Method and system for providing selective access to different portions of a database by different subgroups of database users. Where \( N \) users are involved, up to \( 2^{\log_2 N} - 1 \) distinguishable access subgroups in a group space can be formed, where no two access subgroups have the same members. Two or more members of a given access subgroup can edit, substantially simultaneously, a document accessible to each member.

4 Claims, 3 Drawing Sheets
Fig. 1
Assign distinct priority values $p(m)$ to each of $M$ users, numbered $m = 1, \ldots, M (M \geq 2)$, in a database access subgroup, where $p(m_1) < p(m_2)$ if $m_1 < m_2$.

Provide a document from the portion $d(1; \ldots; M)$ of a database that is accessible to the users $1, \ldots, M$.

Receive proposed edits or other changes to the document from users number, $m$; $m''$ and $m'''$, with $m' < m'' < m'''$.

Provide a first-modified document, including and indicating all changes to document proposed by the user number $m$, after an optional timeout interval.

User $m''$ reviews and approves/disapproves each change presented in the first-modified document, enters the approved changes from the first-modified document, enters additional change(s) proposed by user $m''$ (optional), to provide a second-modified document.

After optional timeout interval, present second-modified document to user $m'''$.

User $m'''$ reviews and approves/disapproves each change presented in the second-modified document, enters the approved changes for the second-modified document, and enters additional changes proposed by the user $m'''$, to provide a third-modified document.

Fig. 2
Provide a document from a portion d (I;...;M) of a database to which a subgroup of M users has access

Provide an agreed order for entry of proposed changes to the document by the users I, ..., M

Receive proposed changes to the document by the users m; m" and m"" with I≤m<m"≤m""<M

Provide a first-modified document, including and indicating all changes to the document proposed by the user number m; after an optional timeout interval

User m" reviews and approves/disapproves each change presented in the first-modified document, enters the approved changes from the first-modified document, enters additional change(s) proposed by user m" (optional), to provide a second-modified document

After optional timeout interval, present second-modified document to user m"

User m"" reviews and approves/disapproves each change presented in the second-modified document, enters the approved changes for the second-modified document, and enters additional changes proposed by the user m"" to provide a third-modified document

Fig. 3
SELECTIVE ACCESS AND EDITING IN A DATABASE

ORIGIN OF THE INVENTION

This invention was made, in part, by one or more employees of the U.S. government. The U.S. government has the right to make, use and/or sell the invention described herein without payment of compensation therefor, including but not limited to payment of royalties.

FIELD OF THE INVENTION

This invention relates to selective access to, and substantially simultaneous editing of, different portions of a database.

BACKGROUND OF THE INVENTION

A complex program having many tasks and sub-tasks, many phases and many workers will often have an associated database with many users, each of which has a limited "need to know" that does not extend to all information in the database. An example is a database that includes information on individual personnel, including confidential evaluations and reports on supervisory interviews. A group of users having access to information in a particular portion of a database may need to edit one or more documents or other collections of information to restate the original information more conveniently or accurately.

What is needed is a database system that provides selective access to different portions of the database for different groups of users, where the different groups may have partly overlapping access group memberships. Preferably, the system should allow substantially simultaneous editing of one or more documents or other collections of information to restate the original information more conveniently or accurately.

SUMMARY OF THE INVENTION

These needs are met by the invention, which provides selective access to as many as \(2^n-1\) (or \(2^n\)) mutually exclusive portions of a database by different subgroups of \(N\) users. One or more members of an access subgroup can edit a document or other information collection (referred to collectively as a "document" herein for convenience), to which the members have access, substantially simultaneously. Optionally, members of a given access subgroup can be assigned different numerical priorities so that, as between first and second users in the subgroup, (proposed) editing of a document by the first user will subsequently be reviewed, and declined or partly entered or wholly entered, by the second user.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a Venn diagram illustrating selective access to different portions of a database by three users.

FIGS. 2 and 3 are flow charts illustrating procedures for substantially simultaneous editing of a document according to different embodiments.

