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TITLE

~~METHOD AND APPARATUS FOR ORGANIZING INFORMATION IN A COMPUTER SYSTEM.~~
Method and Apparatus for Organizing Information into Collections of Documents and for Viewing Documents in a Computer System
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APPLICATION FOR UNITED STATES PATENT

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METHOD AND APPARATUS FOR ORGANIZING INFORMATION IN A
COMPUTER SYSTEM

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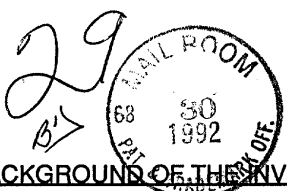
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BACKGROUND OF THE INVENTION

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Field of the Invention

5 The present invention relates to the field of computer systems and more particularly to user interfaces for computer systems and to methods and apparatuses for implementing user interfaces for organizing information in a computer system.

10 Prior Art

1.5 Prior art computer systems for organizing information typically fall into two types of filing systems. These filing systems are often implemented as part of the operating system of the computer system and are therefore provided as a basic utility to the user of the system to allow the user to organize information in a manner desired by the user. The two types of systems referred to above are the flat file system and the hierarchical file system.

2.0 In the flat file system, the computer stores all files (e.g. documents) at one level of hierarchy such that the user when examining these files sees all files at this level. In other words, the system does not discriminate between files which the user may have put in a folder or a subdirectory and files which are not in folders or subdirectories. This type of flat filing system is similar to a desk where all documents on the desk are spread out with none in any folders or other
2.5 containers. Clearly, such a filing system becomes cumbersome when the number of documents becomes large. For example, if the user is searching for

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a particular document on the system, the user may have to search through a long list of documents in order to find the desired document.

Hierarchical filing systems on computers attempt to improve filing systems by providing a hierarchy of folders or subdirectories into which the user may store information, such as text documents. Examples of hierarchical filing systems are well known in the prior art, including a hierarchical filing system disclosed in U.S. Patent No. 4,945,475. In these hierarchical filing systems, the user will file a document into a folder which may itself be within another folder.

Looking for any documents within a first folder will require opening the first folder after opening the second folder which contains the first folder. In this manner, the user is not presented with a bewildering number of documents as in the flat filing system and the user's files are maintained in an orderly and systematic way within the hierarchy specified by the user. An example of this hierarchical filing is shown in Figure 2 of the U.S. Patent 4,945,475 wherein documents 21 and 22 are within folder 20 which itself is within folder 18 which is also stored in another folder, folder 17. Thus, in order to view documents 21 and 22 the user must direct the computer system to examine the contents of the subdirectory represented by folder 20 by specifying the full address of folder 20 (in the case of a non-graphical user interface) or by opening the series of folders necessary to obtain a view of the folder containing the desired documents (in the case of a graphical user interface). Current versions of the Finder on the Macintosh computer systems from Apple Computer are examples of hierarchical filing systems with graphical user interfaces, and other such filing systems with graphical user interfaces are well known.

While these hierarchical filing systems allow the user to specify a structure within which to file (and hence store) information in order to avoid the clutter of a flat filing system, the hierarchical structure forces the computer user to be as organized as possible in filing information. If the user, as is often the case, has difficulty in filing documents because of the difficulty in deciding the proper categories of the document (e.g. the document does not clearly apply to any current category of filing where the category is implemented by having a folder or subdirectory for the category) then the user is typically most comfortable allowing the document to appear in the upper most directory of the hierarchy. As more and more documents which are stored in the computer system memory are left in the highest directory due to the difficulty in filing those documents, the user begins to have a bewildering clutter of documents in that highest directory, which then makes the system act as if it were a flat filing system (at least to the extent of the highest directory or to some other directory/subdirectory where the user is placing documents which are difficult to file away). It should be also noted that the difficulty in filing documents in a computer system also affects the way the user interacts with the computer in that the user attempts to avoid the difficult work involved in filing a document which is hard to categorize. This leads to procrastination or avoidance of the task. This tends to result in the computer becoming cluttered with documents which are hard to categorize or otherwise file or the user does not attempt to place the documents on the computer system at all because of the realization that they will be difficult to organize. This effect tends to negate the advantages of a filing system having a graphical user interface, and particularly a hierarchical filing system with a graphical user interface.



The problems discussed above are particularly troublesome in the case of mail documents (e.g. electronic mail documents) which have not been read by the user or have only been glanced at. By their nature, these documents are most difficult to categorize and file away because the user is not fully familiar
5 with these documents. It will be appreciated that the computer user is responsible for appropriately filing all items; the system offers little assistance in this often tedious task.

The prior art has not provided solutions to deal with these problems. For
1 0 example, Malone has studied the way people work in their physical offices and has noted the significance of piles of documents in these physical offices, and has discussed the implications for the design of electronic office information systems which might use conventional office management tools, such as piles, in a computer based information system. See, Malone, T.W., How do people
1 5 organize their desks? Implications for the design of office information systems, ACM Transactions on Office Information Systems, Volume 1, Number 1, January 1983, Pages 99-112. Malone however does not describe how such a computer system would be implemented nor the graphical user interface involved in dealing with such piles or browsing such piles and other activities
2 0 relating to these piles.

The present invention provides an improved filing system with a graphical user interface which allows users to organize information into piles or collections of documents and assists the user in organizing these collections of
2 5 documents.

SUMMARY OF THE INVENTION

The invention provides a method and apparatus for organizing information in a computer system, particularly one having a graphical user interface which includes graphical representations of documents. The apparatus of the invention displays graphical representations of a plurality of documents each of which may be manipulated by the user by positioning a system cursor over one of the graphical representations (e.g. icon) and signalling to the computer to select the document for some operation specified by the user. In the method of the invention, the user creates a pile (or collection of documents) by positioning the cursor (for example, a pointer) over one graphical representation of a document and then selecting that document and moving the graphical representation of the document (by moving the cursor) over to another graphical representation of another document and then depositing the first document on top of the second document in order to create a pile. The system will typically display a graphical representation of the pile which is different than the graphical representation of each document separately and after a pile is created, the original graphical representation of each document in the collection will typically no longer be displayed. A side-ways view of the graphical representation of the document replaces the original graphical representation of the document, and the side-ways view of the graphical representation is located in the graphical representation of the collection. The user may then browse through the pile by positioning the cursor at an item in the pile for a predetermined period of time to reveal a proxy within a viewing cone for the item positioned under the cursor. After the user creates a pile, the system may display a base (or plinth) under the pile to further indicate to the user that the collection of documents is a pile and to allow the user to

select the pile as a group. The user may then select the pile for further action by pointing the cursor to the base of the pile.

5 The apparatus of the invention includes a processing means, such a
microprocessor which is coupled to a cursor controlling device, such as a
mouse and is coupled to a display means such as a video display screen and is
also coupled to memory (e.g. RAM or a hard disk) for storing documents
maintained in the filing system of the computer. The cursor control device, such
as a mouse, typically includes a means for controlling the position of the cursor
10 on the display screen and also includes a signal generation means, such as a
switch which is mechanically coupled to a button which is depressed by the
user to signal to the computer to make a selection of an item which is positioned
under the cursor.

15 The system and method of the invention provide the user with various
ways to organize piles and to manipulate piles stored in the filing system of the
computer. For example, the filing system may be used to automatically file new
documents into the appropriate pile according to criteria specified by the user or
according to the internal contents of the document relative to the contents of a
20 particular pile. The invention also provides a way for the user to visualize the
contents of a pile according to various criteria (e.g. date), such as using visual
cues such as color. The appearance of the graphical representation of the pile
(e.g. dynamic or static icon of the pile) provides further information to the user,
including the texture, thickness, and color of the various documents within the
25 pile. Moreover, the user may specify to the system that it is the user's
preference to have system created piles look neat and user created piles look
disheveled. The system may also, at the user's request, create subpiles from an

original pile (or any set of selected documents such as documents within a folder) according to criteria specified by the user or determined or suggested by the system.

