BulB – VISUALISING BULLETIN BOARD ACTIVITY

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Abstract: Visualisation is well known as an effective means of enriching user interaction with complex systems. Recent research with online communities has considered the application of visualisation tool support, with the intention of further improving communication between community members. This paper reviews existing work in this area with specific reference to the application of visualisation to improve user interaction within online forums such as bulletin boards. The paper then outlines work undertaken by the authors to develop a second-generation visualisation tool - 'BulB'.

1 INTRODUCTION

Online communities are now widespread and form useful forums, unrestrained by geographical boundaries, for groups who identify and interact around common, purposeful and mutually beneficial interests. Online communities are dynamic, constantly changing systems. They exhibit 'organic' growth, evolving through different phases, reflecting changes in the needs of their members, changes in the social setting, or changes in the support infrastructure (Malhotra et al, 1997; Liedka, 1999; Squire and Johnson, 2000).

There is growing evidence that many online communities fail to fulfil their purpose due to lack of involvement by members (Kim, 2000). Further, while many online communities are supported through the use of communication services such as bulletin boards, chat rooms etc, there is also evidence that the provision of these facilities alone is insufficient to engender a sense of community: there are many examples of websites offering these facilities with little or no participation (Kim, 2000; Mohamed et al, 2002). In order to be successful they must be built on solid foundations. Successful online communities need to be organized and adopted by the community; members must have a shared purpose and be willing to openly share information. They grow and thrive when members are able to fulfil that purpose and accomplish those goals that

require other members to participate in the community (Ferguson et al, 2002).

The concept of community is normally associated with interaction and shared co-presence, whereas the typical contact between user and a website is on the whole a solitary experience with few visual clues of other participants and their activity. The work outlined in this paper is aimed at facilitating member communication within bulletin boards and engendering a feeling of co-presence akin to 'face-to-face' interaction.

This paper outlines the case for the use of visualisations as a driver for enhancing communication within online communities. It then proceeds to review previous work on visualisations within the context of bulletin board support. The authors have been working to develop a second generation visualization tool that embodies lessons learned from earlier work. This system is known as 'BulB' and provides an enhanced range of features that enable community members to easily assimilate bulletin board activity.

2 VISUALISING ONLINE INTERACTION

One of the largest problems faced in trying to sustain online communities is that of withdrawal or attrition (Johnson, 2001; Haythornthwaite et al, 2000). This

may be a direct result of the prevalent text-based representations which tend to suggest uniformity and ennui rather than the lively social scene that is actually present (Donath, 2002). Furthermore, text-based representations tend to be unclear and require extensive user participation in order to gain a holistic view of the interaction environment and context. Therefore, there is a requirement for good facilitation techniques and social scaffolding to support online communication technology. Donath (1996) identifies three important areas in the design of software aimed at supporting successful online communities: visualisation of social phenomena, the role of information spaces as contexts for communication, and the presentation of the user in the virtual world.

Instruments that encourage greater contribution, raising levels of communication and feelings of kinship, will enable interaction and remove barriers that lead to lack of involvement and community stagnation. One such technique is the use of visualisations to augment and enhance existing communication technologies such as bulletin boards.

Visual representation of social phenomena is important in the design of successful software to support online communities (Donath, 2002). In the real world, individuals use social cues and information from other people in order to find their way and inform decisions. Social navigation cues are also valuable in the digital domain, with the movement of people around online communities and activity within chat rooms or bulletin boards helping to guide or inform decisions (Dieberger et al, 2000). A key challenge of information visualisation is inventing visual metaphors and developing new ways of manipulating existing metaphors to make sense of information (Eick, 2001).

Visualisation tools have already been applied successfully to track and display, in a graphical format, the distribution of users on a web site (Minar and Donath, 2001). Much of the existing work is general in nature, whereas this paper applies similar concepts to visualising the activities of members within a community bulletin board.

It is expected that the use of visualisation tools will enrich the user's experience within an online community and lead to benefits such as reinforcing the immediacy of the shared experience through the use of visual cues and indicators, thus enabling online community participation and sustainability.

Social navigation cues are as valuable in online communities as they are in the real world. People require indicators that allow them to make decisions and interact (Dieberger et al, 2000). Within an online community, these indicators enable users to access and assess activities within different functional areas such as chat rooms, bulletin boards, etc.

3 BULLETIN BOARD VISUALISATION TOOLS

There are a number of enhanced interfaces and visualisation techniques that are currently being used successfully to promote user interaction with the web. Examples include WebFan (Xiong and Brittain, 1999) and PeopleGarden (Xiong and Donath, 1999). WebFan visualises web-based bulletin board activity using a fan-like hierarchical structure, allowing web pages with multiple threads to be represented at the same time for overview and comparison purposes. Threads are incorporated into a fan-like structure, and lines on the fan change colour to depict that a given posting has been read.

