NOTATIONS AND NOMENCLATURE

The detailed descriptions which follow may be presented in terms of program procedures executed on a computer or network of computers. These procedural descriptions and representations are the means used by those skilled in the art to most effectively convey the substance of their work to others skilled in the art.

A procedure is here, and generally, conceived to be a self-consistent sequence of steps leading to a desired result. These steps are those requiring physical manipulations of physical quantities. Usually, though not necessarily, these quantities take the form of electrical or magnetic signals capable of being stored, transferred, combined, compared, and otherwise manipulated. It proves convenient at times, principally for reasons of common usage, to refer to these signals as bits, values, elements, symbols, characters, terms, numbers, or the like. It should be noted, however, that all of these and similar terms are to be associated with the appropriate physical quantities and are merely convenient labels applied to these quantities.

Further, the manipulations performed are often referred to in terms, such as adding or comparing, which are commonly associated with mental operations performed by a human operator. No such capability of a human operator is necessary, or desirable in most cases, in any of the operations described herein which form part of the present invention; the operations are machine operations. Useful machines for performing the operation of the present invention include general purpose digital computers or similar devices.

The present invention also relates to apparatus for performing these operations. This apparatus may be specially constructed for the required purpose or it may comprise a general purpose computer as selectively activated or reconfigured by a computer program stored in the computer. The procedures presented herein are not inherently related to a particular computer or other apparatus. Various general purpose machines may be used with programs written in accordance with the teachings herein, or it may prove more convenient to construct more specialized apparatus to perform the required method steps. The required structure for a variety of these machines will appear from the description given.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention will be disclosed in the context of an extension of cascading stylesheets to enable the coding of voice presentation properties. However, the invention is applicable to controlling the style or presentation properties of audible programs generally.

FIG. **1**A is an illustration of an exemplary computer of a type suitable for use in carrying out the invention. FIG. **1**A illustrates a computer system having a processor unit **100**, a display unit **120**, a keyboard **130**, and an input/output device, such as a mouse **140**. One or more disk drives **110**A and **110**B may be provided in the processor unit **100** to facilitate the storage and retrieval of information. One of these may be a hard drive (not shown) or drives utilizing removable media such as floppy drives or CD ROM drives.

FIG. **1**B is a block diagram of an exemplary computer bus architecture of a type suitable for carrying out the invention. A bus **150** connects a central processing unit **155** to other elements of a computer processor system **100**. An interface **145** connects external input/output devices such as keyboard **130** and mouse **140** to the bus. A display interface **125** is also connected to the bus and interfaces the computer display **120** to the central processing unit and to other devices. In this exemplary embodiment, read only memory (ROM) **160** and random access memory (RAM) **165** provides storage of program and data information utilized by the CPU **155**. A disk controller **170** permits information to be read from and written to mass storage such as optical memory **171**, hard drive **172** and floppy drive **173**. A communications port **185** provides a communications interface between external devices and the computer bus **150**. In the example shown, a voice synthesizer **180** is also utilized to generate speech for the audio presentation of information to a user. An optional RF data link **190** can be utilized to provide access to an external network, such as the worldwide web, over a radio or cellular telephone link.

FIG. **1**C is an illustration of an exemplary memory medium suitable for storing program and data information in accordance with the invention. In the example shown, program and data information restored on a floppy disk **195**.

FIG. **2** is a diagram of an exemplary software architecture, shown in relation to memory, suitable for carrying out the invention. Memory is typically divided into two sections, one for storing programs and one for storing data and other information. The allocation of particular data or program elements to various memory elements is dictated by either performance considerations or is relatively arbitrary. For example, which data might be resident in RAM versus stored on hard drive or which data might be resident in processor cache versus RAM will be dictated more by performance considerations than anything else.

An operating system **200**, provides a convenient and standardized interface for a variety of application programs to be run on a computer system. In the example shown in FIG. **2**, a text/screen reader **220** is shown in memory which may be utilized to control a voice synthesizer driver **210** which itself controls a voice synthesizer to present textual information to a user in an audible fashion. A voice synthesizer driver **210** can either utilize the services of operating system **200** or may bypass them, as shown in FIG. **2**, to directly control the hardware of the voice synthesizer. A variety of other application programs **230** may also be stored in memory. In one application of particular interest for this example, a voice browser application may be running and utilize the services of a text/screen reader to permit world wide web pages to be presented to a user in an audible form.

In the data storage area, a library of available voices for the voice synthesizer, shown at **250**, may be stored in memory. In addition, a stylesheet data base, **240**, discussed more hereinafter, may also be stored in memory.

FIG. **3** is an illustration of part of a prior art stylesheet. The particular stylesheet shown in FIG. **3** is taken from the cascading stylesheet, level 1 recommendation referred to above. The meanings of the particular terms are reasonably intuitive for a person conversant with hypertext mark-up language (html). The combinations of characters shown in upper case are for the most part html identifiers utilized with embedded formatting commands in a textual presentation. Associated with certain groups of html identifiers and contained within { } are one or more properties to be associated with that html identifier. Those properties consist of a property type such as "font-family" separated from a value such as "serif" by a colon.

In the example utilized to illustrate the invention, the prior art cascading stylesheets, such as shown in FIG. **3**, are extended to enable encoding of voice presentation proper-

ties. The properties, in this example, are voice-family, voice-pitch, voice-variant, and voice-speed.

The following descriptions help illustrate and explain these properties.

Voice-family: name-of-voice

Four generic voices are provided: man, woman, boy, girl. Additional voices may be defined (e.g., Fred, Lisa) in a manner parallel to that used to specify the font-family for visual presentation. The recommended use of named voices is to provide multiple alternatives and end with one of the generic voices to increase the probability that the user has one of the voices installed. If the user has none of the specified voices installed, then the default voice for the user's browser is used. For example:

BODY {voice-family: "Fred, Joe, man"}

If the user's system has Fred's voice installed, then it is used. Otherwise Joe's voice is used if available, and if none of the named voices are available, the generic male voice is used.

Voice-Pitch: pitch-indication

The pitch indication can either be a relative indication (relative to the pitch of the parent element) measured in octaves or a named pitch from the following exemplary list: bass, baritone, tenor, contralto, mezzosoprano, soprano. For example:

BODY {voice-pitch: baritone}

STRONG {voice-pitch: -loc}

This stylesheet will cause most text to be read in a baritone voice but text encoded as STRONGLY emphasized will be read one octave deeper.

Voice-variant: name-of-variation

Variations of the voice can be applied if supported by the user's speech synthesizer. If not supported, an unmodified voice is used. For example:

A {voice-family: man; voice-variant: danish-accent}

This stylesheet component will cause hypertext anchors to be read by a male voice with a Danish accent (if available).

Voice-speed: number |fast| slow

The voice-speed property is used to control the speed of the voice. The number can be given in absolute terms as a number of words per minute or as a relative percentage value (relative to the parent element's voice speed). For example:

BODY {voice-speed: 50 wpm}

BLOCKQUOTE {voice-speed: 120%}

This stylesheet will cause the page to be read at a speed of 50 words per minute, except that blockquotes are read at a speed of 60 words per minute.

FIG. **4** is an illustration of an exemplary stylesheet data base. A stylesheet data base **240**, shown in FIG. **2** can be implemented, in one example, as shown in FIG. **4**. FIG. **4** shows three columns. Each record in the data base has an entry for each of the columns. When a document refers to a particular stylesheet, the document identifier is listed in column 1. The stylesheet address or addresses of one or more stylesheets associated with that document are listed in column 2. The type of address listed in column 2 is identified in column 3 in this example. If the document in question is local, the document identifier shown in FIG. **1** may be a filename on the local computer. Otherwise, it may be a network address where the document can be retrieved. Stylesheets may also be local or remote. If they are local, then they are identified by a particular device and address range within the device between which the information is stored. If the stylesheet is remotely located, column 2 will contain a network address where the stylesheet may be retrieved. The type of address, as shown in column 3, can be either local or remote or it may be local-default.

A record entry, such as that shown in the data base of FIG. **4**, serves to link documents with stylesheets in a manner designed to facilitate presentation of the document. The information need not necessarily be stored in this manner. As an alternative, once one or more file sheets have been combined as discussed more hereinafter into a presentation file sheet, which could be stored together with the document as part of the same file.

Stylesheets, in use, can be generated by an author as part of the process of creating a document or can be specified by a user to ensure that documents generated by others are presented in a style that the user prefers or combination of the two.

FIG. **5** is an illustration of part of a stylesheet including audio and/or voice elements in accordance with the invention, illustrating an author generated stylesheet. The author generated stylesheet illustrated in FIG. **5**, expands the prior art stylesheet illustrated in FIG. **3** by including, in this example, a voice presentation properties. Comparing FIG. **5** with FIG. **3**, in the BODY section, properties for a voice-family and voice-pitch have been included in FIG. **5**. The voice-family property includes two values separated by a comma. The first is a named voice "Susan" and the second is a voice "woman". If a computer presenting information in accordance with the stylesheet with FIG. **5** is equipped with a named voice "Susan", then the voice "Susan" will be utilized to present the information. If not, a general voice "woman", universally available across all synthesizers would be utilized as a backup.

The second area in which the stylesheet of FIG. **5** differs from the corresponding one in FIG. **3** is that the headings H**1**, H**2** and H**3** in addition to their font size properties, have been given voice properties. As shown in FIG. **5**, text categorized as heading H**1** would be presented in a voice-pitch of bass whereas text presented as heading H**2** would be presented with a voice-pitch baritone and text identified as heading H**3** would be presented with a voice-pitch of contralto. Note also that headings H**1** have voice properties which increase the volume of the voice and reduce the voice speed thus changing the style with which the verbal presentation is generated by the voice synthesizer to the user.

FIG. **6** is an illustration of part of a style sheet including audio and/or voice elements in accordance with the invention such as might be generated by a user to control the presentation of information in accordance with the user's preferences. In the example shown in FIG. **6**, the body of the text will, contrary to the author generated stylesheet shown in FIG. **5**, preferably be presented in Times-Roman font-family. In addition, the background and foreground colors are different from that proposed by the author stylesheet. Also shown in the user stylesheet of FIG. **6**, the user prefers to have text presented to him in a voice-family of either "Susan" or a woman's voice, prefers that the voice-pitch be soprano and prefers that the voice speed with which information is presented to the user be at 200 words per minute. In addition, the user prefers that headings H**1**–H**6** be displayed in block format and with a voice speed reduced by 10% from the base speed to call attention to the headings. A user stylesheet of the type shown in FIG. **6** might be utilized as a default stylesheet for controlling the presentation of information to the user.

FIG. **7** is a flowchart of a process for using stylesheets including audio and/or voice elements in accordance with

invention. When a user downloads or imports a document (705), a check is made to determine whether the document references one or more author-specified stylesheets (710). If it does, the stylesheet is retrieved (715). This portion of the process of FIG. 7 can be better understood with reference to FIG. 8 which is an illustration of a document containing text formatting commands which contain a reference to an external stylesheet.

In the example shown in FIG. 8, an html document is illustrated which contains at or near the beginning, an "@import url" command followed by a network address, in this case an Internet address for the World Wide Web. Thus, if a document contains a reference to one or more author specified stylesheets, (710) such as that illustrated in FIG. 8, a stylesheet will be retrieved over the network.

Continuing with FIG. 7, a check is made to determine if one or more local user stylesheets is present (720). If at least one is, it will be retrieved (725). If a plurality are present, one may either retrieve them all or present them all to the user for selection of the relevant ones for this presentation. Whichever approach is taken, the local user stylesheets are retrieved (725).

FIGS. 5 and 6, presented a situation where a local user stylesheet conflicted with style definitions specified in an author specified stylesheet. The Cascading Stylesheet, Level 1 Recommendation referred to above, specifies how to resolve conflicts and how to combine a plurality of stylesheets into a consistent set of presentations, referred to hereinafter as a presentation stylesheet.

Thus, returning to FIG. 7, if a plurality of stylesheets are applied to a presentation of a particular document, they will be combined and/or ordered in accordance with priorities into a presentation stylesheet for application to the document. The text is then displayed in a manner consistent with the presentation stylesheet (735) and the text/screen reader and/or voice synthesizer properties are set in accordance with the stylesheet (740). The partitioning of functionality between a text/screen reader and a voice synthesizer normally is not a significant consideration. Some implementers may put certain functionality in the screen reader whereas others may put the same functionality in a voice synthesizer. Once the text/screen reader and voice synthesizers have been set up in accordance with the presentation stylesheet, the screen or the text is read to the user using the voice synthesizer, interpreting the text formatting commands imbedded within the text and in accordance with the presentation stylesheet (745).

FIG. 9 is a block diagram of a system illustrating the use of author and user generated stylesheets in accordance with the invention. In the example shown, server 1 (950) and server 2 (960) are servers on a network 900, such as the World Wide Web. A user computer 910, such as shown in FIGS. 1 and 2, is also connected to the network 900. As illustrated here, server 1 has available for public access an html document 1 (955) which document contains two "@ import" statements. The first contains an address pointing toward stylesheet 1 (956) resident on the same server. The second points to stylesheet 2 (965) shown on server 2.

When a user using computer 910 accesses server 1 and downloads html doc 1 into his computer, the process of FIG. 7 is carried out. The stylesheets 956 on server 1 and 965 on server 2 are copied down into the user's computer at 956' and 965'. In addition, the user may have specified one or more local stylesheets for either optional or default use (930). The user's computer illustrated in FIG. 9 includes a display subsystem 915 for presenting information on a display device, such as a cathode ray tube. In addition, as shown in FIG. 9, the user's computer contains an audio subsystem 920 for presenting audio information to a user. As discussed in conjunction with the process of FIG. 7, the information from html doc 1 will be displayed and/or read to the user. The text display style statements contained in the stylesheets will control the display of text on the display subsystem 915. The audio style elements contained in the stylesheets will be utilized to control presentation of information to the audio subsystem 920. The presentation manager 925 symbolically represents the portions of the user's computer which carry out the process of FIG. 7 in which the stylesheets are combined in accordance with the rules and the information presented to the user by the appropriate display or audio subsystem.

When stylesheets in accordance with the invention are downloaded into a computer which is not equipped to provide audio presentations to the user, by voice synthesizer or otherwise, the audio style statements are simply disregarded. This is specifically provided for within the Cascading Stylesheet, Level 1 Recommendation and is a general property of html. When a command is encountered which the system doesn't recognize, it simply ignores it. Thus, the existence of audio style commands in a stylesheet will not adversely affect the style statements for display of text. However, when styles can be set for an audio presentation, those style statements will be recognized and implemented. The result is a much more pleasing and semantically consistent audio presentation for the user.

There has been thus been described methods, apparatus, systems and computer program products which expand the capabilities of stylesheets into the audio domain. Thus, the problems with the prior art are overcome and the user is provided with expanded functionality.

In this disclosure, there is shown and described only the preferred embodiment of the invention, but, as aforementioned, it is to be understood that the invention is capable of use in various other combinations and environments and is capable of changes or modifications within the scope of the inventive concept as expressed herein.

What is claimed is:

1. Apparatus for presenting textual information in audible form, comprising:

a. a computer equipped with an voice synthesizer;

b. an application, running on computer, causing said voice synthesizer to present textual information to a user in audible form; and

c. a style sheet containing audio style elements for controlling said voice synthesizer.

2. Apparatus of claim 1 in which said application is a text reader.

3. Apparatus of claim 1 in which said application is a screen reader.

4. Apparatus of claim 1 in which said style sheet is a style sheet specified by an author or distributor of said textual information.

5. Apparatus of claim 1 in which said style sheet is a style sheet specified by a user of said computer.

6. Apparatus of claim 1 in which said audio style elements include at least one of voice-family, voice-pitch, voice-variant, voice-speed and volume.

7. Apparatus of claim 1 in which said application is a browser application.

8. Apparatus of claim 1 in which said computer further comprises an RF data link for wireless access to a network.

9. Apparatus of claim 8 in which said network accesses the World Wide Web.

10. Apparatus of claim **1** in which said computer stores a library of voices in memory for use with said voice synthesizer.

11. Apparatus of claim **1** in which said computer stores a database of styles sheets.

12. Apparatus of claim **11** in which said database includes at least one style sheet that originated on a different computer.

13. A method of controlling the presentation of information generated by a voice synthesizer, comprising the step of:

a. providing an element for performing a step of controlling said voice synthesizer using one or more style sheets containing audio style elements for the audible presentation of information.

14. A method of controlling the presentation of information generated by a voice synthesizer, comprising the step of:

a. providing an element for performing the step of retrieving one or more style sheets containing audio style elements for the audible presentation of information through a network.

15. The method of claim **14** further comprising the steps of:

a. combining information from a plurality of styles sheets into a presentation style sheet to control the presentation of both text and audible information.

16. The method of claim **14**, further comprising the step of:

a. providing an element for performing the step of presenting audible information in accordance with said one or more style sheets based on embedded text formatting commands.

17. A system for presenting textual information in audible form, comprising:

a. a network;

b. at least one server connected to said network and containing a document containing text;

c. at least one server connected to said network containing at least one stylesheet containing audio style elements for audible presentation of textual information; and

d. a computer connected to said network for downloading a stylesheet from a server and controlling the presentation of textual information in audible form based on said style sheet.

18. A computer program product, comprising:

a. a memory medium; and

b. a computer program stored on said memory medium, said computer program comprising instructions for controlling a voice synthesizer using one or more style sheets containing audio style elements for the audible presentation of information.

19. A computer program product, comprising:

a. a memory medium; and

b. a computer program stored on said memory medium, said computer program comprising instructions for retrieving one or more style sheets containing audio style elements for the audible presentation of information through a network.

20. The computer program product of claim **19**, in which said computer program further comprises instructions for combining information from a plurality of styles sheets into a presentation style sheet to control the presentation of both text and audible information.

21. A computer program product, comprising:

a. a memory medium; and

b. a computer program stored on said memory medium, said computer program comprising instructions for presenting audible information in accordance with one ore more style sheets containing audio style elements based on embedded text formatting commands.

* * * * *

US005915001A

United States Patent [19]

Uppaluru

[11] Patent Number: 5,915,001

[45] Date of Patent: Jun. 22, 1999

[54] **SYSTEM AND METHOD FOR PROVIDING AND USING UNIVERSALLY ACCESSIBLE VOICE AND SPEECH DATA FILES**

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[73] Assignee: **Vois Corporation**, Redwood City, Calif.

[21] Appl. No.: **08/748,943**

[22] Filed: **Nov. 14, 1996**

[51] **Int. Cl.**[6] **H04M 1/64**

[52] **U.S. Cl.** **379/88.22**; 379/88.17

[58] **Field of Search** 379/67, 88, 89, 379/93.05, 201, 67.1, 88.01, 88.04, 88.16, 88.17, 88.19, 88.2, 88.21, 88.22, 88.23, 88.24, 88.27; 704/270, 271, 272, 275; 370/401; 395/200.3, 200.33, 200.47, 200.48, 200.49, 200.55

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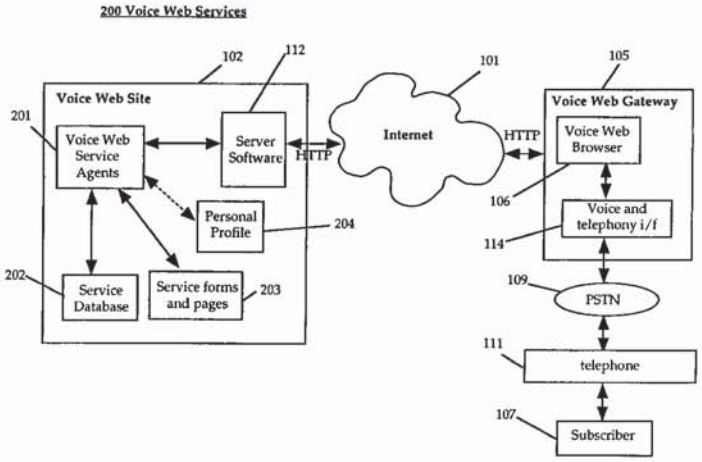
Primary Examiner—Scott Weaver

Attorney, Agent, or Firm—Fenwick & West, LLP

[57] **ABSTRACT**

A system and method provides universal access to voice-based documents containing information formatted using MIME and HTML standards using customized extensions for voice information access and navigation. These voice documents are linked using HTML hyper-links that are accessible to subscribers using voice commands, touch-tone inputs and other selection means. These voice documents and components in them are addressable using HTML anchors embedding HTML universal resource locators (URLs) rendering them universally accessible over the Internet. This collection of connected documents forms a voice web. The voice web includes subscriber-specific documents including speech training files for speaker dependent speech recognition, voice print files for authenticating the identity of a user and personal preference and attribute files for customizing other aspects of the system in accordance with a specific subscriber.

