CAWS: Improving Users' Awareness in Collaborative Authoring Activities

Ilaria Liccardi
Electronics and Computer Science
B32 University Road
University of Southampton
Hampshire, UK, SO17 1BJ
il05r@ecs.soton.ac.uk

ABSTRACT
The aim of this research is to identify the key problems in collaborative authoring, based on collected field data (a field study of the co-authoring process and an observational study of awareness), and a review of previous research on the subject. From this, potential criteria are identified which support awareness in collaborative authoring. Existing tools (analysis) are compared using these criteria. Finally, a prototype system, CAWS (Co-Authoring Wiki based System), is described. This system is designed to enhance users' awareness in order to improve productivity in collaborative development of documents. Experiments will lead to a greater understanding of the quantitative effects of awareness on collaboration.

Categories and Subject Descriptors
H.5.3 [**Group and Organization Interfaces**]: *Asynchronous interaction, Collaborative computing, Computer-supported cooperative work, Web-based interaction*. H.5.2 [**User Interfaces**]: *User-centered design*. H.4.1 [**Office Automation**]: *Groupware.*

General Terms
Design, Human Factors.

Keywords
Asynchronous/Synchronous computer supported collaborative work, awareness, collaborative authoring.

1. INTRODUCTION
The rise of the Internet has made collaborative authoring possible from geographically distant locations. Collaborative systems, groupware and multi-user applications allow groups of users to communicate and collaborate on common tasks from disperse locations. Asynchronous computer communication is now widespread and it is common for people to exchange messages on a wide range of topics (social, business, personal) and to carry out work which previously could only be conducted face-to-face. While remaining aware of the workspaces of other users is taken for granted in the everyday world, maintaining this awareness has proven to be difficult in distributed systems where behaviour can be hard to extrapolate and where interaction technologies are often poor. People use network technologies to attempt to overcome the dispersal of team members; however, any type of asynchronous communication must inevitably differ from face-to-face communication [3]. This doctoral colloquium paper outlines the aims of this research (section 2) and describes the CAWS prototype system developed as part of it. Section 3 delineates the methodology behind the research approach and the four different parts of this research: (1) field study, (2) observational study, (3) analysis, and (4) CAWS groupware evaluation. Section 4 presents the resulting research questions that this work seeks to answer. Finally, the relevance of this research with respect to the current community is explained in section 5.

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2. RESEARCH AIM
The aim of this research is to investigate approaches to interface design that can be used to support the process of group writing (co-authoring). This research will attempt to determine if an enhanced wiki based system (figure 1) with co-authoring features can improve workspace awareness. Ideally, such a system should maintain the types of awareness that are implicitly present in face-to-face meetings. For example, in everyday life individuals might close their office door to indicate that they do not want to be disturbed. It is also possible to observe who is present in an office, who is concentrating on their work, and who might currently be taking a break. CAWS (figure 1) tries to simulate this behaviour online by providing users with up-to-date knowledge of what users are doing as well as what is going on in the document

Figure 1: CAWS Document "front page"

development process.

3. RESEARCH APPROACH

Typically, innovative design is the result of understanding, observation of users' experience, experimentation, the analysis of existing or similar developments and evaluation [4]. This research can thus be divided into: (1) *field study*, (2) *observational study*, (3) *analysis* and (4) CAWS Groupware Evaluation. Parts 1, 2 and 3 are on-going. Preliminary results were published in [1, 2]. Part 4 of this research will begin in September 2007.

3.1 Field Study: Co-Authoring Process

Over the past year, a two-stage field study [1] was conducted with users who were engaged in co-authoring activities, either as part of their degree course (undergraduate and postgraduate), or as part of their work (industrial researchers, professionals and academics). The first stage of the study was used to observe the common practice of users engaged in collaborative activity in order to understand the interactions between users in an online environment (more details in [1]). The second stage of the study sought to identify the common problems facing participants when writing together.

This two-stage field study determined that problems in co-authoring activities arise when participants do not know what other group members are doing at any given time, the motivations behind actions, and what contribution each participant has made their role and responsibility within the activity. The interactions present in face-to-face scenarios are difficult to track within a co-authoring tool. Thus, the problems identified were: 1) *users are not aware of who is working at any given time*, 2) *users are not aware of the progress of the document*, 3) *users waste time in order to identify what has changed in the document*, 4) *users are not aware of roles and responsibilities*, 5) *users suffer from delays when discussing the reasons behind changes.*

These problems result from contributors approaching the activity as if it was a personal one, and not taking into account the activities of other contributors. Tools such as email are used to distribute the document itself, which is written in Microsoft Word, Open Office or Latex. The study led to a deeper understanding of the common problems in the co-authoring activity and deduced that the main problems are due to lack of awareness.

3.2 Observational Study: Awareness

Following the field study, a prototype system was created (figure 1) and was used in a trial with IS (Information System) undergraduate students. The students used the system in groups to write documents together as part of their coursework. In this study, the participants' actions were logged to gain insight into their work process. Afterwards, a questionnaire was given to them to understand whether they felt that the tool improved their development process.

This study found that the response time to queries decreased compared with existing tools (annotation in Microsoft Word, Open Office, Latex and/or emails). The questionnaire found that the tool was useful to them since it provided features such as a blog in which they could discuss development of the document. They also found it useful to have an online version of the document accessible at all times. As a prototype, not all of the functionality was implemented. The study will run again once the tool is fully functional.

3.3 Analysis: Existing co-authoring tools

Existing co-authoring tools are being analyzed [1]. Although some tools (e.g. Google Docs & Spreadsheets, BSCW) present innovative features, they do not provide complete awareness of users' activities in the writing process.

3.4 Groupware Evaluation: CAWS tool

This part of the research will be a progressive evaluation divided into three stages. (1) Attitude-based: evaluation of how individuals interact with and respond to the system. (2) Pre-set scenarios: measurement of the interaction response time using the CAWS tool and using all existing web-based co-authoring tools. The users selected for this stage will be novices to both tools in comparison. (3) Live group-writing: the system will be used by groups of collaborative writers in academia as well as in industry. Feedback from users will help to identify which features have the greatest effect upon the collaborative authoring process.

4. RESEARCH QUESTIONS

The outcomes of this research will determine if an enhanced wiki based system (figure 1) with enhanced features can advance effectiveness of online users' workspace awareness. In particular this research seeks to answer: *Do the following features improve users' workspace awareness?*

1. Real-time tracking of the activities of users.
2. Connecting annotations with discussion.
3. Allowing the specification of separate types of comment.
4. Live tracking system of who is doing what.
5. The ability to determine individual contribution.
6. Alert system for tracking development of the document.
7. Personalised view of comments and/or changes
8. Real-time discussion during real-time editing.

The research will identify features, which improve co-authoring activities and identify other features which support them.

5. SIGNIFICANCE TO GROUP

This research focuses on group interaction in collaborative authoring activities, which is an ongoing field of study in the GROUP and CSCW communities. It also demonstrates that when designing systems to facilitate collaboration, it is insufficient to consider only the technical aspects of collaboration. It is important that the social aspects of collaboration are also taken into account in the design of such systems, particularly awareness of other authors and communication between them.

6. REFERENCES

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