5 Another aspect of the present invention is an apparatus and method for providing an internal representation of the contents of a pile, which representation is used as a criteria for organizing documents and folders within the pile. This internal representation is also used when the system automatically files documents at the user's request or automatically when a new
10 or modified document appears in the filing system of the computer. The internal representation may also be used when the system creates subpiles from an original pile or when searching for documents in the filing system and for other operations relating to the present invention. In the preferred embodiment of the present invention, each document is provided with a vector which is
15 representative of the words contained in the document and each pile includes a representation, such as a vector, which embodies the collective contents of the pile. The vector between a document and a pile may be compared for the purpose of determining the relatedness/similarity of the document to the pile for purposes of filing or other operations described as part of this invention.

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BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows an embodiment of a computer system of the present invention.

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Figures 2a, 2b, 2c, 2d, 2e, 2f, 2g, 2h, 2i, 2j, 2k and 2l show various embodiments and representations of piles according the present invention.



Figure 3 shows, in temporal fashion, an embodiment of the operation of creating a new pile.

5 Figures 4a, 4b, 4c, 4d, 4e and 4f show various embodiments of the operation of browsing a pile.

 Figures 4g, 4h, 4i, 4j, 4k, 4l and 4m show stages over time of an embodiment of browsing a pile.

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 Figures 5a and 5b show two embodiments relating to moving a pile as a unit.

 Figure 6 shows, in temporal fashion, the operation of adding an item to
15 the top of a pile.

 Figure 7 shows, in temporal fashion, the operation of adding an item to the middle of a pile.

20 Figures 8a and 8b show, in temporal fashion, the operation of obtaining an alternate view for two different embodiments of the invention.

 Figures 8c and 8d show another embodiment for obtaining an alternate view of a pile according to the present invention.

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 Figures 9a and 9b show, in temporal fashion, the operation of removing one item from a pile; two embodiments are shown.

Figures 10a and 10b show, in temporal fashion, two embodiments of the operation of removing multiple items from a pile.

5 Figure 11a shows, in temporal fashion, a particular embodiment for creating a pile with the use of an outer zone.

Figure 11b shows, in temporal fashion, an embodiment for creating a pile with the use of an inner zone to allow fine positioning of the pile's appearance.
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Figure 12a shows an embodiment for adding to a pile using an outer zone.

Figure 12b shows a method for adding to a pile using an inner zone to
15 allow fine positioning.

Figure 13a shows a visualization window containing a user pile.

Figure 13b shows another visualization window containing four piles.
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Figure 14 shows a script/criteria control window according to the present invention.

Figure 15 shows a flowchart for indexing documents according to the method and apparatus of the present invention.
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Figure 16 shows a method for browsing a pile and displaying proxies of documents within the pile.

Figure 17 shows a method for allowing the system to control the filing of items within piles.

5 Figure 18a shows a flowchart for the creation of subpiles by the computer system of the present invention, and Figure 18b shows a flowchart for the creation of subpiles where the number of subpiles has been restricted by said user.

10 Figure 19 shows a flowchart for searching of documents in the file system of the present invention.

Figure 20 is a flowchart showing a method for visualizing a pile by color.

15 Figure 21, in flowchart form, shows a typical example of a user performing operations on or with piles.

Figure 22a, 22b, 22c, 22d, and 22e show other examples of a user performing operations with piles; various screens of a computer system
20 operating according to the invention are shown.

DETAILED DESCRIPTION OF THE INVENTION

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25 which is subject to copyright protection and to which a claim of copyright protection is made. The copyright owner has no objection to the facsimile reproduction by anyone of the patent disclosure, as it appears in the Patent and

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5 A system and method for organizing information stored in a file system of a computer system will now be described in detail. The following description, specific steps, procedures, commands, and other specifics are set forth in order to provide a thorough understanding of the present invention. However, it will be apparent to one skilled in the art that the present invention may be practiced without the specific details. In other instances, well known systems and
10 methods are shown in diagrammatic form or not shown at all in order to not obscure in unnecessary detail the present invention.

The computer filing system of the present invention is part of the computer system shown in Figure 1. The computer system includes a
15 processing means 10, such as a microprocessor, a memory means 11, such as system RAM, and a mass storage means 12, such as a hard disk or other storage means having a high capacity for storing documents and other information maintained by the filing system. The processing means 10, the memory means 11, and the storage means 12 (which its own I/O controller) are
20 interconnected by a system bus 15 which includes control signals as well as address lines and data lines for sharing information, including data and instructions, between the components of the computer system. Also connected to the system bus 15 is the I/O controller 17 which controls the signals received from the keyboard 14 and the mouse 16 and provides those signals, which
25 indicate instructions from the user, to the computer system. The display controller 18 is coupled to the system bus 15 and receives commands and data from the processing means 10 and from the memory means 11 via the system

bus 15. The display controller 18 controls the display device 19 in order to provide images on a display screen 22. It will be appreciated that the typical computer system includes a bit mapped screen stored in memory, which may be a dedicated frame buffer memory or the system memory. As shown in Figure 1, the display means 19 displays on its display screen 22 a cursor 21 which is controlled by the cursor control device shown in Figure 1 as a mouse 16. The display means 19 may be any one of a variety of known display systems, such as a video (CRT) display monitor or a liquid crystal display.

1 0 The cursor control device of the present invention may be substantially identical to the cursor control means shown in U.S. Patent No. Reissue 32,632. However, it will be understood by those in the art that many other types of cursor control means may be utilized, such as graphic tablets, touch tablets, trackballs, pen input mechanisms, touch screens, etc. Indeed, any device capable of
1 5 indicating x-y locations and capable of controlling a cursor on a display means of the computer system may be utilized in the present invention as the cursor control device. The cursor control device, such as a mouse will often include a signal generation means which typically includes a switch connected to a button. A user presses the button to send one signal to the computer and
2 0 releases the button to send another signal to the computer. Other signal generation means, as is well known in the art, may be used such as using certain keys on a keyboard or using a pen input device which both positions a cursor and, by pressing the pen's tip against the display screen, selects the item pointed to/pressed at on the display screen.

2 5 The display means 19 of Figure 1 is shown displaying a pile 23 to the left of the cursor 21. A menu bar 20 (described in U.S. Patent No. 4,931,783) is

also displayed at the top of the display screen 22. In the preferred embodiment of the present invention, the file system operates on a Macintosh computer of Apple Computer, Inc. of Cupertino, California. In this computer system, the user controls the position of the cursor 21 to point to an item and then to perform an operation with that item by using the signal generation means, such as the button on the mouse, to signal to the computer that the item has been selected for an operation or to signal to the computer that a particular command has been selected by the user (in the case of the selection of commands from the menu bar 20 or representations of the command displayed elsewhere on the screen 22). The operation of pointing to an item and selecting the item (or a command if a command is pointed to) is well known in the art as a "point and click" operation. For example, to select the pile 23 shown in Figure 1 for an operation to be designated by the user, the user positions the cursor 21 over the pile 23 by moving the mouse 16 in an x-y direction to cause the cursor to be positioned over the pile 23 on the display screen 22. Then the user signals to the computer that the item has been selected by depressing and releasing the button on the mouse (causing the switch under the button to change from a first state to a second state and then back to the first state). Other methods are known in the art for selecting an item which is displayed on a display screen of a computer system. For example, it is known that an object (e.g. document) in a computer filing system having a graphical user interface may be selected without pointing a cursor at the object by, for example, using the tab key on the keyboard to 'tab through' the various objects displayed on the screen. The currently selected object on the screen will typically be highlighted to convey to the user the fact that it is currently selected for an operation which is occurring or will occur upon further user instruction.