While WebFan enables the user to gain an overview of postings and replies, it fails to include a range of elements which would be useful to potential users. Through looking at the visualisation, it is not possible to ascertain which users have posted which messages. Such a feature would be helpful to potential users in order to get an overall picture of posting patterns and of the most prolific users within the bulletin board. Furthermore, there is no indication of temporal thread development which would allow a user to see how long a thread has been active, the length of time between postings in a thread and the comparative timeline of each thread.

PeopleGarden uses a flower and garden metaphor to visualise user activity within a bulletin board. Each bulletin board participant is represented by a flower with the long plant-like stems depicting the length of time the user has been an active participant. Petals are used to signify each post that has been made with red signifying initial postings and blue for replies. Collections of flowers, or gardens, are used to depict the contributions and posting patterns of every participant within the bulletin board.

Although PeopleGarden provides an excellent visualisation of the behaviour pattern of members and their contribution levels, it does not give users information about the size of threads, the length of time that threads have been ongoing or the distribution of users across threads in the bulletin board.

Babble (Erickson and Kellogg, 2000; Erickson et al, 2002) makes use of 'social proxies' to graphically represent users and their activities as a means of supporting long-term conversations within existing groups. Through making careful choices about which social cues to reveal or suppress, they

designed several environments to support a range of various types of interaction. These visually-enable environments allow users to draw inferences about current activity and consequently, shape the collective activity of the group. In one such environment, the "Timeline" social proxy is used to support asynchronous conversations, leaving traces when users log in and when they contribute to conversations. While not applied directly to a bulletin board, this visualisation helps in understanding the usage patterns of the community, highlighting 'hot' times when people tend to log in or have a say.

4 BulB

The BulB visualisation approach, drawing influence from prior work on visualising bulletin board activity, aims to shed light on communication patterns and examine the growth of conversations within bulletin boards. In constructing a visualisation of bulletin board activity, it was deemed important to draw each thread separately so that users could immediately see the distribution of threads and identify which threads in particular were livelier. Through keeping the colour of each contributor consistent across all threads in the visualisation, BulB enables users to instantly see which contributors are most active across all threads. In addition, this allows a user to easily identify the distribution of individuals posting to a particular thread and across the bulletin board as a whole.

The key features of BulB are:
- A stem, or stalk, to represent each thread.

- The height of each stalk represents the total time that each thread has been active, from the first post to the current time. Longer stalks represent threads that have been going longer.
- A unique colour is used to represent each user. This colour is consistent across all threads being visualised.

In addition to browsing through the bulletin board in the normal way, BulB enables users to navigate throughout the bulletin board by clicking on the visualisation applet; the webpage for each appropriate thread is loaded on a mouse click. Further, when users mouse over anywhere within the height of each thread, the thread title appears at the bottom of the visualisation panel. Similarly when moving the mouse over the coloured segment for each user, their username appears at the foot of the visualisation panel. Through providing this information, it is easier from a user's perspective to compare threads and also examine the activity of particular contributors across threads.

There are three separate visualisations within BulB:

- Temporal thread development (Figure 1a)
- User thread participation (Figure 1b)
- Timeline (Figure 1c)

4.1 Temporal Thread Development

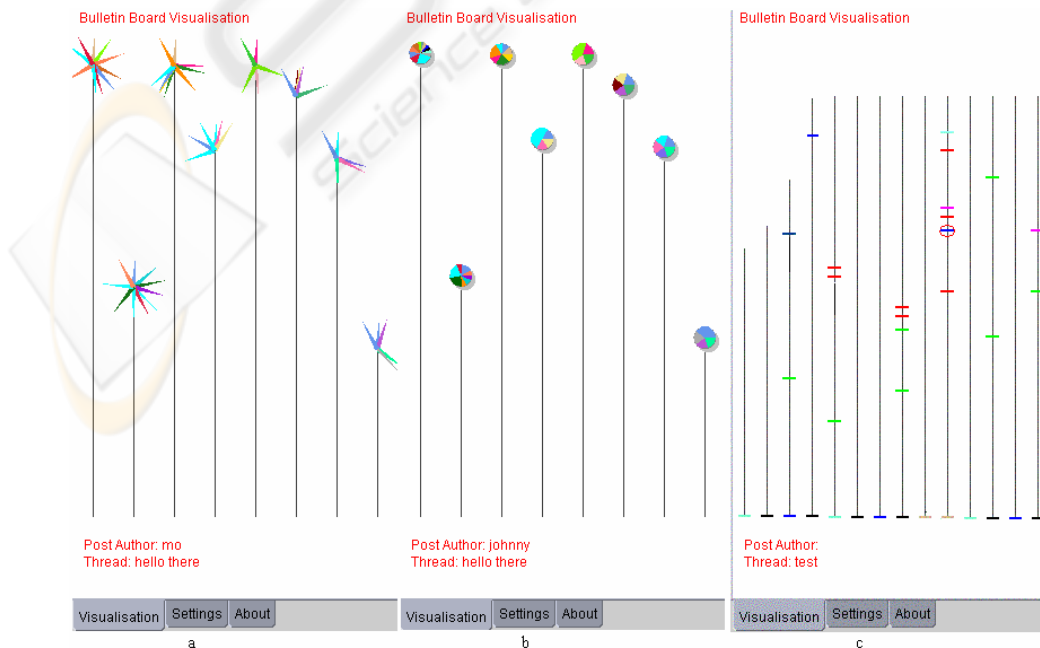In this visualisation, the stalk-head is used to show the development of the thread since it started.

