
CAWS: A wiki system to improve workspace awareness to advance effectiveness of co-authoring activities

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Abstract

Crucial to effective collaborative writing is knowledge of what other people are doing and have done, what meaningful changes are made to a document, who is editing each section of a document and why. This is because awareness of individual and group activities is critical to successful collaboration. This paper presents the problems that surround co-authoring activities, and the advantages of using CAWS are explained and compared with other implementation and techniques for collaborative authoring. This **co-authoring wiki** based **system** (CAWS), aims to improve workspace awareness in order to improve user's response to the document development activity.

Keywords

Asynchronous Communication, computer supported collaborative work, awareness, collaborative authoring, wiki.

ACM Classification Keywords

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.*

Introduction

Collaborative systems, groupware and multi-user applications allow groups of users to communicate and collaborate on common tasks over dispersed locations. After asynchronous communication became available, people began using it to exchange messages on a wide range of topics and to carry out work previously conducted with face-to-face meetings. While staying aware of others is something that is taken for granted in the everyday world, maintaining this awareness has proven to be difficult in real-time distributed systems where information resources are poor and interaction mechanisms are foreign [5]. People use network technologies to attempt to overcome time and space constraints; however, any type of asynchronous communications will differ greatly from face-to-face communication [10]. When people are dispersed in space and time, numerous aspects of communication are affected, including the sequencing of messages, the flow of communication, and the time required to complete a communication cycle [10]. An effective collaborative system should maintain the various forms of awareness that are implicitly present in a face-to-face meeting.

Problems in Co-Authoring

It is now rare for a paper or document to be written by a single individual. Universities often teach with a focus on group activities. Similarly, group training is common within industry. Research [6], [8], [13] and one-to-one interviews¹ with users have shown that the main tools

¹Interviews were conducted with people engaged in collaborative work; these consisted of 9 academics, 8 undergraduate students and 13 professionals working in industry. These interviews are still ongoing.

used to write documents are Microsoft Word and Latex. In some cases these are supplemented with a version control system such as CVS.

The main problems in collaborative authoring are as follows:

Communications degradation: Participants in a collaborative authoring process predominantly use email, which lacks the ability to track and display threaded conversations. A classic problem lies in the difficulty of tracking idea flow as a document develops [8], [13].

Misinterpreted comments referring to sections: It is often difficult to track how suggestions are incorporated into the document as it develops. A common misunderstanding occurs when authors are unable to see the reasoning behind the changes that the document undergoes [13].

Inadequate support for discussion of specific sections [13]: There is often little or no effort made in supporting group discussion. Consequently, conflicting revision suggestions can be difficult to resolve.

Poor connection between annotations and discussion [13]: Writers often make use of comments for a variety of purposes: for example, when asking questions or suggesting changes to the draft versions of a document. Comments can lead to further discussion or revisions. However, poor annotation tools often force authors to resort to email discussion. This leads to confusion over which comments apply to which version of a document.

Tracking previous versions: For reasons such as auditing, users may be required to retain copies of previous versions of documents.

Update Conflicts [11]: Update conflicts can arise when users are using a tool that automatically updates the main document. These must be manually resolved.

Awareness

It is important that collaborators are able to know what other collaborators are working on at a given time. Awareness information is always required to coordinate group activities, whatever the task domain [3]. Awareness of participants' activities with respect to a collaborative context is a critical issue for collaborative authoring systems [3]. Research [5], [4], [9], [2] has presented different types of awareness:

Personal Awareness, the information that a user maintains about their own self and role within the group [4], [9].

Social awareness, the information that a person maintains about others in a social or conversational context [4].

Informal awareness, knowledge in the general sense of who is present and what are they doing. This is the same kind of awareness available to people when working together in an office [4].

Group awareness, knowledge of other users' roles, responsibilities, activities, movements and status in the process [4], [2].

Workspace awareness, real-time information about the activities of other contributors.. In face-to-face activity, workspace awareness is a natural constant and even conscious part of peoples' interactions.

Wikis as tools for Co-Authoring

Co-authoring using the Internet is possible through the use of wikis. First introduced by Ward Cunningham in March 1995 [7], wikis have been applied in many

application domains and many different wiki systems have been developed. Modern wiki software includes a large number of features which can potentially aid users when engaged in collaborative work.

Support for discussion can alleviate problems of communications degradation. Although possible on any wiki by creating a separate "discussion" page, some systems directly support discussion through a "discussion" tab on every page.

Almost all wikis include version control. This allows changes to pages to be tracked and reverted to older versions. The presence of version control solves several co-authoring problems. The latest version of the document is always available. Page history solves any requirements for maintenance of older versions. As the original version is tracked while making an edit, merging is simplified.

A wiki's division into separate pages also helps merging. Merging a large document can be difficult, but division into pages allows users to work separately on different pages. Some wikis take this concept further and allow editing individual sections of pages. A standard feature integrated with version control is a difference viewer. This allows users to directly track how the document changes as it develops by comparing versions. In addition, each revision usually has a comment associated with it. These features together help to provide group awareness to users.