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The user interface of the present invention will now be described.

Figures 2a, 2b, 2c and 2d show various embodiments of the graphical representations (e.g. icons) of the piles (or collections of documents) of the present invention. Figure 2a shows the preferred embodiment of a graphical representation for a pile; this graphical representation 50 includes a base 52 above which are a collection of documents 53. According to the preferred embodiment, each document in the pile represented by the graphical representation 50 may be a miniature of the first page of the actual document or an icon of the document type, a set of keywords related to the document or a set of attributes relating to the document. In this manner, the first page of the document serves as a proxy (indicia) indicating the content of the document, thereby providing the user with information concerning what the representation represents (i.e. what is contained within the document). Figure 2b shows an alternative embodiment of the graphical representation of a pile according to the present invention. The graphical representation 55 of Figure 2b includes a collection of document icons which have been stacked together in a somewhat disheveled form to represent a pile or collection of documents. Figure 2c shows a pile which is similar to that shown in Figure 2b except less information is provided by each icon which represents a single document. Also note that the pile of Figure 2c is disheveled, which the user may instruct the computer to portray when a pile is not organized by the system. Figure 2d shows one graphical representation 57 of a pile which is organized by the system and thus appears as a neat stack of documents as shown in this figure. A pile organized by the system as a result of a user or system supplied script could also appear organized (e.g. not disheveled). This is one possible representation of the attribute of having a script; other attributes include the base having a texture, a pattern, some text on the pile, or an outline around the pile or an indication in

the name of the pile. The graphical representation of a pile may be either a dynamic graphical representation, as in the preferred embodiment, or a static graphical representation, such as a typical icon used in computer systems having graphical interfaces. A graphical representation generally is any item or feature displayed on the display screen of the computer system. The dynamic graphical representation of a pile increases in height when a document is added to the pile and decreases in height when a document is removed from the pile. The icon for each document in the pile may be selected by positioning the cursor over the icon in the pile. In the case of a static graphical representation of a pile, a document is selected based on a mapping of the height position of the cursor relative to the total height of the pile's graphical representation; that is, the ratio of the cursor's height above the base of the pile to the total pile height is mapped to the document's location in the pile. For example, a ratio of 1/4 (cursor is one-quarter up from base) maps to selecting a document which is one-quarter from the bottom of the pile which in the case of a pile with 8 documents is the second document from the bottom. This mapping is similar to how scrolling boxes on windows operate and will be appreciated by those in art.

Figure 2e shows two piles 63 and 65 having bases 64 and 67 respectively on top of which are stacked graphical representations 66 and 68 respectively, which graphical representations represent the collection of various documents in each pile which are stored in a memory (e.g. hard disk) by the filing system of the invention. Note that the pile 63 includes graphical representations of documents within the pile which indicate the thickness of the document relative to other documents. Alternatively, a different color could be used for various documents and a different texture could be used for different

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documents to convey information to the user. The base 64 of Figure 2e and the base 52 of Figure 2a are each a means for selecting the entire pile or collection of documents for an operation on the entire pile (rather than an operation on an individual document or group of documents within the pile). Operations on an entire pile including moving a pile across the desktop on the display screen or opening the pile to show its contents in a window. Other means for selecting a pile include a top means, such as the paperweight 54 shown on top of the pile 56 in Figures 2h and 2i (Figure 2h shows the pile in a 'closed' form where there is no viewing or browsing of documents in the pile and Figure 2i shows the pile 56 in an 'open' form with the paperweight 54 lifted to reveal the cursor 60 pointing to a selected document 58), and a wrapper means, such as band 71 which wraps the pile 70 in Figure 2j or the band 74 which wraps the pile 72 in Figure 2k and pile 73 in Figure 2l. The means for selecting effectively identifies the documents in the pile as a unified collection of documents.

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Piles 63 and 65 are displayed in a mail window 61 which contains electronic mail documents received over a network system or other electronic mail system. It will be appreciated that the method and apparatus for organizing information in the computer system according to the present invention has particular relevance to electronic mail and to other documents where the user does not know the content of the documents. In the case of electronic mail, the user will not typically know the content of a mail message received from another computer user (e.g. over an electronic mail network system) and the computer system will typically collect mail documents from various other user's and accumulate them in a particular location (e.g. a mail window such a mail window 61) from which the user may find each mail message and read each mail message. The automatic filing into piles and subpiling and classification

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methods of the present invention are particularly useful in this mail/message environment. For example, the user may instruct the system to collect mail documents into a pile and then have the system create subpiles or search a pile of mail documents according to the invention and then create subpiles from documents found in the search. These various operations are described below.

Operations and actions relating to piles will now be described. Figure 3 shows three groups 101, 110, and 112 of documents which are related in time in that a user performs an operation as shown in group 101 and the computer completes the operation and shows the progress of the completion of that operation in groups 110 and 112. That is, group 101 shows the action of a user in the computer system of the present invention and groups 110 and 112 show two successive stages in time of the response of the computer system to the operation of the user shown in group 101.

Figure 3 shows the process of creating a new pile where the user performs the operation shown relative to group 101. In particular, the user positions the cursor 106 over one document 105, selects that document and then moves that document (drags the document) over to the document 103 such that the document 105 and/or cursor 106 is positioned over document 103. In this situation, document 105 will overlap document 103. Then the user signals to the computer to create a pile; in the preferred embodiment, this is accomplished by releasing the mouse's button which was depressed when the user selected the document 105. For a better understanding of the preferred embodiment of creating piles a more detailed description will now be provided.

The user positions the cursor 106 by using a cursor control device such as a mouse 16. The cursor is positioned over the document 105 and then the user signals to the computer that the document is to be selected by activating a signal generation means, which in the preferred embodiment occurs by
5 depressing the button on the mouse to indicate the selection. While keeping the button depressed (which continues to indicate to the computer that the document is still selected) the user then uses the cursor control device (e.g. mouse) to move the cursor and the document 105 such that it is moved over the document 103. When the cursor is positioned over document 103, the user
10 releases the mouse button which changes the signal presented to the computer indicating that the document 105 is to be placed in a new pile with document 103. In this manner, a new pile is created having documents 103 and 105. Upon releasing the mouse's button when the cursor 106 is over document 103, the computer is thereby instructed to create a new pile, and a display of the
15 computer reveals an animation indicating the process of creating a new pile. As shown in group 110, the animation by the computer includes a step where document 103 is rotated and slightly inclined while document 105 begins to be rotated and placed downwardly on top of document 103. At the end of the animation by the computer system, the pile shown in group 112 results
20 containing documents 105 and documents 103 both of which are on top of the base 114. Typically, the separate graphical representations of documents 103 and 105 will disappear from the screen leaving the new pile on the screen. In the filing system of the computer, one way of filing documents into a pile includes placing documents 103 and 105 in a subdirectory which is designated
25 as a type of subdirectory which is similar to the subdirectory that a folder represents. Other ways of managing documents in a pile will be evident to those in the art. This subdirectory is maintained in the conventional manner by

the filing system for the information stored in the computer system (e.g. on the mass storage device). Other methods for creating a pile may be employed. For example, the user may select two documents and then select a command, such as "create new pile" provided by the computer system which creates the pile by
5 removing the separate graphical representations of the two selected documents and displays the graphical representation of the pile and then modifies the pathname of both documents to reflect the fact that they are now in a pile which is a new form of a subdirectory or alternatively aliases of the documents could be added to the pile. The pathname, it will be appreciated is typically an
1 0 attribute of a file, document or pile which is maintained by the filing system. Alternatively, the filing system may provide the user with an empty base for placing documents thereon to create a new pile.

