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Communication and Collaboration Tools in World Wide Web Course Tools (WebCT)

Murray W. Goldberg
University of British Columbia
Vancouver, British Columbia, Canada
goldberg@cs.ubc.ca
http://homebrew.cs.ubc.ca/webct/

Abstract

WebCT is a tool being developed at the University of British Columbia that facilitates the creation of sophisticated World Wide Web-based educational environments. WebCT requires minimal technical expertise on the part of the developer of the educational material and on the part of the student. WebCT provides an array of tools to enhance the on-line learning experience. A subset of these tools is intended to facilitate communication and collaboration. This includes a conferencing system, group presentation areas, a synchronous chat system, and electronic mail. While there are other examples of similar tools individually, WebCT assembles these tools into a single package that can be used by course facilitators without technical knowledge to create sophisticated web-based course environments. WebCT also adds features to these tools that are of particular utility in an educational setting.

1.0 Introduction

Recently there has been an explosion of interest in the use of the World Wide Web as a teaching resource [1][2][3][4][5]. The department of Computer Science at the University of British Columbia is no exception. Here there is a wide variety of courses being offered that have web-based components. The problem, however, is that here and elsewhere there are a large number of these web-based resources which are simply repositories for course notes and announcements. Others have gone one step further in making available video, audio, or even simulations to enhance the effectiveness of the resource. These courses are not taking advantage of the full potential of the web as a learning resource.

The true power of the web as a learning resource lies in its ability to bring students together through communication and collaboration. These are brand new opportunities that are easily made available by the web, but are otherwise difficult to achieve, especially in classes with a large student population. Ours and other's experimentation has shown that students take full advantage of electronic communication and collaboration opportunities when they are available [6].

For example, even a simple communication tool such as a shared electronic bulletin board can help form communities of communicating students who might otherwise not have ever spoken to one another outside the classroom. Collaboration tools can bring these students together to work on shared projects, and can present their work to the entire class on-line.

Few educators would disagree that communication and collaboration among students would greatly enhance most course experiences. In order to make it easy for these educators to experiment in this regard, we have added tools that facilitate student communication and collaboration to WebCT [7][8][9][10], our environment for authoring web-based courses. Having done so, WebCT now presents a well equiped "tool box" from which educators can draw.

This paper first provides a brief overview of WebCT, and then presents in fuller detail the tools for communication and collaboration that WebCT can add to a web-based course resource.

2.0 What is WebCT?

WebCT is a tool that facilitates the creation of sophisticated World Wide Web-based educational environments (courses from now on). WebCT requires minimal technical expertise on the part of the developer of the educational material and on the part of the student. WebCT is entirely WWW-based, both for the student and for the course designer. A single web server running the WebCT software is used both for course creation and delivery. Students wishing to interact with course material, and designers wishing to create new courses or modify existing courses use a web browser to connect to the WebCT server.

The content of a course is provided by the course developer or designer. Interactivity, structure and educational tools are provided by WebCT. WebCT, as well as allowing the incorporation of a set of educational tools in a course, also allows for the manipulation of the layout and look of the course. WebCT provides a set of educational tools that can be incorporated into any course. Examples of these tools follow (excluding those tools that facilitate communication and cooperation; the subject of the section following):

- Student Self-Evaluation: This tool allows the addition of automatically graded multiple-choice questions to any page of course content. Questions and answers can have multimedia content. When an answer is selected, WebCT displays an indication of whether the choice was correct, along with an explanation of why that choice was correct or incorrect.
- Searchable and Linkable Glossary: This tool allows the construction of a course glossary (terms with accompanying definitions). The glossary can be searched. Also WebCT can automatically create links from terms in the course content to their glossary entries. - Timed, On-Line Quizzes: This tools allows the creation of a categorized question database. From this database quizzes can be constructed. Questions can be included explicitly or by random selection for each student (where the instructor causes WebCT to choose a selection of questions from a set of candidate questions). Questions can be of four different types. Three of the four are automatically marked. The forth (short answer) uses an approximate matching scheme to assist in marking. Marked quizzes are electronically distributed back to the students and the grades are automatically entered into WebCT's grade database.
- Reference Tool: References (for example text book or URL) can be added to a course and be customized for any page of content.
- Indexing and Searching: WebCT provides the ability for the course designer to create a course

content index. It also allows students to make arbitrary searches of course content.