DESCRIPTION OF BEST MODES OF THE INVENTION

Consider a database that receives information from one or more information sources and that is queried by a plurality of users, as illustrated in FIG. 1 for \(N=3\) users. The database permits selective access of a given user to different portions of the database, depending upon the user's identity and access permissions. The database includes three portions \(d(n1)\) that are accessible only to user \(n1\) (\(1, 2, 3\)), three portions \(d(n1; n2)\) that are accessible jointly to user \(n1\) and to user \(n2\) (\(n1; n2\)), but not to any other user; and a portion \(d(n1; n2; n3)\) that is accessible to all users. User access to different portions of the XDB database is initially determined when a user account is set up. User access can be subsequently changed according to the circumstances.

More generally, where \(N\) users are present (\(N\geq 2\)), the database includes \(N\) portions \(d(n1)\) that are accessible only to user \(n1\), \(B(N;2)\) portions \(d(n1; n2)\) that are accessible only to users \(n1\) and \(n2\) (\(n1; n2\)) and more generally \(B(N;k)\) portions \(d(n1; n2; \ldots; nk)\) that are jointly accessible only to users \(n1, n2, \ldots, nk\) (no two of \(n1, n2, \ldots, nk\) being equal), with \(k=2, \ldots, N\), where

\[
B(P;Q)=\binom{P}{Q}\frac{P!}{Q!(P-Q)!}\quad (1)
\]

is the number of distinct combinations of \(P\) distinguishable objects, taken \(Q\) at a time. Optionally, one or more of the different database portions is empty. Optionally, the entire database is accessible by at least one user. Each of the \(2^{n-1}\) portions of the database discussed above has no overlap with any other of these portions. Optionally, another portion of the database is not accessible by any of these users but may be accessible by another entity not in the user group.

Provision of selective access to the database allows restriction of user access to the information contained in different portions of this database based upon "need to know" or another suitable basis. Thus, users 1 and 2 may be permitted access to and use of information for classes 1 and 2, respectively, of portions of documents and other information collections (referred to collectively herein as "documents"), where classes 1 and 2 are either mutually exclusive or are partly overlapping and partly non-overlapping. This approach may be used where, for example, user 1 is preparing or is modifying, with authorization, one or more documents in class 1 so that access to (a portion of) the class 1 material is temporarily or permanently restricted. This approach may be used where to restrict access to sensitive, such as personality assessment of a worker in connection with the human model.

After all information in a document has been identified as being accessible to the different users, through allocation of accessibility to the different portions, such as \(d(n1; n2; n3; n4)\), one or more group spaces can be implemented, allowing each member of a group to edit the document and to examine what changes have been made or are being made to the document by one or more other members of the group. For example, all members of the group \(G\{n1; n2; n3; n4\}\) have access to the portion \(d(n1; n2; n3; n4)\) of the collection, and each member of this group can independently edit this portion of the document.

Assume that users \(n1, n2\) and \(n3\) are separately editing this portion of the collection. An active user, for example, \(n2\), immediately sees the results of that user's own editing activities but does not yet see the results of the editing activities of each of the other active users (here, \(n1\) and \(n3\)).

In one embodiment, a first copy of each user's own edited copy (referred to herein as a "self-change" copy) of the acces-
for $M=4$, the four priority values might be $\{3.14, 0.5, 2, \sqrt{17}\}$. For definitiveness, it is assumed that $p(m_1) \leq p(m_2)$ if $m_1 < m_2$, for users $m_1$ and $m_2$ ($m_1, m_2, \ldots, M$). In step 22, a document from a portion of a database, to which each of the $M$ users has access, is prepared for editing by this access subgroup. In step 23, two or three users, number $m''$ and $m''$, with $m'' < m'' < m''$, enter proposed changes or other changes for the document. In step 24, a first-modified document, containing and indicating the document changes proposed by user $m''$, is prepared and presented to user $m''$, after a timeout interval (optional) determined by a time at which (1) a user $m''$ enters proposed changes (timeout 1) or (2) a second specified time interval elapses after user $m''$ began presenting the proposed changes (timeout 2) or (3) a second constraint time interval elapses after user $m''$ has presented the most recent proposed change (timeout 3).