After the pile as been created, the user or the system can perform
1 5 numerous actions on the pile, and one such action is referred to as browsing where the user views indicia of documents in the pile without opening the document or the pile.

Figures 4a, 4b, 4c, 4d and 4e reveal various embodiments for browsing a
2 0 pile according to the invention. The graphical representation of pile 151 is shown in Figure 4a as a collection of documents 153 which are stacked on top of a base 152. The cursor 154 is shown as located on top of the collection 153. In the preferred embodiment of the present invention, the user positions the cursor 154 over the graphical representation of the pile and allows the cursor to
2 5 remain positioned over the pile for a predetermined period of time. After that predetermined period of time, the computer system displays a view cone 162 with a proxy 161 in order to allow the user to browse through the documents in

the collection of documents comprising the pile. As shown in Figure 4a, the view cone 162 points to or is connected on one side (the apex or smaller side) to the collection of documents, and the apex is positioned to correspond to the document which has been selected for viewing in the browsing environment.

5 The other side of the viewing cone 162 shows a proxy 161 which is, in one embodiment, a miniature of the first page of the document which has been selected for browsing. The cursor 160, as shown in Figure 4a, has been positioned over this document which indicates that the proxy 161 is for the first document in the pile 156. The user may select any document within the pile by

1 0 moving the cursor on top of a particular document in the pile 156 and sending a signal to the computer to select the document. Once browsing has been invoked and the view cone has been displayed, the cursor need not be positioned for a predetermined period of time over an item in order to make the view cone and the proxy appear. In other words, once the system has been

1 5 instructed by the user to allow browsing of documents within a pile, the system displays the appropriate proxy for the selected document in the pile on demand by the user without waiting for a predetermined period of time. Once browsing has been invoked, the user may quickly scan through the pile by moving the cursor up and down the pile; in this manner, each time the cursor comes to a

2 0 representation of a document in the pile, the system displays the proxy for that document within the view cone 162. The left side (apex) of the view cone as shown in Figure 4a originates from the selected document and the right side (base) of the view cone shows the specific proxy (indicia) relating to that document. It will be appreciated that the view cone provides a means for

2 5 indicating the position of the selected document in the pile when browsing the pile in that the apex points to the selected document. Browsing may be terminated by the user by moving the cursor away from the pile such that it is no

longer positioned over any document area of the pile, including any documents stacked on top of the base which are associated with the pile. Browsing may also continue if the user positions the cursor over the base; in this case, the proxy may reveal the script of the pile or an internal representation of the pile itself rather than of a document in the pile.

In the preferred embodiment, the appearance of the proxy is dependent on the type of pile and the context of its use. For example, if the pile originates from an electronic mail system which accumulates documents in the pile, then the proxy 83 in the view cone 82 shown in Figure 4f for the selected document 81 in pile 80 is shown. This proxy 83, typically used for mail documents, conveys more information to the user in the case of a mail document than a miniature of the document which the user probably has not seen. This proxy 83 is generated by using the most characteristic words (e.g. "design, competition...") in the document as indicated by the document's internal representation, which is described below, and by using information from certain fields (e.g. "To", "Re", and "Date") contained in the document. Other alternative examples of proxies include the proxy 190 shown in Figure 4e which might be used when the user has asked for information about a document which is relevant to the operation of the computer's filing system (e.g. the size of a file when placed on a disk, such as the mass storage of Figure 1). The appearance and content of the proxy may be provided by the application program which created the document, particularly in the case of the miniature of the document; this occurs when the computer's filing system provides a system call to the program which created the selected document (the conventional filing systems typically keep track of this information) and the system call is recognized by the program as a request for the proxy of the selected document, and the program

responds by providing the proxy to the filing system which proxy may have been previously created by the program by miniaturizing (e.g. pixel averaging or other methods known in the art for reducing resolution and size of an image or exaggerating characteristics of the document) the full-size reproduction of the document.

Figures 4b, 4c and 4d show alternative embodiments for browsing. The browsing embodiment of Figure 4b graphically appears the same to the user as the embodiment shown in Figure 4a except that as the user moves from document to document while browsing (e.g. by moving the mouse up and down through the pile) the computer system makes a noise indicating movement from one document to the next document. This noise may be a simple click or the sound of a briefcase closing or some other sound which assists the user so that the user realizes there is a change from one document to the next. This is particularly helpful where the pile is tall and small movements of the cursor causes the view to change from one document to the next. Figure 4c shows an alternative graphical representation of the browsing operation according to a particular embodiment of the present invention. In this embodiment, the document 174 has been selected for browsing and a proxy 175 of that document can be seen at the end of the view cone 176. The cursor 171 is positioned over the selected document, document 174, and the documents in the pile 170 which are above the selected document are moved slightly to the left and are shown as a collection of documents 173. The embodiment shown in Figure 4d, which has been labeled as pile 180 is similar to pile 170 in Figure 4c except that when browsing, no view cone and no proxy within the view cone is shown to the user; in this situation, the proxy is typically a miniature of the document. In this embodiment, the collection of documents 173 above the

selected document during the browsing operation is moved above and to the left so that the user may see the selected document 174.

Figure 4e shows yet another alternative embodiment for the browsing operation where, instead of a proxy which shows the first page miniature of the selected document, the view cone displays system information which is typically maintained in a computer filing system such as the title of the document (Gesture Annotation), the type of document (MacWrite II document), the amount of information on the disk controlled by the filing system, and the date the document was created as well as an icon which is a representative of the document. Note that in this embodiment, the view cone 188 emanates from the selected document and the collection of documents 185 above the selected document moves to the left and above of the selected document so that the user may see the document which has been selected in pile 187. Note that this pile 187 of Figure 4e includes a base 186 and below that base is a rectangular box containing the name of the pile which has been given by the user. Typically, the computer system will prompt the user immediately after a new pile has been created in order to obtain from the user a name for the file. As will be described below, the system may automatically provide or suggest names for a pile.

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The proxies which are shown within the view cone need not necessarily be a physical resolution reduction of the original of each page of the document. To refresh the user's memory about the document, certain features of the document may be exaggerated (e.g. if the document is a spreadsheet a grid may be exaggerated on the proxy to represent the spreadsheet). If the document contains a user created annotation, the annotation may be exaggerated. Similarly, if the document contains a drawing, the image of the

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drawing may be exaggerated by making it larger relative to the rest of the miniature. The user may select the manner in which the proxy appears. It will be appreciated that if a folder is placed within a pile the proxy for the folder may itself be the icon of the folder or may be a representation showing documents within the folder (e.g. an icon of a folder is displayed with smaller icons representing documents shown within the folder). The user may page through a particular document which has been selected during the browsing operation by using a command to indicate to the computer to step through the pages of the document. In one embodiment, the user may use the left and right arrow keys on the keyboard to instruct the computer to page through the document which has been selected during the browsing operation. The computer will then display miniatures of each page as the user presses the left or right key. For example, starting from the first page of the document the user may press the right key three times in order to page through all pages of a four page document; having reached the end of the document after the third key press, the user may depress the left arrow key three times to get back to the first page or may select a new document for browsing by moving the cursor to a new document.