- Searchable Image Archive: WebCT allows the addition of annotated images to a course. The images can be searched by annotation. - Page Annotation: Students can associate private persistent annotations with any page of course content.
- Grade Distribution: The course facilitator (and designated markers) can enter grades for each student. Grades are also automatically entered when on-line quizzes are marked. The facilitator has access to statistics (including a histogram) of class performance for each activity. Likewise, the facilitator can selectively release grades and (separately) statistics on class performance to the students.
- Progress Tracking: WebCT provides the course facilitator with complete information regarding the accesses of individual students, and the access trends for each page of course content [10].

At the time of writing WebCT is in use in over 120 courses at the University of British Columbia and roughly two or three times that number in other parts of the world.

3.0 Communication and Collaboration Tools

In this section we discuss the communication and collaboration tools that are part of WebCT. These tools are being used in three courses being taught by the author: a third-year Operating Systems course (80 students), a fourth-year Advanced Operating Systems class (100 students), and a multi-section first-year fundamentals of Computer Science course (750 students). We will briefly state our experiences with each of these tools in these three classes.

3.1 Conferencing Tool

This is the first tool covered here because it is arguably the most important type of communication tool for our students. Students at the University of British Columbia have little opportunity for course-related communication outside the classroom. This tool fills that void and allows for a community of students to form where the large class size would have otherwise inhibited such a formation. In our courses we require that students read each message posted to the conferencing system. There is no contribution requirement. Still, in our third year course we had over 700 contributions and in our first year course, over one thousand. The nature of the postings varied widely, but the bulk were questions relating to the course material. These questions were answered by the TAs, the instructors, or other students. The conferencing tool also became a forum for voicing complaints about or praise for the course.

The basic structure of the conferencing system is pretty familiar. Any number of discussion fora can be created. Contributions can be listed either threaded by subject, or ordered by time of posting. URLs typed into the body of a message are seen by readers as links which, when clicked, cause the destination to be viewed in a separate window. By default, the conference message listing only presents new messages. However, old messages can be searched for based on content, time of sending, subject and sender.

The conferencing system does have some features that make it particularly useful in an educational setting. For example, message readings, followups and original contributions are tracked and recorded for each student. This may be useful for courses where discussion forms part of the evaluation.

Also, the conference system can be accessed from any page of course content (as well as from the course homepages). When a posting is made from a page of content, an assumption is made that the

posting is about that page of content. Thus readers of that message will be able to click on the subject line to display the page from which the message was posted. This allows readers to view the context that the poster was in when the posting was made.

Finally, all postings and all follow-ups to postings made from pages of course content are automatically archived and made available from that page of content. The idea is that discussions about a page of content can form part of the learning experience for future students. Now after a student views a page of content the expectation is that he or she will then click on the icon which gives access to the archive of messages related to that page (and can then add to that archive if he or she so wishes).

We are currently in the process of adding several new features to the conference tool. These include the ability to categorize and archive articles not related to pages of content, the ability to make audio, video, image and text attachments to messages, and the ability for the facilitator to allow a student "vote" on the quality of the contributions made to the conferencing system.

3.2 Group Presentation Areas

Group presentation areas allow groups of student (of any size including one) to form and present their work. We have used this in our advanced Operating Systems class. Here there were roughly 20 groups of 5 students. Each group researched an aspect of an operating system implementation such as a device driver for a particular device, or an operating system module such as memory management or process scheduling. The resulting projects are not only available for current students, but will also be retained for the benefit of future students.

The WebCT group presentation tool provides a page where all groups are listed. Next to each group is a description of the project and a link that allows the project to be viewed. If the student viewing that listing is a member of any of the groups, there will also be a "file manager" link next to the group name. The file manager allows the student to manipulate (edit, rename, organize, archive, upload, etc) the files associated with that presentation area. Thus every student has read access to all projects, and every student has update access for projects on which he or she is a member.