In step 25, user $m''$ reviews the proposed changes or other changes and disapproves each of the changes proposed in the first-modified document, enters the changes from the first-modified document that are approved by user $m''$, and optionally enters additional changes proposed by user $m''$, to provide a second-modified document that includes the changes proposed by user $m''$ and the surviving changes proposed by user $m''$. In step 26, after a timeout interval (optional) analogous to the timeout interval in step 25, the second-modified document is presented to user $m''$.

In step 27, user $m''$ reviews the proposed changes or other changes and disapproves each of the changes proposed in the second-modified document; enters the changes from the second-modified document that are approved by user $m''$; and optionally enters additional changes proposed by user $m''$, to provide a third-modified document. This process can be continued until each user with proposed edits for the document has had an opportunity to present, and have considered, that user’s proposed edits to the document. This approach requires assignment of a distinct priority value to each user in the subgroup and has the advantage that no ambiguity exists as to whether a given change is ultimately accepted.

FIG. 3 is a flow chart of an alternative procedure for entering (or ignoring) edits presented substantially simultaneously for a given document, using a change tracking system. In step 31, a document from a portion of a database, to which each of a subgroup of $M$ users, numbered $m'' < m'' < m''$, have access ($M \geq 2$), is provided for editing by this access subgroup. In step 32, an agreed order $\alpha(m)$ for entry of proposed changes for the document by each of the users $m''$ is provided. Without loss of generality, this order of entry may be taken to be $\{1, \ldots, M, 1, \ldots, M\}$. In step 33, each of two or three users, number $m''$, $m''$, and $m''$, presents proposed changes for the document, with $1 \leq m'' < m'' < m'' \leq M$.

In step 34, a first-modified document, containing and indicating the document changes proposed by user $m''$, is prepared and presented to user $m''$ by the change tracking system, after a timeout interval determined by a time at which (1) a user $m''$ presents the proposed changes (timeout 1) or (2) a first specified time interval elapses after user $m''$ began presenting the proposed changes (timeout 2) or (3) a second specified time interval elapses after user $m''$ has presented the most recent proposed change (timeout 3). Proposed changes in the document may be indicated on a visual display screen by use of a different character color and/or use of a different font size and/or use of a different font than is used for display of the unchanged portions of the (first-modified) document.

In step 35, user $m''$ reviews the proposed changes or other changes and disapproves each of the changes proposed in the first-modified document, enters the changes from the first-modified document that are approved by user $m''$, and optionally enters additional
changes proposed by user m", to provide a second-modified document that includes the changes proposed by user m" and the surviving changes proposed by user m'. In step 36, after a timeout interval analogous to the timeout interval in step 34, the second-modified document is presented to user m". In step 37, user m" approves/disapproves each surviving change presented by user m", enters the approved changes from the second-modified document, and presents (further) changes proposed by user m"", to provide a third-modified document. After another timeout interval, the third-modified document can be returned to user m' or to user m" or to another user within the access subgroup to present further changes, if desired.

Optionally, where one or more users have brought up a copy of a given document within an accessible portion d(1; ... ; M) of a database, a portion of a display screen of each such user will indicate that one, two or more such users are presently editing the document. Optionally, the user's screen will identify, by name or associated symbol, which user or users are presently engaged in such editing. Where two or more users are presently engaged in editing of a given document, each of these users has the option of (1) entering his or her edits in a passive mode initially and subsequently merging these (proposed) edits with (proposed) edits for the document received from the other users and (2) entering that user's edits in an active mode in which the (proposed) edits are accepted or declined substantially as these edits are proposed, by reference to changes proposed by the other users and to the associated editing priorities.

Where the users are engaged in a brainstorming or equivalent session, in which items are added but are not deleted or edited or analyzed at the time such items are entered on a list, a user in that group space optionally can receive a copy of the list off-line and can assign the items to suitable categories as the items are received (referred to herein as "off-line categorization"). This feature allows one or more users in that group space to categorize the items profiled in such a session as the session proceeds. This off-line categorization can be subsequently used as a basis for analysis or other processing of the items on the list(s).

A group space for GrSpf{1, ... , M} includes users number 1, ... , M, the set of documents and other collections of information in the database to which each of these users has access, and a system that allows one, two or more of the (active) users to enter proposed changes in a document substantially simultaneously. Members in two different group spaces will have access to different collections of documents from a given database; and no two different group spaces will have precisely the same set of members. A collection of group spaces may be formed for any database for which changes in a document can be proposed and subsequently entered.