20 Alternative methods for scrolling through the pages of the proxy will be apparent to those in the art, including a thumb roller knob on the mouse 16 which allows the user to roll the knob to scroll through the pages.

 It will be appreciated that many variations for the browsing operation may
2.5 be produced according to the invention.



For example, browsing may only allow viewing of certain types of documents selected by the user. In particular, if the user selects a selective viewing mode, then only a user specified type of document (e.g. only documents containing drawings) is shown during browsing; for instance, if the user selects this mode and specifies that only documents containing a "To" field or documents containing a chart will be shown during browsing, then the user eliminates unnecessary information by filtering, in effect, such information.

Figure 4g, 4h, 4i, 4j, 4k, 4l and 4m show another embodiment for viewing the contents of a pile, which in this embodiment results from a search of documents stored in said computer system. Figures 4g-4m show the embodiment over various stages of time, beginning with a user's request for a search of the term "Blackstone" in the documents stored in the system, as shown in Figure 4g prior to initiating the search. This embodiment may be performed in a pen-based computer system having a graphical user interface controlled by a pen (or stylus input) and touch screen which is sensitive to the placement of the pen or stylus on the screen. These computer systems are known and the pen provides both cursor positioning functionality as well as the selection functionality in one operation; that is, the pen positions the cursor and selects an object with the same gesture/operation.

As shown in Figure 4g, the user has indicated to the computer that a search of documents in the system for a word is desired, causing the computer to display a find dialog box with the "start" button 127 displayed in front of a document 125. The user enters in the term "Blackstone" and then selects the "start" command by selecting the "start" button which causes the computer to search for documents containing the desired term. The computer displays, as

shown in Figure 4h, a pile 129 which contains the documents found in the search, which may be performed according to the methods described below, and the computer displays the first document 128 in the pile. Note that the indicia (e.g. document 128) in this embodiment is a full-size reproduction of the document. Then the user, selects the next document in the pile 129 for viewing by selecting the next document in pile 129; this could occur by the user pointing the stylus input device at the pile 129 or at the next document in pile 129. This action by the user causes the system to respond initially with the image shown in Figure 4i and then with an animation where an icon 132 of the document which has been viewed lifts up from and away from the pile 131 and flips over as it moves away from the pile 131 to a location near the pile. This animation is shown in successive stages over time in Figure 4i, 4j, 4k, 4l and finally 4m. The next document which was selected from pile 129 is shown behind the graphical representation of the pile 131 and behind the find dialog box. Figures 4j, 4k, 4l and 4m have not included the document 128 in order to save space in the drawings. In this embodiment, the system manages the pile for the user during browsing so that documents which have been viewed are put in a 'viewed' subpile (containing the document icon 132 as shown in Figure 4m) and unviewed documents remain in the original pile 131. When viewing is completed the user may reassemble the original pile by adding the 'viewed' pile back to the original or may separate the 'viewed' pile by removing these from the original pile. Without an affirmative act by the user, the 'viewed' subpile will remain part of the original pile after viewing of the search pile is completed.

Note that in many of these browsing operations the pile remains visible either in its original form or in slightly modified form. This is unlike prior computer systems which have subdirectory "containers" such as folders which

might disappear or be obscured from view when the container is opened to view the contents of the container. That is, the user can maintain the context (e.g. the graphical representation of the pile and all other items on the desktop remain visible) of the filing system while browsing a pile unlike the situation with
5 examining folders in a typical filing system with a graphical user interface. The proxy of the invention, with or without the view cone, may also be used with any icon or object on a desktop in a graphical user interface to permit browsing/viewing of the icon or object without losing the context of the filing system. For example, browsing of the contents of a conventional folder could
10 produce a proxy for each document (or selected types of documents) within a folder, such as the folder 312 shown in Figure 8a. In particular, the user positions the cursor over the folder for more than a predetermined period of time and, while the icon of the folder remains visible, the proxy of a document appears next to the icon of the folder. In one embodiment, the particular
15 document selected depends on the mapping of the ratio of the vertical position of the cursor relative to the bottom of the folder to the location of the document in a listing of the contents of the folder, in the same manner described above for browsing a static graphical representation.

20 The operation of moving a pile will now be described by referring to figures 5a and 5b. Figure 5a shows a graphical representation 201 of a pile with a base 203. As shown in Figure 5a, the user has positioned the cursor 204 over the base 203. With the cursor positioned over the base 203 the user then selects the pile and moves the cursor by manipulating the cursor control device
25 while keeping the pile selected. In this manner, the pile follows the movement of the cursor and is moved around the display screen 22 of the computer system. In the preferred embodiment, the selection is indicated by using a

signal generation means such as a mouse's switch to signal to the computer that a selection has been made at the location of the cursor and moving occurs by keeping that switch in the same state while moving the mouse to move the cursor. When the user has moved the pile to the location which is desired, the user indicates to the computer that the move is over. In the preferred embodiment, the user releases the switch's button on the mouse, which switch remained in a depressed state since the selection of the pile. At end of the move, the pile is shown at the location where the user released the switch. During the move, either an outline of the pile or a facsimile of the pile's graphical representation may follow the cursor around the display screen 22.

The alternative embodiment of the move operation is illustrated in Figure 5b, where the pile 205 does not have a base. The user positions the cursor 204 over the pile 205 and signals to the computer that the pile has been selected for a move by depressing the mouse's button which causes the switch to change its state in the mouse. Then the user manipulates the cursor control device in order to move the cursor and the graphical representation of the pile or the outline of the pile follows the cursor until the user releases the mouse button in order to deposit the pile at the desired location at the end of the move.

Adding an item to the top of a pile is shown in Figure 6. Figure 6 shows the same pile at different stages in time of the operation of adding an item to the top of the pile; specifically, three stages or groups, 220, 221 and 222 are shown in Figure 6. The initial stage 220 is the one in which the user instructs the computer to add the item to the top of the pile, and stages 221 and 222 show the animation displayed by the computer system as a result of the user's operation. In the first stage 220, the user positions the cursor 231 over a

document 230 and moves that document (in the well known manner of moving an icon in a graphical user interface, such as the Macintosh finder) so that the cursor is positioned over the pile 224. When the cursor 231 is placed over the pile 224 and the system provides feedback to the user by highlighting the pile
5 and then the user signals that the move operation for document 230 is over, then the system responds by implementing stages 221 and 222 which cause the document 230 to be added to the pile. Typically, the user will signal the end of the move to the document 230 by releasing the mouse's button while the cursor is positioned over the pile 224. The computer then responds as shown
1 0 in stage 221 of Figure 6 by inclining and rotating document 230 to show the animation of placing the document 230 on the pile 226. At the end of the computer's operation, (shown as stage 222 of Figure 6) the document 230 is shown on the top of the pile 228. The operation of placing the document on the pile is similar to the operation of placing the document within a folder of a
1 5 graphical user interface filing system in a computer in that, in one implementation, the pathname for the document which is maintained by the filing system is modified to include the name of the pile in the complete path name for the document. The user can have gross or fine grain control over the placement of documents on the pile, as will be discussed in conjunction with
2 0 Figures 11a, 11b , 12a and 12b.

