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(54) **METHOD AND APPARATUS FOR PUBLISHING HYPERMEDIA DOCUMENTS OVER WIDE AREA NETWORKS**

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Publication Classification

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(52) **U.S. Cl.** **709/217**; 709/203

(57) **ABSTRACT**

The present invention addresses the critical needs of publishers seeking to create and publish hypermedia content in electronic form across the wide area networks ("WAN's") such as the World Wide Web. Toward this end, a client-server development platform is provided for handling the important functions of document authoring, content-based indexing and retrieval of documents, management and control of proprietary assets, and a support for developing form-driven interactive services, all in a manner that is uniquely and seamlessly WAN-integrated.

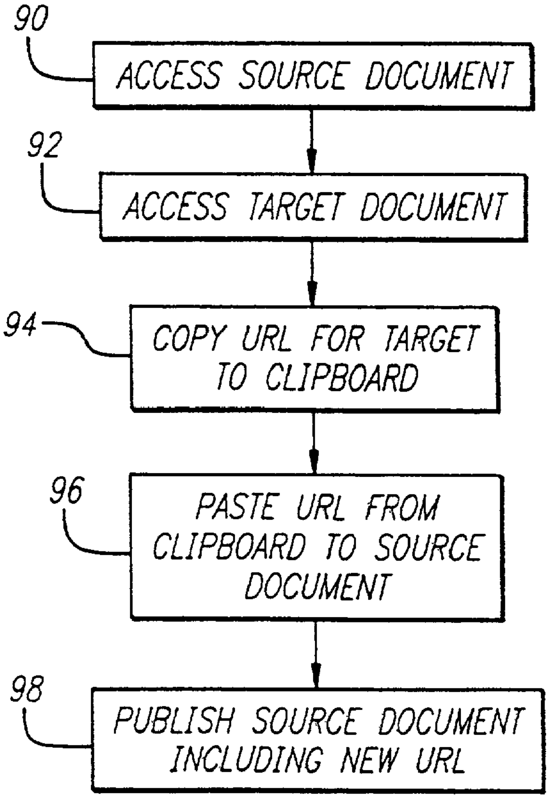
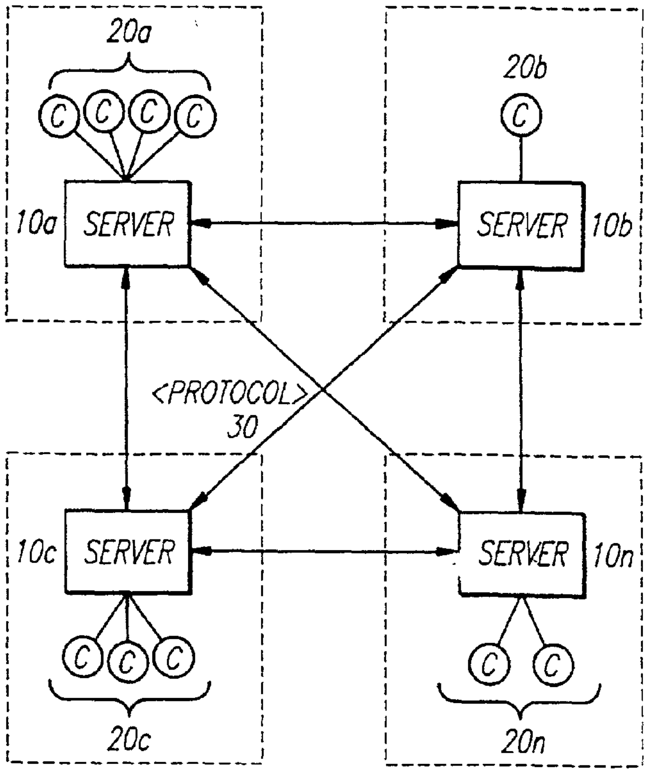

90
ACCESS SOURCE DOCUMENT
92
ACCESS TARGET DOCUMENT
94
COPY URL FOR TARGET TO CLIPBOARD
96
PASTE URL FROM CLIPBOARD TO SOURCE DOCUMENT
98
PUBLISH SOURCE DOCUMENT INCLUDING NEW URL

FIG. 1

PRIOR ART



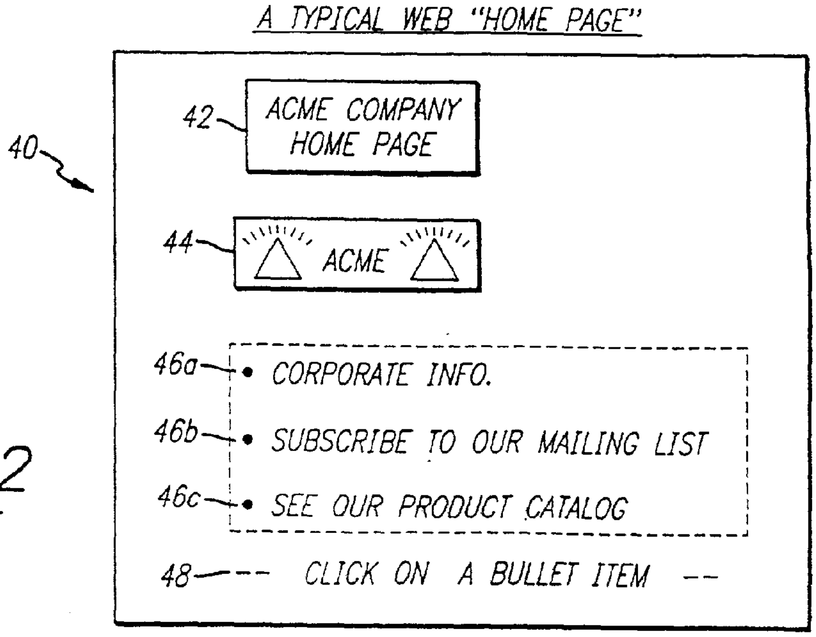
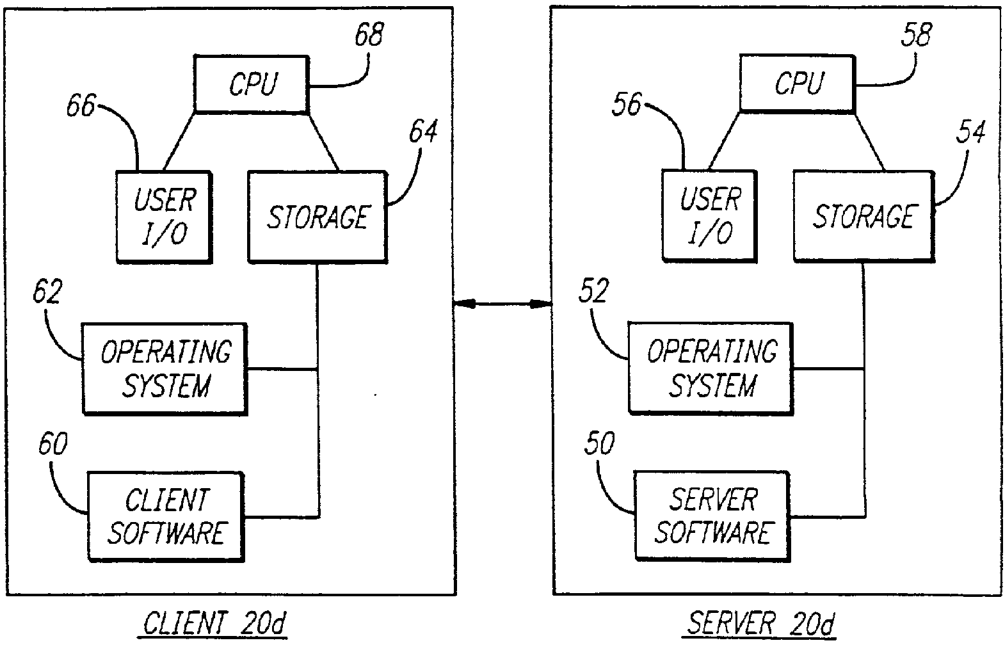

A TYPICAL WEB "HOME PAGE"
40
42
ACME COMPANY HOME PAGE
44
ACME
46a
• CORPORATE INFO.
46b
• SUBSCRIBE TO OUR MAILING LIST
46c
• SEE OUR PRODUCT CATALOG
48
--- CLICK ON A BULLET ITEM --

FIG. 2

PRIOR ART

FIG. 3



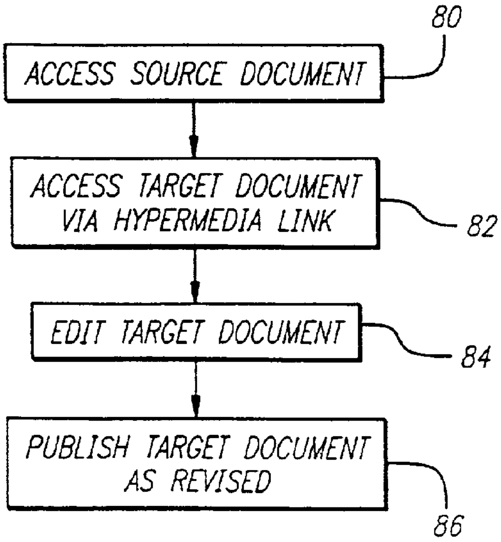

ACCESS SOURCE DOCUMENT
80
ACCESS TARGET DOCUMENT VIA HYPERMEDIA LINK
82
EDIT TARGET DOCUMENT
84
PUBLISH TARGET DOCUMENT AS REVISED
86