Figure 1: Sample BulB Visualisations

Segments are drawn to signify each new post with livelier threads having more segments. The stalk-head circumference is scaled to represent the timeline of every thread. Each segment in the head is drawn clockwise around the circumference and the position of each segment represents the time the post was made in relation to the time the thread was created.

Figure 2 shows a small thread with three posts, each contributed by three different users. Given that there has been a week since this thread was started, it can be seen that the first reply to the initial post was not made until midway through the fifth day, and the final post in the thread was made a day ago - six days after the thread was started.

4.2 User Thread Participation

This visualisation draws a pie chart as a stalk-head. The pie signifies the proportion of each thread that is made up by each contributor. Each slice of the pie chart constitutes the percentage of each thread made up by a particular user's posts.

The visualisation extract in Figure 2 shows a set of 3 threads. Thread *a* has a single post from one contributor, Visualisation *b* shows a thread with one dominant contributor, while thread *c* depicts a more even spread of users.

4.3 Timeline

Unlike the previous two BulB visualisations, where the bulletin board posts are drawn at the top of each stalk, the Timeline distributes posts along the height of each thread stalk. Each post is drawn at the appropriate position on the Timeline, depending upon when the post was made in relation to the length of time that the thread has been active.

The Timeline visualisation in Figure 2 shows three threads, the middle of which has a small flurry of activity within a short time period. There are a total of 4 posts shown, with the red oval depicting that there are 2 posts close to each other and which are overlapping on the visualisation.

4.4 BulB Settings

Users can customise BulB through using a settings panel in order to get different views of the bulletin board activity.

As previously outlined, users can choose between one of the three different visualisations depending upon their circumstances and preferences. Other settings include the ability to filter the number of threads that are drawn within the visualisation at any time. For example, users can choose to visualise only the five most popular threads within the bulletin board at any time. In addition, users can change the way that threads are filtered, opting to display the most popular threads over a give time period, or visualise the threads with the most recent posts. Users can also filter each view by time-scale. For example, visualising the most active threads over the last week. All of these settings can be combined to give fully customisable visualisations depending upon the user's requirements.

4.5 Using BulB

From looking at all BulB visualisations, it is easy to see which threads have been active longest through studying the length of each stalk. Similarly, users can easily identify frequent contributors across multiple threads by looking for the reoccurrence of colours within the visualisations (see Figure 1).

Initial results from user trials have shown that different visualisations are more helpful in certain circumstances. The 'Timeline' and 'Temporal Thread Development' visualisations aid in identifying 'hot' points in a thread where there is a flurry of posts in a short time period. The 'Timeline' visualisation has proved especially successful in such circumstances given that posts are distributed in a larger area along the height of the thread.

The User Thread Participation visualisation has proved most helpful to users in identifying repeat contributors across threads. Given that posts from the same user are group together in a pie, users can easily spot if there is an even distribution of contributors in a particular thread, or whether there are dominant users.
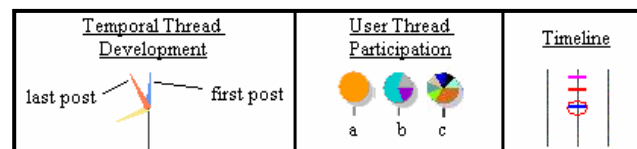

Figure 2: BulB Visualisation extracts

4.6 Areas for Further Research

There are several directions for future work related to BulB. Formal user testing is underway to test the usability of the system, and also to assess which visualisations prove most successful in which situations. The results of these tests will be useful in modelling profiles of user interaction. BulB may also be modified to visualise activity in other communication areas such as Usenet newsgroups and chat rooms.

5 CONCLUSION

Visualisation techniques have proven to be an effective means of promoting user interaction with complex systems. In this paper, the authors have reviewed a number of visualisation tools aimed specifically at promoting and enhancing user interaction within online communities and specifically bulletin boards.

This paper has introduced BulB, a second-generation tool embodying a range of visualisations and addressing some of the limitations of existing tools. BulB elucidates communication patterns within bulletin boards, enabling users to observe the growth of conversations. Preliminary feedback on the utility of these visualisations looks promising and the authors are currently undertaking an in-depth evaluation of their effectiveness through a series of user trials.

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