

**METHOD AND APPARATUS FOR  
CONSOLIDATING EDITS MADE BY  
MULTIPLE EDITORS WORKING ON  
MULTIPLE DOCUMENT COPIES**

COPENING APPLICATION

This application is the one of four sibling patent applications filed on an even date herewith and commonly assigned, including U.S. patent application Ser. No. 08/638,908, entitled "METHOD AND APPARATUS FOR ORGANIZING A DOCUMENT USING HIERARCHICAL ARRANGEMENT OF OBJECTS", and U.S. patent application Ser. No. 08/638,904 entitled "OBJECT ORIENTED DOCUMENT VERSION TRACKING METHOD AND APPARATUS" and U.S. patent application Ser. No. 08/637,310, entitled "METHOD AND APPARATUS FOR DISPLAYING MODELESS BAR INTERFACES IN A COMPUTER SYSTEM". The subject matter of the above-identified copending patent applications is hereby incorporated by reference.

FIELD OF THE INVENTION

This invention relates to document editing and to team document editing systems in which a group of editors cooperatively edit documents and, in particular, to a method and apparatus for consolidating all edits produced by the editors into a single document.

BACKGROUND OF THE INVENTION

Current computing applications are largely single user systems. For example, conventional editing applications allow a single user to open a file and make modifications to the content. In most cases, a file is considered an atomic unit which is not sharable. While the file is open by a first user, a second user will be prevented from opening or modifying the file. The second user is sometimes permitted to obtain a snapshot copy of the file. The snapshot copy, however, is not updated with any of the subsequent modifications made to the original copy made by the first user. Thus, the second user is unable to share in the first user's ideas manifested as file modifications. Moreover, while the file is open, the second user is prevented from modifying the content of the original file and, thus, is prevented from sharing his or her ideas manifested as file modifications. In short, the first and second user are unable to collaborate.

For example, there are many conventional word processing programs available which allow a single author to create and edit a word processing document which may contain text and embedded graphics. However, with most of these programs, the word processing document itself is not shareable. When one user has the document open and is actively editing it, another user cannot simultaneously open the same document and edit it. Typically, the second user can only make a copy of the document for editing purposes. Consequently, it is common practice to "circulate" an electronic word processing document to several editors who then make their edits on a single copy of the document. With electronic computer networks, it is easy to circulate the document among the editors. However, the original author of the document maintains little control over the marked-up copy. Editors may delete insertions made by other editors or make other changes in an uncontrolled fashion.

Alternatively, the original author can simultaneously send separate copies of the original document to each of the editors. The editors then edit their own copy individually

and return the marked up copy to the author. However, after the edits are made, the task then remains to reconcile the multiple marked-up copies. This task can often be a time consuming and manual process of comparing the documents in order to locate the changes made by each editor and compare the changes with the original.

Still other collaborative word processing systems utilize a single document or a copy of a single document and allow a number of users to simultaneously "view" and edit the document such that changes made by one editor are immediately viewed by others. Such a collaborative word processor requires that all reviewers be simultaneously present to view the document and the changes made by each editor. In addition, the document view seen by all editors is the same portion of the document and, therefore, it is not possible for one editor to work on one portion of the document while the remaining editors are working on a different portion of the document. Consequently, these systems, while truly collaborative, are not efficient in the use of editor's time.

There is a need in the art for collaborative editing software. More particularly, there is a need for document editing software which makes efficient use of editor's time, yet allows rapid consolidation of the edits into a single final document.

SUMMARY OF THE INVENTION

The foregoing problems are overcome, and the foregoing need is fulfilled by an illustrative embodiment of the invention in which a document is collaboratively edited by multiple editors by providing each editor with a separate copy of the document. Each editor then edits his own document copy using an editing application program, such as a word processor, to produce an edited copy. The edited copies are then retrieved and compared and a single marked-up document is created in which sections of the original document and corresponding sections of each of the edited documents (with changes from the original document indicated) are displayed in physically adjacent locations of the display screen. A set of "consolidation" tools are provided to quickly transfer edits between the physically adjacent areas of the screen and to make, or accept, edits made by any of the editors. Edits which are not accepted can also be easily deleted. The result is a single consolidated document containing the edits which are desired by the original author of the document.

In a preferred embodiment, a unique, automated comparison routine is used to compare the multiple edited document copies with the original document. The inventive comparison routine can detect corresponding portions of the original and edited documents even if substantial edits have been made to the original document in the edited copies.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic block diagram of a conventional computer system in which a preferred embodiment of the invention may execute.

FIGS. 2A and 2B illustrate the beginning steps of an illustrative editing session in which an original copy of a word processing document generated by an author is first sent to, and then reviewed by, three editors and then the edited copies are consolidated into a single final document.

FIG. 3 schematically illustrates the process of consolidating changes in each of the edited document copies into a consolidated marked-up copy and generation of a final document copy.