FIG. 5a

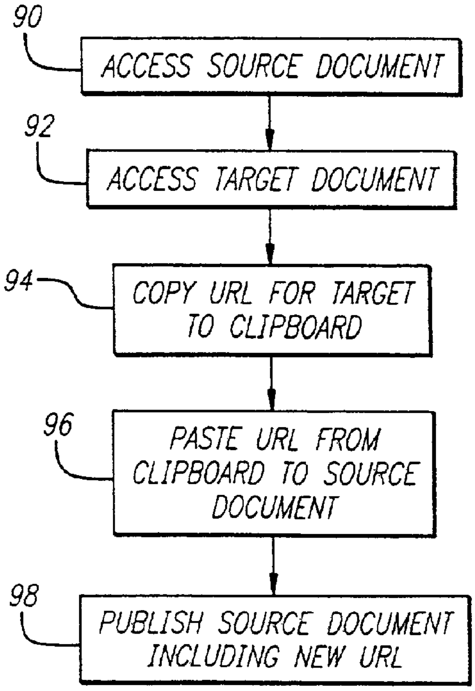
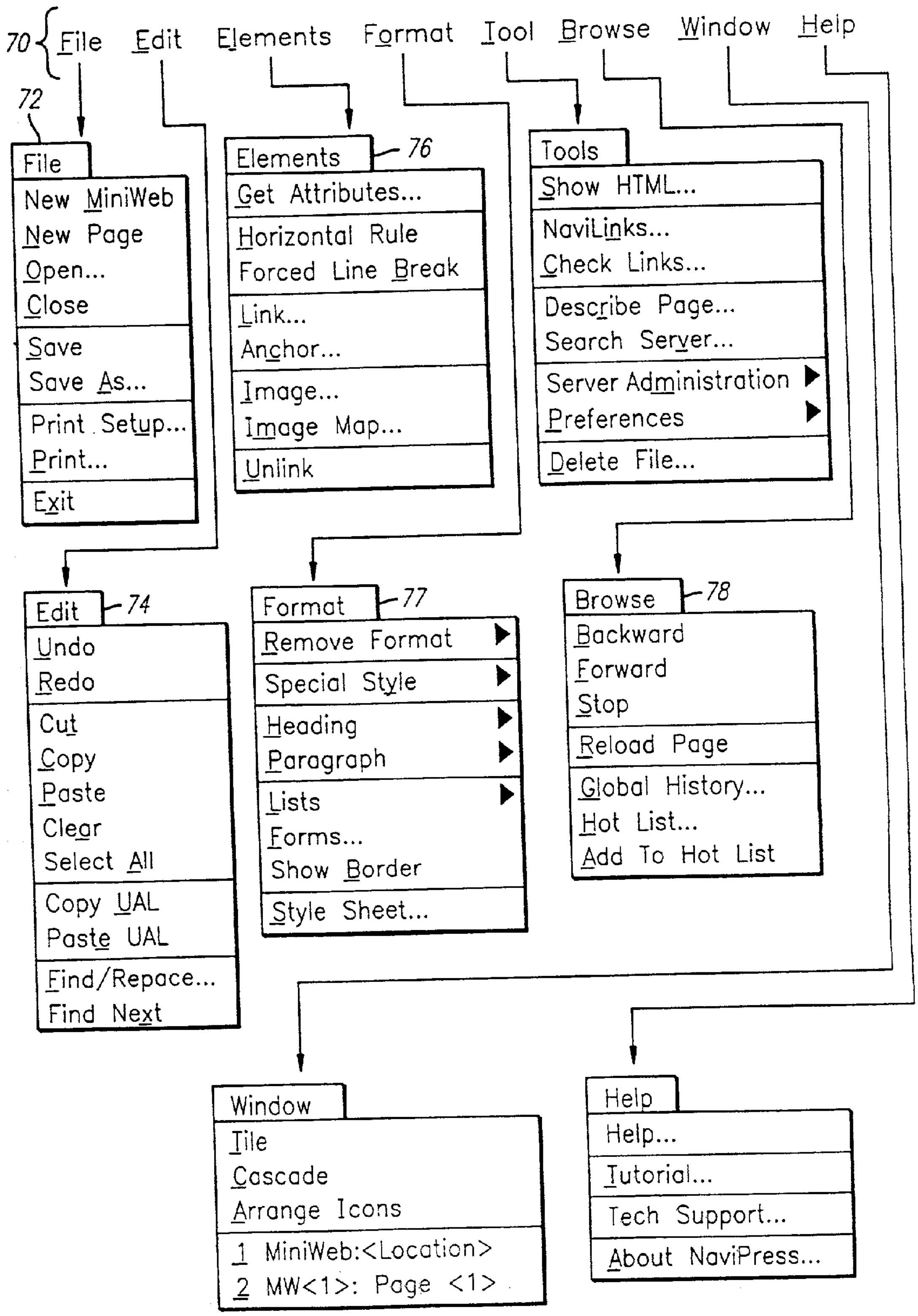

90
ACCESS SOURCE DOCUMENT
92
ACCESS TARGET DOCUMENT
94
COPY URL FOR TARGET TO CLIPBOARD
96
PASTE URL FROM CLIPBOARD TO SOURCE DOCUMENT
98
PUBLISH SOURCE DOCUMENT INCLUDING NEW URL

FIG. 5b

FIG. 4


70
File
Edit
Elements
Format
Tool
Browse
Window
Help
72
File
New MiniWeb
New Page
Open...
Close
Save
Save As...
Print Setup...
Print...
Exit
Elements
76
Get Attributes...
Horizontal Rule
Forced Line Break
Link...
Anchor...
Image...
Image Map...
Unlink
Tools
Show HTML...
NaviLinks...
Check Links...
Describe Page...
Search Server...
Server Administration
Preferences
Delete File...
Edit
74
Undo
Redo
Cut
Copy
Paste
Clear
Select All
Copy UAL
Paste UAL
Find/Repace...
Find Next
Format
77
Remove Format
Special Style
Heading
Paragraph
Lists
Forms...
Show Border
Style Sheet...
Browse
78
Backward
Forward
Stop
Reload Page
Global History...
Hot List...
Add To Hot List
Window
Tile
Cascade
Arrange Icons
1 MiniWeb:<Location>
2 MW<1>: Page <1>
Help
Help...
Tutorial...
Tech Support...
About NaviPress...

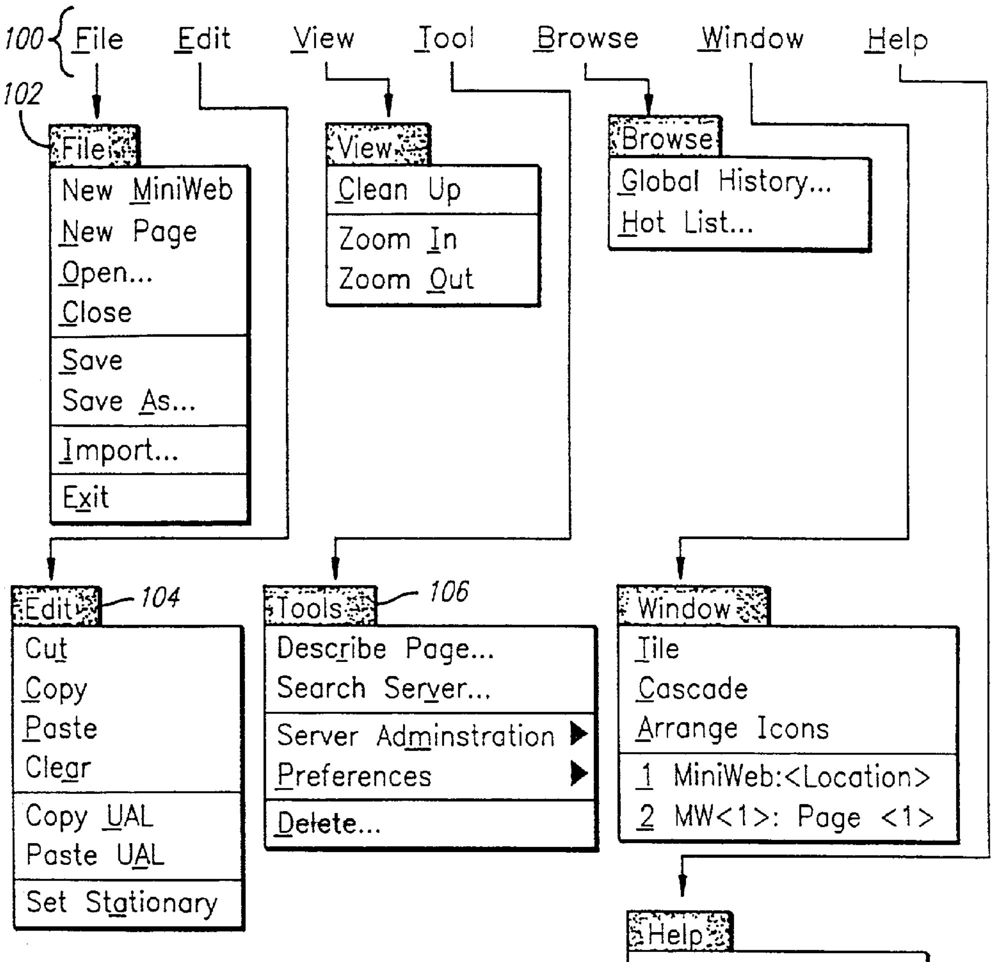

100
File
Edit
View
Tool
Browse
Window
Help
102
File
New MiniWeb
New Page
Open...
Close
Save
Save As...
Import...
Exit
View
Clean Up
Zoom In
Zoom Out
Browse
Global History...
Hot List...
Edit
104
Cut
Copy
Paste
Clear
Copy UAL
Paste UAL
Set Stationary
Tools
106
Describe Page...
Search Server...
Server Adminstration
Preferences
Delete...
Window
Tile
Cascade
Arrange Icons
1 MiniWeb:<Location>
2 MW<1>: Page <1>
Help
Help...
Tutorial...
Tech Support...
About NaviPress...

FIG. 6

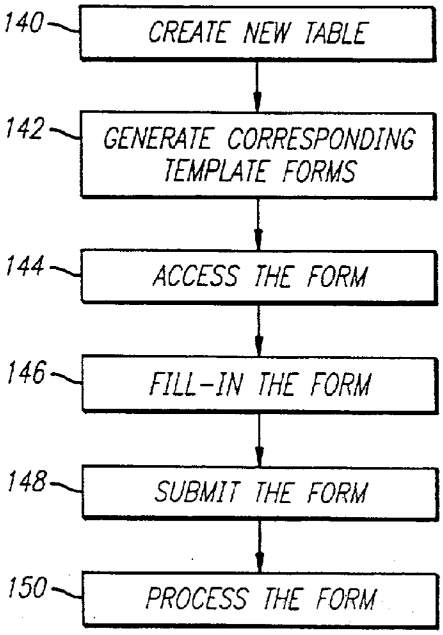
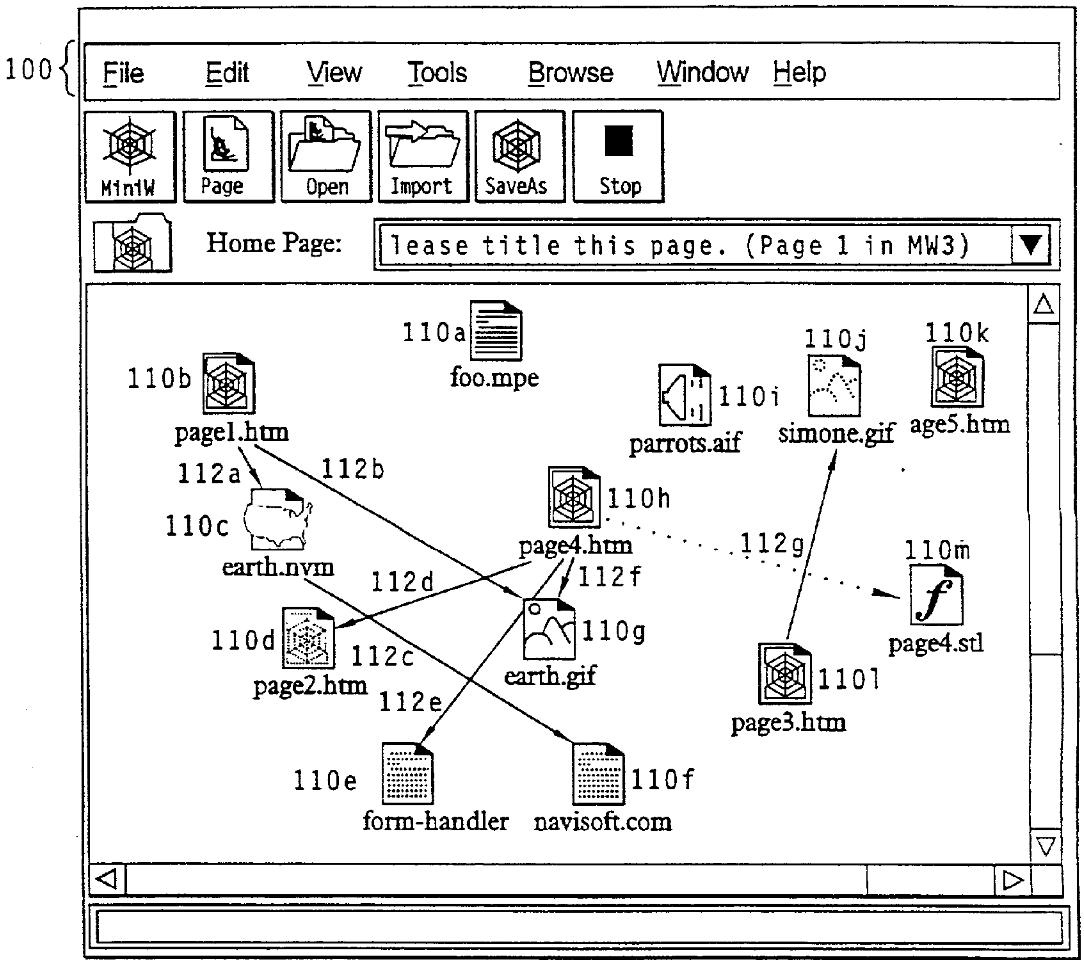