CAWS – Prototype

A prototype system named CAWS has been developed, as a collaborative authoring system specifically designed to improve awareness in users. CAWS has been developed based around the *wiki* concept. In a normal wiki, the focus is on creating multiple pages,

each on separate subjects, with the individual pages connected through hyperlinks. In contrast, this system aims to provide a tool for writing professional papers for conferences and journals. The research focuses on allowing users to navigate and orient themselves in a collaborative activity as though they were interacting face-to-face. Instead of multiple pages, the system comprises multiple document sections that form a complete document.

The system supports communications through the use of threaded discussion directly linked to an annotations system. Comments on a page are shown in a column to the right of the page text (see Figure 1). Each annotation links to a forum-style system in which

The screenshot displays the CAWS interface. At the top, the logo 'CAWS' is visible. Below it, there are navigation links: Home, Discussion, and Blog. The main content area is titled 'Awareness' and contains several paragraphs of text. A 'Comments' section is located on the right side of the page, showing a list of annotations and their corresponding discussions. The annotations are color-coded: a blue box for 'CRITIQUES', a red box for 'SUGGESTION', and a pink box for 'COMMENT'. Each annotation includes a 'More...' link that leads to a threaded discussion system. The interface also includes a search bar and a user profile icon for 'admin'.

figure 1: The CAWS interface being used for annotation. The text related to the annotation is highlighted; the "more" links of the annotation lead to a threaded discussion system.

discussion is more extensively supported. This addresses problems of group awareness.

It is important to provide visual conventions which convey information about how the comment/annotation was intended to be handled [12] - for example, as a proposal, a request for discussion, etc. The system can be configured in two ways. In the first, comments are coloured according to the user who wrote them. In the second, users may choose from several comment types when adding a comment to the types are configurable to allow tailoring to the document. Highlighting of text provides a direct visual link between a comment and the section of text it relates to: readers benefit from seeing comments alongside the original document [1].

To further promote discussion, the system includes a forum system attached to each document. In this case, instead of discussion being attached to a particular annotation, the intent is to facilitate general discussion of the document.

One problem in co-authoring is management of the document: the authors must agree on the document structure and assign responsibility for each section of the document. CAWS includes a document structure editor. In this, the document is presented as a tree of sections and subsections. The document structure can then be changed by rearranging the tree. Users may be assigned to work on sections of the tree.

The system includes several features which are intended to improve awareness for its users. Firstly, a news system allows users to post updates related to development of the document. The intention is that this should be used for announcing important changes to the document. This helps to improve workspace awareness for the authors.

Each document within the system has a “front page” displayed when the user accesses it. Along with basic details about the document, the page is intended to help promote workspace awareness. Along with the latest news posts, information on the most recent revisions to the document is displayed, along with details of current discussions. In this way, a user returning to the document is immediately given an overview of work and discussions currently in progress.

recent changes for documents in which they are involved. The customisable nature of the page allows the user to tailor it in order to provide notification of events relevant to them. For example, a user might decide to monitor changes to a particular section of a document. This helps further to improve workspace awareness.

Although annotations are an effective means of communications, they have a major flaw: interaction is

The figure displays two screenshots of the CAWS (Computer Supported Collaborative Work) system interface. The top screenshot shows the 'Awareness' document page. It features a navigation menu with 'Home', 'Discussion', and 'Blog' links. The main content area displays the document title 'Awareness' and a text snippet. To the right, there are two boxes: 'Latest Edits' and 'Latest Comments'. The 'Latest Edits' box lists three recent changes: 'Fixed Spelling Error', 'Section Deleted', and 'Definition of Acronyms', all by 'admin'. The 'Latest Comments' box lists three recent comments: 'We need to change it into the text as well...', 'Can we eliminate this section?', and 'It stands for Computer Supported Collaborative...', all by 'admin'. The bottom screenshot shows a 'COMMENT' section with a comment by 'admin' stating 'It stands for Computer Supported Collaborative Work.' and links for 'Parent' and 'Reply'.

figure 2: A user's personalised front page, displaying a list of recent comments on and edits to a document, linking to a differencing and discussion interfaces.

On a similar theme, each user has a personal front page, which he or she may customise to their preferences. As the system supports hosting multiple documents, a user may choose to monitor the most

primarily between person and document, not person and person. As a result, communicating ideas is often slow and cumbersome. People must revisit the document to see the latest comments. One way to

address this problem is to integrate a notification mechanism into the annotation system [1], [10]. Users receive notifications about comments which are relevant to them: for example, a user may choose to be notified of comments on text that they have written. Users may also choose to be notified of new comments on particular sections that they are interested in.

Future Work

The system as described is still in the process of being developed. Once complete, the next stage will involve user testing of the system. This will involve testing the system in three different scenarios: Students in group projects making use of the system to write their report, people in industry writing documentation for user tools and fourth year students peer reviewing research projects. Feedback from users will highlight problems with the design, and evaluate the effectiveness of the new features described. From this, it will be possible to make effective recommendations for the design of collaborative authoring tools and individualise which features are useful to enhance workspace awareness.

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