The operation of adding an item to the middle of the pile will now be described by referring to Figure 7 which shows three stages in time 251, 253 and 255 for this operation. In stage 251 the user moves the document 256 over
2 5 to the pile 250 and positions the cursor (while keeping the document 256 selected) over an inner zone of the pile 250. Further details regarding the inner zone of the pile will be described below with reference to Figures 12a and 12b

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and particularly Figure 12b. When the cursor 252 has been kept in the inner zone for a predetermined period of time then the computer responds by presenting on a display means 22 the graphical representation shown in stage 253 which includes the pile 250 (now slightly modified) and view cone 257 with a proxy 258 within the view cone. The proxy shown within the view cone 257 is of the document which is immediately below the document 256 and the cursor 252. It will be appreciated that in effect, the browsing mode has been activated and the user may move the cursor up and down within the pile to browse through the pile. In this operation, however, the mouse button is down (depressed by the user) as the cursor is moved up and down unlike the browsing operation described above in the preferred embodiment. As soon as the mouse button is released by the user during this operation shown in stage 253, the document 256 will be deposited on top of the current item within the pile which is also shown within the view cone 257. The currently selected item may be changed by browsing up and down over the pile by moving cursor up and down over the pile. As shown in stage 253 of Figure 7, if the cursor 252 were kept in its position shown in stage 253 and the mouse button released, then the document 256 would be placed on top of the folder, the proxy of which is shown as proxy 258 within the view cone 257. This results in stage 255 in which the pile 259 is shown with the new document 256 added in the middle of the pile; the document 256 will have been added immediately above the folder the proxy of which is shown as proxy 258 at stage 253.

In addition to browsing a pile in the manner described above, the present invention provides a method and apparatus for obtaining an alternate view of the contents of a pile; various embodiments for obtaining an alternate view are shown in Figures 8a, 8b, 8c and 8d. In the embodiment shown in Figure 8a, the

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user obtains an alternate view of the pile by positioning the cursor 303 over the base 302 of the pile 301 and rapidly depresses and releases the mouse button twice, which causes the computer system to respond by making the pile 301 disappear and making a region of the display screen, such as a window 304, appear containing contents of the pile spread out in the manner shown in Figure 8a. Other methods for obtaining this alternate view will be appreciated by those in the art, particularly by referring to the art relating to graphical user interfaces for computer filing systems. For example, the user may select the pile and then select an "Open" command from a pull down menu 20. As shown in Figure 8a, graphical representations of documents 310, 311, folder 312, and documents 313, 314 and 315 are shown within region or window 304. According to the present invention, items in the pile are arranged in a grid within the window 304 and top to bottom order of the pile is preserved in a left to right format. The standard window operations are provided by window 304 and the computer's operating system; these standard window operations are well known and are available in graphical user interfaces with windows, such as the Macintosh Finder from Apple Computer, Inc. of Cupertino, California. Thus, for example the graphical representations of the documents or folders within the window 304 may be moved within the window or moved outside of the window, or a document such as 310 or 311 may be moved into folder 312, etc. The window 304 may be removed from the screen ("closing the window") by positioning the cursor 303 over the region 305 shown in the upper left hand corner of the window 304 and by depressing and releasing the mouse button to activate the operation of closing the window which then causes the computer system to revert back to displaying the pile 301 as shown in Figure 8a.

An alternative embodiment for obtaining an alternate view of a pile 320 is shown in Figure 8b. In this embodiment, there is no base for the pile and thus the user cannot double click on the base of the pile. Rather, the user must double click on the pile itself which will cause the computer to remove the graphical representation of the pile 320 from the display screen means 22 and cause the appearance of the window 321 which contains the iconic representation to the various documents within the pile in a typical window for computer systems with graphical user interfaces. Other methods for obtaining an alternate view will be easily observed by combining the techniques of the invention with the skill of the art.

For example, Figures 8c and 8d show another embodiment for obtaining an alternate view of a pile. In this embodiment, the user moves the mouse 325 in a manner shown by the arrow 327 (moving the cursor back and forth in a horizontal fashion across the pile 326). This causes the pile 326 to be displayed in a spread out manner 330 shown in Figure 8d. After the computer displays the pile in a spread out manner the user may provide an instruction to the computer to redisplay the pile 326 in the stacked format shown in Figure 8c. Note that this back and forth horizontal movement is perpendicular to the vertical cursor movements (up and down a pile) to achieve browsing.

Two different embodiments for the operation of removing an item from a pile are shown in Figures 9a and 9b respectively. Figure 9a shows one embodiment in three stages of time 350, 352, and 354. In stage 350, the user positions the cursor 351 over the desired item 355 a proxy 356 of which is shown within the view cone 357. The user will check the contents of the view cone to determine whether or not the proper proxy is shown within the view

cone which will then tell the user that the cursor is on the proper/desired document. Browsing of the pile may be employed to find the desired document. At this point, the user moves the cursor 351 so that it no longer is over a portion of the pile as shown at stage 352; note that the view cone and the proxy are no longer shown at stage 352 because the cursor is no longer over a region of the pile. The user continues the process by continuing to move the document 355 away from the pile as shown in stage 354 and when the user has moved the document far enough away from the pile the document 355 appears in its upright orientation and is no longer slanted relative to the generally rectangular region of the display screen 22. In the embodiment shown in Figure 9b, in order to remove an item from the pile 360 the user must first obtain an alternate view of the pile--e.g. position the cursor over the pile and repeatedly press and release the mouse button twice ("double clicking") in order to cause the window 362 to appear. Other methods for obtaining this alternate view will be appreciated by those in the art, particularly by referring to the art relating to graphical user interfaces for computer filing systems. For example, the user may select the pile and then select an "Open" command from a pull down menu 20. At this point, the user may use normal operations for graphical user interfaces having windows in order to remove items from the pile. In particular, the user positions the cursor 351 over the desired item 355 and selects the document and keeps the document selected while moving the cursor out of the window thereby moving the document with the cursor out of window 362.

Two different embodiments for removing multiple items from a pile are shown in Figures 10a and 10b respectively. This operation in the case of the embodiment shown in Figure 10a is shown in three stages 401, 405 and 407 which are three stages in time for this operation. The user begins the operation

in the same way as described for the browsing operation by positioning the cursor 351 over the pile 402 for more than a predetermined period of time causing the view cone 357 to appear with its proxy 403. The user then depresses the mouse's button to signal to the computer that the currently
5 selected document (as shown in the view cone with the proxy 403) is to be selected. Then the user signals to the computer that further items are to be selected; this is typically done by holding down a particular key of the keyboard or some other button to change the stage of the switch which is coupled to the computer system. In the preferred embodiment the shift key on the keyboard is
10 held down while the cursor is placed on other documents which are desired. With the shift key down, the user may release the mouse button after selecting the first document and then press the mouse button down and release it to select additional documents. For each additional document which is to be selected, the user positions the cursor 351 over the document and presses and
15 releases the mouse button while also holding down the shift key. As shown in stage 405, this results in three documents 407 being selected from the pile. The user then positions the cursor away from the pile and continues to move the cursor away. After moving the cursor outside of the region of the pile, the computer system causes the documents to revert to their upright non-inclined
20 form as shown in stage 407.

The operation of removing multiple items from the pile not having a base is shown in Figure 10b. In this operation, the user must first obtain an alternate view of the pile--for example, opening a window by double clicking the mouse
25 button with the cursor 361 over the pile 360 thereby causing the window 362 to appear. Then the user selects multiple items in the well known manner for dealing with windows in filing systems with graphical user interfaces.