140
CREATE NEW TABLE
142
GENERATE CORRESPONDING TEMPLATE FORMS
144
ACCESS THE FORM
146
FILL-IN THE FORM
148
SUBMIT THE FORM
150
PROCESS THE FORM

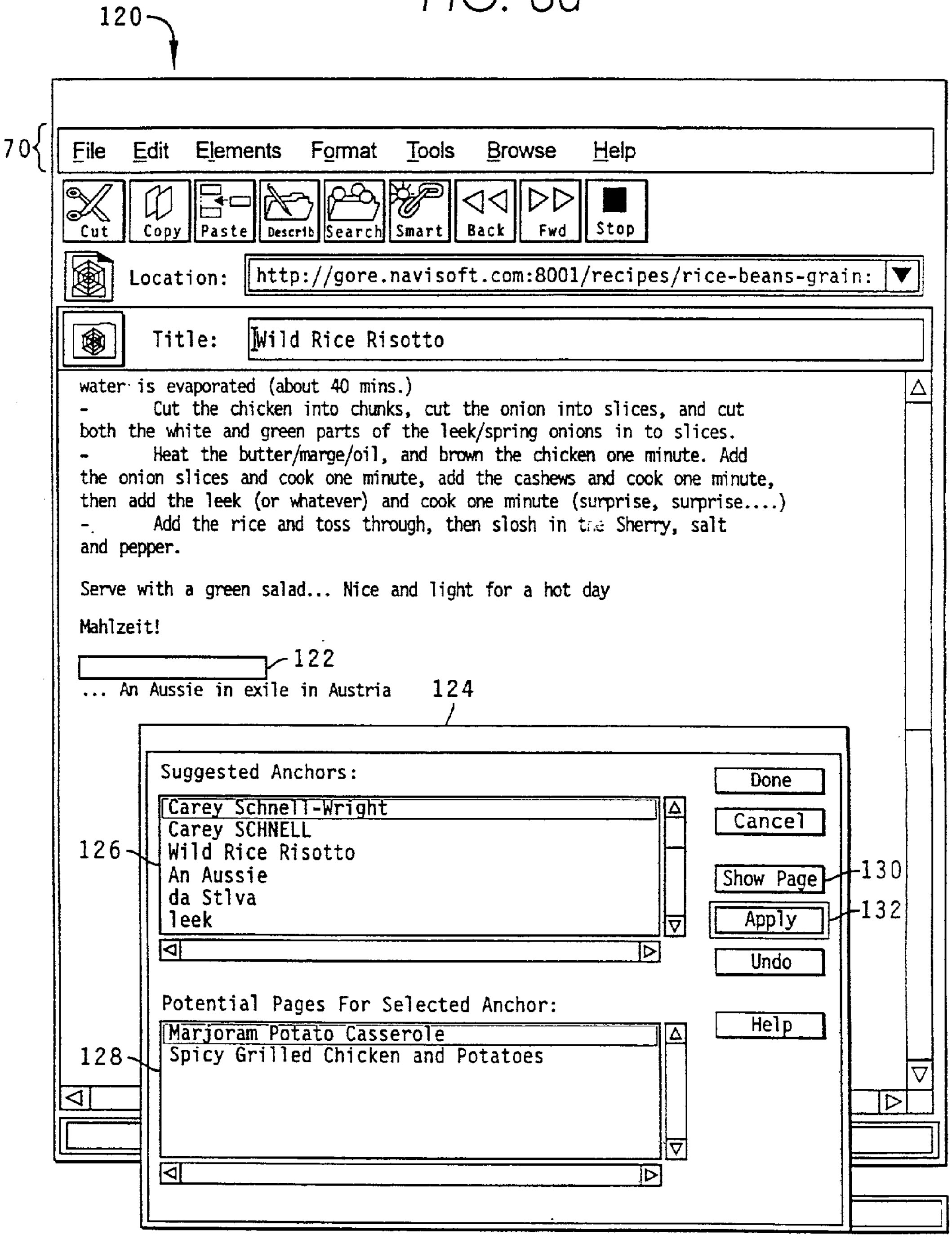
FIG. 9

FIG. 7



Home Page: lease title this page. (Page 1 in MW3)

FIG. 8a



http://gore.navisoft.com:8001/recipes/rice-beans-grain:

Wild Rice Risotto

water is evaporated (about 40 mins.)
- Cut the chicken into chunks, cut the onion into slices, and cut both the white and green parts of the leek/spring onions in to slices.
- Heat the butter/marge/oil, and brown the chicken one minute. Add the onion slices and cook one minute, add the cashews and cook one minute, then add the leek (or whatever) and cook one minute (surprise, surprise....)
-. Add the rice and toss through, then slosh in the Sherry, salt and pepper.

Serve with a green salad... Nice and light for a hot day

Mahlzeit!

... An Aussie in exile in Austria

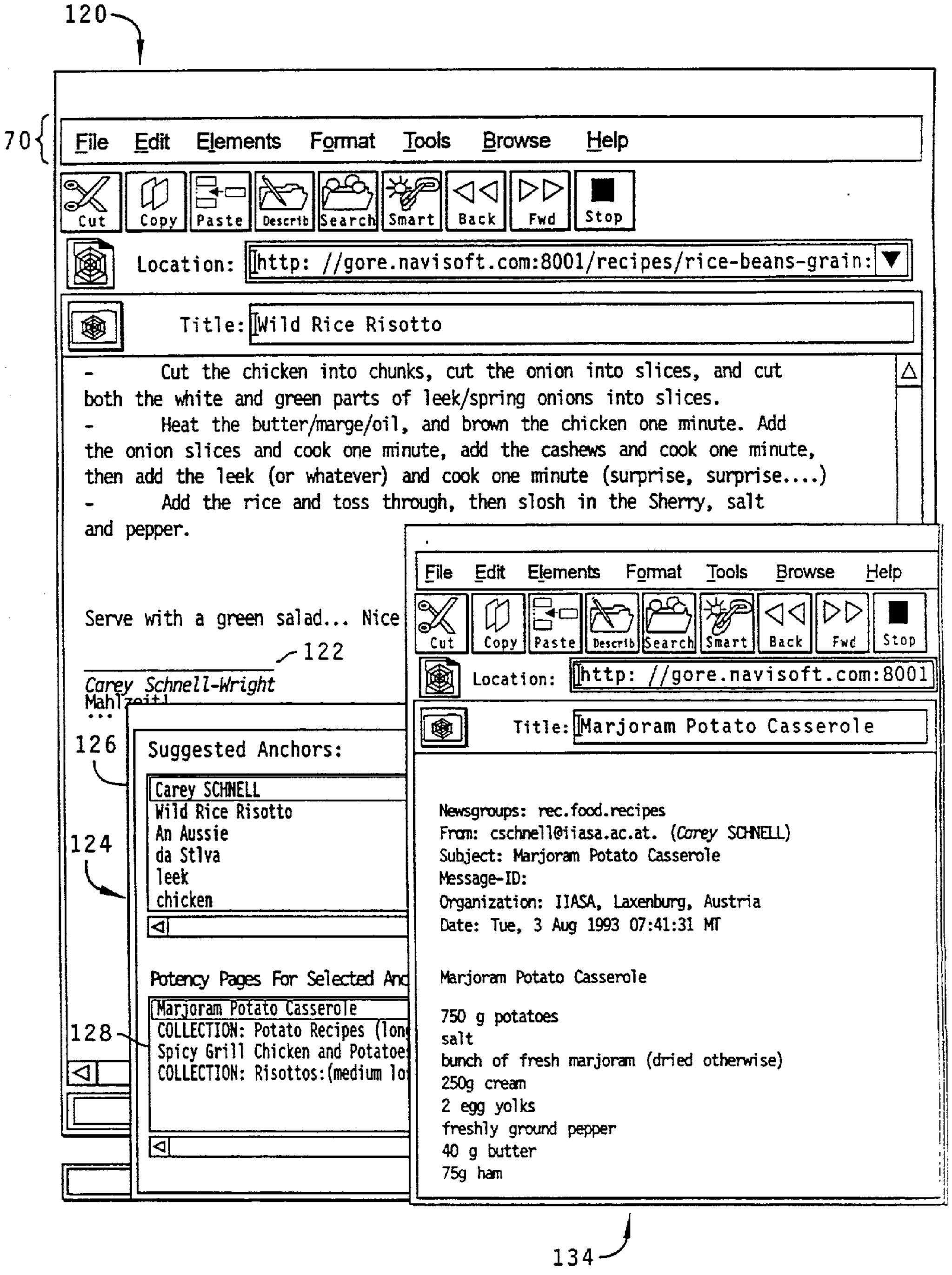
Suggested Anchors:

Carey Schnell-Wright
Carey SCHNELL
Wild Rice Risotto
An Aussie
da Stlva
leek

Potential Pages For Selected Anchor:

Marjoram Potato Casserole
Spicy Grilled Chicken and Potatoes

FIG. 8b



Location: http: //gore.navisoft.com:8001/recipes/rice-beans-grain:

Title: Wild Rice Risotto

- Cut the chicken into chunks, cut the onion into slices, and cut both the white and green parts of leek/spring onions into slices.
- Heat the butter/marge/oil, and brown the chicken one minute. Add the onion slices and cook one minute, add the cashews and cook one minute, then add the leek (or whatever) and cook one minute (surprise, surprise....)
- Add the rice and toss through, then slosh in the Sherry, salt and pepper.

Serve with a green salad... Nice

Carey Schnell-Wright
Mahlzeit!
...

Suggested Anchors:

Carey SCHNELL
Wild Rice Risotto
An Aussie
da Stlva
leek
chicken

Potency Pages For Selected Anc

Marjoram Potato Casserole
COLLECTION: Potato Recipes (lon
Spicy Grill Chicken and Potatoe
COLLECTION: Risottos:(medium lo