11 Claims, 12 Drawing Sheets



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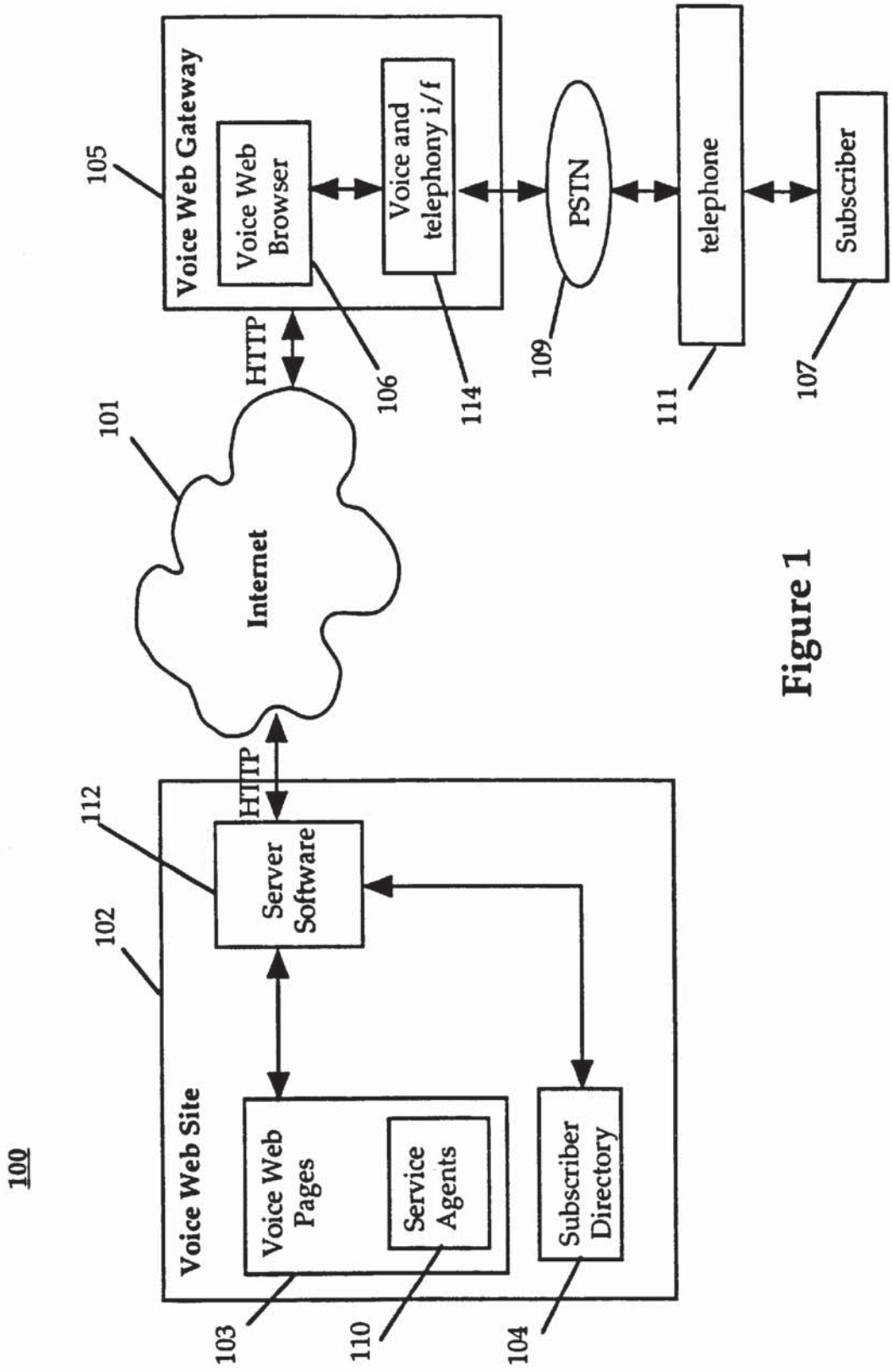
100
Voice Web Site
Voice Web Pages
Service Agents
Subscriber Directory
Server Software
HTTP
Internet
HTTP
Voice Web Gateway
Voice Web Browser
Voice and telephony i/f
PSTN
telephone
Subscriber
101
102
103
104
105
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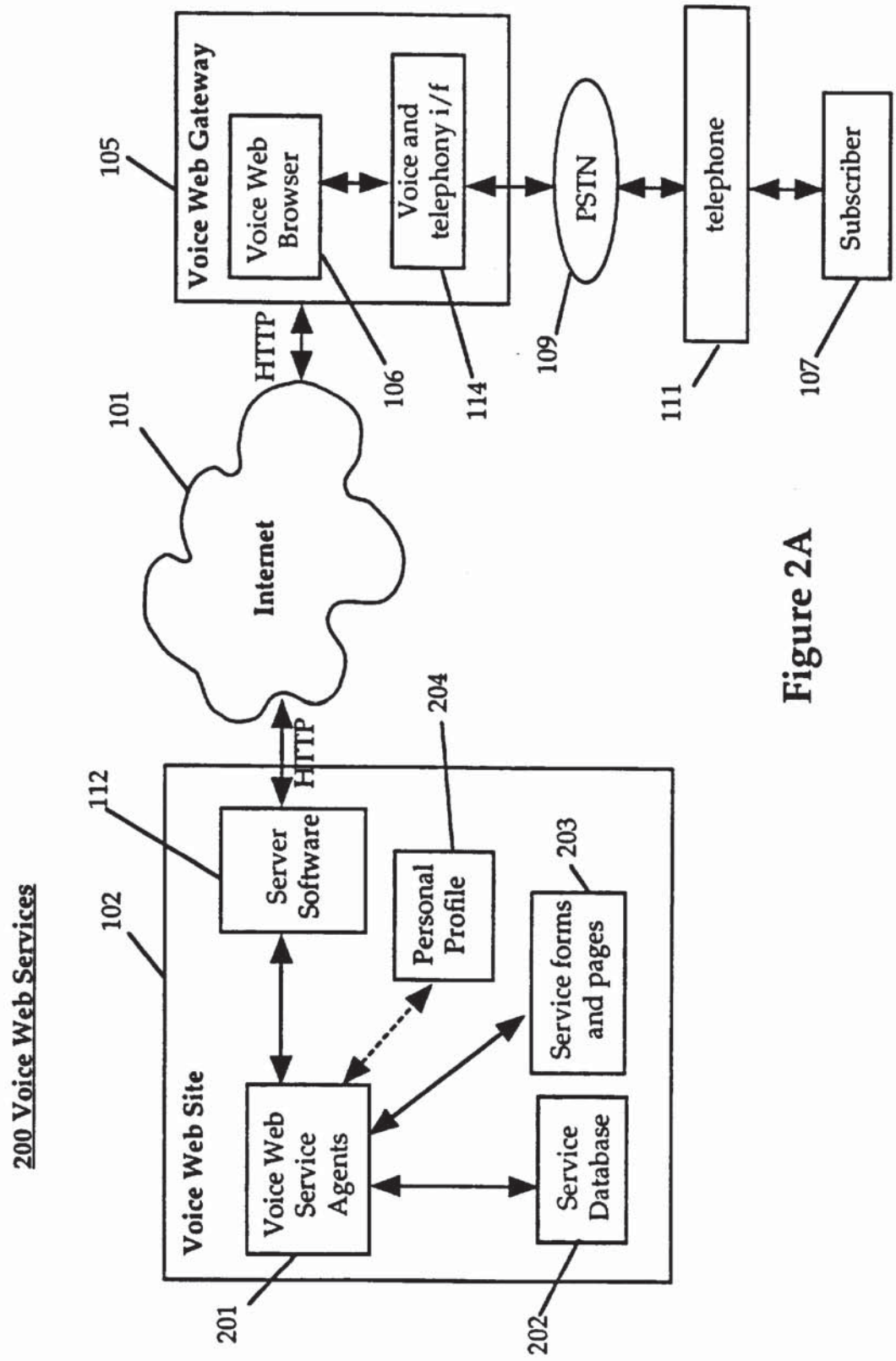
110
111
112
114

Figure 1


200 Voice Web Services
Voice Web Site
Voice Web Service Agents
Server Software
Personal Profile
Service forms and pages
Service Database
Internet
HTTP
HTTP
Voice Web Gateway
Voice Web Browser
Voice and telephony i/f
PSTN
telephone
Subscriber
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204

Figure 2A

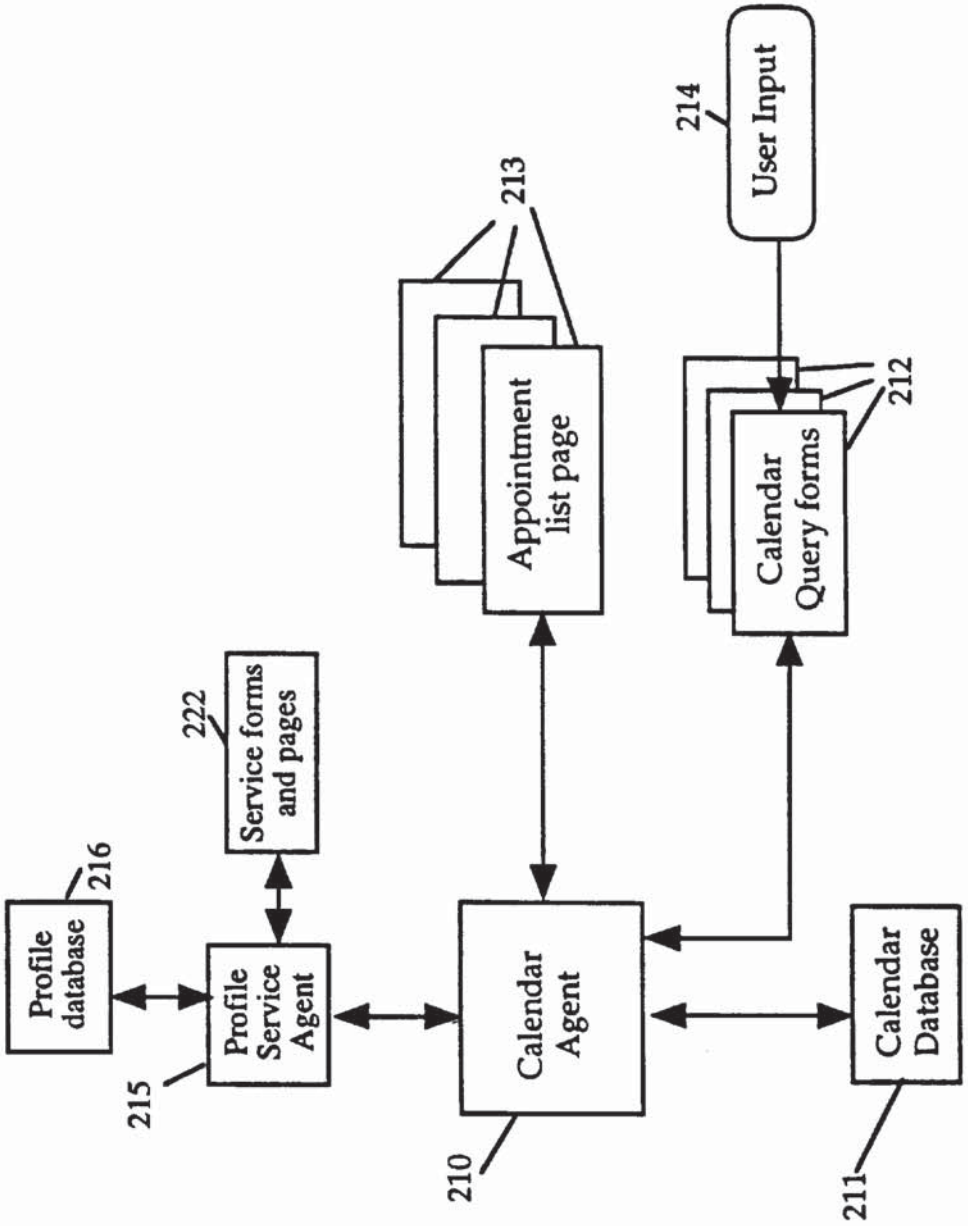
User Input
214
213
Appointment list page
Calendar Query forms
212
222
Service forms and pages
216
Profile database
Profile Service Agent
215
Calendar Agent
210
Calendar Database
211

Figure 2B

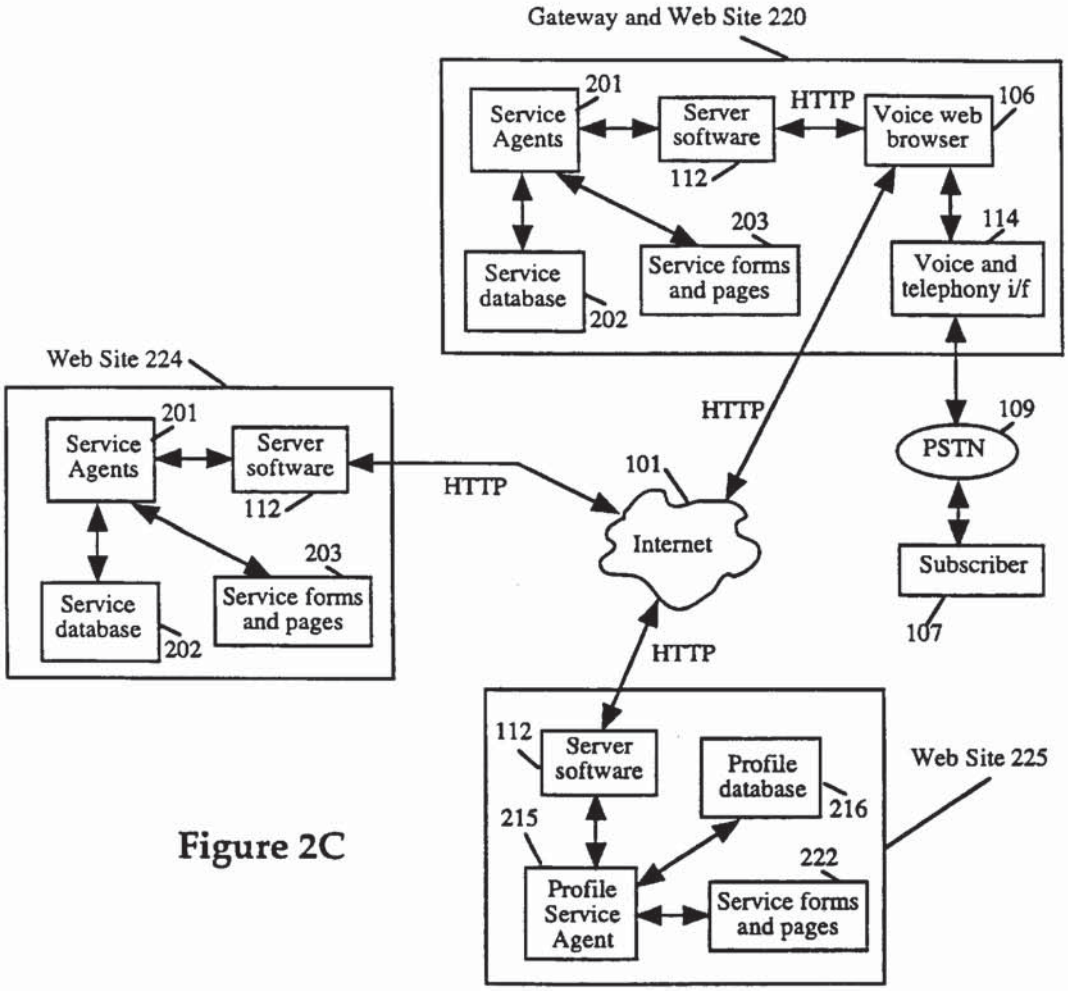
Gateway and Web Site 220
Service Agents
201
Server software
HTTP
Voice web browser
106
112
203
Service database
Service forms and pages
202
Voice and telephony i/f
114
Web Site 224
HTTP
109
PSTN
Service Agents
201
Server software
101
HTTP
Internet
112
203
Service database
Service forms and pages
202
Subscriber
107
HTTP
112
Server software
Profile database
Web Site 225
216
215
222
Profile Service Agent
Service forms and pages

Figure 2C

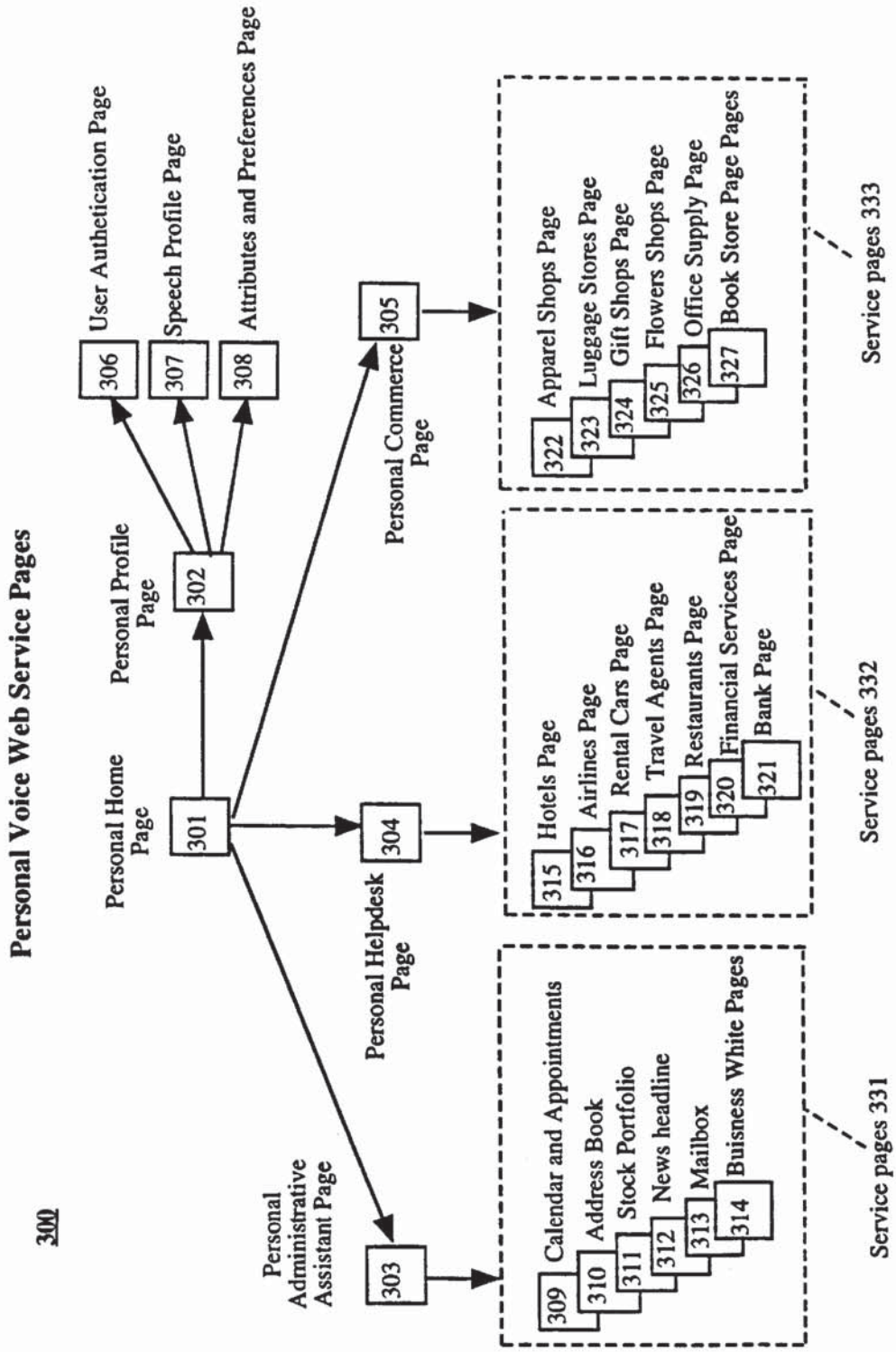
Personal Voice Web Service Pages
300
Personal Home Page
301
Personal Profile Page
302
Personal Administrative Assistant Page
303
Personal Helpdesk Page
304
Personal Commerce Page
305
306
User Authetication Page
307
Speech Profile Page
308
Attributes and Preferences Page
309
Calendar and Appointments
310
Address Book
311
Stock Portfolio
312
News headline
313
Mailbox
314
Buisness White Pages
Service pages 331
315
Hotels Page
316
Airlines Page
317
Rental Cars Page
318
Travel Agents Page
319
Restaurants Page
320
Financial Services Page
321
Bank Page
Service pages 332
322
Apparel Shops Page
323
Luggage Stores Page
324
Gift Shops Page
325
Flowers Shops Page
326
Office Supply Page
327
Book Store Page Pages
Service pages 333

Figure 3

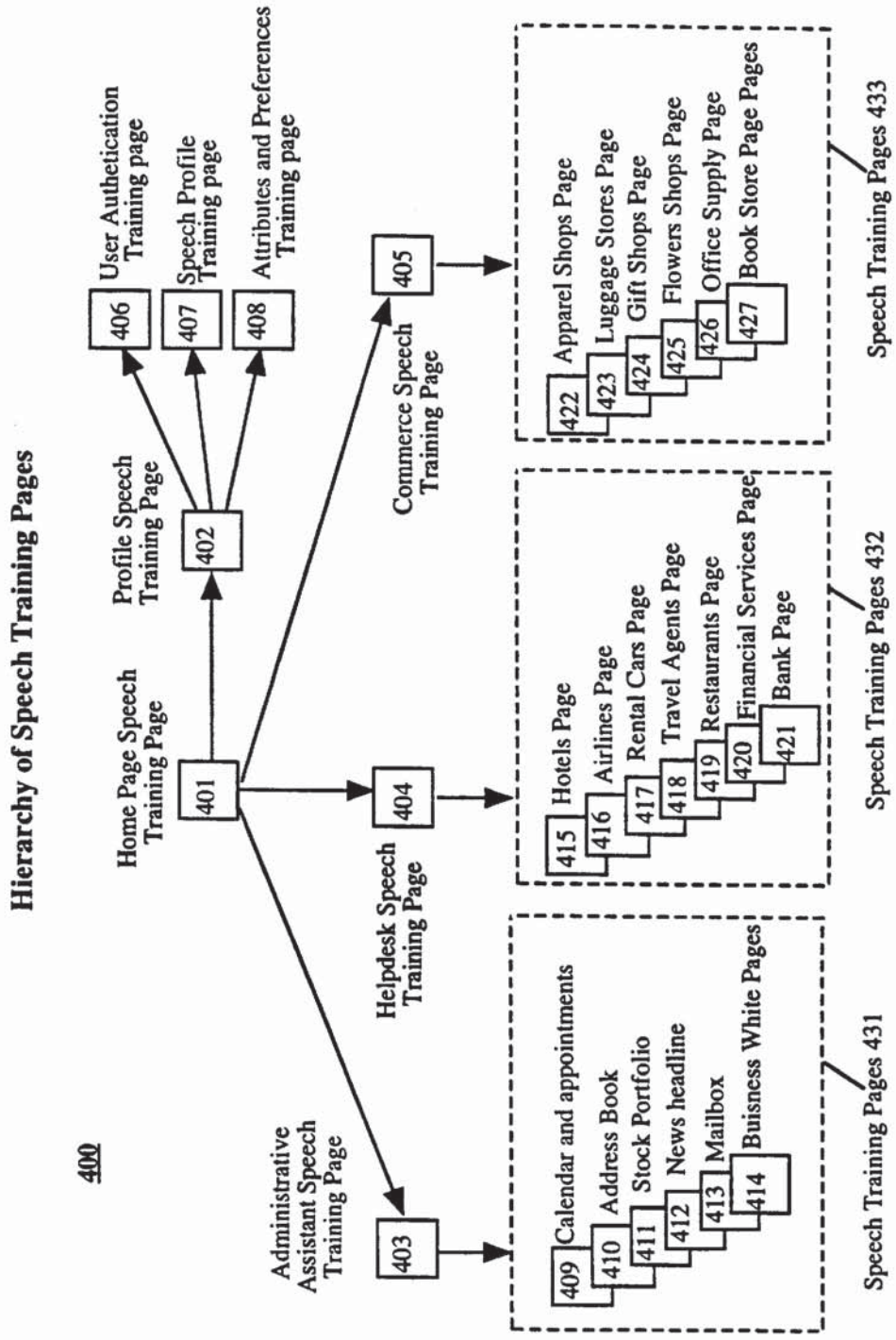
Hierarchy of Speech Training Pages
400
Home Page Speech Training Page
401
Profile Speech Training Page
402
User Authetication Training page
406
Speech Profile Training page
407
Attributes and Preferences Training page
408
Commerce Speech Training Page
405
Helpdesk Speech Training Page
404
Administrative Assistant Speech Training Page
403
Hotels Page
415
Airlines Page
416
Rental Cars Page
417
Travel Agents Page
418
Restaurants Page
419
Financial Services Page
420
Bank Page
421
Speech Training Pages 432
Apparel Shops Page
422
Luggage Stores Page
423
Gift Shops Page
424
Flowers Shops Page
425
Office Supply Page
426
Book Store Page Pages
427
Speech Training Pages 433
Calendar and appointments
409
Address Book
410
Stock Portfolio
411
News headline
412
Mailbox
413
Buisness White Pages
414
Speech Training Pages 431