Groups are formed by WebCT at the request of the course facilitator. The facilitator has two options. First, he or she can form the groups manually. In that case WebCT will list either the entire class, or only those students that are not currently in a group. The facilitator will select those students that are to be in the new group, and the group is formed. Alternatively, WebCT can automatically assign group membership. In that case the designer indicates the requested group size and WebCT randomly divides the class into the appropriate number of groups. WebCT can also create a discussion forum in the conferencing tool devoted to any group.

Future plans for the group presentation area include the following. First is the ability to have students declare characteristics about themselves (such as interests, grades, backgrounds) in order to allow more intelligent automatic or manual group generation. We also intend to enhance the presentation area security by having the students in the group decide when their project should be released for public view. As it stands now, all projects are visible at all times.

3.3 Chat

WebCT chat areas provide synchronous communications among course participants. The intent is that

the chat areas can be used for general student discussion or for organized on-line tutorials. In our courses we have not yet attempted on-line tutorials, though we intend to experiment with this shortly. Still, in our large first year Computer Science class we observed several instances of keen students spontaneously offering (via a message in the conferencing tool) to appear in a chat room at a certain time. Their intent was to offer help on-line to other students in the course that might be having trouble. This occurred several times during the term but did not become a regular occurrence.

The chat area for each course in WebCT consists of six rooms. Each Five of the rooms are local to the course in that participants can only enter those rooms if they are in the same course. The sixth room is a general room. Participants can enter there from any course on the same WebCT server.

Four of the chat rooms in each course are logged. Here, all the conversations that occur are archived and made available to the course facilitator. The may be useful where the facilitator would like to monitor participation and contributions to discussions.

Our plans for the chat areas in the near future include the following. First, we plan to give students the ability to name the rooms they occupy in order to advertise the nature of the conversations taking place there. We are also working to facilitate private conversations, and to be able to notify proposed chat partners who are not currently in any chat room.

3.4 Electronic Mail

We use WebCT e-mail (as expected) in order to facilitate private communication among course participants. The basic structure of the e-mail facility is as follows. The reader is made aware that new messages exist by a change in the e-mail tool's icon. New messages are presented to the reader on access to the e-mail tool. All the usual e-mail functionality (quote, reply, delete, forward, etc) are provided. WebCT also allows searches through old e-mail messages according to content, sender, date of sending and subject. When composing a message, any part of the user name or login identifier can be used in the "to" field. If an ambiguity exists, WebCT provides a selection box with the matching users and asks the sender to choose the appropriate one(s).

WebCT e-mail integrates with two other WebCT tools; the student management tool and the student progress tracking tool. For example, using the student management tool the course facilitator can make a query to select all students that have (as an example) failed a particular exam. Having made that query, the list of failing students can be copied to a "clipboard" tool in WebCT. If the facilitator would now like to send each of those students a message to offer extra help, he or she can copy the the list of students into the "to" field of an e-mail message by pressing "copy from clipboard". Note that the recipients of the message do not see the names of the other recipients of the same message. Similarly a message can be sent to any group of students that exhibit some particular characteristic with respect to participation or progress (for example all the students that have made no conference postings).

4.0 Conclusion and Future Work

WebCT provides an array of tools to facilitate communication and collaboration in web-based courses. While there are other examples of similar tools individually, WebCT assembles these tools into a single package that can be used by course facilitators without technical knowledge. WebCT also adds features to these tools that are of particular utility in an educational setting. We have been using WebCT for roughly four months now to construct on-line course environments. The number of users continues to

grow almost daily and we are very eager to continue our development and experimentation efforts.

Two new tools to further facilitate communication and collaboration are currently underway. These are the shared whiteboard and the questionnaire tool.

For the shared whiteboard we are currently evaluating whether it is best to integrate one of the existing implementations, or to construct our own. In either case it will provide collaborative access to a distributed electronic whiteboard. The whiteboard will allow its contents to be archived for later viewing and rework.

For the questionnaire tool, course facilitators can construct questionnaires to be delivered to the students. Questions can be either "select one of" or short answer. Statistics will be generated for the selection question results, and compilations of the short answers will be generated. Finally, raw responses will be available for download into external applications.

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