Location: http: //gore.navisoft.com:8001

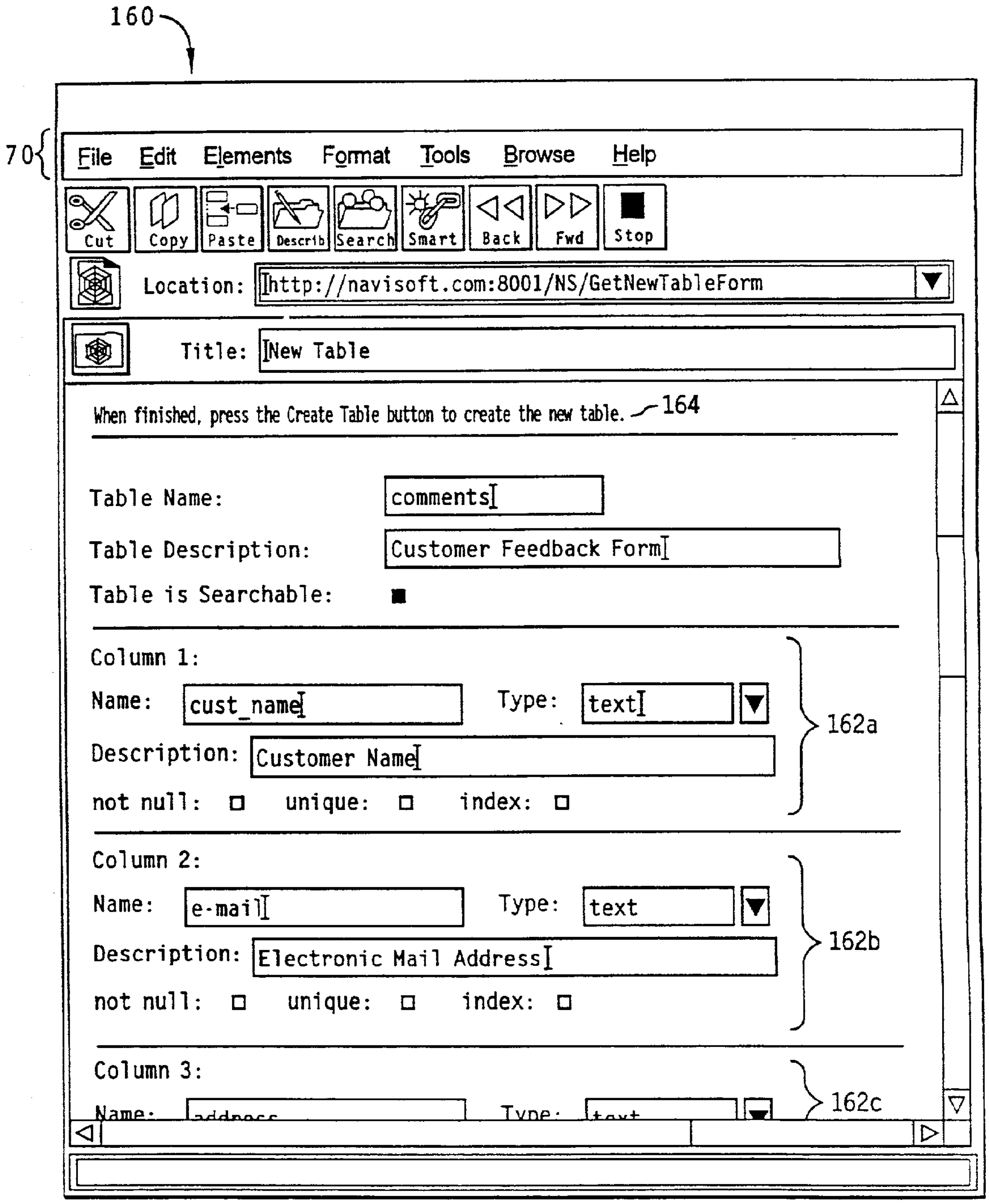
Title: Marjoram Potato Casserole

Newsgroups: rec.food.recipes
From: cschnell@iiasa.ac.at. (Carey SCHNELL)
Subject: Marjoram Potato Casserole
Message-ID:
Organization: IIASA, Laxenburg, Austria
Date: Tue, 3 Aug 1993 07:41:31 MT

Marjoram Potato Casserole

750 g potatoes
salt
bunch of fresh marjoram (dried otherwise)
250g cream
2 egg yolks
freshly ground pepper
40 g butter
75g ham

FIG. 10a



Location: http://navisoft.com:8001/NS/GetNewTableForm

Title: New Table

When finished, press the Create Table button to create the new table.

Table Name: comments

Table Description: Customer Feedback Form

Table is Searchable: ■

Column 1:

Name: cust_name Type: text

Description: Customer Name

not null: □ unique: □ index: □

Column 2:

Name: e-mail Type: text

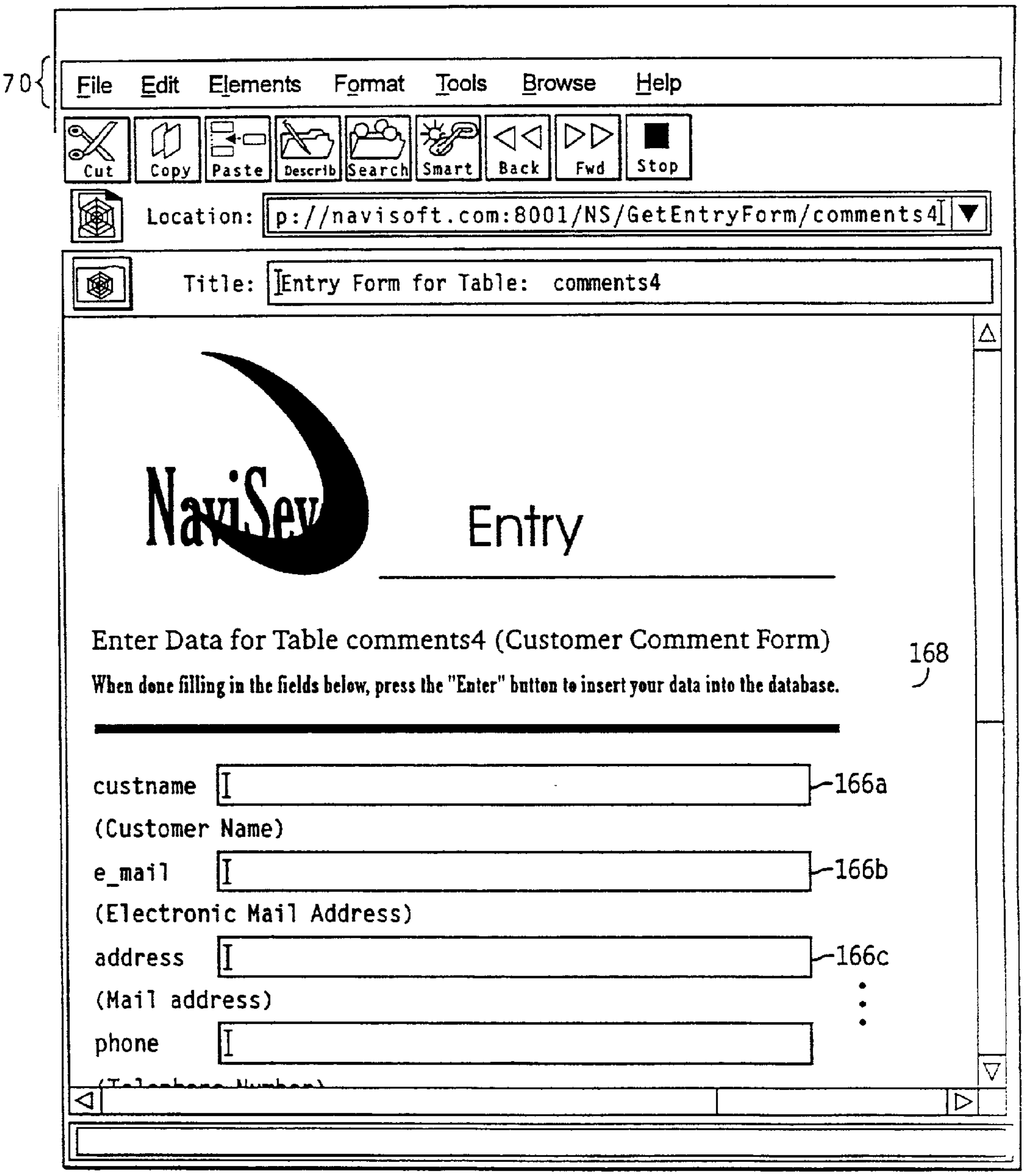
Description: Electronic Mail Address

not null: □ unique: □ index: □

Column 3:

Name: address Type: text

FIG. 10b



Location: p://navisoft.com:8001/NS/GetEntryForm/comments4

Title: Entry Form for Table: comments4

Enter Data for Table comments4 (Customer Comment Form)

When done filling in the fields below, press the "Enter" button to insert your data into the database.

custname

(Customer Name)

e_mail

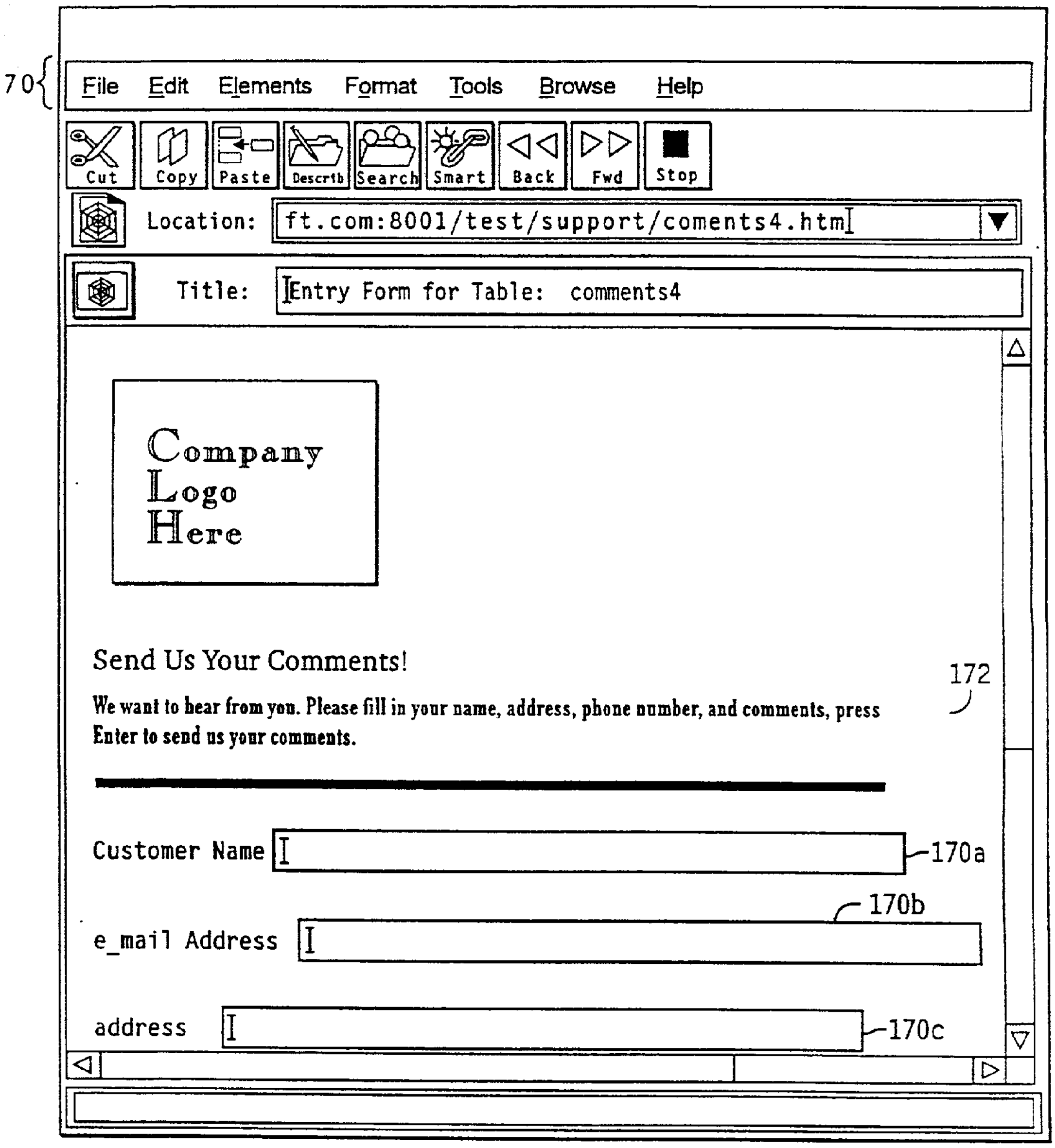
(Electronic Mail Address)

address

(Mail address)

phone

FIG. 10c



Location: ft.com:8001/test/support/coments4.htm

Title: Entry Form for Table: comments4

Send Us Your Comments!