Figure 4

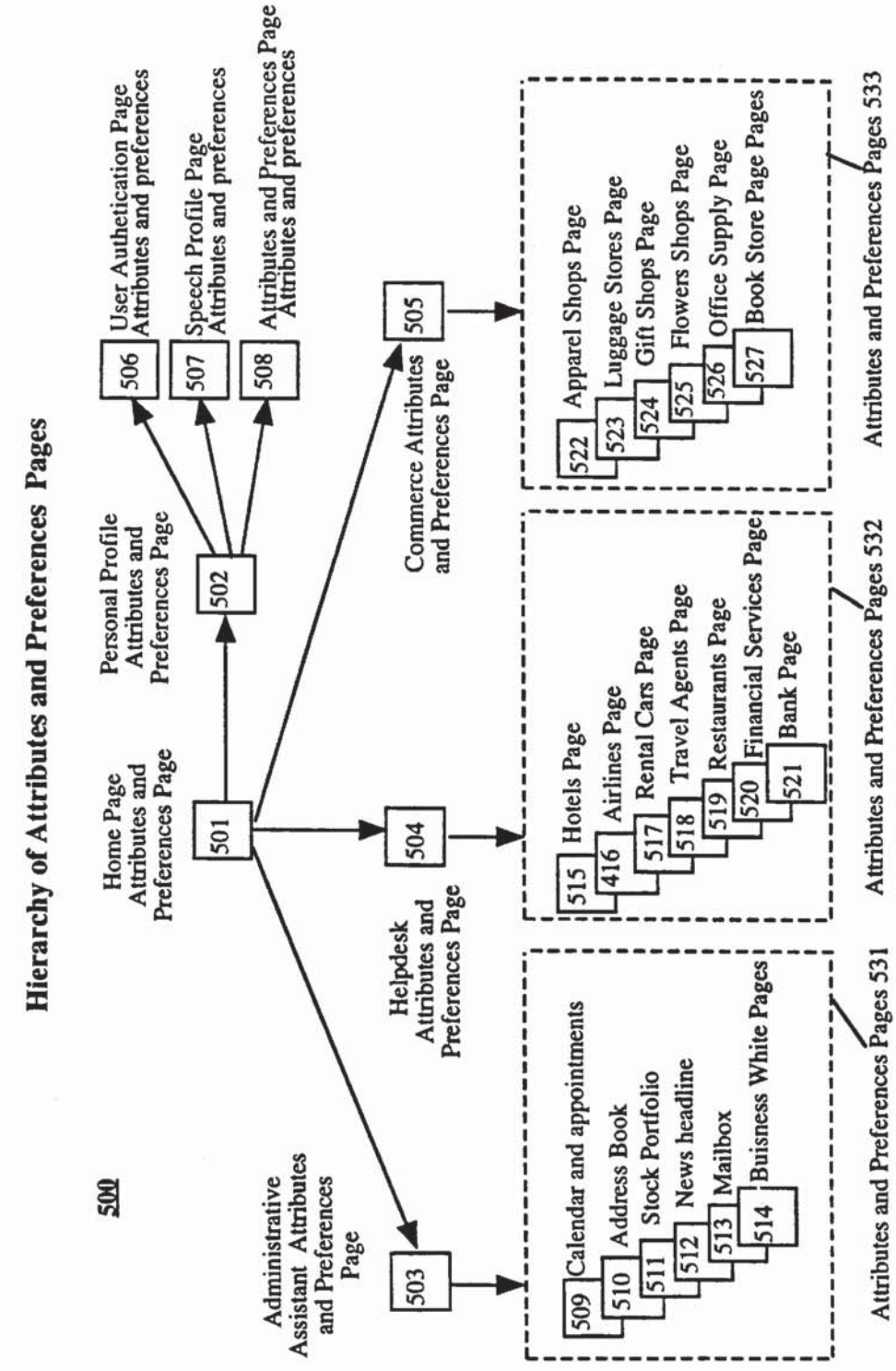
Hierarchy of Attributes and Preferences Pages
500
Home Page Attributes and Preferences Page
501
Personal Profile Attributes and Preferences Page
502
User Authetication Page Attributes and preferences
506
Speech Profile Page Attributes and preferences
507
Attributes and Preferences Page Attributes and preferences
508
Administrative Assistant Attributes and Preferences Page
503
Helpdesk Attributes and Preferences Page
504
Commerce Attributes and Preferences Page
505
509 Calendar and appointments
510 Address Book
511 Stock Portfolio
512 News headline
513 Mailbox
514 Buisness White Pages
Attributes and Preferences Pages 531
515 Hotels Page
416 Airlines Page
517 Rental Cars Page
518 Travel Agents Page
519 Restaurants Page
520 Financial Services Page
521 Bank Page
Attributes and Preferences Pages 532
522 Apparel Shops Page
523 Luggage Stores Page
524 Gift Shops Page
525 Flowers Shops Page
526 Office Supply Page
527 Book Store Page Pages
Attributes and Preferences Pages 533

Figure 5

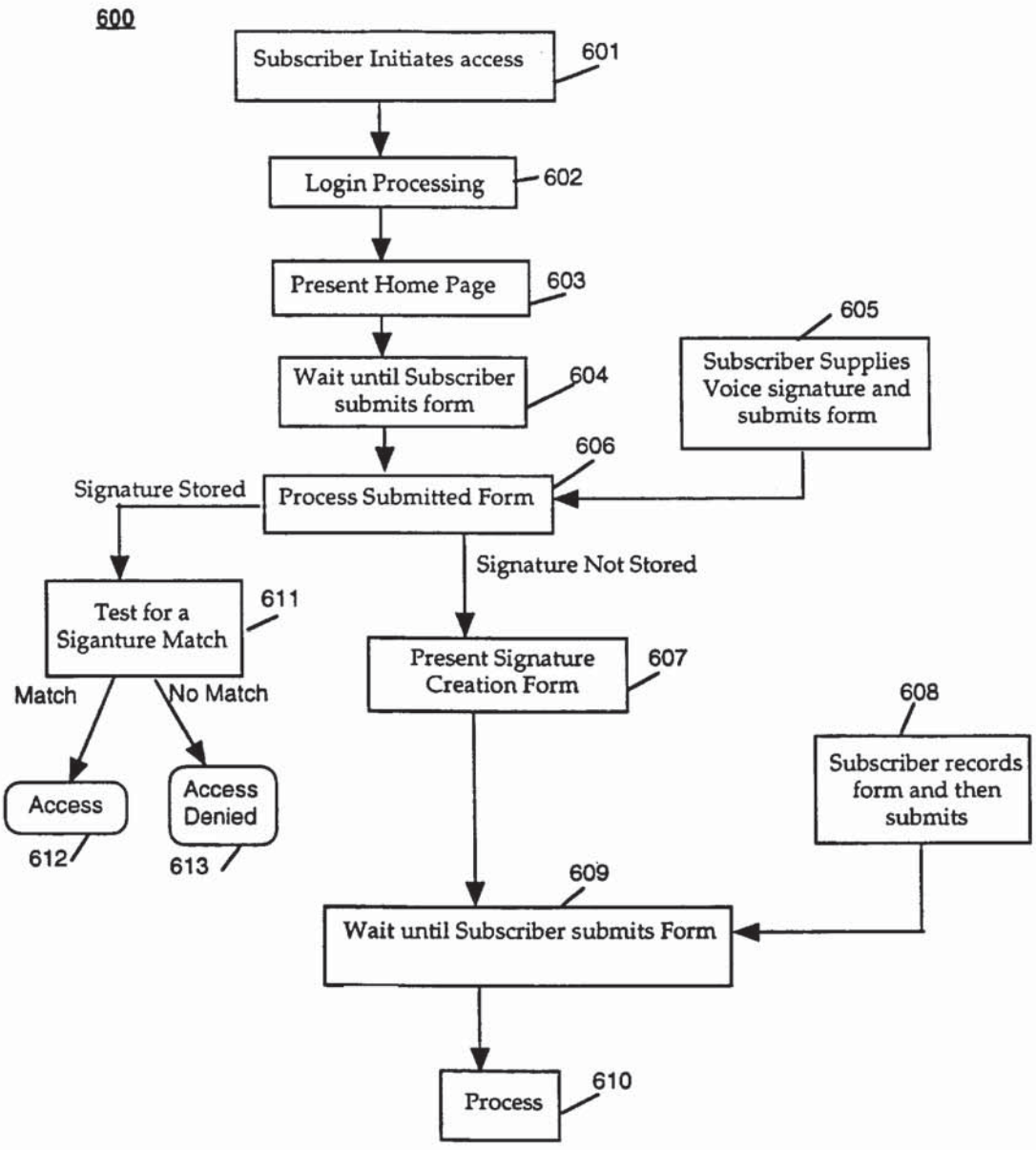
600
Subscriber Initiates access
601
Login Processing
602
Present Home Page
603
Wait until Subscriber submits form
604
605
Subscriber Supplies Voice signature and submits form
606
Process Submitted Form
Signature Stored
Signature Not Stored
Test for a Siganture Match
611
Match
No Match
Access
612
Access Denied
613
Present Signature Creation Form
607
608
Subscriber records form and then submits
609
Wait until Subscriber submits Form
Process
610

Figure 6

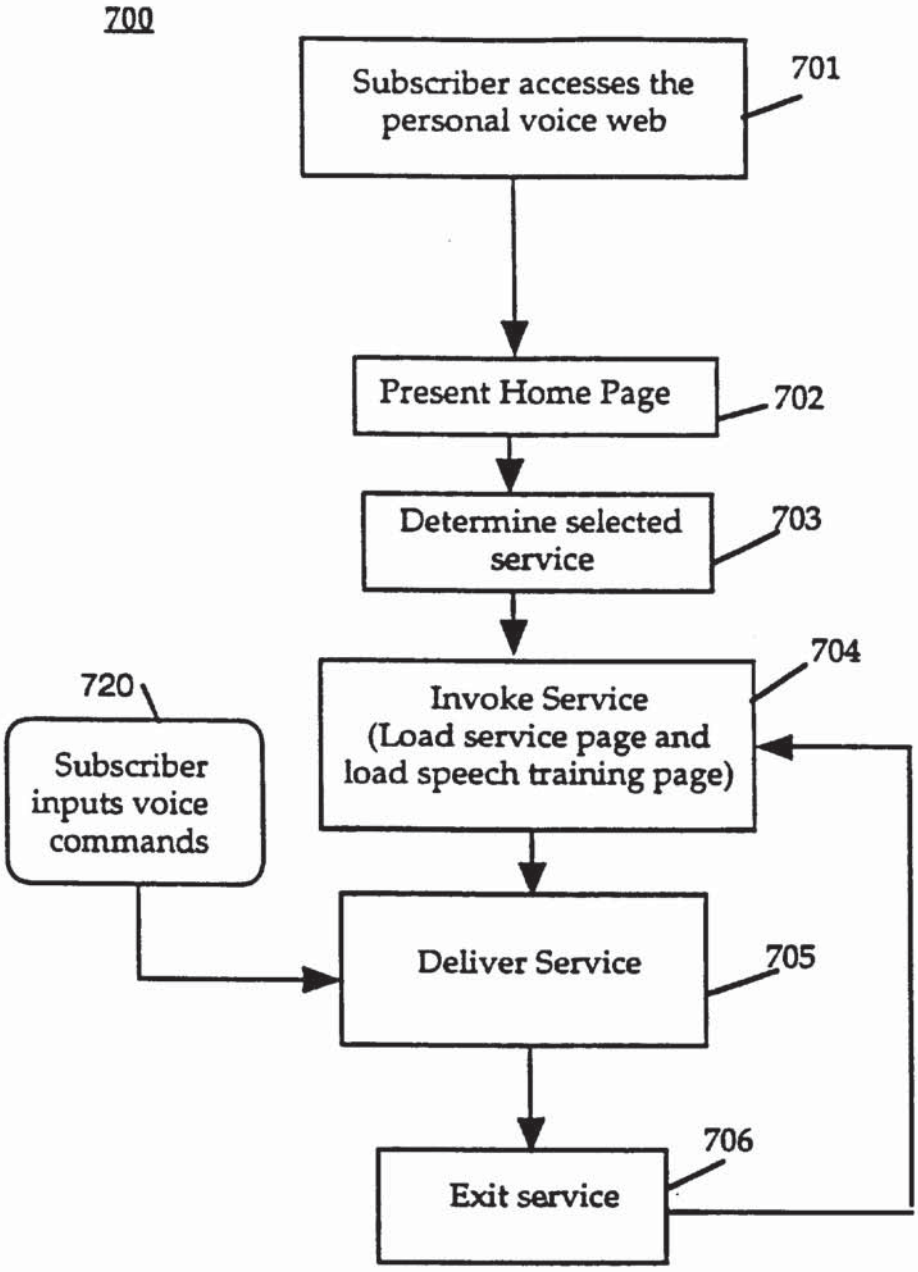
700
Subscriber accesses the personal voice web
701
Present Home Page
702
Determine selected service
703
Invoke Service (Load service page and load speech training page)
704
720
Subscriber inputs voice commands
Deliver Service
705
Exit service
706

Figure 7

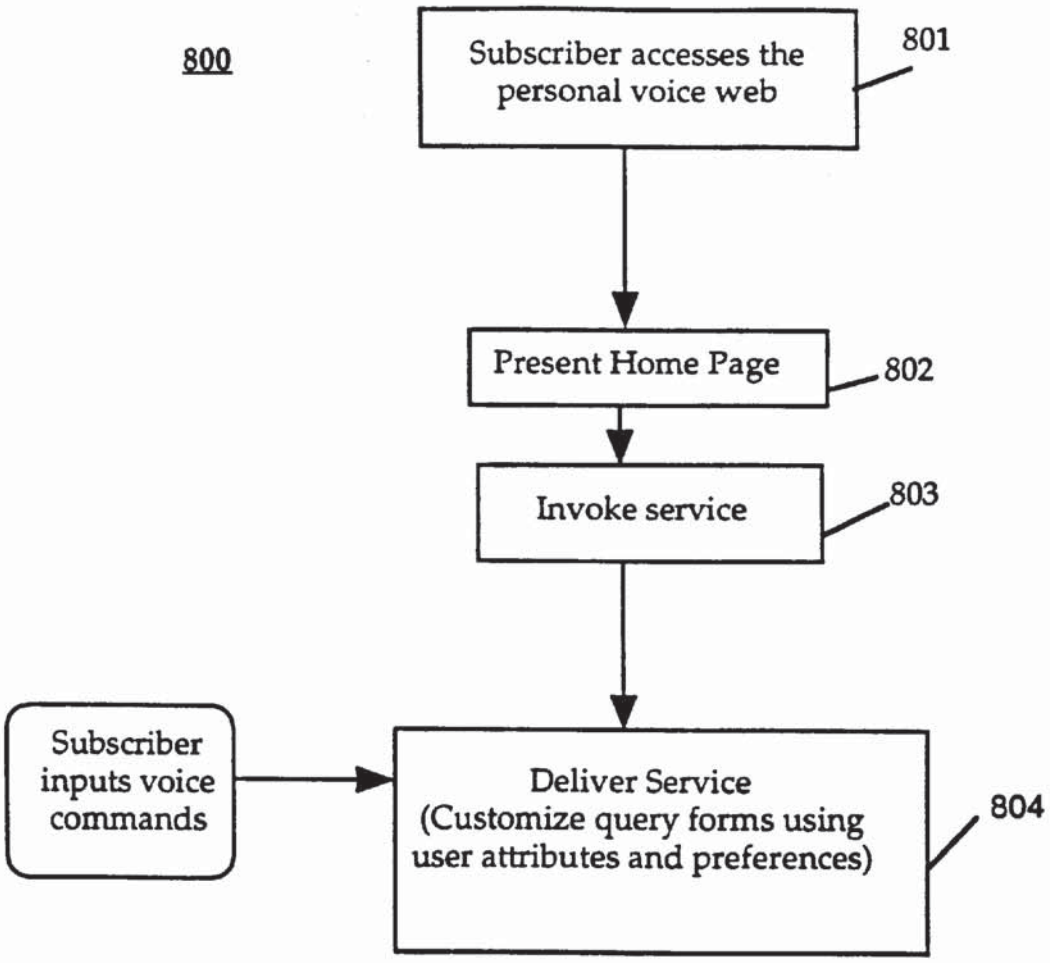
800
Subscriber accesses the personal voice web
801
Present Home Page
802
Invoke service
803
Subscriber inputs voice commands
Deliver Service (Customize query forms using user attributes and preferences)
804

Figure 8

Voice Web Form Publishing

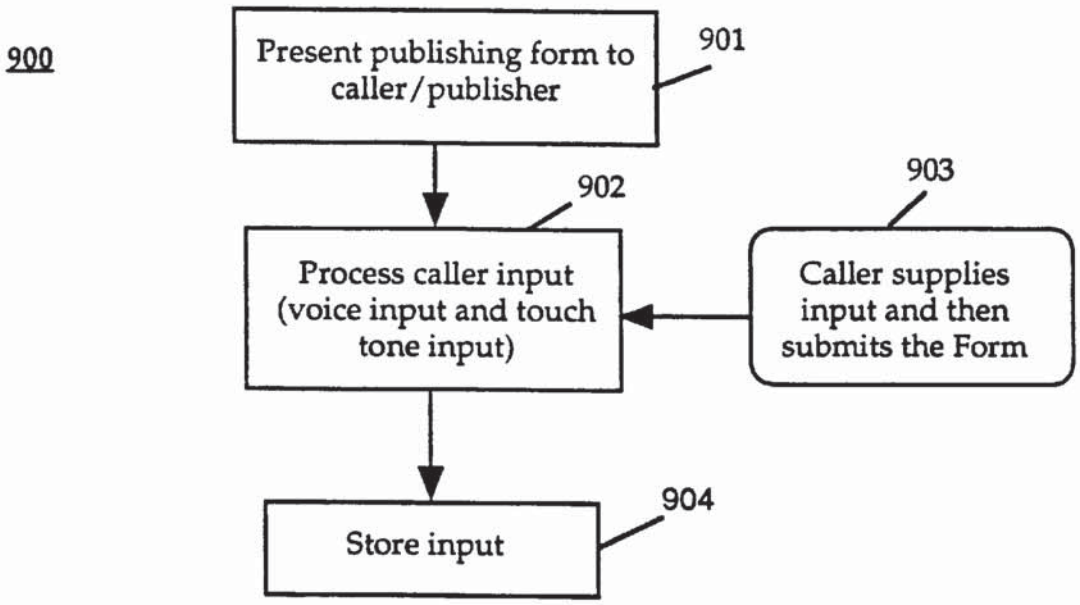

Figure 9

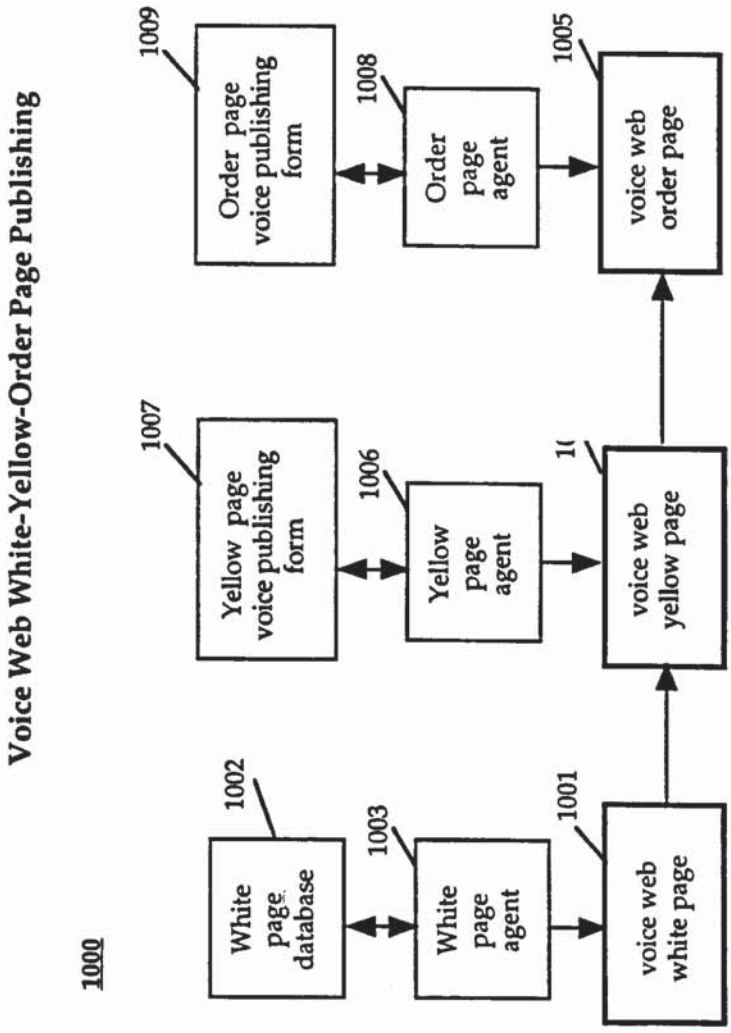
Voice Web White-Yellow-Order Page Publishing
1000
White page database
1002
White page agent
1003
voice web white page
1001
Yellow page voice publishing form
1007
Yellow page agent
1006
voice web yellow page
Order page voice publishing form
1009
Order page agent
1008
voice web order page
1005

Figure 10

SYSTEM AND METHOD FOR PROVIDING AND USING UNIVERSALLY ACCESSIBLE VOICE AND SPEECH DATA FILES

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to the construction and use of distributed interactive voice and speech processing systems, including interactive voice response (IVR) systems and voice messaging (VM) systems. More particularly, the invention relates to form based publishing of voice information and the use of universally accessible personal profiles for authentication of the user by voice signatures and generating context sensitive active vocabularies to improve speaker dependent speech recognition. The invention also relates to the use of the user attributes and preferences stored in universally accessible personal profiles to improve the efficiency of navigation and search as well as efficacy of search results pertaining to user queries.