What is claimed is:

1. A method for managing a database that is accessible by at least three users, the method comprising:
   - providing a document or other collection of information (collectively referred to as a "document") for a database;
   - for at least one subgroup of M users of the document (M≥3), numbered m=1, ... , M, providing a portion of the database that is accessible only by members of the subgroup of M users;
   - assigning a priority value p(m) for access to the document by each user number m, where no two users in the subgroup of M users have the same priority value;
   - disallowing access to the collection of information by any user not a member of the subgroup of M users;
   - receiving, from users number m', m" and m"", in the subgroup of M users with p(m')>p(m")>p(m""), a first change in the document proposed by the user m" and a second change in the document proposed by the user m"";
   - permitting the user m' to enter the first change in the document, to provide a first-modified document;
   - after a first selected timeout interval is completed, determined with reference to at least one of (i) a time the user m' first began entering the first proposed change in the document and (ii) a time the user m' last made an entry that contributes to the first change in the document, terminating further changes in the first-modified document, as modified by the user m', and displaying the first-modified document, to the user m", where the first change in the document is displayed in at least one of (a) a first color, (b) a first font and (c) a first font size that is distinguishable from at least a portion of the document that is not modified by the first change;
   - visually displaying and permitting the user m" to review and to accept, or to not accept, the first change proposed by the user m' in the first-modified document, to provide a first-modified-and-reviewed document;
   - permitting the user m" to enter the second change in the first-modified-and-reviewed document, to provide a second-modified document;
   - after a second selected timeout interval is completed, determined with reference to at least one of (i) a time the user m" first began entering the second proposed change in the document and (ii) a time the user m" last made an entry that contributes to the second change in the document, terminating further changes in the second-modified document, as modified by the user m", and displaying the second-modified document to the user m", where the second change in the document is displayed in at least one of (a) a second color, (b) a second font and (c) a second font size that is distinguishable from at least a portion of the document that is not modified in the first-modified-and-reviewed document and is not modified by the second change; and
   - visually displaying and permitting the user m" to review and to accept, or to not accept, the changes proposed in the second-modified-and-reviewed document.

2. The method of claim 1, further comprising:
   - permitting said user m"" to enter a third change in said second-modified-and-reviewed document, to provide a third-modified document; and
   - after a third selected timeout interval is completed, determined with reference to at least one of (i) a time said user m"" first began entering the third proposed change in said document and (ii) a time said user m"" last made an entry that contributes to the third change in said document, terminating further changes in the third-modified document, as modified by said user m"", and displaying the third-modified document, to the user m"", where the third change in said document is displayed in at least one of (a) a third color, (b) a third font and (c) a third font size that is distinguishable from at least a portion of the document that is not modified by said first change, is distinguishable from at least a portion of said document that is not modified in said second-modified-and-reviewed document and is not modified by the third change.

3. The method of claim 2, further comprising:
   - after said third timeout interval is completed, and a user m*, who is at least one of said user m' and said user m"", has a fourth change to propose in said document, permitting the user m* to enter the fourth change in the document, to provide a fourth-modified document;
after a fourth selected timeout interval is completed, determined with reference to at least one of (i) a time the user m* first began entering the at least fourth proposed change in said document and (ii) a time the user m* last made an entry that contributes to the fourth change in said document, terminating further changes in the fourth-modified document, as modified by the user m*, and displaying the fourth-modified document, with the fourth change in the document, to said user m**, where the fourth change in said document is displayed in at least one of (a) a fourth color, (b) a fourth font and (c) a fourth font size that is distinguishable from at least a portion of said document that is not modified in said third modified-and-reviewed document, and is not modified by the fourth change; and visually displaying and permitting said user m** to review and to accept, or to not accept, the fourth change proposed by the user m* in the fourth-modified document, to provide a fourth-modified-and-reviewed document.

4. The method of claim 1, further comprising: after a no-activity timeout interval is completed, during which no additional proposed change in said document is received, displaying said document, with all of said changes in said document that have been accepted, for at least a selected display time interval.

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