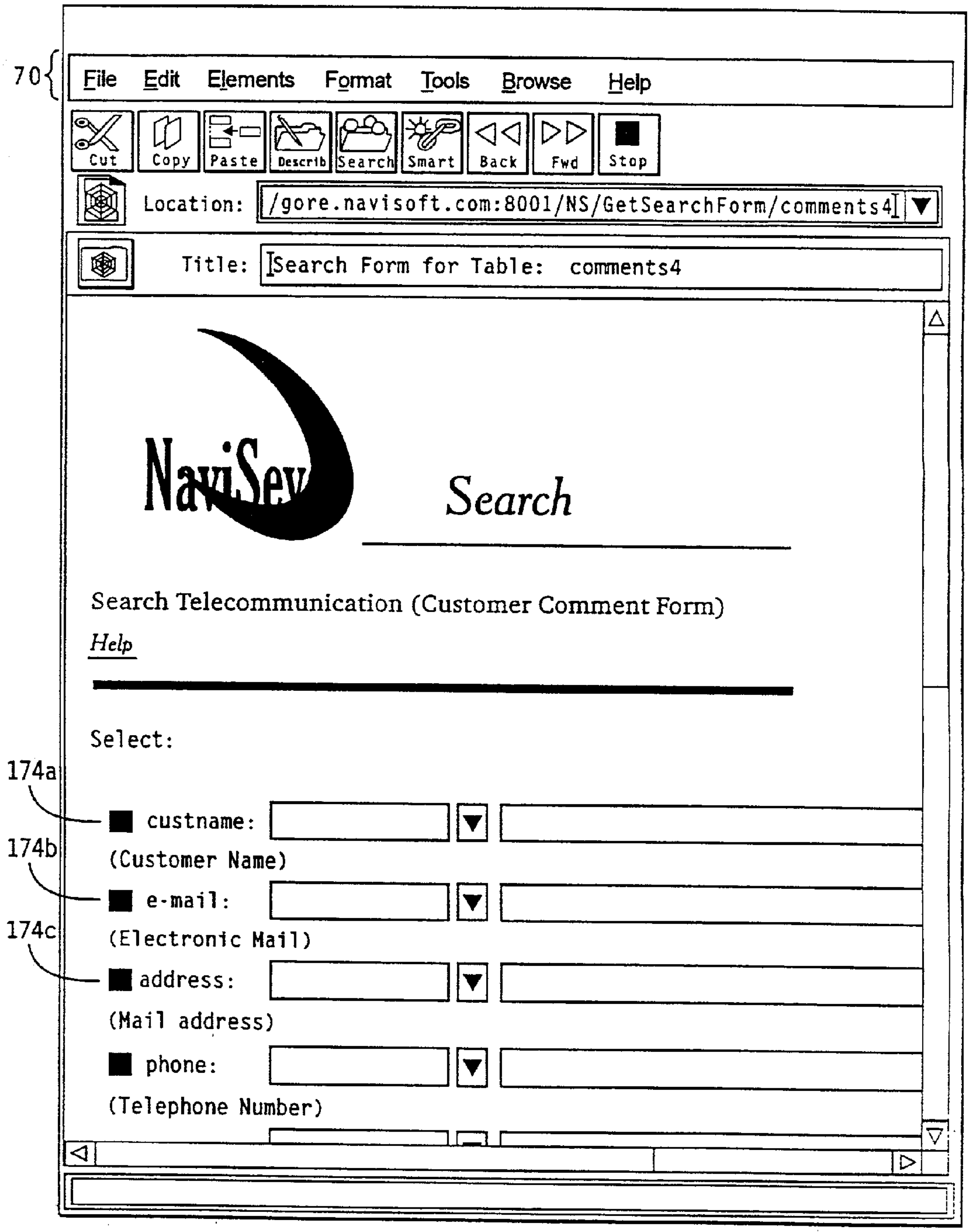
We want to hear from you. Please fill in your name, address, phone number, and comments, press Enter to send us your comments.

Customer Name

e_mail Address

address

FIG. 10d



Location: /gore.navisoft.com:8001/NS/GetSearchForm/comments4

Title: Search Form for Table: comments4

Search

Search Telecommunication (Customer Comment Form)

Help

Select:

■ custname:
(Customer Name)

■ e-mail:
(Electronic Mail)

■ address:
(Mail address)

■ phone:
(Telephone Number)

METHOD AND APPARATUS FOR PUBLISHING HYPERMEDIA DOCUMENTS OVER WIDE AREA NETWORKS

[**0001**] This application is a continuation of U.S. patent application Ser. No. 09/204,745, filed Dec. 2, 1998, which is a continuation of U.S. Patent Application No. 08/412,981, filed Mar. 28, 1995, now U.S. Pat. No. 5,870,552, both of which are incorporated by reference.

FIELD OF THE INVENTION

[**0002**] The present invention relates to the field of authoring, publishing, and managing electronic hypermedia documents across distributed, wide area networks such as the World Wide Web.

BACKGROUND OF THE INVENTION

[**0003**] The distribution of information is being revolutionized before our very eyes. Wide area networks ("WAN's"), notably the Internet, are assuming the role of "information superhighways" and are distributing electronic embodiments of mail, textbooks, magazines, advertisements, and even audio and video clips around the world. Herein, the term "document" denotes and includes any and all such electronic content, generically.

[**0004**] **FIG. 1** conceptually illustrates the basic architecture of a "client-server" WAN like the Internet. Servers 10*a-n* form the backbone of the WAN. The servers are interconnected by a telecommunications infrastructure and exchange information in the form of one or more recognized protocols, such as protocol 30. For example, in the case of the Internet, network protocols include FTP, for file transfer, and Telnet, for remote log-in. Each server effectively represents and services its one or more "clients." Basically, the clients are the ultimate sources and targets of underlying information, while the servers dispatch and receive messages across the WAN in compliance with network protocols. Each client may correspond to a single user's computer, or may itself be hierarchically complex and may comprise a further sub-network or collection of numerous computers, such as the well-known, proprietary sub-networks of America Online, CompUServe, and Prodigy. In this way, information of any kind can be distributed worldwide in electronic form at telecommunications speeds.

[**0005**] One of the most rapidly expanding aspects of the Internet is the World Wide Web (the "Web"). The Web is comprised of those Internet servers (and their clients) able to support the Hyper-Text Transfer Protocol, better known as "http." The Web allows documents and graphical materials to be interlinked by means of "hypertext"(or more generally, hypermedia) document elements. When a user utilizes a cursor control device to select and "click" on a hypermedia item in one document, a related document will automatically be accessed as identified by that link. For example, **FIG. 2** illustrates a simple example of a popular Web document known as a "home page." Home page **40** includes title **42**, graphic image **44**, instructional text **48**, and list of bullet items **46***a-c*. Selections **46***a-c* are each hypertext. A Web hypermedia item is actually encoded with a Uniform Resource Locator ("URL") tag, which literally addresses a document located on a remote network server. If a client of a Web server is equipped with suitable "browser" software, then a user of that client can point and click on any one of the hypermedia items within home page **40**, and an http request to view the associated, linked content residing elsewhere on the Internet will automatically be generated and dispatched by the client's server to the appropriate Internet server which "hosts" the linked document. The linked material will then automatically be retrieved and ultimately displayed on the client. Http further includes the Hyper-Text Markup Language ("html"), which may be used to specify a certain layout structure for Web documents, e.g., specifying subsections of the document as a title, image, list, etc. Html specifications are interpreted by a client's browser, resulting in an appropriate display on the particular client's computer platform. A survey and discussion of many popular Web browsers is provided in the Feb. 7, 1995, issue of PC Magazine ("PC Magazine"), at pages 173-196.

[**0006**] An important challenge that must be addressed, especially in light of the burgeoning expansion and Apopularity of the Internet and the Web, is how best to facilitate the authoring and publishing of hypermedia documents on the Web. Many large and small publishers of content —such as newspaper and magazine publishers, for example —wish to make their content available in on-line form to subscribers. However, this opportunity presents a major bottleneck, because high-quality development platforms and authoring tools have not yet been developed that adequately facilitate the authoring and publishing of hypermedia on a distributed WAN like the Web. A summary of the primary limitations of current Internet and Web publishing tools follows:

[**0007**] 1. Current publishing tools are typically not fully network-integrated. Browsers or other "cruiseware" help users view existing WAN content, but do not generally support authoring of new WAN content. Current authoring tools, on the other hand, are typically either "stand-alone" local products, or at best offer a limited bridge to WAN access such that authoring and WAN navigation remain fundamentally non-integrated processes.

[**0008**] For example, in order to publish a document on a WAN, it is typically necessary to edit documents in a local storage context using authoring tools, and thereafter manually copy the documents to a WAN server. Manual copying is often tedious and inconvenient, especially where a publisher frequently publishes a large quantity of content from diverse sources, including text files, graphics images, video and sound clips, etc. Yet, current authoring tools generally provide little assistance with this chore.

[**0009**] The non-integrated nature of current authoring tools presents other difficulties and limitations as well. For example, it is not generally possible to "open" multiple WAN documents for editing and to transfer text, images, and URL's among those documents in the seamless fashion as is presently done with typical word processors for local computer documents. As another example, current Web authoring tools generally do not provide full WYSIWYG ("What You See Is What You Get") feedback as to html markups and hypermedia links. In other words, the creation and editing of documents is typically performed in a purely local context; html and URL codes must then be separately tested in a serial fashion, by loading the document into a WAN browser or the like. This serial, iterative process is highly inefficient.

[**0010**] 2. Current WAN publishing tools provide little assistance with managing collections of documents. Although the World Wide Web is famous for supporting hypermedia document links, current tools provide scant support for maintaining and operating on collections of related documents as a group. Much progress is needed in this area. For example, an integrated publishing environment should preferably allow users to visually navigate through collections of interconnected documents; to upload, download, and transport collections of documents from one WAN location to another as a group; and to set access privileges or other attributes for a WAN collection as a group. Current tools generally fall far short of these objectives.

[**0011**] 3. Current publishing tools provide little assistance with content-based indexing and retrieval. Current navigational tools, such as browsers, provide very little assistance with systematically organizing and searching the information content contained within the numerous sites comprising a network like the Internet. Clearly, as the volume of both information and traffic on the Internet continues to explode, publishers need to be able to make their content available to subscribers in an intelligently organized fashion that facilitates uniform, content-driven search and access.

[**0012**] 4. Current publishing tools provide little assistance with asset management. For commercial publishers of proprietary material like newspapers or periodicals, asset management is critical. In other words, publishers need to be able to control and limit access to their WAN documents, and to keep track of usage for billing and other purposes. Yet, currently available tools for WAN publishing generally ignore this area almost completely.

[**0013**] 5. Current Publishing tools do not address the creation of application programs. For on-line network publishing to realize its full potential, publishers will want to do more than simply dump passive, one-way content onto the Internet. They will want to provide application programs allowing network users to take advantage of interactive on-line services such as subscribing to a publication, registering for a conference, or perhaps even more exotic applications like participating in multi-player games contests. Current network publishing and authoring tools largely ignore this area.

[**0014**] Accordingly, there is a great need for a new development platform for distributed publishing that overcomes the various limitations described above. This need is especially pronounced and important in view of the rapid expansion of interest in the Internet and the Web, and the tremendous economic opportunities presently available to publishers if a suitable development platform can be provided. Recently, authoring tools have begun to emerge, which attack some of the foregoing problems in piecemeal fashion. See PC Magazine at pp. 110-196. However, there remains a great need for a comprehensive solution to the problems described, and especially for an authoring/publishing tool that is truly and fully network-integrated.

SUMMARY OF THE INVENTION

[**0015**] We disclose herein a development platform technology for publishing hypermedia documents across wide area networks ("WAN's"). This technology supports key publishing functions including document authoring, management and publishing of document collections, and support for database operations and interactive application program development. These functions are supported in a uniquely and fully WAN-integrated manner, as described further below.