2. Description of the Related Art

Conventional interactive voice response (IVR) systems allow a user to place a telephone call into a system, navigate (generally using touch tone input) through a hierarchy of options in response to voice prompts and retrieve information stored in a computer database. Airlines, banks, credit companies and many other service organizations are just a few examples of the types of businesses using IVR systems to allow a customer (or prospective customer) to retrieve desired information. These conventional systems are generally organization-specific in that they offer access to a single database or set of databases related to the goods, services or other aspects of the organization maintaining the IVR system. Thus, conventional IVR technology is used to offer access to information specific to a single organization (i.e. a specific airline, bank or credit company). For example airlines typically use IVR to allow callers to access flight arrival and departure information or to select reservation options, for the particular airline only.

It is desirable to provide an IVR system that enables access to an aggregation of databases and services rather than a single database and service. One barrier to the provision of aggregated services in an IVR system is that conventional IVR systems do not have a distributed information publishing means. Conventional IVR systems do not have a mechanism for service/information providers to readily access the IVR system and add updated or entirely new information for publication on the IVR system.

Further, conventional IVR systems are generally configured for uniform access by any caller admitted to the IVR system. Each caller is handled by the system in the same manner and offered an identical set of options. One reason that IVR systems use uniform user interfaces for each caller rather than caller-specific configurations is that conventional IVR systems operate in "closed" computer environments hosting the particular IVR system. Thus, when a caller accesses a conventional IVR system, the only caller-specific information which the system has at its disposal, is any information previously provided by the caller which the system has maintained or any information that is provided by the caller during the IVR session (i.e. when a user enters an account number using touch tone telephone input). Because, however, collecting and storing caller-specific information with conventional technology is cumbersome and time consuming, most IVR systems do not offer caller-specific (caller customized) features.

There are numerous applications in which it is desirable for an IVR system to use caller-specific information in handling a call. Caller-specific information in the form of user preferences can aid in minimizing the size of a command tree which the user must navigate to access desired information. Additionally, caller specific information could also be used to authenticate the identity of a user in cases where security is an issue (i.e. in bank and credit contexts). Further, caller-specific speech training profiles could be used to implement speaker dependent speech recognition to allow for a caller to use voice commands in place of touch-tone commands. Still further, an IVR system having access to caller-specific data could be used to apply IVR technology in new application areas such as personal productivity.

Thus, there is a need for an improved voice and speech processing system that provides universal access to caller-specific information to provide user-customized IVR systems. Further, there is a need to provide universal access to voice and speech files in order to allow widespread use of such files for caller authentication and for performing speaker dependent speech recognition in IVR systems.

SUMMARY OF THE INVENTION

The system and method of the present invention extends World Wide Web (referred to herein as "www" or the "web") and Internet technology to provide universally accessible caller-specific profiles that are accessed by one or more IVR systems. The invention features a set of web pages containing information (components) formatted using MIME and hypertext markup language (HTML) standards with extensions for voice information access and navigation. These web pages are linked using HTML hyper-links that are accessible to users via voice commands and touch-tone inputs. These web pages and components in them are addressable using HTML anchors and links embedding HTML universal (uniform) resource locators (URLS) rendering them universally accessible over the Internet. This collection of connected web pages are referred to herein as the "voice web" and the individual pages are referred to herein as "voice web pages". Each web page in the voice web contains a specially tagged set of key words and touch tone sequences that are associated with embedded anchors and links used for navigation within the web.

In addition, the invention features a set of linked HTML pages representing the user's "personal profile". The personal profile contains user's attributes and preferences. Attributes include user's name, address, phone number, personal identification code, voice imprints for authentication, speech training profile and other information. Preferences include, configuration preferences such as personal greetings and gender and language selection, selection preferences such as bookmarks and favorite places and presentation preferences such as priority ordering, default overrides and preferred vocabulary.

The personal profile is designed for component access within web pages allowing easy extraction of context sensitive profile information. In particular, speech training profiles (included as a user attribute and which contain word patterns representing speaker dependent training information) partitioned into sets of related words likely to occur in combination within corresponding voice web pages. A set of command and control words such as "play, pause, continue, previous, next, home, reload, help, etc." are stored in a top level component set enabling user dependent but context independent navigation and control. Other component sets are designed to match the key word sets in corresponding voice web pages such as a calendar page or an address book page enabling user and context dependent navigation and control.

When a user calls into the distributed voice and speech processing system associated with the voice web, the system first identifies the user utilizing a unique account number (such as phone number or social security number). Next, it accesses the user's personal profile using the corresponding URL and retrieves the user attributes and preferences related to authentication and security. Using this personal profile information, the voice web system authenticates the identity of the user using a combination of personal identification code based password checking and voice imprint matching. The voice imprint is any sufficiently long utterance or phrase that the user has previously entered into his/her profile. Each user's voice imprint is analyzed and stored in the profile for quick matching on demand with a real-time provided user sample. The combination of every individual's unique vocal characteristics stored in the voice imprint coupled with the random choice of the password phrase ensures a high degree of security and authentication.

Once authenticated, the user is allowed to navigate and access more information from the voice web using voice commands. In order to effectively accomplish this task, the voice web system retrieves the context independent command and control key word set from the user's speech profile.

The voice web system then presents a top level voice web personal home page for user's perusal. At the same time, it retrieves the set of word recognition patterns associated with the key words in the presented page from the user's speech profile. Thus, the system is able to match the active vocabulary and associated speaker dependent word patterns dynamically in a context sensitive manner. The process continues as the user navigates from page to page. The voice web system dynamically retrieves the suitable subset of training word patterns from the user's speech profile matching the voice navigation key words in the page being presented to the user.

The process described above greatly reduces the size of the training information that needs to be retrieved at any time while significantly enhancing accuracy of speech recognition using speaker dependent training profiles. Since the speech profile is constructed using HTML pages and components, it is universally accessible using its URL. This enables the user to call into any compatible Internet connected voice web system in user's proximity from anywhere in the world, identify himself/herself to the system and then enable the system to dynamically retrieve suitable information that enhances his/her navigation and access of the information stored in the voice web using voice commands and input.

In addition to the user attribute information discussed above, the personal profile contains user preferences relative to configuration, presentation and information selection. These preferences are components within the personal profile pages and are easily available to the voice web system for dynamic retrieval. For example, if the user requests his/her stock portfolio from the voice web, it first retrieves the user's preferred portfolio of companies from his/her profile and applies this list to limit the search on stock quotes from all companies. The user gets exactly the information relevant to his/her interest in exactly the order of priority he/she prefers.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a functional block diagram of a voice web system in accordance with the present invention.

FIG. **2A** is a functional block diagram of the voice web system shown in FIG. **1** configured to provide voice web services.

FIG. **2B** is a functional block diagram of an exemplary calendar service.

FIG. **2C** is a functional block diagram of an alternative configuration of a voice web system in accordance with the present invention.

FIG. **3** illustrates personal voice web used to provide personal services using the system shown in FIG. **2A**.

FIG. **4** illustrates a hierarchy of speech training pages that correspond to the service pages shown in FIG. **3**.

FIG. **5** illustrates a hierarchy of attributes and preferences pages that correspond to the service pages shown in FIG. **3**.

FIG. **6** is a flow diagram of a subscriber authentication method used in the delivery of the personal voice web services shown in FIG. **3**.

FIG. **7** is a flow diagram of an enhanced speech recognition processes used in personal voice web systems shown in FIG. **3**.

FIG. **8** is a flow diagram of a query customization process in accordance with the present invention.

FIG. **9** is a flow diagram of a voice publishing method in accordance with the present invention.

FIG. **10** is a system diagram of a business-yellow-order page system in accordance with the present invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

The figures depict a preferred embodiment of the present invention for purposes of illustration only. One skilled in the art will readily recognize from the following discussion that alternative embodiments of the structures and methods illustrated herein may be employed without departing from the principles of the invention described herein.

System Description

FIG. **1** is a functional block diagram of a voice web system **100** in accordance with the present invention. Voice web system **100** extends the conventional internet and world wide web ("web" or www) technology to voice and speech processing applications and also enables new uses for interactive voice response (IVR) technology. Voice web system **100** includes one or more voice web sites **102** coupled to one or more voice web gateways **105** via the Internet **101**. Voice web sites **102** and voice web gateways **105** transfer files over Internet **101** in accordance with hypertext transport protocol (HTTP). A subscriber **107** accesses the voice web system **100** by coupling to the gateway **105** using a telephone **111** coupled to the public switched telephone network (PSTN) **109**.

Internet **101** is a system of linked communications networks that facilitate communication among computers which are coupled to internet **101**. Generally, internets such as Internet **101** facilitate communication by providing file transfer, electronic mail and news group services. Internet **101** is preferably the Internet which evolved from the ARPANET and which is publicly accessible world wide. It should be understood however, that the principles of the present invention apply to other internets and even closed (private) networks such as corporate intranets.

It should be noted that system **100** may include numerous voice web sites **102** and numerous voice web gateways **105**. A single voice web site **102** and a single voice web gateway **105** are shown in FIG. **1**, however, to keep the figure uncluttered. Thus, voice web system **100** is a collection of voice web gateways **105** and voice web sites **102** connected

over internet **101** enabling subscribers **107** to access voice web pages **103** via their telephones as shown in FIG. **1**.

A voice web page **103** is web page specified using a navigable markup language that includes voice extensions. A navigable markup language is an enhanced type of markup language that facilitates publication navigation and access of information stored in documents specified in the navigable markup language. An exemplary markup language is the Hypertext Markup Language 2.0, RFC1866, HTML working group of Internet Engineering Task Force, Sep. 22, 1995, edited by D. Connolly published on the www at the following uniform resource locator (URL) address: http://w3.org/pub/www/Markup/html-spec.

A markup language is a language that includes a set of conventions for marking portions of a document so that, when accessed by a parsing program such as a web browser, each marked portion is presented to a user with a distinctive format. In contrast to formatting codes used by word processing programs, markup language codes, called tags, do not specify exactly how the tagged portion should be presented. Instead the tags inform the web browser (parser) that the information is in a certain portion of a document such as title, heading, form or text and the like. The web browser (parser) determines how to present the tagged information.

A navigable markup language is an enhanced markup language that uses tags that are anchors and that are links. When these link and anchor tags are invoked, a user is then presented another navigable markup language document in accordance with the link and anchor tags. This link is sometimes called a hyperlink. A hyperlink is a reference to another markup language document which when invoked facilitates access of the referenced markup language document.

A navigable markup language thus uses attributes, tags and values that enable (i) a publisher to specify the presentation of information to a user; (ii) a user to interactively access the stored information; and (iii) a user to access other navigable markup language documents using hyperlinks.

The navigable markup language used to specify voice web pages **103** is HyperVoice Markup Language (HVML). HVML is a version of HTML that includes voice extensions as described in Appendix A, incorporated herein by reference. Voice web pages **103** include HVML tags and attributes that extend HTML to facilitate publication, navigation and access to voice information. For example, HVML specifies functions and protocols that facilitate voice and speech processing including voice authentication, speaker dependent speech recognition, voice information publishing (e.g. creating a voice form) and voice navigation.

Just as conventional web documents are displayed for the user , voice web documents **103** are "played" to a subscriber over a telephone. A voice web page **103** is played (by voice web browser **106**) by sequentially presenting the embedded voice components according to the HVML and MIME specifications.

While a conventional web site enables on-demand access over an internet to conventional web pages, voice web site **102** enables on demand access to voice web pages **103**. Voice web site **102** is a computer that hosts voice web pages **103** and serves them up to other computers (i.e. voice web gateway **105**). More specifically, voice web server **102** is a computer configured with conventional web server software **112** and which has access to stored voice web pages **103**. A voice web site **104** additionally optionally includes a subscriber directory **104** that stores a list of registered system subscribers. Voice web site **102** stores, serves and manages voice web pages **103** and can execute associated external scripts or programs in accordance with the present invention. These external scripts and programs interface with databases and other information sources both internal and external to web site **102**.

Voice web gateway **105** is a computer connected to the internet **101**. Voice web gateway **105** also includes a conventional voice telecommunications interface **114** for coupling to the public switched telephone network (PSTN) **109** for telephonic communications with a subscriber **107**. Telephone **111** is any voice enabling telecommunications device. Exemplary telephones include conventional desktop telephones, portable telephones, cellular telephones, analog telephones, digital telephones, smart phones and a computer configured to operate as a telephone and perform telephonic functions. Thus voice web pages **103** are universally accessible from any ordinary telephone **111**. Alternatively, a subscriber **107** may access voice web pages **103** either by using a subscriber interface local to voice web gateway **105** (i.e. a direct user interface with voice web gateway **105**) or by dialing into voice web gateway **105** using another computer such as a personal digital assistant or a smart phone.

Voice telecommunications interface **114** serves as an interface between a voice web browser **106** and telephone **111** and preferably includes conventional telephony and voice processing hardware and software enabling voice web gateway **105** to receive and answer telephone calls, respond to touch tone and voice commands, route and conference calls, play voice prompts and record voice messages.

Voice web gateway **105** additionally hosts a voice web browser **106**. Voice web browser **106** is a computer program capable of accessing and processing voice web pages **103** in response to a request placed by subscriber **107**. More specifically, voice web browser **106** (i) processes voice and touch tone activated subscriber commands, (ii) retrieves requested voice web pages **103** from the appropriate voice web site **102**, (iii) interprets the embedded markup language (HVML) in the retrieved voice web page **103** and (iv) delivers the contents of a voice web page **103** to a subscriber **107** over the telephone **111**. In performing the above-mentioned processing, voice web browser **106** executes scripts, including "voice scripts" embedded in a voice web page **103**. Voice web browser **106** provides a subscriber **107** with fast, easy, convenient voice activated navigation and access to voice web pages **103**.

Voice web browser **106** is a conventional web browser modified with appropriate voice information playback and recording extensions and enhancements. Appendix A includes a specification of HVML and voice web browser commands and is incorporated herein by reference.

Some voice web pages **103** contain references to scripts and programs that operate as service agents **110**) to respond to subscriber requests as well as external events and carry out prescribed actions. These scripts and programs are externally stored on voice web sites **102** (for example as Common Gateway Interface (CGI) Scripts or Internet Services Application Programming Interface (ISAPI) programs). These external scripts and programs execute in the voice web server **102** environment as a service agent **110**. The external scripts and programs that comprise service agents **110** are referred to by URLs embedded in an associated voice web page **103**. In the case of a voice web page **103** that is a voice form, the script or program associated with the service agent executes in response to voice form submission by a subscriber **107**. Service agents **110** follow standard Internet protocols such as HTTP, and conform to

conventional formats such as MIME and application programming interfaces (APIs) such as CGI and ISAPI.

HVML Description

Conventional web pages are designed primarily for presentation on a computer color monitor and navigation by a mouse and key board. As such, graphics, images and text are the primary media types supported widely. Although, audio, video and 3-dimensional graphics extensions are becoming available, these extensions are directed primarily at computer users and not telephone users.

Voice web pages **103** consist of HTML pages that have been extended with Hyper Voice Markup Language (HVML) for easy and effective navigation and access of voice information via a voice activated device such as an ordinary telephone. Voice web pages **103** retain all the properties and behavior of conventional HTML pages such as HTML markup tags, universal identifiers (URLs), and hyper-links and can be accessed by a conventional web browser using HTTP protocols from a conventional web server. The additional markup tags are interpreted by an HVML extended web browser to enable subscribers **107** to navigate and access voice web pages **103** over the phone or similar voice activated device. Appendix A includes a specification of HVML and voice web browser commands and is incorporated herein by reference.

HVML pages web pages voice web page **103** are specially designed for presentation using an ordinary telephone **111** and navigation using touch tones and voice commands. This is in contrast to conventional multimedia web pages that may embed audio data to be presented on a multimedia personal computer using its speakers and navigated using its mouse, key board and microphone. Although, HVML voice web pages **103** can be embedded in generic multimedia web pages, thus sharing some of the information, they are designed to be presented using an ordinary phone and navigated using commands generated by touch tone signals and speech recognition.

An HVML web page (voice web page **103**) is first and foremost an HIML page. Each web page **103** has a unique universal resource locator (URL) (also called uniform resource locator). A URL is a string of characters that uniquely identifies an internet resource including an identification of (i) the access protocol to be used; (ii) an indication of resource type; and an identification of its location in the computer network. For example, the following fictitious URL identifies a www document: http://www.voiscorp.com/banner.gif uniquely identifies the location of a resource on the world wide web computer network. "http://" indicates the access protocol. "www.voiscorp.com" is the domain name of the computer on which the resource is located. "banner" is the name of the resource located on the computer specified by the domain name. "gif" indicates that the banner resource is a gif (graphical interchange file) type resource. Similarly, the following fictitious URL uniquely identifies the location of a voice web page **103**: http://www.voiscorp.com/voicememo.hvml. In this example, "voicememo" is the name of the resource located on the computer specified by the domain name. "hvml" indicates that the voicememo resource is an hvml type resource. Thus, web pages **103** are each uniquely identified by their corresponding URL. Once located, a web page **103** can be created, edited and played using existing web publication tools, it can be stored on any conventional web server anywhere on the Internet, it can be accessed by any conventional web browser and presented on a computer monitor, it can be navigated using the computer's mouse, keyword, and (with some additional plug-ins) microphone, and it can contain embedded anchors and hyper links to other HTML pages, including other HVML pages.

Voice web pages **103** are designed for three primary purposes: (i) presenting structured voice information to a user; (ii) enabling the user to navigate across and within voice pages; and (iii) capturing user input for information queries or submission.

a. HVML Presentation

Presentation of voice information is accomplished primarily by the voice tag. The voice tag has a type attribute which specifies the type of voice information to be presented. If the type attribute has the file value, the voice information is obtained from a voice file specified by its URL. If the type attribute has the text value, the voice information is synthesized from the specified text. If the type attribute has number, ordinal, currency, date, or character value, then the voice information is generated by concatenating voice fragments from a pre-recorded indexed system voice file. If the type attribute has the stream value, then the voice information is obtained from the voice stream specified by its URL. Composition of several voice elements into a seamless voice string is accomplished by the voice-string tag.

Combining these tags, publishers can compose and present: (i) pre-recorded voice prompts and messages; (ii) voice prompts generated using text-to-speech technology; and (iii) Pre-formatted voice prompts with dynamic speech synthesis elements.

b. HVML Navigation

Navigation of voice web pages **103** is primarily accomplished by extending the HTML anchor tag with new attributes—tone and label. These attributes are used in conjunction with the existing href attribute in an anchor element that makes the anchor into a hyper link. When the user selects the touch tone signals specified by the value of the tone attribute or utters the word specified by the label attribute, the browser invokes the corresponding hyper link. The tone and label attribute values must be unique within a page. Navigation is also accomplished by system commands such as next, previous, reload, home, bookmarks, help, fax, and history which are invoked by specific touch tone sequences or utterance of the words. Users can control the voice browser operations by issuing system commands such as stop, start, play, pause, exit, backup, and forward. Using these attributes, publishers can enable (i) touch tone command and control and link navigation; (ii) pre-defined, system and user specific, spoken command and control key word recognition; and (iii) page and user specific spoken command and control key word recognition.

c. HVML Forms

HVML uses the form tag to enable user input similar to HTML including the method attribute which specifies the way parameters are passed to the server and the action attribute which specifies the procedure to be invoked by the server to process the form. HVML extends the input tag within forms by introducing voice-input tag. Voice-input takes a type attribute similar to the input tag with three new values "voice", "tone" and "review" in addition to the existing "reset" and "submit" values. The HVML browser pauses at each voice-input statement in a HVML form until the specified input is supplied or input is terminated, before processing the remaining form. Using these tags and attributes, publishers can enable: (i) touch tone command and control and parameter input; (ii) pre-defined, user specific, spoken alphabet and digit input; (iii) page and user

specific, spoken key word and proper names input; and (iv) free form voice information input.

Operational Description of the Voice Web Browser

Syntactic and structural intelligence, such as in-line pre-recorded voice prompts, pre-formatted voice prompts with dynamically generated voice elements, key word accessible anchor elements, voice responsive hyper links etc. are embedded in voice web pages **103** through voice access extensions to HTML. Behavioral intelligence including command interpretation, page access, file caching, HVML interpretation and user interaction is embedded voice web browser **106** (the HVML browser). Voice web browser **106** has the following states: (i) waiting for user commands; (ii) active accessing and playing HVML pages; and (iii) paused for user input.

Initially, voice web browser **106** is launched upon the system's receipt of a subscriber's telephone call. Once launched, voice web browser **106** goes through an initialization sequence that includes subscriber authentication and normally becomes "active" accessing and playing the subscriber's home page. Once the home page is played, voice web browser **106** "waits" for subscriber commands. As part of playing the page, the browser may "pause" for subscriber input and continue once the input is provided.

Independent of any specific voice web page **103** that a subscriber may be accessing, voice web browser **106** provides a set of navigational and operational commands. Within the telephone key pad, "*" and "#" are special keys that generate unique tones. Voice web browser **106** has special meaning for these keys. In general, the "*" key followed by a sequence of touch tones, excluding the "#" key, signals a browser command, an escape or a skip and the "#" key signals a link activation, termination of form input, termination of a key sequence or a selection.

Voice Web Services

Voice web system **100** can be used to provide voice web services to a subscriber **107**. A voice web service is a service that provides on-line telephone based access to information. The information is presented to the user through the publication of voice web pages **103**. The information presented to (published for) the subscriber may be information retrieved from a single information source or a combination of information sources including publicly accessible on-line databases, information proprietary to voice web system **100**, information previously stored by subscriber **107** or another informaton source. Exemplary services provided by voice web system **100** include (i) personal information services such as calendar, address book, electronic mail, voice mail, (ii) information services such as headline news, weather reports, sports score, stock portfolio quotes, business white pages, yellow pages, classified information and (iii) transaction services (commerce services) such as banking, bill payments, stock trading, airline hotel and restaurant reservations and catalog store orders.

