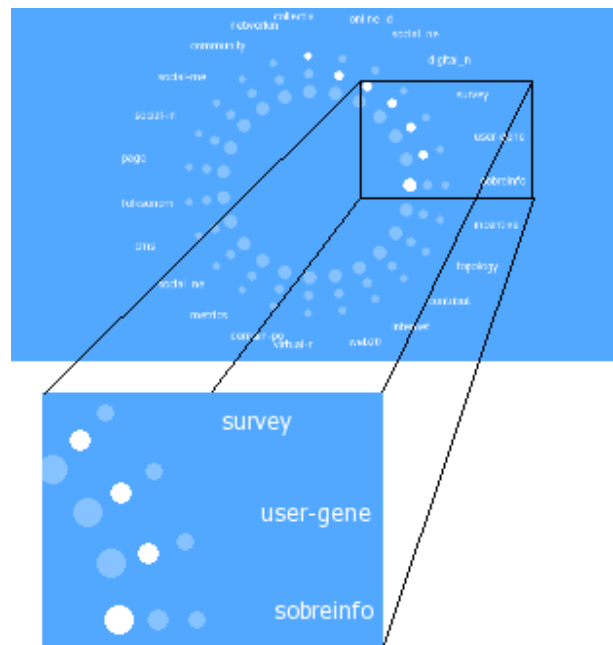


Figure 6. User tag activity visualization.

Figure 6 is very similar to Figure 5. Browsing through displayed tags provides an idea about user's current interests answering the question “what are my group member's current interests?”

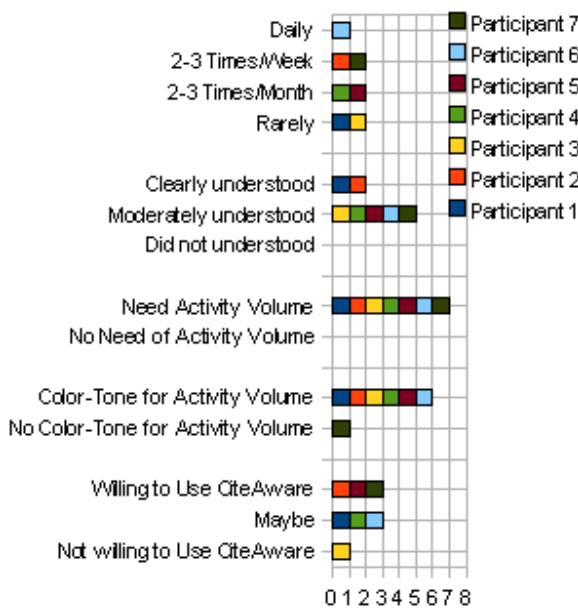
**PRELIMINARY USER STUDY**

We conducted a preliminary user study to get feedback for our visualization approach. Participants of user study were seven PhD students from the University of Pittsburgh with solid Web experience and some exposure to visualization systems. Nature of participation was voluntary. We short-listed participants on the basis of their activity in CiteULike.

The study session with each subject started with a 4.5 minutes long video demonstration. Demo was followed by an interactive session: the subjects were asked to explore

CiteAware application with their own CiteULike usernames. We allowed up to 20 minutes for this stage. After that, the subjects were requested to fill-up a small 5-question questionnaire. Each session concluded with an open-ended discussion.

The design of the study and the questionnaire was focused on two objectives: First, we wanted to assess the clarity and usefulness of the current version of the system. Our visualization is trying to convey a message to the user, how well are these *visual messages* being absorbed by our participants? Are the students willing to use CiteAware as a starting point for CiteULike browsing? Two questions in the questionnaire were provided to assess these issues.



**Figure 7. Preliminary Study Results.**

Second, we solicited guidance in making the system more useful. During a preliminary discussion of CiteULike at a group meeting, it was suggested that recency visualization should be complemented by visualization of the amount of work for better group awareness. It was also suggested that the amount of work could be visualized by changing color intensity or circle size in the time bands. To solicit more formal feedback for these two ideas, we included the questions about both the need and the form of work amount visualization. Finally, to interpret subject answers in the context of their CiteULike experience, the questionnaire

started with a question about the frequency of their CiteULike usage.

The analysis of subjects' answers is provided on Figure 7. As the data shows, the message presented by our time band visualization was clearly to moderately understood by all subjects. Only one subject was "not willing" to use CiteAware, however this subject is a rare user of CiteULike. In answering the second group of questions, all subjects indicated the need for activity volume visualization and the majority preferred color tone approach.

### SUMMARY AND FUTURE WORK

The paper presented CiteAware, a visual front-end to collaborating bookmarking system CiteULike. CiteAware attempted to explore the use of visual group awareness, an approach developed in the field of CSCW, in a new context of community-driven Web 2.0 systems. CiteAware provided some evidence that visual awareness could be a useful tool for a research group using a collaborating bookmarking system. In our future work we plan to expand CiteAware and to run more user studies of this technology. We also plan to explore the power of group awareness in other Web 2.0 systems based on user contributions, such as Twitter, discussion forums, etc.

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