[**0016**] In one feature of the present invention, a WAN document residing on a WAN server may be accessed via a hypermedia link, edited, and stored to the same server or any other WAN server, using a client computer coupled to the same server or any other WAN server. The processes of accessing, editing, and storing may be performed using a seamless user interface on the client computer. By "seamless" user interface we mean that users are not required to request additional steps such as intermediate copying or storage of the document being edited, or to switch back and forth among distinct "modes" or interfaces. Thus, browsing and editing of WAN documents is truly integrated. A related feature of the invention allows convenient transfers of content and/or hypermedia links among a plurality of WAN documents, such as by "cut and paste" or "drag and drop" copying. Another related feature provides immediate execution and feedback for any display instructions added to the document using a standard WAN mark-up language.

[**0017**] In another feature of the present invention, at least two WAN documents residing on the same or different WAN servers are accessed, and a hypermedia link addressing one of the documents is inserted into another. Once again, the processes of accessing and editing are performed using a seamless user interface on a client computer. In a related feature of the invention, a list of suggested target hypermedia links is automatically generated using statistical language processing techniques, and the link to be inserted is interactively chosen from that list.

[**0018**] Another feature of the present invention provides a method for publishing and managing a collection of related documents on a WAN. The related documents to be included in the collection are specified, and a desired operation (such as setting access controls or changing location) may then be performed collectively on each document in the collection, simply by interactively issuing a single command corresponding to the operation. A related feature includes hypermedia links between documents of the collection, which address target documents relatively to source documents; i.e., each link address does not specify an absolute address for the target independently of the source. In another related feature, elements of the collection including documents and hypermedia links are graphically depicted using icons and connecting lines, thereby facilitating convenient, visual navigation and organization of the collection.

[**0019**] In a further feature, the present invention includes a method for providing form-driven interactive services on a WAN. A form-driven service is developed by creating a template form comprising one or more informational fields, as well as one or more hypermedia links addressing a database system or other utility program stored on an application server. The form-driven service is utilized by filling in the informational fields, and "clicking" or otherwise signalling on the hypermedia link when ready. In response, the application server is sent an appropriate WAN message, and processes the form. These steps (except the last step) are performed using a seamless user interface environment, so there is once again no need for users to switch interfaces or request any intermediate copying in order to perform the process of creating and filling in a template form and signalling when the form is ready for processing.

BRIEF DESCRIPTION OF THE DRAWINGS

[**0020**] **FIG. 1** illustrates a basic, high-level architecture for a typical client-server WAN such as the Internet or the World Wide Web.

[**0021**] **FIG. 2** illustrates a simple example of a typical "home page" document on the World Wide Web.

[**0022**] **FIG. 3** broadly outlines a client-server architecture in accordance with the present invention.

[**0023**] **FIG. 4** illustrates a preferred document editor environment in accordance with the present invention.

[**0024**] **FIG. 5***a* illustrates a flow diagram for a scenario in which WAN hypermedia documents are created and edited in accordance with the present invention.

[**0025**] **FIG. 5***a* illustrates a flow diagram for a second scenario in which WAN hypermedia documents are created and edited in accordance with the present invention.

[**0026**] **FIG. 6** illustrates a preferred set of interactive commands for working with a collection of interrelated hypermedia documents.

[**0027**] **FIG. 7** illustrates a preferred graphical interface for organizing and working with a collection of interrelated hypermedia documents.

[**0028**] **FIG. 8***a* is a screen image illustrating use of the preferred "NaviLinks" facility to generate suggested hypermedia links.

[**0029**] **FIG. 8***b* is a screen image further illustrating use of the preferred "NaviLinks" facility to generate suggested hypermedia links.

[**0030**] **FIG. 9** illustrates a flow diagram for developing and running WAN-based, form-driven, interactive application programs in accordance with the present invention.

[**0031**] **FIG. 10***a* illustrates a preferred interface form for adding a customer feedback table to an indexed database, in accordance with the present invention.

[**0032**] **FIG. 10***b* illustrates a default template form for adding a particular customer's feedback to an indexed database, in accordance with the present invention.

[**0033**] **FIG. 10***c* illustrates a modified template form for adding a particular customer's feedback to an indexed database, in accordance with the present invention.

[**0034**] **FIG. 10***d* illustrates a template form for searching an indexed database for particular customer feedback, in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Introduction

[**0035**] **FIG. 3** provides a broad outline of a client-server architecture in accordance with the present invention, for use in the context of a WAN such as illustrated in **FIG. 1**. User's client machine **20***d* preferably includes digital computer facilities including CPU **68**, user I/O peripherals **66**, and storage device **64** (including internal and external memory) storing operating system **62** and client software **60**. WAN server **10***d*, preferably coupled to client **20***d* through a high-speed local connection, is equipped with digital computer facilities analogous to those of client **20***d*, and also with server software **50**.

[**0036**] As described in much greater detail below, client software **60** and server software **50** preferably share the responsibility for providing advantageous and innovative electronic publishing capabilities in accordance with the present invention. Note that a user of client computer 20d seeking the benefits of the present invention need only have client software **60** available on client computer **20***d*, and all or part of server software **50** available on server **10***d* (depending on the particular features desired). The user can then advantageously access and publish documents to and from the remainder of the WAN in accordance with the present invention, even though other computer systems on the WAN have not been similarly modified or upgraded.

[**0037**] The inventors are, as of this writing, in the process of developing a preferred embodiment of the present invention including client software **60** called "NaviPress" and server software **50** called "NaviServer." As a supplement to the detailed description provided below, an Appendix is provided herewith which contains illustrative source code, architectural specifications entitled "NaviPress and NaviServer: A Client-Server Publishing System for the World-Wide Web" (hereinafter "White Paper"), and excerpts from a draft User Manual for NaviPress and NaviServer. The reader is referred to the Appendix for more details regarding this preferred embodiment, and the Appendix materials are incorporated herein in their entirety by this reference.

Network-Integrated Editing

[**0038**] The present invention enables users to access, edit, and store documents distributed throughout a WAN, in the advantageous manner of state-of-the-art, private computer or local area network word processing tools. In accordance with the present invention, the basic process framework by which WAN documents are accessed, edited, and stored is seamless and is substantially the same as, if all steps occurred locally on a private computer. In particular, users are not required to perform any intermediary downloading or copying steps, or to switch back and forth among distinct "modes" or interfaces in order to access and browse WAN documents, to edit them, and to store them.

[**0039**] As a more concrete illustration of this capability, **FIG. 4** illustrates a preferred, menu-driven document editor in accordance with the present invention. Typically, menu bar **70** would be displayed continually at the top of a computer display "window" in which a particular document is being edited. "Pull-down" menus, such as "file" menu **72**, are displayed when a user selects a corresponding item from command bar **70**, preferably using a cursor control device. For example, file menu **72** includes commands to "open" existing documents for editing, and to "save" such documents as revised, etc. This general, menu-driven methodology is of course by now familiar to those of ordinary skill in the relevant arts. The present invention enables these capabilities to be applied seamlessly across a wide area network. In other words, a user can conveniently access, edit, and save any WAN document in much the same way as the user has been accustomed to doing with respect to documents residing locally on the user's private, personal computer. Consider a scenario in which multiple WAN hypermedia documents are being worked upon. As indicated in **FIG. 4**, edit menu **74** includes "cut and paste" commands allowing text and other information to be transferred conveniently between multiple WAN documents. "Cut" and "copy" commands will typically post to a "clipboard" (i.e., temporary storage) selected content from any document being edited, while the "paste" command will insert whatever content is currently held in the clipboard into a different document at a point of insertion selected by the user.

[**0040**] The present invention provides further advantages in the context of hypermedia WAN documents, as illustrated by the scenarios described in the flow charts of **FIGS. 5***a* and **5***b*. With respect to **FIG. 5***a*, at step **80** the user of client computer **20***d* invokes file menu **72** to access a source document, such as by "opening" an existing document located on any WAN server. In this example, the source document contains a hypermedia link addressing a target document, located on the same or any other WAN server. At step **82**, the user accesses the target document by "clicking" on the hypermedia link using a cursor control device, which immediately opens the target document for editing in accordance with menu bar **70**, preferably in a separate document window.

[**0041**] At step **84**, the user can immediately edit and revise the accessed target document. This step preferably includes use of a markup language recognized on the WAN, such as html; elements menu **76** and format menu **77** in **FIG. 4** provide convenient tools for creating and editing html content with immediate WYSIWYG feedback. The editing step also preferably includes interactively transferring or copying any selected portion of the source document to the target document (or vice versa), such as by "cutting and pasting" or by "dragging and dropping" the selected portion using a cursor control device. Moreover, the copied portion may include hypermedia links (URL's) or other mark-up codes, and any such mark-up codes will immediately be active as soon as inserted into the target document. Because the browsing and editing environment is seamless in accordance with the present invention, these editing tasks can now be performed without requiring users to switch between separate interface modes or to temporarily download documents into local storage, as was traditionally necessary.

[**0042**] Finally, at step **86**, the target document is saved as revised to any WAN server by using the "save" or "save as" commands of file menu **72**. Note that server **10***d*, the source server, target server, and the ultimate destination server of the target document may all be the same server, or may all be different.

[**0043**] In the scenario described in **FIG. 5***b*, at steps **90** and **92** the user of client computer **20***d* accesses a source document and a target document, such as by invoking file menu **72**. The source and target may originally be located on any wan servers. At step **94**, the "copy URL" command of edit menu **74** is used to post a hypermedia pointer addressing the target document onto a clipboard for temporary storage. (Recall that "URL" is the term for a hypermedia link on the World Wide Web, as discussed earlier in the Background section.) At step **96**, the "paste URL" command of edit menu **74** is used to paste the stored hypermedia link onto a selected "anchor" item of content within the source document. At step **98**, this new document, including the new hypermedia link, may be "published" by storing it to any WAN server, simply by using the "save" commands of file menu **72**. Thus, in accordance with the present invention, publishing hypermedia content across a WAN is achieved in a highly advantageous manner that fully and seamlessly integrates hypermedia browsing and editing.

[**0044**] As briefly noted above, the WAN-integrated editing environment is enhanced by elements menu **76** and format menu **77** which provide WYSIWYG feedback for html markup authoring without any need for users to separately launch a browser program or upload the document being edited. Other, preferred features of the editing environment depicted in **FIG. 4** include WAN browser menu **78**, display options and preferences, and access to help. Menu bar **70** further provides access to various WAN tools and services discussed further below, including "NaviLinks" link generation; form-driven database update and search, and asset administration services.

[**0045**] In summary, prior art technology has traditionally separated between WAN "browsing" on one hand, in which WAN documents are accessed and mark-up codes are interpreted and executed, and document editing on the other hand, in which documents are modified. Conventionally, users must manually switch between distinct browsing and editing environments or "modes," and/or perform intermediate steps in which WAN documents of interest are downloaded to the user's private local storage, thereafter edited, and thereafter uploaded back to the WAN. The present invention now enables users to access WAN documents, copy content (including hypermedia links and other mark-up codes) among multiple WAN documents, and execute WAN mark-up codes, all in a seamless fashion without requiring intermediate steps. Moreover, these capabilities require only the user's computer system to include software implementing the browsing and editing environment, and do not require any modification of other WAN computers.

[**0046**] For more details on an exemplary embodiment of the WAN document editing and browsing environment, the user is referred to the Appendix, and especially to the draft User Manual at Chapters 2, 3, and Appendix A. Exemplary source code for use in implementing this unique environment is also included in the Appendix.

[**0047**] Working With Collections of WAN Documents Another aspect of the present invention is the ability to publish, maintain, and otherwise operate on collections of multiple, related documents as a group. This is an especially valuable capability in the context of hypermedia collections, where there are explicit links between specific, related portions of documents.