Users gain access to voice web services by becoming voice web subscribers **107**. Subscribers **107** preferably sign up (e.g. register) for services through a service provider. In one embodiment, each subscriber **107** is assigned a unique account number on a calling card and subscribers **107** access the voice web system **100** by dialing a single "800" (e.g. toll free) service phone number and by then supplying their account number via the telephone **111**. In an alternative embodiment, the services are publicly available and any user placing a call into the system is processed as a subscriber **107** without requiring any registration.

FIG. **2**A is a functional block diagram of a voice web system **200** configured to provide voice web services to a subscriber **107**. Voice web system **200** includes one or more voice web gateways **105** coupled to one or more service sites **202** via internet **101**. Service site **200** is a voice web site **102** configured to provide voice web services. Each voice web service is implemented using a collection of service agents **201** and service pages **203** centered around a service database **202**. Additionally, service site **200** optionally includes a personal profile **204** to be used to the extent that the service being provided requires pre-stored subscriber-specific information (i.e. pre-stored information personal to the particular subscriber).

Voice web service agents **201** are a type of service agent **110** (shown in FIG. **1**) that execute on service site **102** to provide voice web services to a subscriber **107**. Voice web service agents **201** are therefore scripts and programs represented by a web page **103** (show in FIG. **1**).

Service database **202** is a database of service information. The content of the service information varies with the type of service being provided. For example, if voice web system **100** is configured to deliver a business white page service, then service database **202** is a database of address and phone number listings for businesses. If voice web system **100** is additionally or alternatively configured to deliver news headlines, then voice web system **100** includes a service database **202** that includes current news headlines.

Service forms and pages **203** are voice web pages **103** that are HVML templates (voice forms and pages) that are "filled in" in response to a specific subscriber request. Service pages and forms **203** are used to gather subscriber input, to retrieve information and to deliver (publish) information to a subscriber. Some service pages **203** are database entry and administration forms, some are database query forms and others are database response pages. Entry forms are used to add information to the database. Query forms are used to extract information from the database. Response pages are used to present retrieved information to the user. In the prefered embodiment, service agents dynamically generate service and pages forms **203** by retrieving requested data from service database **202** and using the retrieved data in place of corresponding variables stored in an HVML template. The HVML templates link to each other specifying request-response dependencies. Thus, subscribers **107** are able to enter and retrieve information in personal and external databases over internet **101** using web protocols without having to create a voice web page for each entry in service database **202**.

Service agent **201** typically uses a service database **202** and a set of service pages and forms **203** to provide the corresponding voice web service. The service database **202** hosts the information that subscribers **107** wish to access. The service forms allow subscribers **107** to input and query information in service database **202**. Service pages allow service agents **201** to present the requested information to the subscriber **107** using voice web browser **106**.

FIG. **2**B is a functional block diagram of an exemplary calendar service. The calendar service agent **210** uses the calendar database **211** together with the calendar and appointment details input and query voice web forms **212** and appointment list and details voice web pages **213**. Subscribers fill in the calendar and appointment details input voice web forms **212** to set their calendar appointments and their details. The calendar service agent **210** processes the submitted form and updates the calendar service database **211**. Later, subscribers can retrieve their appointments for

any day by supplying **214** the month, date and year for that day in the calendar query voice web form **212**. The calendar service agent **210** processes the submitted form, retrieves the matching appointments from the calendar database, and dynamically composes and returns the appointment list voice web page **213**. If the subscriber requests for the details of any appointment, the calendar service agent **210** dynamically generates and supplies the corresponding appointment details page **213**.

The Personal Voice Web

FIG. **3** shows a personal voice web **300** in accordance with the present invention. Personal voice web **300** is standardized collection of linked voice web pages and voice web forms (a special type of voice web page) that form a personal service space for the subscriber. Preferably, all subscribers share a common structure of linked voice web pages although the contents of personal voice web pages vary from subscriber to subscriber. Because each subscriber of the personal voice web system **300** has the linked page structure shown in FIG. **3**, subscribers navigate about and access information from their personal voice web **300** in a standardized way. Each page in personal voice web **300** includes an agent that performs various processing tasks required for each respective page. At the root of personal voice web **300** is the personal home page **301**. Personal home page **301** links to a personal profile page **302**, a personal administrative assistant page **303**, a personal helpdesk page **304**, and a personal commerce page **305**.

The personal administrative assistant page **303** is linked to a number of personalized voice web services (service pages) **330** including, by way of an example, a calendar and appointments page **309**, an address book page **310**, a stock portfolio page **311**, a news headlines page **312**, a mail box page **313**, and a business white pages home page **314**.

Calendar and appointments page **309** is used to provide an appointments service. The appointments service enables a subscriber to track personal and business appointments in a voice-based calendar. The subscriber thus adds and retrieves appointments over the phone using personal voice web **300**. In addition to providing day and time information related to stored appointments, a subscriber may also store voice note annotations that is associated with a particular appointment.

Address book page **310** is used to provide an address service. The address service enables a subscriber to add and retrieve address, phone number, and other information related to individual names or company names. The information added and retrieved is stored in a address book service database private to the subscriber.

Stock portfolio page **311** is used to provide a stock quote service. The stock service enables a subscriber to retrieve current stock pricing and portfolio valuation information as well as statistical information related to changes in portfolio or stock positions. The stock service uses information retrieved from a stock portfolio service database private to the subscriber and additionally retrieves current stock pricing information from an on-line data-base or information source.

News headlines page **312** is usedenables ide a news service. The news service enables a subscriber to retrieve news headlines related to subscriber customized topics.

Mail box page **313** is used to provide a mailbox service. The mailbox service enables a subscriber to access electronic mail (e-mail) messages. The e-mail messages are played for the subscriber using text to speech conversion and a speech synthesizer.

Business white pages home page **314** is used to provide a white page service. The white page service enables a subscriber to enter partial company name, and optionally city name and state code to retrieve the company's full name, address and phone number.

Each service page **309–314** is part of a collection of voice forms and pages that are used by the corresponding service agent to retrieve a request from the subscriber, generate an appropriate database query responsive to the subscriber-request, retrieve subscriber-requested information, and generate a voice web page that incorporates the retrieved information and that is adapted for presentation (publication) to the subscriber using a voice web browser. Thus, for example the service agent associated with calendar and appointments page **309** generates a voice form for prompting a subscriber for month, day and year information. After receiving the prompted information, calendar and appointments service agent generates the appropriate query to extract the requested calendar information from a calendar service database. Once the calendar information is retrieved from the database, the calendar and appointments service agent generates a voice web page that includes the retrieved information. The new page is then presented (published) to the subscriber over the telephone by the voice web browser.

Each of the other personal service agents associated with personal service pages **308–327** operate in a similar way to provide a subscriber with information retrieved from associated service databases.

Personal helpdesk page **304** is linked to personal voice web helpdesk service pages **331** including, by way of example, a hotels page **315**, an airlines page **316**, a rental cars page **317**, a travel agents page **318**, a restaurants page **319**, a financial services page **320**, and a banks page **321**. The personal helpdesk page has an associated personal helpdesk agent that is used to provide a set of helpdesk services. Helpdesk services enable a subscriber to access product, pricing, availability and other information of the corresponding services.

Hotels page **315** is used to provide a hotel reservation service. Airlines page **316** is used to provide an airline booking service. Rental cars page **317** is used to provide a rental car reservation service. Travel agents page **318** is used to provide a travel service. Restaurants page **319** is used to provide a menu and reservations service. Financial services page **320** is used to provide a financial service. Bank page **321** is used to provide a bank service.

Personal commerce page **305** is linked to personal voice web commerce service pages **332** including, by way of example, an apparel shops page **322**, a luggage stores page **323**, a gift shops page **324**, a flower shops page **325**, an office supplies stores page **326**, and a book stores page **327**. The personal commerce page provides commerce services that enables a subscriber to access catalogs associated with various retail establishments. As part of the commerce service, the personal voice web allows a subscriber to shop in various catalogs and then submit orders for selected items directly to the sponsor of the associated catalog. Orders are submitted to the catalog sponsor either as a voice web form or conventional web form sent to the sponsor, as an electronic message or using another means.

Personal profile page **302** links to a set of personalized voice web profile pages including an authentication page **306**, a speech profile page **307**, and an attributes and preferences page **308**.

User authentication page **306** contains authenticating information including a subscriber account number, an

encrypted password or personal identification number and links to a voice authentication signature MIME resource.

Speech profile page **307** is linked to a hierarchy of speech training pages that correspond to the hierarchy of personal voice web **300**. FIG. **4** shows the hierarchy **400** of speech training pages **401–427**. Speech training pages **401–427** are sets of pre-captured training files to be used in performing speaker dependent speech recognition in providing the corresponding service to a subscriber. Each speech training page is thus accessed by the corresponding agent in performing the corresponding service. For example, the administrative assistant service accesses administrative speech training set **431** (including speech training pages **409–414**). The helpdesk service accesses the helpdesk training page set **432** (including speech training pages **415–421**). The commerce service accesses the commerce training page set **433** (including speech training pages **422–427**).

Each speech training page **401–427** includes training data specifically tailored to the words more commonly associated with the corresponding service. For example, the calendar speech training page **409** includes training vocabulary to aid in the recognition of voice commands such as "Tenth", "November", "Tuesday" and so forth.

Referring now again to FIG. **3**, personal attributes and preferences page **308** includes subscriber attribute information including name, account number, address, voice telephone number, fax telephone number, paging telephone number, encrypted credit card numbers and the like as well as personal preference information such as configuration, selection and presentation preferences. Personal attributes and preferences page **308** is also linked to hierarchy of attribute and preferences pages (shown in FIG. **5**) that correspond to the hierarchy of personal voice web **300**.

FIG. **5** shows the hierarchy of attributes and preferences pages **501–527** associated with personal attributes and preferences page **308**. Attributes and preferences pages **501–527** are pages that store subscriber-specific preference information to be used in providing the corresponding service to a subscriber. Each attributes and preferences pages **501–527** is thus accessed by the corresponding agent in performing the corresponding service. For example, the administrative assistant service accesses attributes and preferences set **531** (including attributes and preferences pages **509–514**). The helpdesk service accesses the helpdesk attributes and preferences set **532** (including attributes and preferences pages **514–521**). The commerce service accesses the commerce training page set **543** (including attributes and preferences pages **522–527**).

It should be noted that the user profile information for multiple subscribers is stored in user profile databases. The user profile databases are accessed by service dependent profile agents. For example, personal identification and verification information of multiple subscribers is stored in a user profile home page database (a service database) and accessed by the subscriber's profile home page agent. Calendar attributes and preferences information for multiple subscribers is stored in the subscriber calendar attributes and preferences profile database (a service database). Calendar service specific speech training information for multiple subscribers is stored in the subscriber calendar speech training profile database (a service database). Calendar service profile agent responds to HTTP form requests for calendar attributes and preferences or calendar speech training profile page information for any particular subscriber and supplies the appropriate subscriber profile page information as HVML voice web pages.

The collection of profile pages for a single user constitute that user's personal voice web profile **300**. Personal Voice web profile **300** need not be a collection of static HVML pages (voice web pages), but instead be generated dynamically using user profile page databases. However, once generated, these profile pages can be reused from various cache systems within the voice web system without having to retrieve them from their original databases thus saving significant time and resources.

In operation, a personal voice web service agent uses a corresponding service profile agent to retrieve subscriber and service specific attributes and preferences, speech training profiles and other information from the corresponding service profile database. The personal voice web service agent uses the retrieved subscriber and service specific information in personalizing the voice web service forms and pages as well as in enhancing and improving speech recognition by embedding the speech training profiles in the corresponding voice web forms and pages.

Referring back to FIG. **2**B, for example, the calendar service agent **210** uses a corresponding calendar service profile agent **215** to retrieve subscriber specific calendar attributes and preferences included in profile database **216** by specifying the subscriber's calendar attributes and preferences profile URL as part of a profile request web form. Calendar service profile agent **215** responds to the submitted web form, retrieves the requested subscriber information from the calendar service profile database **216** and delivers it to calendar service agent **210** as a table formatted web page. Calendar service agent **210** retrieves the requested information from the table format in the web page and uses the subscriber's attributes and preferences to customize the voice web service form and page templates **213** before presenting them to the subscriber. In this way, the subscriber can have a personalized form or page presented to him/her without having to supply information about himself/herself repeatedly in each call.

Similarly, calendar service agent **210** uses a corresponding calendar service profile agent **215** to retrieve subscriber specific calendar speech training profiles from profile database **216** by specifying the subscriber's calendar speech training profile URL as part of a profile request web form. Calendar service profile agent **215** responds to the submitted web form retrieves the requested subscriber information from the calendar service profile database **216** and delivers it to the calendar service agent **210** as a table formatted web page. The calendar service agent **210** retrieves the requested information from the table format in the web page and embeds the subscriber's speech training profiles in the voice web form and page templates (pages **212,213**) before delivering them to the voice web browser. The voice web browser uses these speech training profiles to dynamically change the active vocabulary in the voice processing software and hardware thereby customizing it to the subscriber.

FIG. **2**C is a functional block diagram of an alternative configuration of a voice web system in accordance with the present invention. The system includes a computer configures as a combined voice gateway and voice web site (combined site) **220**. Combined site **220** includes gateway components such as a voice and telephony interface **114**, a voice web browser **106** and server software **112**. Combined site **220** additionally includes voice web site components such as service agents **201**, service database **202** and service forms and pages **203**. Combined web site **220** provides voice web access to a subscriber **107** coupling the combined site **220** via the PSTN **109**. Because the voice gateway and voice web site functions are combined within a single computer

environment, the server software **112** (located in combined site **220**) and the voice web browser **106** exchange files without suffering the delays imposed by routing across the Internet **101**. In certain applications, for example when a subscriber is accessing personal databases this configuration is advantageous to improve system performance. It should be noted, however, that even though server software **112** (located on combined site **220**) and voice web browser **106** exchange files using a local interface as opposed to Internet **101**, they nonetheless exchange files in accordance with HTTP.

Voice web browser **106** communicates with other web sites (such as web sites **224** and **225**) using Internet **101**. Web site **224** is a computer coupled to Internet **101** configured with server software **112**, service agents **201**, service database **202** and service forms and pages **203**. Web site **224** is configured to deliver voice web services as described in reference to FIGS. **2**A and **2**B.

Web site **225** is a computer configured with server software **112**, a profile service agent **223**, service forms and pages **222** and profile database **221**. Web site **225** is a universally accessible profile web site that is accessed by any other web site or web gateway in the voice web system as long as the accessing web site or web gateway has the appropriate URL information. Web site **225** provides user profile information to web site agents (such as service agents **201**) located on other web sites (such as web site **224** and combined site **220**). Advantageously, any web site and/or web gateway can thus access information stored in the profiles database **216** by hyperlinking to the web page associated with profile service agent **215**.

User Authentication and verification

Personal voice web system **300** uses a login agent as a gatekeeper to the access of each subscriber's personal voice web. The login agent is a distributed software program that can receive subscriber information over a telephone, access the subscriber's personal profile pages from the subscriber's personal voice web and verify the subscriber's credentials over the telephone.

Each system subscriber is given (i) an account number (ii) a personal identification number (PIN) and (iii) a service calling number. In order to access a personal voice web, the subscriber calls the service calling number and uses account information and the PIN to initiate a subscriber authentication process. FIG. **6** is a flow diagram of a subscriber authentication method **600** in accordance with the present invention. The subscriber authentication method **600** includes authentication signature creation form processing and subscriber authentication processing.

A subscriber initiates access **601** of his or her personal voice web **300** by calling the service calling number using a conventional telephone or a similar voice activated device computer configured to access the public telephone network. After the subscriber initiates access **601**, a login agent starts login processing **602**.

During login processing **602**, the login agent answers the call and presents a standard login form to the subscriber. A login form is a voice form for collecting and submitting login information including subscriber account number and the subscriber PIN. After a subscriber enters the login information (into the login form) and submits the login form, the login agent uses the login information to retrieve the URL of the subscriber's personal voice web home page **301**. The login agent retrieves the URL by looking up the subscriber's account number in the voice web subscriber directory. The login agent additionally verifies the PIN which was submitted. Upon verification of the PIN, the login agent presents **603** the subscriber's voice authentication form to the subscriber over the telephone. As part of the presentation, the login agent requests the subscriber to supply a personalized voice authentication sample. The login agent then waits **604** for the subscriber to supply the sample and submit **605** the form. After the subscriber submits **604** the form, the login agent processes **606** the submitted form. During processing **606** of the submitted form, the login agent accesses the subscriber's personal authentication page from the subscriber's personal voice web profile (linked to the subscriber's home page) and attempts to retrieve the voice authentication signature. If this is the first time the subscriber is accessing the service, the signature will be missing from the subscriber's authentication page. In this case, the login agent presents **607** the authentication signature creation form to the subscriber. Using the options presented in the signature creation form, the subscriber selects the option to create or modify the personal voice authentication signature. Following the instructions provided by the login agent, the subscriber fills in **608** the voice authentication signature creation form and records a personalized voice phrase as an authentication signature. After filling in **608** the signature creation form, the subscriber submits the form to the login agent. The login agent waits until the signature creation form is submitted **609**. The login agent then processes **610** the recorded phrase converting it into a signature pattern and linking it to the user authentication page as a MIME resource for future verification.

If however, after processing **606**, the login agent determines that there is an authentication signature stored in the subscriber's personal profile then the login agent perform a test **611** to determine whether there is a match between the stored authentication signature and the voice sample submitted by the subscriber. If test **611** determines that there is a match between the sample and the signature, then the subscriber is given access to the personal voice web and the voice web. Test **611** uses conventional voice authentication methods. A "match" is determined by test **611** when the conventional voice authentication method determines that the speaker's voice print or voice signature matches a master stored voice print or voice signature within a specified tolerance. If, however, the test determines that there is not a match between the sample and the signature, then the subscriber is denied access **613**.

Enhanced Speech Recognition

Automatic speech recognition falls into three categories: speaker dependent, speaker adaptive, and speaker independent. A speaker dependent system is developed to work for a single speaker and are usually easier to develop, cheaper to buy and more accurate but requires the use of user-specific speech training files.

The size of the vocabulary of a speech recognition system affects the complexity, processing requirements and the accuracy of the system. Referring now again to FIG. **3**, personal voice web **300** uses small to medium sized vocabularies (ten to hundred of words).

An isolated-word or discrete speech system operates on single words at a time requiring a pause between each word utterance. This conventional type of speech recognition is a simple form of recognition to perform because the end points are easier to find and the pronunciation of a word tends not to affect others. As the occurrences of the words

are more consistent and sharply delimited they are easier to recognize. Personal voice web **300** focuses on discrete speech and in particular on speech used for command and control.

Personal voice web **300** typically uses speech coded at 8 kHz using 8 bit samples resulting in 64 kbps bandwidth and storage. Conventional adaptive pulse code modulation (ADPCM) techniques can reduce the bandwidth to 16 kbps without loss of information.

Personal voice web **300** uses conventional speaker dependent recognition of discrete speech. This conventional speaker dependent recognition relies on digital sampling of the word utterances. After sampling, the next stage is acoustic signal processing. Most techniques include spectral analysis. This is followed by recognition of phonemes, groups of phonemes and words. This stage uses many conventional processes such as Dynamic Time Warping, Hidden Markov Modeling, Neural Networks, expert systems and combination of techniques. Hidden Markov Modeling based techniques are commonly used and generally the most successful approach. Additionally, personal voice web **300** uses some knowledge of the language to aid the recognition process.

Personal voice web **300** improves speaker dependent recognition of discrete speech in a command and control context using universally accessible personal speech training profiles **401–427**. As described above, the personal speech training pages **401–427** are organized as a linked collection of voice web profile pages each linked to the corresponding personal voice web service page. Thus, the personal speech training profile pages parallel the personal voice web service pages in structure as shown in FIGS. **3** and **5**. Each speech training page **401–427** contains the training vocabulary for browser command and control that is context dependent.

Each service page **301–327** linked to the personal voice web home page **401** has a corresponding speech training page **402–427**. The personal voice web **300** is constructed in such a way that each voice web service page **302–327** links to its corresponding speech training page **401–427** using its URL. As the subscriber navigates from service page to service page in the personal voice web **300**, the system is able to access the corresponding speech training page using its embedded URL.

Each speech training page **401–427** contains a set of command and control key words and their personalized speech recognition patterns representing the context sensitive vocabulary for the corresponding service page. For example, the calendar and appointments service page **309** is linked to a corresponding speech training page **409** containing key words and recognition patterns for "year", "month", "day", the names of the months and days, digits representing dates and times etc. Similarly, stock portfolio page **311** is linked to a corresponding speech training page **411** containing key words and recognition patterns for "stock", "quote", "volume", "option", "symbol", names of companies in the portfolio etc.

FIG. **7** is a flow diagram of a speech recognition process **700** in accordance with the present invention. The process is initiated after a subscriber has gained access **701** to the personal voice web in accordance with the process described in reference to FIG. **6**. Once the subscriber gains access to the personal voice web **701**, the login agent accesses the subscriber's personal voice web home page and presents **702** the home page to the subscriber over the phone. During the process of presenting **702** the home page, the login agent loads the personal voice web profile page **302** and the speech profile page **501** containing the command and control vocabulary for the home page. Th is vocabulary includes the basic voice web browser command and control as well as home page specific command and control. From the home page, the subscriber requests a particular service (i.e. personal administrative assistant, the personal helpdesk or the personal catalog store). The home page agent determines **703** what service the subscriber has selected and in response, invokes **704** the selected service and then proceeds to deliver **705** the service. During invocation **704** of the service, both the service page and the speech training page associated with the service page are loaded on the voice web gateway where the voice web browser uses them to deliver the service and improve speech recognition.

During delivery **705** of the selected service, the service agent uses the speech training page associated with the selected service to recognize voice commands submitted **720** by the subscriber. Specifically, the service agent obtains the speech training profile, embeds it in the service page as a MIME resource and forwards it to the voice web browser which uses the training profiles to improve recognition. Thus, responding to the subscriber's voice commands pertinent to the accessed voice web service page, the voice web browser recognizes the command and control word utterances (the subscriber's voice commands that are submitted **720**) and matches them against the personalized vocabulary in the corresponding voice web speech training page for accurate speaker dependent recognition of discrete speech.

If the subscriber requests access to a new service page linked to a currently accessible service page, the currently active service agent exits **706** the current service and then invokes **704** the requested service. During the invocation of the requested service, the requested voice web service page corresponding to the requested service is loaded as well as the corresponding speech training page containing the matching command and control vocabulary. In this process **700**, the active service agent always uses the most appropriate vocabulary for the existing context thereby greatly reducing the size of the active vocabulary that needs be accessed while significantly improving the speaker dependent recognition.