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Figures 2f and 2g show two different embodiments which utilize an outer zone and inner zone for allowing the user to select between the creation of a pile where the user can control the appearance of the pile and the creation of a pile where the user delegates to the system the task of placing the document neatly on top of a new pile. An inner zone 77 is contained within the interior of the circle shown over an icon of a document 75 in Figure 2g. The inner zone 77 is used to indicate to the computer system that the user desires to indicate to the computer system that the user desires to control the positioning of documents in the pile so that the appearance of the graphical representation of the pile is, at least to the extent of the orientation of documents in the pile, controlled by the user. An outer zone 76 is contained within the circle shown over the icon 75 excluding the region in the inner zone 77. That is, the outer zone 76 is an annular ring having two boundaries defined by the outer circle of Figure 2f and the inner circle of Figure 2g; this annular ring may be thought of as the subtraction of the area within the inner circle from the area within the outer circle. The outer zone 76 is used to indicate to the computer system that the user desires to allow the computer system to control the positioning of documents in the pile. The user may when adding one document to the pile use the inner zone 77 to control positioning, and then when adding another document to the pile the user may use the outer zone 76 to allow the computer system to control the positioning of the new document in the pile. The circles of Figures 2f and 2g would typically not be shown during use of the invention, and they are shown in these figures for purposes of illustration. The shape and size of the inner and outer zones is a design choice which may be varied to suit the user's desire. The operation of using the inner and outer zone will be described

by referring to Figures 11a and 11b which use a different shape and size for the inner and outer zones.

Figure 11a shows the circumstance where the user, by using the outer
5 zone, allows the system to neatly place the document on top of the new pile,
and Figure 11b shows four stages of where the operation where the user
creates a new pile and controls, by using the inner zone, the positioning of the
documents in the pile and hence the appearance of the pile. In the embodiment
shown in Figure 11a, the user selects a document and moves the selected
1 0 document on top of the document 450 shown at stage 451 of Figure 11a. The
document which has been selected is not shown at this stage in the figure in
order not to obscure the outer and inner zones of the document 450. The outer
and inner zones are not normally displayed during the use of the invention, and
they are shown in Figures 11a and 11b for purposes of illustration. The user,
1 5 having selected a document positions the cursor 453 over the outer zone 452 of
the document 450 as shown in stage 451. This is also shown at stage 455
where the cursor 453 has been used to select document 454 and the document
454 and the cursor 453 have been moved on top of the outer zone of document
450. When the user releases the mouse button indicating that the document
2 0 454 is no longer selected, the computer responds with animation as shown at
stage 457 where the document icons 458 and 460 are inclined and rotated and
finally in stage 459 are shown deposited neatly on top of a base 461 as a new
pile. The operation of creating the new pile causes the base 461 to appear. In
an alternative embodiment of the use of the outer zone 452, the user moves the
2 5 selected document over the outer zone 452 of the document 450 so that at least
a portion of the inner zone (or some other central "hot spot") of the selected
document (e.g. the inner zone of document 454) is over a portion of the outer

zone of the document 450. Then the user indicates that the selected document is no longer selected (or that a pile is to be created) and the computer responds with the animation shown in stages 457 and 459 to create a neat graphical representation for the pile over the base 461.

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The operation of creating a new pile while maintaining user control via the appearance of the pile is shown in Figure 11b and proceeds in a manner similar to that described for Figure 11a except that the user positions the cursor 467 over the inner zone 466 of the document 450. Thus, as shown at stage 465 of Figure 11b, the cursor 467, after having selected a document and moving the document and the cursor while keeping the document selected, is positioned over the inner zone 466 of the document 450. This is also shown at stage 470 of Figure 11b where the cursor 467 is shown over the original document 482 which is selected, and the cursor 467 is also over the inner zone 466 (not shown). Upon the user's reaching the inner zone of the bottom document icon 450, the computer responds at stage 473 by inclining and rotating the document icons and then by observing the position the user indicates by moving the cursor 467 relative to the bottom, document icon 481. As long as the top document icon is left touching the bottom document icon, the computer follows the positioning of the top document relative to the bottom document and allows the user to position the document at any location. If the user moves the cursor outside of the bottom document icon such that the top document icon is no longer touching the bottom document icon then the computer system reverts back to showing two separate document icons which are not inclined and rotated.

2.5 When the user is satisfied with the position of the top document icon relative to the bottom document icon user releases the selection on the top document (by releasing the mouse button) which causes the computer to respond as shown at

stage 475 by creating a pile having a base 461 with the top document aligned according the user positioning of the top document relative to the bottom document as described previously. In an alternate embodiment of the use of the inner zone 466, the user moves the selected first document over the inner
5 zone 466 of the document 450 so that at least a portion of the inner zone (or some other central "hot spot") of the selected document 482 is over a portion of the inner zone of the bottom document 450 for at least a predetermined period of time. Then the user indicates that the selected document is no longer selected (or that a pile is to be created) and the computer responds with the
10 animation shown in stages 473 and 475 to allow the user to position the top document 482 over the bottom document 450 in the manner described above.

Figures 12a and 12b show the outer and inner zone designs respectively for the process of adding an item to a pile. The inner and outer zones are
15 shown in Figures 12a and 12b for the purpose of illustration. The operation of adding to the pile and allowing the system to control the location of the new document, as shown in Figure 12a, is similar to the operation described relative to Figure 11a. In particular, the user selects a document and moves the document over to the pile and positions the cursor 503 (or alternatively the inner
20 zone/hot spot of the selected document) in the outer zone of the pile as shown in stage 501. As shown in stage 505, the document 506 which has been selected and moved along with cursor 503 is positioned over the pile and the cursor 503 is positioned in the outer zone. Upon releasing the selection of the document while the document and the cursor is positioned over the pile and
25 particularly the cursor is positioned over the outer zone, the computer responds at stage 511 by inclining the document 506 as it is positioned by the system on top of the pile. At stage 514, the operation is complete as the icon 506 is shown

on top of the graphical representation of the pile, which representation is dynamic as illustrated in the figures. The operation shown in Figure 12b allows the user to add a document anywhere in the pile. This is accomplished by selecting the document and taking the document with the cursor 517 and
5 positioning the cursor (or alternatively the inner zone/hot spot of the selected document) over the pile and particularly over the inner zone 516 of the pile shown at stage 515. After a predetermined period of time, the computer responds as shown at stage 520 with the view cone 518 and the proxy 519 within the view cone, which proxy shows the document immediately underneath
10 the current location in the pile which the user has selected by placing the cursor 517 (or alternatively the inner zone/hot spot of the selected document) into the inner zone. If the user is satisfied with this location the user releases the selection by typically releasing the mouse button on the mouse causing the pile appear as shown at stage 525.

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The invention provides a method for the user to include a user defined specification, such as a script, for a pile. A user defined specification may be provided by the user (e.g. typing keywords as a specification or selecting a sample document, having an internal representation which is described below
20 and which provides the specification) or may be suggested by the system and ratified by the user. Normally, the user can control whether a pile has such a specification and thus the system will not create such a specification without the user's approval. Not every pile needs or will have a user defined specification, although every pile will have an internal representation (described below) or a
25 user defined specification.

A tool for visualizing and organizing the contents of a pile will now be described by referring to Figure 13a and 13b. A pile 550 is shown within the visualization window 551 of Figure 13a. Typically, the user would select the pile 550 and then select a command from the computer which would invoke and display this visualization window with the selected pile 550 within the window 551. The window 551 includes several command options which allow the user to view the pile in different ways and to order the contents of the pile in different ways and to select between those different ways in order to obtain different appearances of the pile or to otherwise reorganize the pile (e.g. create subpiles from a single original pile). For example, by placing the cursor over the arrow icon 555 and by selecting the icon 555 by depressing the mouse button or otherwise signalling to the computer to select the arrow icon 555, the user causes the computer to display a pull down menu indicating the various ways in which the contents of the pile may be ordered. The system shows in box 556 that the pile is currently ordered by date which means either that the most recent items are on the top or the oldest items are on the top depending on the designer's preference. Other options which may be included in the "order" pull down menu (activated by selecting arrow 555) may include: ordering by content; ordering by size; ordering by author (alphabetically). The operation of the pull down menu is well known in the art and has been described for example in U.S. Patent Reissue 32,632. The arrow icon 560 allows the user to select the way in which the pile is colored. As shown in box 561 the system currently has colored the pile by date in which, in one embodiment, the most saturated shade of a color is displayed near the bottom of the pile (indicating the older documents) then the top of the pile has a lesser saturated shade of the same color. It will be apparent to those in the art how to implement this function by assigning colors; for example picking a color in a perceptual color space

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(e.g. Munsell color space) and varying the saturation of the color holding the luminance constant and the hue of the color constant. The range of the dates would be used to set the outer limits of the saturation. That is, the oldest and most recent documents would form the extremes of the saturation range and a
5 date in the middle of that range would specify a color in the middle of the saturation range.

Other ways of presenting various colors according to a measure of the date/age of the document will be appreciated by those in the art, particularly by
10 referring to art relating to color management systems in computers. For example, the hue may be varied (e.g. from red to blue) while keeping a constant saturation and luminance. Alternatively, preselected colors (and the color values) may be used in a look-up table for mapping the measure of date/age of the document to one of the preselected colors in the look-up table.

15 In a similar manner, the user may desire to view the color of the pile 550 according to the content of the pile. This would be done by the user selecting the arrow icon 560 to cause a pull down menu to appear below the arrow icon 560, which pull down menu would include the command option of "coloring by
20 content." The user would then select this command option placing the cursor over that command option and releasing the selection (e.g. by releasing the mouse button) which then causes the word "content" to appear within the box 561 indicating that the system will color the pile by content. This will be described in more detail below particularly with reference to Figure 20.

25 The visualization window 551 also includes an arrow icon 565 which activates a pull down menu to allow the user to select the manner in which the



pile is organized (e.g. "pile by content"). As shown in Figure 13a, the user has selected "pile by content" which may cause the system (depending on how related all documents are within the pile 550) to create subpiles from this pile 550. The user could have selected other options available in the pull down menu from icon 565, such as, "pile by date," "pile by stamps," "pile by data type", "pile by source," etc. Let us assume that pile 550 is a pile of mail messages obtained through electronic mail which the user has moved out of a mail window such as window 61 and has selected this pile for visualization in a visualization window 551. Because it is a mail message pile, it is likely that the contents of the various documents in the pile will vary over a large range and that the pile would be better organized into several subpiles according to content. Accordingly the user has placed the pile into the visualization window 551 and desires to pile by content; that is, the user desires to make subpiles from the original pile. The user does this by selecting a command to indicate that the pile should be piled by content. In the embodiment shown in Figure 13a, the user selects this by selecting the "arrow" button 565 which the user may do, for example, by placing the cursor over the region of the button 565 and pressing and releasing the mouse button or by otherwise signalling to the computer to make this selection. Upon making the selection, visualization window 13b appears wherein three organized piles 575, 576 and 578 are displayed along with a miscellaneous pile ("other") 577. The system has, in addition to creating the subpiles, provided a name for each pile in the manner described below, particular with reference to Figure 15. At this point, the user may instruct the computer system to infer a user defined specification, for example, a script, from the system created subpiles which could then be used to automatically file new mail documents received over the electronic mail network into one of the subpiles according to the particular script of the subpile. The

system infers the script by using the system provided internal representation of each subpile; for example, the 'N' (where N is an integer) most characteristic words in the pile's internal representation (e.g. the pile's vector described below) could be used. The user could then review the list of the 'N' (set by
5 some system threshold value) most characteristic words and approve or disapprove of all or some of these words and then create the script. More details concerning scripts will be presented below with reference to Figure 14.

The piles in Figure 13b were created from the original pile 550 by
1 0 allowing the system to create the subpiles as described in the manner below. In this way, the user of the computer may more efficiently review the various mail messages and other documents within the original pile rather than having to browse through the pile to see the keyword proxy of Figure 4f or otherwise select documents from the original pile. Thus, for example, if the user is most
1 5 interested in "art, design" documents, then the user may begin looking at documents in that pile first and defer examining the other subpiles or perhaps the "notebook computer" pile depending on the interests and priorities of the user. As will be described in more detail, the system analyzes each document in the original pile based on the content of the document and then determines
2 0 the most appropriate subpile in which to place the document. Each subpile will have a representation of the content of the documents within the subpile and that representation will be compared against the representation provided by the system for the particular document. The closer the match between the two representations and the more likely the particular document will end up in the
2 5 particular subpile.

If the user is satisfied with the results of the subpiling process shown in Figure 13b, the user may retain this structure by selecting the "Ok" button icon 571. Otherwise, the user may cause the documents in the subpiles to be reassembled into the original pile 550 by selecting the "Revert" button icon 570.

5 If the user selects "Ok" 581, the filing system creates a new pile for each subpile, which in one implementation involves changing the pathname of each document in each subpile in the manner described above.

Figure 14 shows another tool, a script window 601, for manipulating piles

1 0 which have a user defined specification (e.g. a script) and controlling the way they work in the computer system. The user may obtain the window 601 or other windows for creating and/or editing scripts in various ways, such as providing a command to the computer to display such a window on a display screen 22 (e.g. a "Create script" command) or adding a document to a pile that

1 5 already contains a script where the document's content does not match the script in a close enough way and where the system has been instructed to so notify the user when this occurs. In either instance, the script window 601 appears on the display screen 22. If the window was invoked by adding an item to a pile and the user does not mind that the content of the document does not

2 0 precisely match the script of the pile, the user may select the command "just add this item" by selecting this command in the various ways known to select the command in a graphical user interface. This would typically take place by positioning the cursor near the button icon 602 and selecting this command while the cursor is positioned over the button 602. If the user desired to modify

2 5 the pile's script to accommodate the new document which was added then the user may select this option by placing the cursor in the button 603 and selecting that option (e.g. by depressing and releasing the mouse button while the cursor

is held over button 603). As shown in Figure 14, the user has selected the option of modifying the pile's script.

The script window 601 as shown in Figure 14 has appeared after the
5 user attempted to add a text document from Richard Mander (dated April 19,
1991 and regarding design competition update) to a pile having a script. Since
the document's representation did not match in a close enough manner the
criteria of the pile's script, the computer displayed the window 601. The script of
the pile to which the Richard Mander document was added can now be
1 0 modified by selecting various options within the script window 601. The region
605 of window 601 contains three check boxes 607, 608 and 609. If the user
selects any of these three check boxes this will instruct the system to modify the
script to cause the system to collect into the pile items "from Richard Mander" or
items "dated April 19, 1991" or items "regarding design competition update",
1 5 depending on which option or options are selected by the user. For example, if
the user selects the option to collect items "from Richard Mander" then the
computer system searches the filing system for documents containing a "from"
line or field indicating that Richard Mander is the author of the document or an
author of the document. Similarly, if the user selects the option of collecting
2 0 items which are dated April 19, 1991, the system will collect documents which
are dated April 19, 1991 into the pile which is controlled by this script. Typically,
the user will select any of these options by manipulating the cursor control
means to position the cursor over one of the check boxes and then by selecting
the check box, which may occur by depressing and releasing the mouse's
2 5 button. Thus, for example, if the user wanted to pull all documents into the pile
which have a regarding line "design competition update" then the user would
position the cursor over the check box 609 and select that option by depressing

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