[**0048**] **FIG. 6** illustrates a preferred, menu-driven authoring environment called "the MiniWeb" for working with collections of related documents in accordance with the present invention. Typically, menu bar **100** is displayed continually at the top of a computer display "window" in which a particular collection is being operated on. Many of the basic operations provided by the pull-down menus available through menu bar **100** are performed collectively upon the current document collection (or "miniweb"); in other words, a single command will be applied to all members of the collection, as a group. For example, pull-down "file" menu **102** includes commands to "save" a miniweb to any specified location in the WAN. When invoked, the command automatically stores all documents and objects in the collection to the desired new (or old) storage site. Preferably, edit menu **104** includes commands to globally search and replace a common portion of content, such as an updated company logo or URL, shared by many or all documents in the collection, although this particular command option is not explicitly shown in **FIG. 6**. Similarly, tools menu **106** performs administrative tasks, such as setting access controls (i.e., costs and security privileges), for collections as a group.

[**0049**] A related aspect of this invention involves the ability to transport collections of documents interrelated by hypermedia links in a convenient manner. Those of skill in the art recognize that when the target reference of a hypermedia link is moved, the link is thereby "broken," much like the address on a letter to a recipient who has moved and left no forwarding address. Thus, moving a collection of documents interrelated by numerous hypermedia links has been extremely onerous using prior art technology, since the hypermedia links must manually be "fixed" to address new locations.

[**0050**] In accordance with the present invention, one or more relative hypermedia links are preferably created among the documents of a collection. A "relative" link only addresses its target document relative to the source document's address. In other words, only a portion of the full target address is given, namely, a portion sufficient to locate the target relative to the source. Preferably, a specification of a hierarchical directory structure for each collection is maintained in a separate file along with the collection, so that only the topmost page in the collection need be tied to an absolute address, while other hypermedia links within the collection can be made relative and still be interpreted properly. Sample listings for such a specification are included on the following pages. Because the links are relative, they do not need to be modified when the collection is moved.

```
navidoc 1.0
graph=1
nametype=0
title=
style=
template=
Pages:
"top.htm" Up="" Style="" Title="The NaviServer Documentation" 1 94 467
"install.htm" Up=""Style="" Title="Installing the NaviServer" 1
"startup.htm" Up="" Style="" Title="Starting up the NaviServer" 1
"security.htm" Up="" Style="" Title="Security on the NaviServer" 1
"costs.htm" Up="" Style="" Title="Charging money for access " 1
"search.htm" Up="" Style="" Title="Searching the NaviServer" 1
"srchdata.htm" Up="" Style="" Title="Searching Database Tables" 1
"srchpage.htm" Up="" Style="" Title="Searching for Pages" 1
"hitlist.htm" Up="" Style="" Title="Hitlists and Hittabies" 1
"hilite.htm" Up="" Style="" Title="Hiliting and MoreLikeThis" 1
"under.htm" Up="" Styles="" Title="Coming Soon!" 1
"entup.htm" Up="" Style="" Title=Entering Data and Updating It" 1
"smartlnk.htm="" Up="" Style="" Title="SmartLinking" 1
"describe.htm" Up="" Style="" Title="Describing Pages" 1
"custom.htm" Up="" Style="" Title="Customizing Entry, Update and Search Forms" 1
"archive.htm" Up="" Style="" Title="Archive Versioning" 1
"logging.htm" Up="" Style="" Title="Logging" 1
"ops.htm" Up="" Style="" Title="NaviServer URL Reference" 1
"maktable.htm" Up="" Style="" Title="Creating.and Dropping Tables" 1
"tables.htm" Up="" Style="" Title="NaviServer System Tables" 1
"page21.htm" Up="" Style="" Title="Please title this page. (Page 21 in servdocs)" 1
"sumobanr.gif" Up="" Style="" Title="" 1
"sumoguy1.gif" Up="" Style="" Title="" 1
"sumoguy2.gif" Up="" Style="" Title="" 1
"sumoguy3.gif" Up="" Style="" Title="" 1
"sumoguy4.gif" Up="" Style="" Title="" 1
"sumoguy5.gif" Up="" Style="" Title="" 1
"sumoguy6.gif" Up="" Style="" Title="" 1
"sumochar.gif" Up="" Style="" Title="" 1
"sumoleaf.gif" Up="" Style="" Title="" 1
"sumoguy7.gif" Up="" Style="" Title="" 1
"sumoguy8.gif" Up="" Style="" Title="" 1
"fujibrch.gif" Up="" Style="" Title="" 1
"fujimt.gif" Up="" Style="" Title="" 1
"sumobboo.gif" Up="" Style="" Title="" 1
"sumofeet.gif" Up="" Style="" Title="" 1
"sumohnds.gif" Up="" Style="" Title="" 1
"sumoarm.gif" Up="" Style="" Title="" 1
"cthulhu.gif" Up="" Style="" Title="" 1
"iceman.gif" Up="" Style="" Title="" 1
"sumochr2.gif" Up="" Style="" Title="" 1
Ghosts:
```

-continued

```
Refs:
"top.htm"
    0 "install.htm"
    0 "startup.htm"
    0 "security.htm"
    0 "costs.htm"
    0 "search.htm"
    0 "under.htm"
    0 "entup.htm"
    0 "smartlnk.htm"
    0 "describe.htm"
    0 "custom.htm"
    0 "archive.htm"
    0 "logging.htm"
    0 "ops.htm"
    0 maktable.ht:
    0 "tables.htm"
    2 "sumobanr.gif"
    0 "srchpage.htm"
    0 "http://www.yahoo.Com/Computers/World_Wide_Web/Databases_and_Searching/"
"install.htm"
    0 "startup.htm"
    2 "sumoguyl.gif"
"startup.htm"
    4 "costs.htm"
    4 "archive.htm"
    4 "logging.htm"
    2 "sumoguy2.gif"
"security.htm"
    0 "/NS/GetSearcForm/ns_users"
    0 "/NS/GetSearchForm/ns_groups"
    0 "/NS/GetSearchForm/ns_groups2user5
    0 "/NS/GetSearchForm/ns_permission"
    0 "/NS/GetSearchForm/ns_methods"
    2 "sumoguy3.gif"
"costs.htm"
    0 "security.htm"
    4 "startup.htm"
    2 "suxnoguy8.gif"
    0 "/NS/GetSearchForm/ns_costs"
    0 "/NS/GetSearchForm/ns_charges"
    0 /NS/GetSearchForm/ns_total_charges
"search.htm"
    1 "/NS/GetSearchFormPicker
    1 "srchdata.htm"
    1 "srchpage.htm"
    1 "hitlist.htm"
    1 "hilite.htm"
    2 "sumoguy4.gif"
    1 "/NS/GetSearcForm/ns_permissions"
    1 "/NS/GetSearchForm/ns_users"
"srchdata.htm"
    8 "http://www.navisoft.com/STUB"
    2 "sumoguy5.gif"
"srchpage.htm"
    2 "sumoguy6.gif"
    8 "http://www.navisoft.com/STUB"
    0 "/NS/GetSearchForm/ns_default_collection"
"hitlist.htm"
    0 "INS/GetSearchFormlns_default_collection"
    0 "http://www.navisoft.com/STUB"
    0 "http://www.ncaa.uiuc.edu/SDG/Software/XMosaic/help-on-version-2.5b5.html'
    0 "http://ww.netscape.com/info/newsrelease16.html"
    0 "http://www.w3.org/hypertext/WWW/Arena/"
    0 "/NS/GetSearcbForm/ns_total_charges"
    2 "sumochar.gif"
"hilite.htm"
    0 "/NS/MoreLikeThis/?Url=%2fservdoc%2ftop.htm"
    0 "/servdoc/top.htm"
    0 "NS/GetLHP/?Url=%2fservdoc%2ftop.htm&terms=cool"
    2 "sumoleaf.gif"
"under.htm"
    2 "cthulhu.gif"
"entup.htm"
    8 "http://www.navisoft.com/STUB"
    2 "sumoguy7.gif"
```

-continued

```
    0 "/NS/GetEntryForm/ns_permissions"
"smartlnk htm"
    2 "fujibrch.gif"
"describe.htm"
    8 "http://www.navisoft.com/STUB"
    2 fujimt.gif"
"custom.htm"
    2 "sumofeet.gif"
    2. "/NS/GetSearchForm/ns_columns"
"archive.htm"
    4 "startup.htm"
    2 "sumohnds.gif"
    0 "http://navisoft.com:8001/NS/ArchiveVersions/index.html"
    0 "http://navisoft.com:8001/index.html"
    0 "http://navisoft.com:8001/NS/Archive/19950222000000/index.html"
"logging.htm"
    4 "startup.htm"
    2 "sumoarm.gif"
"ops.htm"
    2 "iceman.gif"
    1 "/NS/GetSearchFormPicker"
    1 "/NS/Admin"
    1 "/NS/About"
    1 "/NS/GetNewTableForm"
"maktable.htm"
    0 "/NS/GetDropTableForm"
    0 "/NS/GetCreateTableForm"
    2 "sumobboo.gif"
"tables.htm"
    2 "sumochr2.gif"
"page21.htm"
"sumobanr.gif"
"sumoguy1.gif"
"sumoguy2.gif"
"sumoguy3.gif"
"surnoguy4.gif"
"sumoguy5.gif"
"su.moguy6.gif"
"suxnochar.gif"
"sumoleaf.gif"
"sumoguy7.gif"
"sumoguy8 gif"
"fujibrch.gif"
"fujimt.gif"
"sumobboo.gif"
"sumofeet.gif"
"sumohnds.gif"
"stumoarm.gif"
"cthulhu.gif"
"iceman.gif"
"sumochr2.gif"
```

[**0051**] A preferred embodiment of the MiniWeb facility that has been described includes an advantageous, graphical front-end for viewing and navigating within a collection of hypermedia documents. **FIG. 7** illustrates an example of such a miniweb interface. Display icons **110***a-n* each represent corresponding documents located anywhere on the WAN, or anywhere within the user's local storage. Arrow icons **112***a-n* indicate hypermedia links between documents, in the direction indicated by the arrows. Thus, the miniweb display provides an intuitive, graphical view of the relationship among a collection of hypermedia documents.

[**0052**] The graphical interface of **FIG. 7** is preferably displayed in a separate window of client computer 20d, alongside document editing windows in accordance with **FIG. 4**. Users can preferably use the miniweb window as a short-cut to access desired documents within a collection by simply "double-clicking" on the corresponding icon in the miniweb, or by "dragging and dropping" an icon from the miniweb onto a document editing window. Moreover, the precise appearance of icons and connecting arrows preferably indicates the nature or state of the corresponding document or link. For example, icon **110***i* represents a sound file, while icon **110***b* is a hypermedia "web" document, as suggested by the appearance of those two icons. Further, the color and shading of icons and arrows may indicate such states as a modified and unsaved document, or a relative or absolute address link. For more details regarding the graphical interface of **FIG. 7** and its preferred uses, the reader is referred to the draft User Manual in the Appendix, and particularly chapters **4** Appendix B thereto. Once again, source code included in the Appendix provides exemplary means for implementing the miniweb facility we have described.

[0053] Automated Authoring of WAN Hypermedia: "NaviLinks"

[0054] Most content on the World Wide Web is not originally created as hypermedia. For example, news articles, product brochures, and other literature originally created for non-interactive environments do not initially contain any hypermedia links to other documents. Such links must be creatively defined and implemented. A preferred feature of the present invention provides assistance in the authoring of hypermedia WAN documents, by facilitating and partially automating the creation of useful hypermedia links. This facility, which we call "NaviLinks" herein, uses statistical language processing algorithms to generate automatically a list of suggested, possible hypermedia links between a source document and a collection of potential target documents. A human author can then review the suggestions in a convenient manner, and choose to incorporate, modify, or discard them.

[0055] The NaviLinks facility is preferably integrated along with the publishing tools described above, and as illustrated in the "screen shots" of **FIGS. 8***a* and **8***b*. Both figures depict document editing window **120**, including menu bar **70** in accordance with the teachings of **FIG. 4** and the earlier discussion herein. A document entitled "Wild Rice Risotto"(evidently a recipe) is currently open within window **120**. In the example shown, the user has already invoked the NaviLinks facility for assistance in creating hypermedia links from the recipe document to related documents. NaviLinks window **124** is thus shown overlapping on document editing window **120**. Window **124** displays list **126** of suggested anchor items. An "anchor" item is an item of content within a source document encoded as a hypermedia link; users "click" on anchor items to bring up linked target documents. Thus, the highlighted entry in list **126** corresponds to item **122** in the recipe document, namely, the recipe author's name (Carey Schnell-Wright). NaviLinks window **124** also displays list **128** of potential target documents for the currently highlighted anchor item. The lists of suggested anchor items and potential targets are generated automatically, preferably using statistical language processing techniques such as provided in the Xerox Lexical Technology ("XLT") package commercially available from the Xerox Corporation.

[0056] Because of the integrated nature of the tools described herein in accordance with the present invention, the process of exploring and selecting among the suggested anchor items and corresponding hypermedia links shown in **FIG. 8a** can be performed very conveniently. For each anchor item in list **126**, a suggested link in list **128** can be encoded directly onto the anchor item in the source document by pressing "Apply" button **132**; or, the target document addressed by the suggested link can itself be accessed and edited in yet another editing window, by pressing "Show Page" button **130**. **FIG. 8***b* illustrates the results of pressing these buttons. The visual appearance of anchor item **122** is updated to indicate that it is now encoded as an URL (i.e., a hypermedia link), as a result of the user "applying" a suggested link. In addition, as a result of the user selecting a "Show Page" request, document editing window **134** has been created overlapping on windows **120** and **124**, and displays an open WAN document containing another recipe by the same author and entitled "Marjoram Potato Casserole."

[0057] WAN-Integrated. Form-Driven, Interactive Services

[0058] A hypermedia publishing platform should preferably support not only the authoring and distribution content, but also a variety of form-driven interactive services, such as content-based indexing of documents, and controlled access to proprietary WAN documents. Preferably, application developers and end-users should be able to generate and store new forms, retrieve existing forms, fill out forms, and submit them for appropriate processing, all in a convenient and seamless manner utilizing an integrated editing and browsing environment such as described earlier in connection with FIGS. **4**-**7**.

[0059] A great many, desirable, interactive WAN services are database-oriented. For example, a service might involve a particular database "view"(i.e., a specified set of indices) for indexing WAN documents, for managing historical versions of WAN documents, for collecting and reviewing customer feedback, or for relating specified access controls (such as security restrictions and access costs, perhaps of a hierarchical nature) to specific, proprietary WAN documents. Therefore, the form-driven interface environment of the present invention is preferably integrated not only with editing and browsing tools as previously described, but also with a database management system such as the Illustra object relational database management system.

[0060] **FIG. 9** illustrates a sample process flow diagram for developing and utilizing form-driven, interactive, database services in accordance with the present invention. At step **140**, a developer user begins the process of setting up a new interactive service by using client computer **20***d* to create a new database table for the service, preferably using an integrated authoring environment such as window **160** in **FIG. 10***a*. As shown, window **160** includes menu bar **70**, and the seamless browsing and editing facilities described earlier herein. The table created in step **140** will include a plurality of data fields **162***a-n*. As illustrated in **FIG. 10***a*, each one of data fields **162***a-n* preferably may be associated with various specifications such as a required data type, and whether or not database entries in the table will be indexed (and hence searchable) using that field. As indicated by comment **164** in **FIG. 10***a*, step **140** is completed by pressing a "create table" button or the like. The "create table" button is actually just a special kind of hypermedia link which transmits a requested operation for processing by a target WAN server on which server software **50** is available, as will be described in greater detail further below. In this case, clicking on a "create table" button sends a network message formally registering the new database table with server **10***d* or another selected WAN server (hereinafter, the "application server") on which server software **50** including a database management system is available.

[0061] Once a database table is created, at step **142** template forms are generated for interactively updating and searching the database described by the new table. Updating, such as by adding a new database entry, may interactively be performed using a form as illustrated in **FIG. 10***b*, in which informational fields **166***a-n* correspond to the data fields **162***a-n* specified in the database table. Thus, a user who accesses the entry form at step **144** can then describe the database attribute values for a new entry at step **146** simply by filling in informational fields **166***a-n*. Analogous comments apply with regard to forms for submitting a specific database search or query, such as the form of **FIG. 10***d* which includes corresponding information fields **174***a-n*.

[**0062**] Because description and search forms are integrated with the authoring environment previously described, as indicated by the presence of menu bar **70** in **FIG. 10***b*, **10***c*, and **10***d*, users can seamlessly take full advantage of the editing capabilities of that environment in the course of filling out description or search forms. For example, while a WAN document is being accessed and edited by the user in one display window, the user can fill out a corresponding description form or access control form in another window, concurrently. Moreover, users can even modify and customize the style and appearance of entry or search forms, by using the editing facilities of menu bar **70**, such as the html mark-up commands of the Elements and Format menus (as discussed previously in connection with **FIG. 4**). For example, **FIG. 10***c* depicts an edited version of **FIG. 10***b* that still corresponds to the database table of **FIG. 10***a*. Thus, fields **170***a-n* of **FIG. 10***c* map directly onto fields **166***a-n* of **FIG. 10***b*, but are merely displayed in a somewhat different appearance.

[**0063**] Thus, the steps of generating and filling in new tables, entry forms, and search forms are seamlessly integrated with the editing and browsing environment previously described. Moreover, even the step of submitting a completed form to the application server for processing may likewise be performed in seamless fashion together with the preceding steps. Thus, at step **148**, a user who has completed a database entry or search form submits the form to the application server by pressing a hypermedia "enter" button or the like using a cursor control device as indicated by comments **168** (on **FIG. 10***a*) and **172** (on **FIG. 10***b*), akin to the "create table" button described above in connection with **FIG. 10***a*. Entry and search forms are thus "live," meaning that completing a form and interactively signalling a hypermedia link included in the form will automatically send an appropriate message to the application server, causing server software **50** to initiate appropriate database actions at step **150**. The user need not invoke a separate interface, copy any files, or compose any database scripts. Thus, to enjoy interactive database services, users can simply fill out forms using the same environment they use to access and edit documents.

[**0064**] Note that a WAN document referenced in a database may preferably be located anywhere in the WAN in accordance with the present invention, and need not be local to the application server. From the standpoint of server software **50** the database tables reference and index WAN-compatible URL's, (i.e., WAN address pointers), and so need not store documents locally. Note also that, multiple tables and hence multiple indexing views and forms covering the same documents are possible. For example, an administrator might systematically index all documents on a server, while individual users might create their own indexing schemes for documents and criteria of special interest.

[**0065**] For more details regarding various menu-driven interactive services provided by a preferred embodiment of the present invention, the reader is referred to the Appendix, and especially to chapter **5** of the draft User Manual and chapter 3.3 of the White Paper. Details regarding a preferred architecture and implementation for server software **50** in support of menu-driven interactive database services will now be described.

[**0066**] Preferred embodiments of client software **60** ("NaviPress") and server software **50** ("NaviServer") communicate through a WAN hypermedia protocol such as http. All requests and responses between client and server are accomplished through http. Thus, NaviPress sends requests to NaviServer using GET, PUT, POST, BROWSE, and DELETE methods, and NaviServer returns results using standard http return codes, as well as some special content types in accordance with the present invention. Both NaviPress and NaviServer are thus "open" in the sense that any http-compliant client computer can access most services provided by NaviServer, and NaviPress can be used with any http-compliant WAN server.

[**0067**] NaviPress requests for services from NaviServer may contain ordinary URL's, but sometimes contain special URL's that map to server functions. If a request is not immediately serviceable—e.g., GET a page for browsing—NaviServer checks to see if the URL contains a special data field encoding a registered operation that maps to server-specific processing code. For example, NaviServer preferably includes about twenty pre-installed operations, listed in Table 1, for implementing common server functions such as publishing, administration, information retrieval, and document management functions. These special URL's take the general form of "/prefix/operation/arguments," where the "arguments" are an arbitrarily long string that is passed to the "operation." The NaviServer looks for registered prefixes and recognized operations, and then passes the request to the appropriate utility program or process. NaviServer is designed so that custom services can be added easily. Application developers can register new operations with their own unique prefixes. Since a standard, open protocol is used for communications between client and server, even vendors of other authoring tools can write interfaces that advantageously publish content to a server running NaviServer software.

TABLE 1

Examples of NaviServer operations

GetSearchFormPicker	Get list of links to a variety of search forms installed on the server. Examples include problem report forms, customer comments, permissions.
GetSearchForm	Get a specific search form for specifying search criteria.
SearchQueryByForm	Search via query by form.
GetLocalHilitedPage	Get a local highlighted page, where highlights identify the terms in the page that met the selection criteria
GetRemoteHilitedPage	get a remote highlighted page, where highlights identify the terms in the page that met the selection criteria

TABLE 1-continued

Examples of NaviServer operations	
MoreLikeThis	search via "more like this" (find similar documents by using terms in the target page)
NaviLink	generate anchor terms and phrases
GetEntryForm	get form for database entry
GetUpdateForm	get form for database update
GetUpdateOrEntryForm	get update (existing data) or entry (new data) form as appropriate
GetMeta Tables	get list of entry tables
Admin	administrative controls and views for access (permissions and costs), tables (view, add, drop), users and groups (view, add, assign), and usage (raw or by user)
About	gets information about server (name, version, host, port, database, archiving charging)
ArchiveVersions	archive a version of a page or document
GetNewTableForm	get a new table form, for creating a new table
CreateTable	create a table

[0068] For more details on this subject, the reader is referred to the Appendix hereto, especially the White Paper at chapter **4**, and sample source code for the server software and related code.

Other Variations

[0069] The fully integrated client-server environment illustrated herein represents a very powerful and flexible platform for authoring hypermedia content. Detailed illustrations have been provided for the edification of those of ordinary skill in the art, and not as any kind of limitation on the scope of the invention. Numerous variations and modifications within the spirit of the present invention will of course occur to those of ordinary skill in the art in view of the preferred embodiments that have now been disclosed. Such variations, as well as any other systems embodying any of the following claims, all remain within the scope of the present invention:

NaviSoft

NaviPress and NaviServer

A Client-Server Publishing System for the World-Wide Web

Linda T. Dozier

NaviPress and NaviServer form an integrated client-server network publishing system for creating content, managing information, and developing applications on the World-Wide Web. Our software is intended for companies and enterprising individuals who want to create and maintain innovative, operational Web applications. NaviPress and NaviServer provide the following unique combination of services:

- the "MiniWeb," to graphically visualize and organize a collection of pages into a document;
- integrated WYSIWYG authoring and browsing of Web pages without typing HTML (hypertext markup language) tags or names of URLs (uniform resource locators);
- seamless access to both local and remote Web pages, allowing remote authoring over the Internet;
- "NaviLinks," to easily translate text into hypertext and automatically identify related pages;
- an information architecture for management and control of assets;
- HTML as a general-purpose, forms-oriented interface to a DBMS that eliminates the need for CGIs (common gateway interfaces);
- an easy-to-use hierarchical access control and cost model;
- example "Blueprints" that function like Microsoft Wizards for the Web;
- extensibility, to implement custom services.

What is claimed is:

1. A computer program, residing on a computer-readable medium, for publishing electronic documents comprising one or more servers, said computer program for use by a user having a client computer operably coupled to a first server, said computer program comprising instructions for causing a computer to:

access a source document located on a source server, the source document including at least one link addressing a target document located on a target server;

access the target document by signaling the link using a cursor control device;

edit the target document; and

save the target document as modified on a destination server,

wherein the foregoing instructions are performed regardless of whether the first, source, target, and destination servers are the same or different servers.

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