Query localization and customization

Query customization uses stored subscriber attributes and preferences to customize queries of service databases. Query customization is accomplished by maintaining user attributes and preferences in a collection of voice web pages **501–527** (described above in reference to FIG. **5**) that parallel the corresponding voice web service pages **301–327** (described above in reference to FIG. **6**) and using the attribute and preferences information corresponding to the service requested to customize the query parameters within forms.

Referring now again to FIG. **5**, the attributes and preferences pages **501–527** parallel the personal voice web service pages **301–327** in structure as shown in FIG. **3**. Each service page linked to the personal voice web home page **301** has a corresponding voice web attributes and preferences page linked to it. The personal voice web **300** is constructed in such a way that each voice web service page **301–327** links to its corresponding voice web attributes and preferences page **501–527** using its URL. As the subscriber navigates from service page to service page in the personal voice web **300**, the system is able to access the corresponding voice web attributes and preferences page using its embedded URL.

A subscriber of voice web services requests information by accessing a voice web service page and having it played by the corresponding agent (i.e. administrative assistant, helpdesk or commerce agent). The subscriber requests service through submitting a query form presented by the corresponding agent. The query form is an HVML form for touch tone and voice data input. When a service is requested by the subscriber, the agent retrieves the corresponding voice web attributes and preferences page and automatically fills the query form with appropriate default parameters obtained from the subscriber's attributes and preferences. For example if the subscriber is accessing the weather service page, the agent fills in the subscriber's home town and other chosen cities automatically from the subscriber's attributes and preferences page. Similarly, if the subscriber is accessing the stock portfolio service page, the agent accesses the corresponding attributes and preferences page and fills in the subscriber's chosen portfolio of stocks in the query form. In addition, the agent also automatically fills in the appropriate subscriber attributes such as his/her access account number, password etc., thereby easing the subscriber's access while exploiting the availability services through web based queries.

FIG. **8** is a flow diagram of a query customization process **800** in accordance with the present invention. The process is initiated after a subscriber has gained access **801** to the personal voice web in accordance with the process described in reference to FIG. **6**. Once the subscriber gains access **801** to the personal voice web, the login agent accesses the subscriber's personal voice web home page and presents **802** the home page to the subscriber over the phone.

During the process of presenting **802** the home page, the login agent loads the attributes and preferences page **501** from the subscriber's voice web personal profile. Attributes and preferences page **501** contains preferences for the home page **301**. From the home page **301**, the subscriber accesses the targeted voice web service page by navigating the appropriate hyper links from the voice web home page **301**. In response, the selected service is invoked **803** and the selected service then proceeds to deliver **804** the service. During invocation **803** of the selected service, both the service page and the attributes and preferences page associated with the service page are extracted by the service agent.

During delivery **804** of the selected service, the service agent uses the attributes and preferences page associated with the selected service to customize queries of the associated service database. More specifically, using the attributes and preferences information, the service agent automatically fills in the needed fields in the corresponding query form with user specified defaults and preferences. Having filled the appropriate fields, the service agent plays the remaining query form to the subscriber thereby greatly reducing the information that the subscriber has to supply on the telephone. The service agent then obtains the remaining information, if any, from the subscriber and submits the query form to the service database. When the results are returned (i.e. the information is retrieved from the service database), the service agent plays the results to the subscriber over the telephone.

Form Based Voice Web Page Publishing

In another aspect of the invention, voice web system **100** enables publishers to compose voice web forms and pages statically using ordinary word processing programs and link them to voice files created using ordinary audio capture and editing tools available on personal computers and workstations. Alternatively, voice web agents can dynamically compose voice web pages and forms based on user requests and optionally profiles as well as accessed databases and services. Advantageously, dynamic form-based publication enables information and service providers to publish voice web pages using the conventional telephone without the need for any additional computer based voice web publishing tools. Dynamic form-based publication is achieved by combining voice web publishing forms, voice web publishing agents and voice web page publishing templates.

FIG. **9** is a flow diagram of a voice publishing method in accordance with the present invention. The method presents **901** a voice web form to a caller calling into a voice web system using a conventional telephone. Voice web publishing forms are specially designed voice web forms that when interpreted (i.e. when played back) using the voice browser prompt the caller (the voice information publishers) to input voice and touch tone based input using a telephone. The forms guide the caller step by step to supply the needed information, edit and modify the information and finally submit **903** the information for processing **902**.

Voice web publishing agents process **902** the filled voice web publishing forms extracting and separating voice information and touch tone input. Based on the touch tone inputs, the agents may present additional publishing forms to the caller (publisher). The voice information is stored **904** in voice files and linked to the corresponding voice web page publishing template by substituting variables within the page template with the generated files. The touch tone input is used whenever the caller (publisher) needs to input alphanumeric information that can be processed by the publishing agent.

Voice Web White, Yellow and Order Pages

Without limiting the general applicability of form based voice web page publishing, a specific application of the process of form-based publishing is next described. The exemplary form based publishing process relates to the publication of voice web business white pages, yellow pages and order entry pages. FIG. **10** shows a white-yellow-order page system **1000** in accordance with the present invention. Voice web business white pages **1001** are voice web pages that are dynamically composed by the voice web business white pages agent **1003** from a business white page database **1002** information including the name, address, phone number of businesses. The white pages agent **1003** presents a search form to a caller for specifying the name of the business and allows further narrowing of the search by city and state. Each business white page can be linked to a corresponding business yellow page **1004**. Business yellow pages **1004** contain additional information about the business including a tag line, advertisement, directions, working hours, and promotions. In addition, each yellow page **1004** can be linked to a corresponding business order entry form **1005**. Business order entry forms **1005** allow users to order products and services or transact business by specifying product or service codes, preferences, quantity, and credit card numbers for payment.

A participating business can publish a voice web yellow page **1004** by simply filing a corresponding voice web yellow page publishing form **1007**. A yellow page publishing agent **1006** processes the yellow page publishing form **1007** and dynamically generates a business yellow page **1004** for that business from a standard yellow page template by replacing variables in the template with values supplied by the submitted yellow page publishing form.

The yellow page publishing agent **1006** (a publishing agent) presents a yellow page voice web publishing form **1007** to the participating business. Voice web publishing forms are specially designed voice web forms that when interpreted (i.e. when played back) using the voice browser prompt the caller (the voice information publishers) to input voice and touch tone based input using a telephone. Yellow page publishing form **1007** guides the caller step by step to supply the needed information, edit and modify the information and finally submit the information for processing, as described in reference to FIG. **9**. Specifically, yellow page publishing form **1007** prompts for voice information including name, tag line, advertisement, directions, working hours and promotions. In addition, the yellow page publishing agent **1006** prompts for touch tone input including the account number, password, phone number, yellow page category code and credit card number. Yellow page publishing agent **1006** uses the account number to identify the business, the password to verify the business, the phone number to link it to the corresponding white page, the yellow page category code to classify the business within business yellow pages, and the credit card number to pay for the business yellow page. Once the business is identified and verified, yellow page publishing agent **1006** dynamically creates a business yellow page **1004** from a standard template for the appropriate category. Yellow page publishing agent **1006** uses the supplied business phone number to match with the appropriate database entry in the business white pages and updates it with the URL of the newly created yellow page to link it.

A very similar process occurs for publishing order entry forms. A business order entry form publishing agent, order page publishing agent **1008** presents an appropriate order entry publishing form **1009** to a participating business. Order page publishing agent **1008** requests for appropriate customized prompts for specific fields in the business order entry form such as product or service code, customer preferences, quantity, credit card number etc. Order page publishing agent **1008** also requests for touch tone input for the account number, password, phone number, and credit card number. Order page publishing agent **1008** uses the account number and password for identification and verification, the phone number to link it to the corresponding yellow page **1004** and the credit card number for payment for the order entry form. Once the business is identified and verified, order page publishing agent **1008** dynamically generates an order entry form for that business by filling the supplied information into a standard order entry template for that business category. Order page publishing agent **1008** uses the supplied business phone number to match with the appropriate database entry in the business white pages, updates it with the URL of the newly created order entry page, locates the corresponding yellow page using its URL in the database, and updates it to link to the newly created order entry page.

The foregoing discussion discloses and describes merely exemplary embodiments of the present invention. As will be understood by those familiar with the art, the invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. Accordingly, the disclosure of the present invention is intended to be illustrative, but not limiting, of the scope of the invention, which is set forth in the following claims.

APPENDIX A

I. HVML Specification

Hyper Voice Markup Language consists of a set of extensions to existing HTML. Some of the extensions are new elements with new tags and attributes. Others are extensions to existing elements in the form of new attributes. All attribute values are shown as %value type%.

In-line Voice components

The primary mechanism for introducing voice prompts into an HTML page is a new inline voice HVML element similar to the inline image HTML element. The tag for this element is "VOICE" and it has many variations. Each variation is specified by value of the TYPE attribute. Depending on the type, each variation has additional attributes.

Voice Files

<VOICE TYPE= "File" SRC= "%URL%" TEXT= "%text%">
VOICE tag with TYPE set to "File" indicates a file containing pre-recorded voice information. It's attributes are SRC and TEXT. SRC attribute specifies the URL for the voice file and TEXT attribute, which is optional, specifies the text that can be translated to speech as an alternative to the voice file.

Voice Index Files

<VOICE TYPE= "Index" SRC= "%URL%" INDEX= "%index%" TEXT= "%text%">
VOICE tag with TYPE set to "Index" indicates an indexed file containing pre-recorded voice phrases. It's attributes are SRC, INDEX and TEXT. SRC and TEXT have same meaning as in Voice Files. The INDEX attribute specifies index of the phrase within the file either as a number or a label.
For example:
<VOICE TYPE= "File" SRC="myweb/home/greeting.wav">

Text-to-Speech

<VOICE TYPE= "Text" TEXT= "%text%">
VOICE tag with TYPE set to "Text" indicates a text-to-speech string. It's attribute is TEXT which specifies the string that needs to be translated to speech.
For example:
<VOICE TYPE= "Text" TEXT="Welcome to your Home Page">

Voice Streams:

<VOICE TYPE= "Stream" VALUE= "%URL%" TERMINATE= "%tone%">
VOICE tag with TYPE set to "Stream" indicates a continuous voice stream identified by its URL. The browser accesses the voice stream and continuously plays it to the user. It's

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attribute is TERMINATE which specifies the tone the user can enter to terminate the playback.

Currency

<VOICE TYPE= "Money" VALUE= "%number%" FORMAT= "%format%">
VOICE tag with TYPE set to "Money" indicates a number that needs to be presented as currency. It's attributes are VALUE and FORMAT. VALUE specifies the decimal value of the number and FORMAT, which is optional, specifies the currency type such as "US Dollar", "British Pound" etc. The default value for FORMAT is "US Dollar".

Numbers

<VOICE TYPE= "Number" VALUE= "%number%" FORMAT= "%format%">
VOICE tag with TYPE set to "Number" indicates a number that needs to be presented as a decimal number. It's attributes are VALUE and FORMAT. VALUE specifies the decimal value and FORMAT, which is optional, specifies the precision to be conveyed. Digits after the decimal point are pronounced as characters. Default value for the FORMAT is 2 which indicates 2 digit precision after decimal point.

Characters

<VOICE TYPE= "Character" VALUE= "%string%>
VOICE tag with TYPE set to "Character" indicates a sequence of characters that are to be presented separately with no pauses in between. It's attribute is VALUE which specifies the sequence of characters as string.

Dates

<VOICE TYPE= "Date" VALUE= "%date%" FORMAT= "%format%">
VOICE tag with TYPE set to "Date" indicates an expression that is to be presented as a date. It's attributes are VALUE and FORMAT. VALUE attribute specifies the expression and the FORMAT attribute, which is optional, specifies the format of the expression. Default format is MM/DD/YY.

Ordinals

<VOICE TYPE= "Ordinal" VALUE= "%number%">
VOICE tag with TYPE set to "Ordinal" indicates a number that is to be presented as an ordinal (i.e. as Nth value). It's attribute is VALUE which specifies the number. Values are pronounced as "first", "second", "third" etc.

Strings:

<VOICESTRING NAME= "%name%">
. . . Voice Components . . .
</VOICESTRING>
VOICESTRING tag indicates a sequence of voice components that are grouped together for presentation without any pauses in between. Each of the voice components can be any of the primitives previously defined. The voice browser gathers the individual components and plays them together in sequence.
<Voicestring NAME= "welcome">
<Voice TYPE= "Index" SRC= "welcome.vap" INDEX= "begin" TEXT= "Welcome">
<Voice TYPE= "File" SRC= "username.vox" TEXT= "user's name">
<Voice TYPE= "Index" SRC= "welcome.vap" INDEX= "end" TEXT= "to VOIS NET"
</VoiceString>
The voice browser "plays" each in-line voice component in sequence as it encounters it in the HVML page starting from the beginning of the page. Each voice component is played only once for each presentation. A "reload" command would cause the voice browser to re-play the page.
Of course, voice elements can also be invoked by hyper links pointing to voice files containing digitized voice data. This is similar to existing HTML conventions. The voice browser simply fetches the new page and plays it once. In the next section, we will discuss how hyperlinks can be invoked using touch tone or key word input.

Voice responsive labels for hyper-links

In order to invoke hyper links embedded in a HVML page, two new attributes "TONE" and "LABEL" are added to the anchor element. These attributes are used in conjunction with the existing HREF attribute in an anchor element that makes the anchor into a hyper link. When the user selects the touch tone signals specified by the value of the TONE attribute followed by the "#" tone or utters the word specified by the LABBL attribute, the browser invokes the corresponding hyper link. The TONE and LABEL attribute values must be unique within a page.
For example:
<A HREF="myweb/home/greeting.vml TONE="HELLO">
or
<A HREF="myweb/home/greeting.vml LABEL="HELLO">
When the user presses "H,E,L,L,O,#" on the touch tone phone or the user says the word "HELLO" on the phone, the browser will invoke the corresponding hyper link and accesses the "greeting.vml" page.

Keyword accessible indexes for anchors

HTML allows the index access of fragments within a page by unique labels associated with anchors surrounding the fragment. The NAME attribute in an anchor element specifies a label that is unique within the page. This label can then be used as an index by

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the browser to search for the fragment by matching the unique label with the one supplied in the hyperlink. The hyperlink for the indexed fragment uses the regular URL for the page concatenated with the fragment's unique label with a "#" separator.
Coupled with voice responsive hyper links, fragment labels can be used to construct simple menus or database searches.
For example:
Suppose "myweb/home/prompts.vml" contains the following HVML text.
<A NAME="prompt1">
<VOICE TEXT="Press CAL# for Calendar">
</A>
<A NAME="prompt2">
<VOICE TEXT="Press ADDR# for Address Book">
</A>
<A NAME="prompt3">
<VOICE TEXT="Press EMAIL for Electronic Mail">
</A>
Suppose another HVML page contains the following hyperlinks.
<A HREF="myweb/home/prompts.vml#prompt1" TONE="1">Press 1 to hear Prompt1</A>
<A HREF="myweb/home/prompts.vml#prompt2" TONE="2">Press 2 to hear Prompt2</A>
<A HREF="myweb/home/prompts.vml#prompt3" TONE="3">Press 3 to hear Prompt3</A>
Then, if the user presses "1,#", the browser will fetch the "myweb/home/prompts.vml" HVML page, match "prompt1" index with the first anchor's "prompt1" label, and start presenting the prompts starting with text-to-speech translation of "Press CAL# for Calendar".
Browser Control

<PAUSE TIMEOUT= "%seconds%" TERMINATE= "%tone%">
In order to let the voice page publisher to control the behavior of the voice browser, HVML defines a tag "Pause" with "TIMEOUT" and "TERMINATE" attributes. When the browser encounters a PAUSE statement, it pauses until either the amount of time specified in the TIMEOUT attribute elapses or the user enters the tone specified in the "TERMINATE" attribute. If the values of the TIMEOUT attribute is 0, then the browser waits there indefinitely. The default value for TIMEOUT is 1 second. Default value for TERMINATE is "#".
Voice Responsive Forms

HVML uses the FORM tag to enable user input similar to HTML including the METHOD attribute which specifies the way parameters are passed to the server and the ACTION attribute which specifies the procedure to be invoked by the server to process the form. HVML extends the INPUT tag within forms by introducing VOICEINPUT tag. VOICEINPUT takes a TYPE attribute similar to the INPUT tag with three new values "voice", "tone" and "review" in addition to the existing "reset" and "submit" values. The HVML browser pauses at each VOICEINPUT statement in a HVML form until the specified input is supplied or input is terminated before processing the remaining form. The VOICEINPUT tag with TYPE value set to "voice" indicates a form that accepts voice input. Usually, a voice prompt or text-to-speech segment precedes the VOICEINPUT tag alerting the user that input is required and how to terminate input. The user is expected to speak and this message is recorded in real-time and supplied to the Voice Web server for processing. The VOICEINPUT tag containing "voice" value for the TYPE attribute also supports a MAXTIME attribute which specifies the maximum recording time for the message and a TERMINATE attribute which specifies the touch tone that terminates input. If the MAXTIME attribute is not specified, then the default value of "15" is assumed. If TERMINATE attribute is not specified, then the default value of "#" is assumed. For example, if the MAXTIME value is 20 and TERMINATE value is "#", then recording terminates when the user presses "#" or 20 seconds of time elapses.
The VOICEINPUT tag with TYPE value set to "tone" indicates a form that accepts touch tone input. Again, a voice prompt or a text-to-speech segment precedes the VOICEINPUT tag alerting the user for input. The user is expected to press a sequence of touch tones which are recorded and supplied to the Voice Web server for processing. The VOICEINPUT tag containing "tone" value for the TYPE attribute also supports a MAXDIGITS attribute which specifies the maximum number of touch tone digits that can be supplied and a TERMINATE attribute which specifies the touch tone that terminates input. If the MAXDIGITS attribute is not specified, then the default value of "20" is assumed. If TERMINATE attribute is not specified, then the default value of "#" is assumed. For example, if the MAXDIGITS value is 10 and TERMINATE value is "#", then input process terminates when the user presses "#" or 10 digits are supplied.
The VOICEINPUT tag with TYPE value set to "review" indicates that the current values of the form can be reviewed by selecting the "review" input. The VOICEINPUT tag with TYPE value set to "reset" indicates that the current values of the form should be reset to their original defaults. The VOICEINPUT tag with TYPE value set to "submit" indicates that the current form should be submitted to the server. Each of these three TYPE values support a SELECTTONES attribute and a SKIPTONES attribute. SELECTTONES attribute specifies the sequence of touch tones that activates the corresponding selection. SKIPTONES attribute specifies the sequence of touch tones that skips the selection. If the SELECTTONES attribute is not specified, then the default value of "#" is assumed and

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if the SKIPTONES attribute is not specified, then the default value of "*" is assumed. For example, if the SELECTTONES attribute value is "REVIEW" and SKIPTONES attribute value is "SKIP" for a VOICEINPUT element with TYPE value set to "review", the user can enter "REVIEW" to review the form values or enter "SKIP" to skip the selection. VOICEINPUT tag with TYPE value set to "submit" similarly indicates the values of the form can be submitted to the server. If the SELECTTONES attribute value is "DONE" and the SKIPTONES attribute value is "**", the user can either enter "DONE" to submit the form or press "**" to skip the selection. VOICEINPUT tag with TYPE value set to "reset" similarly indicates that the values of the form be reset to their original values.

II. Voice Browser Commands

All browser commands must start with the "*" key. Each browser command is associated with one or more key words that uniquely identify it. For example, in order to activate "Home" command, the user would press "*home" on the telephone key pad. The key words are chosen in such a way to generate unique dial tone sequences. A set of default browser commands are listed below with the keyword and description of the command. Alternatively, the browser commands can also be issued by vocalizing the corresponding commands. For example, to activate the "Home" command, the user would say "home" on the telephone.

Previous

Jump to the previous page from which the current page was accessed via a hyper link. This command is activated by pressing "*pr" (*77) or "*prev" (*7738) sequence.

Next

Jump to the next page in a sequence of hyper links. This command is activated by pressing "*n" (*6) or "next" (*6398) sequence.

History

Present the titles of the pages accessed so far in the order of their hyper link access sequence. Pause after each title. If the user presses "#", then jump to the page specified by the title. If not, proceed to the next title. This command is activated by pressing "*hi" (*44) or "*hist" (4478) sequence.

Home

Jump to the first page in the sequence of hyper links. This command is activated by pressing "*ho" (*46) or "*home" (*4663) sequence.

Reload

Reload the current page again from the Web server. This command is activated by pressing "*re" (*73) or "*relo" *(7356) sequence.

Help

Jump to the home page of the help page set. Help pages are navigated in exactly the same way as ordinary HVML pages. However, a new browser instance is, created on activation which must be "exited" to get back to the page context from which "Help" page set was accessed. This command is activated by pressing "*h" (*4) or "*help" (*4357) sequence.

Fax

Jump to the home page of the Fax dialog session using HTML forms. Again, a new browser instance is created on activation which must be "exited" to get back to the page context from which "Fax" dialog session was activated. This command is activated by pressing "*fa" (*32) "*fax" (*329) sequence.

Stop

Stop loading the page that is currently being accessed. This command is activated by pressing "*t" (*8) or "*stop" (*7867) sequence.

Exit

Exit the current instance of the browser and return to the page being accessed in the previous instance of the browser. If this is the first instance of the browser, then exit the browser and hang-up the phone. This command is activated by pressing "*x" (*9) or "*exit" (*3948) sequence.

Bookmarks

Present the titles of the pages selected as bookmarks in the order of their hyper link access sequence. Pause after each title. If the user presses "#", then jump to the page specified by the title. If not, proceed to the next title. This command is activated by pressing "*bo" (*26) or "*book" (*2665) sequence.

III. Voice Browser Playback Controls

When the Voice browser is activated to play back voice prompts or speech segments, an additional set of browser commands are available to the user to control the playback.

Pause

Pause the play back at current position. This command is activated by pressing

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"*p" (*7) or "*pause" (*72873).
Play
Continue play back from current position. This command is activated by pressing "*p" (*7) or "*play" (*7529).
Backup
Back up the play back position by 5 seconds and start play back. The command is activated by pressing "*b" (*2) or "*back" (*2225). Repeated pressing of the same tone implies successive back up by 5 seconds for each tone.
Forward
Forward the play back position by 5 seconds and start play back. The command is activated by pressing "*f" (*3) or "*frwd" (*3793). Repeated pressing of the same tone implies successive skip forward by 5 seconds for each tone.
Start
Back up the play back position to the beginning of the play back sequence and start play back. The command is activated by pressing "*0".
End
Jump to the end of the play back sequence, backup by 5 seconds and start play back. The command is activated by pressing "*1".

What is claimed is:

1. A method of delivering caller-customized voice-based information to a caller, comprising:

storing caller-specific information in a computer file at a universal resource locator (URL):

determining a URL associated with the caller;

retrieving the caller-specific information using the URL;

processing at least one caller command received over the telephone to determine a service request;

retrieving information responsive to the service request and responsive to the caller-specific information, including;

generating a database query form responsive to the service request;

customizing the database query form using the caller-specific information; and

performing a database search using the query form, wherein generating a database query form responsive to the service request includes:

storing a voice form associated with the service request at a universal resource locator (URL) address in the computer network wherein the voice form is stored in a markup language;

playing the voice form to the caller to generate at least one information prompt for the caller;

collecting information from the caller in response to each prompt; and

generating a database query form using at least a portion of the collected information; and

playing back the retrieved information to the caller over the telephone.

2. The method of claim **1** wherein collecting information from the caller in response to each prompt includes collecting touch tone inputs from the caller.

3. The method of claim **1** wherein collecting information from the caller in response to each prompt includes collecting voice command inputs from the caller and performing speech recognition on the voice command inputs.

4. A method of processing voice-based information received from a telephone caller over a computer network, comprising:

storing a voice form at a universal resource locator (URL) address in the computer network wherein the voice form is stored in a markup language with voice extensions; and

during a calling session:

playing the voice form to the caller to generate at least one information prompt to the caller;

collecting information from the caller in response to each prompt; and

storing the collected information in a first markup language document and including in the document a hyperlink to a second markup language document.

5. The method of claim **4** wherein the hyperlink is determined responsive to at least a portion of the collected information.

6. A method of processing voice-based information received from a telephone caller over a computer network, comprising;

storing a voice form at a universal resource locator (URL) address in the computer network wherein the voice form is stored in a markup language with voice extensions; and

during a calling session:

playing the voice form to the caller to generate at least one information prompt for the caller;

collecting information from the caller in response to each prompt; and

storing the collected information in a first markup language document and including in a second markup language document a hyperlink to the first markup language document.

7. The method of claim **6** wherein the hyperlink is determined responsive to at least a portion of the collected information.

8. A system for delivering information over a telephone, comprising:

a business white pages database including business name, address and phone number information;

a database query form;

a first processing agent programmed to:

collect user information using a voice based telecommunications device;

include at least some of the collected information to the database query form;

search the database by applying the database query form to the database to retrieve information; and

generate a voice web page having a universal resource locator (URL) address using the retrieved information;

a yellow page database including business advertising information; and

a second processing agent wherein the voice web page generated by the first processing agent includes a hyperlink to the second processing agent and wherein the second processing agent is programmed to:

search the yellow page database to retrieve information; and

generate a voice web page using the retrieved information; and

a voice web browser adapted to play voice web pages to a user.

9. The system of claim **8** wherein the hyperlink identifies an entry in the yellow page database and wherein searching the yellow page database comprises locating the yellow page database entry identified by the hyperlink.

10. The system of claim **8** further comprising:

an order page database including business order information; and

a third processing agent wherein the voice web page generated by the second processing agent includes a second hyperlink to the third processing agent and wherein the third processing agent is programmed to:

search the order page database to retrieve information; and

generate a voice web page using the retrieved information.

11. The system of claim **10** wherein the second hyperlink identifies an entry in the order page database and wherein searching the order page database comprises locating the order page database entry identified by the hyperlink.

* * * * *

US005953392A

United States Patent [19]

Rhie et al.

[11] Patent Number: 5,953,392

[45] Date of Patent: Sep. 14, 1999

[54] **METHOD AND APPARATUS FOR TELEPHONICALLY ACCESSING AND NAVIGATING THE INTERNET**

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[21] Appl. No.: **08/609,699**

[22] Filed: **Mar. 1, 1996**

[51] **Int. Cl.**[6] **A04M 1/64**

[52] **U.S. Cl.** **379/88.13**; 379/88.14; 379/88.17; 379/88.24; 704/271; 395/200.49

[58] **Field of Search** 379/67, 88, 89, 379/93, 100, 67.1, 88.01, 88.02, 88.03, 88.04, 88.13, 88.17, 88.18, 88.14, 88.24; 395/2.79, 2.8, 2.67, 200.47, 200.48, 200.49; 707/501; 704/270, 271, 290

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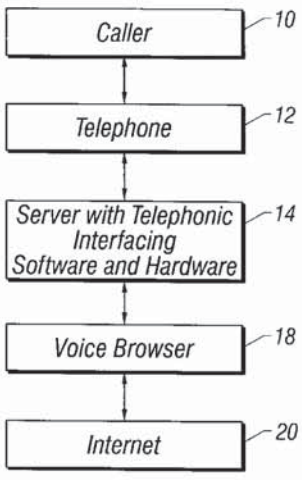
[57] **ABSTRACT**

A method for accessing and browsing the internet through the use of a telephone and the associated DTMF signals is disclosed. The preferred embodiment provides a system that converts the information content of a web page from text to speech (voice signals), signals the hyperlink selections of a web page in an audio manner, and allows selection of the hyperlinks through the use of DTMF signals generated from a telephone keypad. Upon receiving a DTMF signal corresponding to a hyperlink, the corresponding web page is fetched and again delivered to the user via one of the available delivery methods such as voice, fax-on-demand, electronic mail, or regular mail.

68 Claims, 4 Drawing Sheets

Microfiche Appendix Included
(4 Microfiche, 46 Pages)



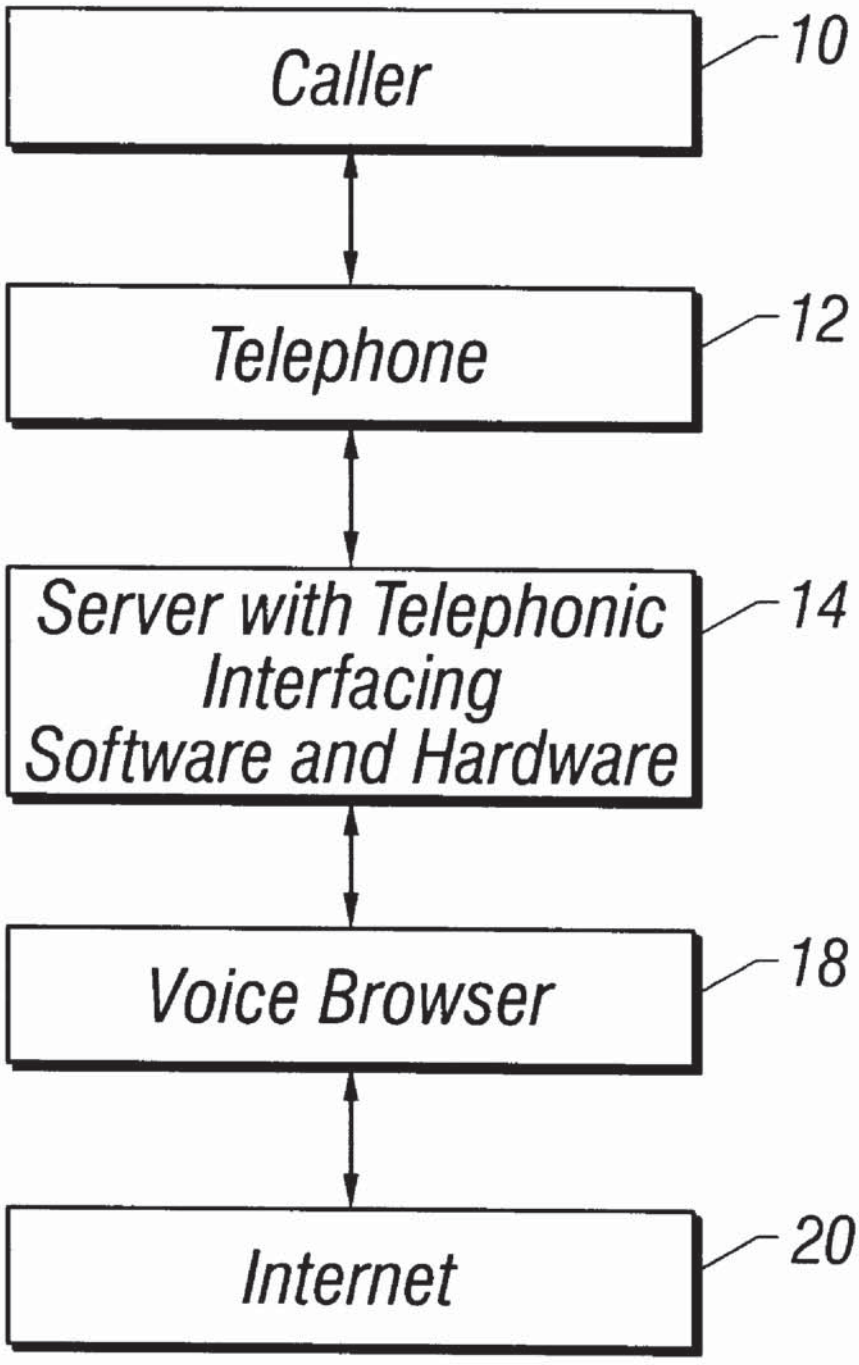

Caller
10
Telephone
12
Server with Telephonic Interfacing Software and Hardware
14
Voice Browser
18
Internet
20

FIG. 1

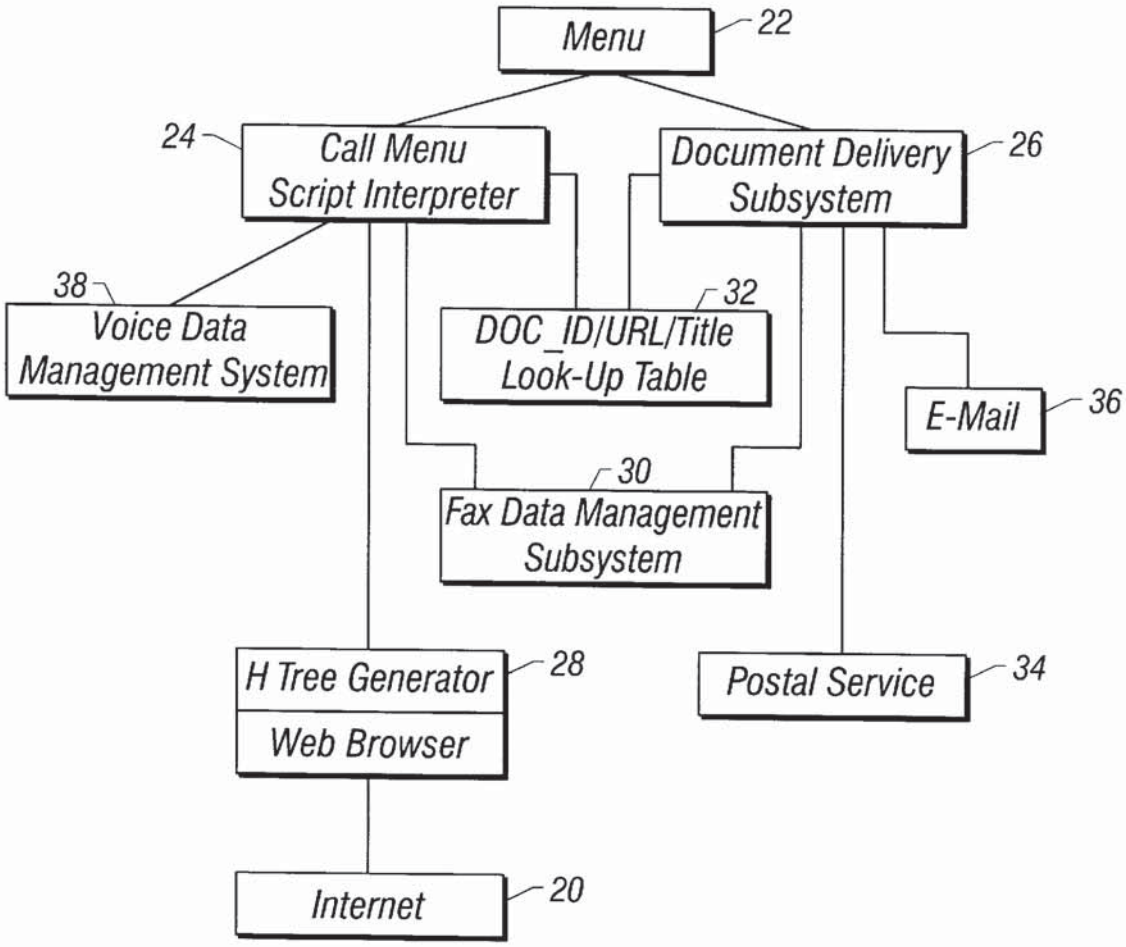

Menu
22
24
Call Menu Script Interpreter
Document Delivery Subsystem
26
38
Voice Data Management System
32
DOC_ID/URL/Title Look-Up Table
E-Mail
36
30
Fax Data Management Subsystem
H Tree Generator
28
Web Browser
Postal Service
34
Internet
20

FIG. 2

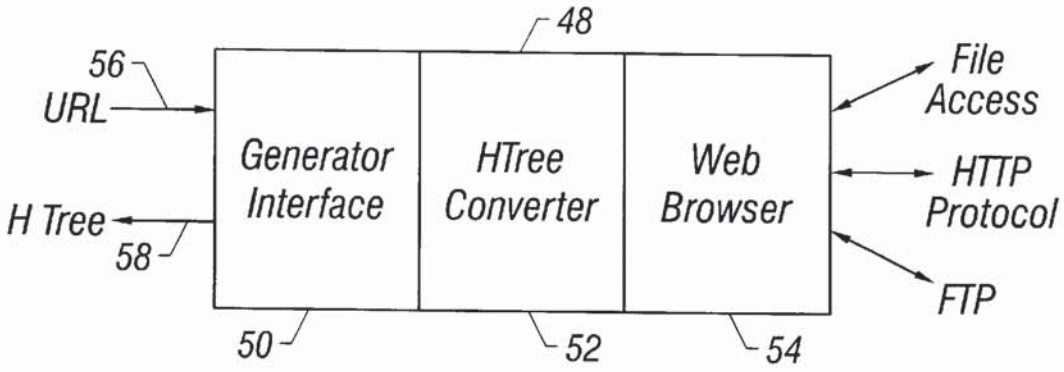

48
56
URL
Generator Interface
HTree Converter
Web Browser
File Access
HTTP Protocol
FTP
H Tree
58
50
52
54

FIG. 3

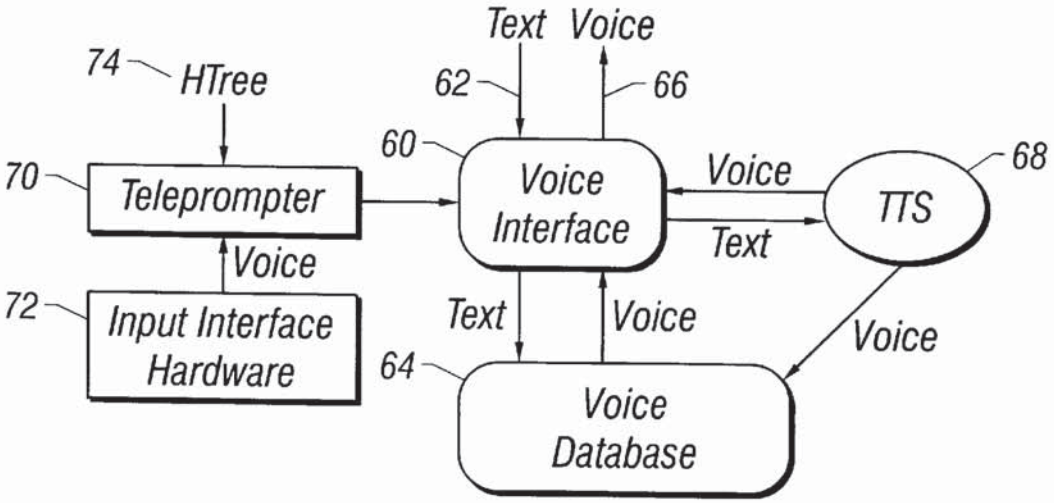

74
HTree
Text
Voice
62
66
60
70
Teleprompter
Voice Interface
Voice
TTS
68
Text
Voice
72
Input Interface Hardware
Text
Voice
Voice
64
Voice Database

FIG. 4

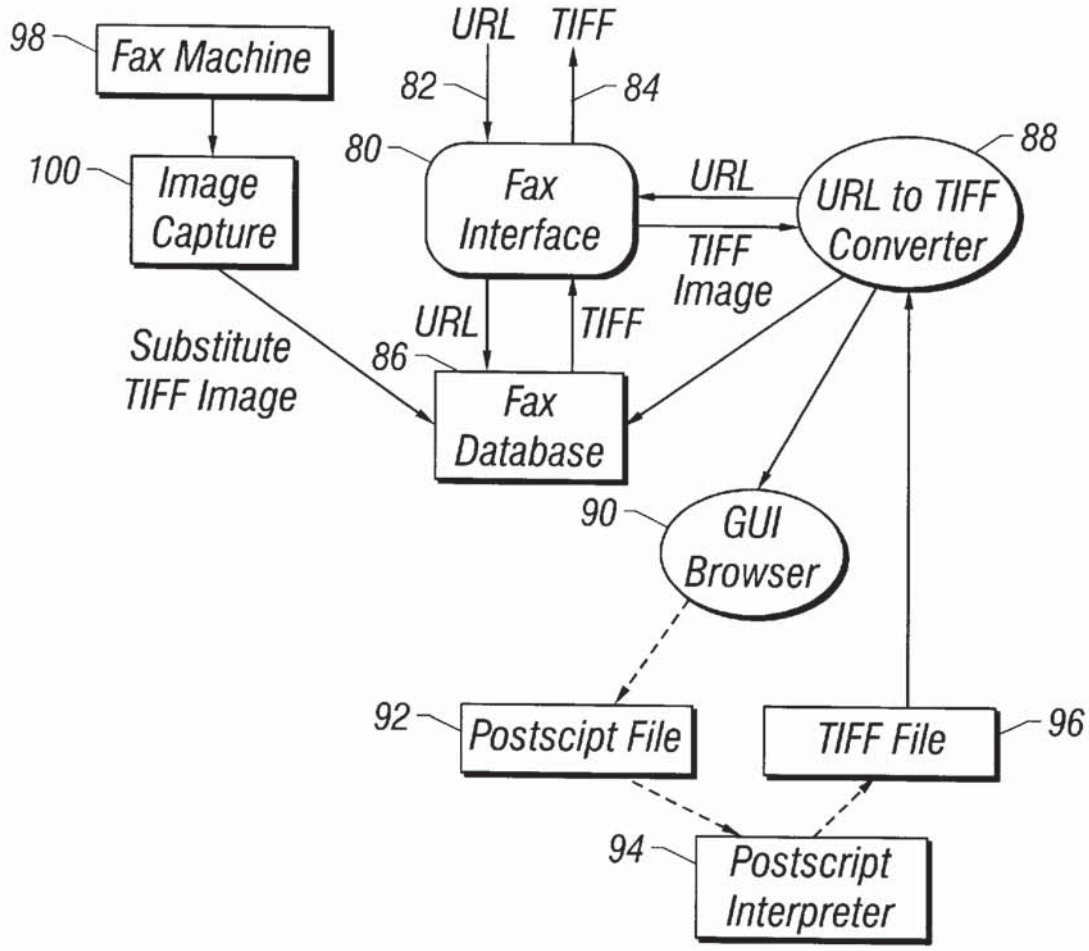

98
Fax Machine
URL
TIFF
82
84
80
Fax Interface
URL
TIFF Image
88
URL to TIFF Converter
100
Image Capture
URL
TIFF
86
Substitute TIFF Image
Fax Database
90
GUI Browser
92
Postscipt File
TIFF File
96
94
Postscript Interpreter

FIG. 5

METHOD AND APPARATUS FOR TELEPHONICALLY ACCESSING AND NAVIGATING THE INTERNET

REFERENCE TO A MICROFICHE APPENDIX

A Microfiche Appendix conforming to the standards set forth in 35 CFR §1.96(c)(2) is attached. The Microfiche Appendix includes four microfiche including an Appendix A microfiche, an Appendix B microfiche, an Appendix C microfiche and an Appendix D microfiche. The Appendix A microfiche includes nine frames. The Appendix B microfiche includes four frames. The Appendix C microfiche includes four frames. The Appendix D microfiche includes 29 frames.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to methods for retrieving information from an interconnected network and for accessing and delivering the retrieved information to a user, and, more particularly, a method for accessing and retrieving information from an interconnected networks such as the internet via a telephone in response to the user's request and for delivering the information via voice, fax-on-demand, email, and other means to the user.

2. Description of the Prior Art

Under the conventional method of accessing information on an interconnected network such as the internet, the user is required to have a certain amount of computer software and hardware and is expected to have a certain level of computer expertise before the user can successfully access (or browse) a wide range of information now available on the internet. If the user does not have the necessary hardware and the appropriate software to direct the computer to establish a connection to the internet via a modem or a direct connection to the internet, the user would then have no other means available to him or her for accessing the internet.

Given the amount of information now readily available on the internet, having the ability to access the internet becomes a matter of convenience as well as a matter of having access to an invaluable information source.

Additionally, from a company or an organization point of view, it is advantageous to direct customers to a centralized information database and thereby necessitating the maintenance of only one database rather than multiple databases.

The software and hardware requirement for accessing the internet creates a barrier for most people to take advantages of this information source. Prior art systems overcome this problem by providing a telephone fax-on-demand system where a user uses a telephone to dial into a company's web page and directs the system to fax the web page back to the user. However, the manner in operating this type of system is tedious and time consuming. In order for the user to access a hyperlink on the web page, the first web page needs to be faxed back to the user with the hyperlinks numerically annotated for reference. The user then calls a second time (or waits for the first fax page to arrive on another line) to access subsequent web pages numerically using the now numbered hyperlinks.

It is thus clear that a better system is needed to access and browse the internet in an inexpensive and efficient manner.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a method for accessing and browsing the internet through the use of a telephone.

It is another object of the present invention to provide a method for accessing and browsing the internet by converting the information content of a web page to voice format.

It is yet another object of the present invention to provide a method for signaling the user in an audio manner the hyperlink selections in a web page.

It is yet another object of the present invention to provide a method for accessing and browsing the internet where the information content of a web page may be provided to the user via voice format, fax-on-demand, e-mail, or regular mail.

Briefly, a method for accessing and browsing the internet through the use of a telephone and the associated DTMF signals is disclosed. The preferred embodiment of the present invention provides a system that converts the information content of a web page from text to speech (voice signals), signals the hyperlink selections of a web page in an audio manner, and allows selection of the hyperlinks through the use of DTMF signals as generated from a telephone keypad. Upon receiving a DTMF signal corresponding to a hyperlink, the corresponding web page is fetched and again delivered to the user via one of the available delivery methods.

An advantage of the present invention is that it provides a method for accessing and browsing the internet through the use of a telephone.

Another advantage of the present invention is that it provides a method for accessing and browsing the internet by converting the information content of a web page to voice format.

Yet another advantage of the present invention is that it provides a method for signaling the user in an audio manner the hyperlink selections in a web page.

Yet another advantage of the present invention is that it provides a method for accessing and browsing the internet where the information content of a web page may be provided to the user via voice format, fax-on-demand, e-mail, or regular mail.

These and other objects and advantages of the present invention will no doubt become obvious to those of ordinary skill in the art after having read the following illustrations and detailed description of the preferred embodiments.

IN THE DRAWINGS

FIG. **1** illustrates the components of the preferred embodiment of the present invention;

FIG. **2** shows the subsystems for the voice browser of the present invention;

FIG. **3** illustrates the subsystems of the HTree Generator/Web browser;

FIG. **4** shows the components of the Voice Data Management System; and

FIG. **5** illustrates the components of the Fax Data Management System.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. **1**, the preferred embodiment of the present invention is operated by a caller **10** using a telephone **12** to dial into a server having telephonic interfacing software and hardware. The server provides audio directions to the caller and provides a number of options which may be selected by the corresponding DTMF tones generated through the use of a telephone keypad. By pressing a number

on the keypad corresponding to the desired option, the caller selects one of the several available options. The server then receives the DTMF tone, converts the tone to a corresponding DTMF code, identifies the option corresponding to the code, and executes the action corresponding to the selected option. In this manner, the caller is able to direct the server to take certain available actions.

One of the available actions is to direct a voice browser **18** to navigate the internet **20**. By selecting the voice browser, the caller is provided with an audio readback of a default web page where the available links to other web pages are read back to the user and are indicated by a special audio signal such as a short duration tone signal, a beep, a "bong" sound, etc.

For example, referring to Appendix D illustrating a listing of the code of the preferred embodiment as described below, instructions (starting from page 13 of Appendix D) are provided to direct a user to navigate through available documents and the hyperlinks therein. By repetitively selecting documents and the hyperlinks contained therein, the user can navigate the entire internet.

User Interface for Operating the Voice Web

To operate the preferred embodiment of the present invention, a touch-tone phone and the phone number to access a server are all that is required.

The voice browser provides a series of audio menus to guide the caller to retrieve documents or web pages from the internet. Several options are provided at each menu and the caller may make a selection by pressing the corresponding key(s) on the telephone. The opening menu may request a password before allowing the caller to access the system.

For inputs requiring specific spelling of the information being entered (e.g. e-mail address, name, street address, etc.), each character can be defined by pressing a two-key combination. The first key indicates the key where the letter appears, and the second key indicates the position it occurs on that key. For example, the letter "A" is defined as 21, "B" is defined as 22, "C" is defined as 23, "D" is defined as 31, etc. However, the letters "Q" and "Z" are not defined on a telephone keypad and they may be assigned by special two-key combinations. In the preferred embodiment, the letter "Q" is defined as 17 and the letter "Z" is defined as 19. Other special characters may be assigned as well. For example the "@" sign is defined as 12, the "_" character is defined as 18, the "." (period) is defined as 13, and a "" (space) is defined as 11.

The actual interface between the voice browser and the telephony interfacing hardware is expected to vary according to the implementation. There are two issues involved here. One issue involves interface control, namely how the software commands are accepted by the interface and how errors or exceptions are signaled. The other issue involves audio encoding—how audio (e.g. voice) data is represented at the interface. For example, the Rockwell chip set utilizes a Hayes-compatible command set which is extended for fax and voice operations, and audio data is encoded in the Adaptive Differential Pulse Coded Modulation (ADPCM) format. Under a Unix system, ioctl() commands may be used to manipulate the audio interface. There may be another protocol for ISDN lines as well.

Voice Web

Referring to FIG. **2**, the voice browser is software driven and is composed of several cooperating subsystems. From the main engine **22**, depending on the selection made or the scheduling algorithm, either the Call Menu Script Interpreter **24** or the document delivery subsystem **26** may be activated.

The Call Menu Script Interpreter (CMSI) guides a caller through a series of call menus and plays voice segments of retrieved web pages or documents to the caller. It responds to the caller's touch tone selection and drives the HTree Generator/Web Browser **28**. The task is accomplished by first directing the web browser to retrieve the desired web page(s) from the internet. The HTree Generator then converts the retrieved web page into an HTree which is a data structure storing web page data in a particular format conducive for conversion into voice format. The CMSI then traverses the HTree, sending HTree segments to the Voice Data management Subsystem (voice DMS) **38**. The Voice DMS contains pre-recorded texts or text-strings. For the texts or text-strings not in the Voice DMS, a text-to-speech engine is provided to convert the text to speech. The information content of the web page is then delivered to the caller in the voice format. Optionally, the web page can also be delivered to the caller in other available methods, or it can be marked as a document request job for later processing. If the caller is calling from a phone line connected to a fax machine, the web page can be immediately delivered to the caller via the fax machine.

The web browser **28** of the preferred embodiment is a general web browser modified to interface with the HTree Generator and to access the internet **20**. The web page or documents that may be readily accessed by the caller are indexed by document-ID, title, or Universal Resource Locator (URL) and stored in a database.

The document delivery subsystem **26** responds to the several available methods for delivering the web page to the caller. These methods include delivery via fax, electronic mail, and regular postal mail. The document delivery subsystem **26** also may directly retrieve a web page as selected by a caller and deliver the information to the caller via one of the available delivery methods.

In the case of delivery by fax, the documents may be directly retrieved by a Fax Data Management Subsystem (Fax DMS) where the web pages in the HTML format may be converted to the PostScript format and then from the PostScript format to TIFF image format.

In the case of delivery by e-mail, documents may be directly retrieved by an E-Mail Data Management Subsystem where web pages in the HTML format may be converted to straight ASCII text or to the PostScript format.

Call Menu Script Interpreter

The Call Menu Script Interpreter (CMSI) guides the caller through a series of call menus via voice prompts and plays voice segments of a retrieved web page to the caller. The caller interacts with the CMSI by generating DTMF tones from the caller's touch-tone keypad. The DTMF tones are converted into ASCII text usually by the telephony interface hardware. In one embodiment, the conversion from DTMF tones to ASCII text is performed by a voice modem.

In order to carry out all of the tasks, the CMSI is implemented utilizing a set of software registers and instructions. A software register may be readable, writable, markable, or nav-writable where a nav-writable register allows the navigational mechanism of the browser to write to it. Registers which can be written by the DTMF-converted ASCII text are referred to as "caller-writable registers." These registers include the DocID, FaxNum, ExtNum, ExtName, Passwd, Userid, and Selection registers. Registers for which the ASCII text can be converted into voice are termed "caller-readable registers". These registers include the DocId, FaxNum, ExtNum, ExtName, and Title registers. Markable registers include the DocId and URL registers. The nav-writable registers include the DocId, URL, Title, MarkedNumDoc, MaxNumDoc, and MaxRepeatInput registers.

There is also an instruction set associated with the registers. There are four basic categories of instructions: Execution Control instructions, Caller Register instructions, Audio Output instructions, and Miscellaneous instructions. Some of the more basic instructions are the Play instruction which plays the content of a register, a prompt, or a web page; the Get instruction which gets the DTMF input into a register; the Mark instruction which marks a page or document according to a URL or DocId; the Goto instruction which unconditionally jumps to a different location in the script; and the Selection instruction which jumps if a given register matches a given DTMF string. Appendix A attached herein explains each of the registers and instructions. The preferred embodiment is not limited to the listed registers and instructions in Appendix A. New instructions and/or registers can be readily added to accommodate new features or functionalities.

As the caller navigates through the web, a URL list is kept. A maximum size limit is imposed on the URL list where a First-In-First-Out system is maintained. Additionally, each URL entry in the URL list may have an associated HTree. There is an HTree cache for all the HTree entries. For the HTree cache, if there is a limitation in size, the least recently used entry is deleted first.

HTree Generator/Web Browser

The HTree Generator/Web Browser (hereinafter "HTree Generator") is the Voice Browser's agent for accessing the World-Wide-Web. It is similar to a GUI-based web browser except that the user interface is replaced by an audio interface residing within the CMSI. The HTree Generator is driven by the CMSI. Referring to FIG. **3**, the HTree Generator **28** is generally comprised of a generator interface component **50**, an HTree Converter **52**, and a web browser **54**. The CMSI sends a URL **56** to the HTree Generator **28**. The generator interface **50** receives the URL and sends the URL to the web browser **54** to retrieve the web page or document via one of the several available methods (e.g. FTP and HTTP). The HTree Converter **52** converts the retrieved web page/document into an HTree, and the HTree is sent to the CMSI. Thus, regardless of the format of the retrieve document, it can be converted into HTree format for processing.

At its highest level, an HTree contains a series of HTree sentences. An HTree sentence can comprise several HTree segments which when strung together forms a complete sentence in the language of choice including English and Spanish. The top level structure, represented by the symbol _HTree, represents a given web page where the structure may include the URL of the page, its title, and it may include a number of linked lists. Appendix B attached herein provides a full explanation of the HTree structure.

Voice Data Management Subsystem

The Voice Data Management Subsystem (Voice DMS) provides audio segments to the CMSI for the given text segments. Referring to FIG. **4**, the main interface between the Voice DMS and the CMSI is the voice interface **60**. The voice interface **60** receives a text string from the CMSI and passes it to the Voice database **64** to retrieve the corresponding digitally encoded voice pattern. The voice interface **60** then returns the encoded voice pattern **66** to the CMSI. If the voice interface does not find the text string in the Voice database, it will send the text string to the Text-To-Speech subsystem **68** to generate the digitally encoded voice pattern for that text string. The generated voice pattern is passed to the voice interface to pass to the CMSI. Whenever the Text-To-Speech subsystem generates a voice pattern for a text string, the text string and the generated voice pattern is passed to the Voice database and stored for future reference.

Some of the voice interface's functions for driving the application program interface (API) include voiceopen, voiceget and voiceclose. The voiceopen function creates a voice handle for a given URL that enables the CMSI to keep track of the data during a session. The voiceget operation uses the voice handle to retrieve a voice pattern. The voiceclose function simply closes the interface associated with a voice handle.

Commonly used text strings may be recorded with human voice. A method of inputting text strings and associated human voice into the voice database involves the using of a voice teleprompter **70** and input interface hardware **72**. Some of the capabilities that the teleprompter include Play, Start, Stop, and Record. The voice teleprompter **70** receives an HTree as input **74** and displays HTree segments on the teleprompter **70**. A person whose voice is being recorded would read the text strings as displayed by the teleprompter **70** and use the input interface hardware **72** to input his or her voice. Once the recording is satisfactory, the teleprompter sends the recording along with the text string to the voice interface **60** for storage into the voice database **64**.

Document Delivery Subsystem

The Document Delivery Subsystem provides a method for the caller to request a document or a web page to be delivered via one of the available delivery methods such as delivery via fax, via e-mail, or via regular postal service.

In delivering a document or web page via e-mail, the document or web page may be formatted for ASCII, a selected word processing program format, or another available format. In delivering a document or web page via regular postal mail, the system will ask for the caller's name and address if it is not already in a caller information database.

In delivering a document or web page via fax, once the TIFF files for all the requested documents have been retrieved or received, the files are concatenated into one file and queued for transmission. The fax can be sent to the caller right away if the caller has another phone line connected to a fax machine.

The document delivery subsystem operates like a queue where the queue is periodically check to see if there are any pending jobs. If there is a pending job, a scheduling file that contains the time for delivery, the method of delivery, and the file for delivery for each job is checked. If the transmission attempt is unsuccessful, the job will be rescheduled for transmission at a later time. There is a limit on the number of retries before the system administrator is notified. Appendix C attached herein provides the specific details for the document delivery subsystem.

Fax Data Management Subsystem

The Fax Data Management Subsystem (Fax DMS) interacts with the CMSI and Document Delivery Subsystem through an interface called the fax interface. Referring to FIG. **5**, the fax interface **80** receives a URL **82** and returns a TIFF formatted file **84**. The fax interface **80** searches the Fax database **86** for the corresponding TIFF file for the given URL. If a TIFF file is found, the fax interface retrieves the file and returns it to the requesting subsystem. If the requested file is not found in the Fax database, the fax interface sends the URL to a URL-To-TIFF convertor **88**. The TIFF converter invokes a GUI browser **90** to retrieve the web page or document if it has not already been retrieved and uses the browser to convert the web page or document into a PostScript formatted file **92**. The PostScript formatted file is then passed to a PostScript interpreter **94** which creates a TIFF file **96** from the PostScript file. The TIFF file is then passed back to the fax interface **80** and/or a fax

database **86**. Fax images can also be directly imported into the fax database through the use of a fax machine which creates an image capture file **100** for import into the fax database. The image capture file **100** ensures the quality of an image and may compare favorably against TIFF formatted images.

Although the present invention has been described in terms of the presently preferred embodiment, it is to be understood that such disclosure is not to be interpreted as limiting. Various alterations and modifications will no doubt become apparent to those skilled in the art after reading the above disclosure. Accordingly, it is intended that the appended claims be interpreted as covering all alterations and modifications as fall within the true spirit and scope of the invention.

What we claim is:

1. A method for telephonically accessing and navigating a computer network, the method comprising:

receiving a first request transmitted from a telephone, the first request comprising data signals that correspond to a first unique address of a first data file residing on the computer network, and the first data file comprising a first hyperlink;

transmitting a first response to the telephone, the first response comprising voice signals that correspond to text stored in the first data file the first data file corresponding to a Hyper Text Mark-up Language (HTML) format; and,

converting the first data file to a first format, the first format including an H-tree data structure.

2. The method as recited in claim **1** wherein the first hyperlink corresponds to a second unique address of a second data file residing on the computer network.

3. The method as recited in claim **1** wherein the computer network comprises the Internet.

4. The method as recited in claim **1** wherein the first data file resides on a first computer of the computer network, and the first hyperlink corresponds to a second unique address of a second data file residing on a second computer of the computer network.

5. The method as recited in claim **1** wherein the data signals comprise Dual Tone Multiple Frequency (DTMF) signals.

6. The method as recited in claim **1** wherein the voice signals comprise synthesized voice signals.

7. The method as recited in claim **1** wherein the voice signals comprise recorded voice signals.

8. The method as recited in claim **1** further comprising:

receiving a second request transmitted from the telephone, the second request comprising data signals that correspond to a second unique address of a second data file residing on the computer network, and the second unique address corresponding to the first hyperlink of the first data file.

9. The method as recited in claim **8** wherein the first data file comprises a Hyper Text Mark-up Language (HTML) format.

10. The method as recited in claim **1** further comprising:

transmitting predetermined signals to the telephone, the predetermined signals indicating the first hyperlink.

11. The method as recited in claim **10** wherein the predetermined signals comprise a predetermined tone.

12. The method as recited in claim **1** further comprising:

fetching the first data file using a Hyper Text Transfer Protocol (HTTP).

13. The method as recited in claim **1** wherein the voice signals comprise a verbal reading of the first unique address.

14. The method as recited in claim **1** further comprising:

receiving a facsimile request transmitted from the telephone, the facsimile request indicating a request for a copy of the first data file transmitted via facsimile; and

transmitting a facsimile response, the facsimile response comprising the first data file transmitted via facsimile.

15. The method as recited in claim **14** further comprising:

converting the first data file from a Hyper Text Mark-up Language (HTML) format to a first format.

16. The method as recited in claim **15** wherein the first format comprises a PostScript format.

17. The method as recited in claim **15** further comprising:

converting the first data file from the first format to a second format, the second format comprising a Tagged Image File Format (TIFF).

18. The method as recited in claim **1** further comprising:

receiving an electronic mail request transmitted from the telephone, the electronic mail request indicating a request for an electronic copy of the first data file transmitted via electronic mail; and

transmitting an electronic mail message, the electronic mail message comprising the first data file.

19. The method as recited in claim **1** further comprising:

receiving a postal mail request transmitted from the telephone, the postal mail request indicating a request for a printed copy of the first data file; and

transmitting a postal mail message, the postal mail message comprising the first data file in a paper-based document format.

20. The method as recited in claim **1** wherein the voice signals comprise recorded voice signals that correspond to the text stored in the first data file, the recorded voice signals being stored in a voice database.

21. A method for telephonically accessing and navigating a computer network, the method comprising:

receiving a first request transmitted from a telephone, the first request comprising data signals that correspond to a first unique address of first data file residing on the computer network, and the first data file comprising a first hyperlink;

transmitting a first response to the telephone, the first response comprising voice signals that correspond to text stored in the first data file;

fetching first data file using the first unique address, the first data file comprising a Hyper Text Mark-up Language (HTML) format, and the first unique address comprising a Universal Resource Locator (URL) the fetching step including a Hyper Text Transfer Protocol (HTTP) request transmitted via the Internet, and the URL including an address of a first computer in communication with the Internet; and,

converting the first data file to an H-tree data structure.

22. The method as recited in claim **21** further comprising:

generating the voice signals that correspond to the text stored in the first data file; and

generating predetermined signals preceding the first hyperlink to indicate the first hyperlink.

23. The method as recited in claim **22** wherein the generating the voice signals step comprises:

outputting recorded voice signals, the recorded voice signals being stored in a voice database.

24. The method as recited in claim **23** wherein the generating speech signals step further comprises:

outputting text-to-speech synthesized voice signals, the text-to-speech synthesized voice signals being generated by a text-to-speech voice synthesizer.

25. The method as recited in claim **22** further comprising:

receiving a second request transmitted from the telephone, the second request comprising DTMF signals that correspond to the first hyperlink; and

transmitting a second response to the telephone, the second response comprising voice signals that correspond to text stored in the second data file, and the second data file comprising a second hyperlink.

26. The method as recited in claim **25** wherein the first data file comprises a first Web page, and the second data file comprises a second Web page.

27. The method as recited in claim **25** further comprising:

inputting recorded speech in the voice database using a teleprompter.

28. The method as recited in claim **25** wherein the fetching step comprises:

requesting a Web page corresponding to the first unique address using a Web browser.

29. The method as recited in claim **28** further comprising:

converting the first data file to a Tagged Image File Format (TIFF); and

transmitting the converted first data file via facsimile.

30. The method as recited in claim **28** further comprising:

converting the first data file to a paper-based document format; and

mailing the converted first data file via postage mail.

31. The method as recited in claim **28** further comprising:

converting the first data file to an ASCII format; and

transmitting an electronic mail message, the electronic mail message comprising the converted first data file.

32. The method as recited in claim **28** wherein the predetermined signals comprise a numeric voice message.

33. The method as recited in claim **28** wherein the voice signals are encoded in Adaptive Differential Pulse Coded Modulation format.

34. The method as recited in claim **28** further comprising:

generating text-to-speech synthesized voice signals that correspond to the text stored in the first data file if recorded speech corresponding to the text stored in the first data file is not stored in the voice database; and

storing the generated text-to-speech synthesized voice signals in the voice database for subsequent lookup.

35. An apparatus for telephonically accessing and navigating a computer network, the apparatus comprising:

logic that receives a first request transmitted from a telephone, the first request comprising data signals that correspond to a first unique address of a first data file residing on the computer network and the first data file comprising a first hyperlink, the first data file comprising a Hyper Text Mark-up Language (HTML) format;

logic that transmits a first response to the telephone, the first response comprising voice signals that correspond to text stored in the first data file;

logic that converts the first data file to a first format, the first format including an H-tree data structure.

36. The apparatus as recited in claim **35** wherein the first hyperlink corresponds to a second unique address of a second data file residing on the computer network.

37. The apparatus as recited in claim **35** wherein the computer network comprises the Internet.

38. The apparatus as recited in claim **35** wherein the first data file resides on a first computer of the computer network, and the first hyperlink corresponds to a second unique address of a second data file residing on a second computer of the computer network.

39. The apparatus as recited in claim **35** wherein the data signals comprise Dual Tone Multiple Frequency (DTMF) signals that correspond to the first unique address.

40. The apparatus as recited in claim **35** wherein the voice signals are generated using a voice interface that outputs synthesized voice signals.

41. The apparatus as recited in claim **35** wherein the voice signals are generated using a voice interface that outputs recorded voice signals.

42. The apparatus as recited in claim **35** further comprising:

logic that receives a second request transmitted from the telephone, the second request comprising data signals that correspond to a second unique address of a second data file residing on the computer network, and the second unique address corresponding to the first hyperlink of the first data file.

43. The apparatus as recited in claim **42** wherein the first data file comprises a Hyper Text Mark-up Language (HTML) format.

44. The apparatus as recited in claim **35** further comprising:

logic that transmits predetermined signals to the telephone, the predetermined signals indicating the first hyperlink.

45. The apparatus as recited in claim **44** wherein the predetermined signals comprise a predetermined tone.

46. The apparatus as recited in claim **35** further comprising:

logic that fetches the first data file using a Hyper Text Transfer Protocol (HTTP).

47. The apparatus as recited in claim **35** wherein the voice signals comprise a verbal reading of the first unique address.

48. The apparatus as recited in claim **35** further comprising:

logic that receives a facsimile request transmitted from the telephone, the facsimile request indicating a request for a copy of the first data file transmitted via facsimile; and

logic that transmits a facsimile response, the facsimile response comprising the first data file transmitted via facsimile.

49. The apparatus as recited in claim **48** further comprising:

logic that converts the first data file from a Hyper Text Mark-up Language (HTML) format to a first format.

50. The apparatus as recited in claim **49** wherein the first format comprises a PostScript format.

51. The apparatus as recited in claim **50** further comprising:

logic that converts the first data file from the first format to a second format, the second format comprising a Tagged Image File Format (TIFF).

52. The apparatus as recited in claim **35** further comprising:

logic that receives an electronic mail request transmitted from the telephone, the electronic mail request indicating a request for an electronic copy of the first data file transmitted via electronic mail; and

logic that transmits an electronic mail message, the electronic mail message comprising the first data file.

53. The apparatus as recited in claim **35** further comprising: