

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
12 July 2001 (12.07.2001)

PCT

(10) International Publication Number  
WO 01/50453 A2

- (51) International Patent Classification<sup>7</sup>: **G10L**
- (21) International Application Number: PCT/US01/00376
- (22) International Filing Date: 4 January 2001 (04.01.2001)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
60/174,371 4 January 2000 (04.01.2000) US
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- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:**  
— Without international search report and to be republished upon receipt of that report.
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*



WO 01/50453 A2

(54) Title: INTERACTIVE VOICE RESPONSE SYSTEM

(57) Abstract: A voice response system and method for navigating any network and using facilities and applications provided by various destination nodes within the network. No change is required in the applications provided by the destination nodes. A user can control and navigate the system with no prior knowledge of the system via self-discovery facilities provided as part of a learning system that adapts itself to the user.

# INTERACTIVE VOICE RESPONSE SYSTEM

## 5 BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention relates to voice-based interactive user interfaces, particularly to  
10 interactive voice response systems, and more particularly to interactive voice response  
systems for accessing information from a computer network via remote telephony  
devices.

### 2. Description of Related Art

15

Voice mail and other interactive voice response (IVR) systems allow a user to access  
audio information stored in a computer memory such as a hard disk. Typically, the  
audio information is stored in audio files created either by the user or for the user.  
Conventional IVR systems use dual-tone multi-frequency (DTMF) signalling to allow  
20 the user to interact with the server through a standard telephone keypad. Pre-recorded  
audio information is available on IVR systems in the form of instructional phrases  
such as "Please type in your account number followed by the pound sign."

Pre-recorded audio is also used for introductory phrases such as "Your account  
25 balance is . . . " At this point, the IVR computer may access a connected database that  
stores the requested account balance in numerical format, convert the numerical  
format to an audio format using a numerical text-to-speech engine, and state the  
account balance. This conversion from numerical format to audio format is extremely  
rigid and completely predefined. IVR systems are "closed" in that each IVR system is  
30 uniquely designed, not connected to a computer network, and IVR systems cannot be  
used interchangeably. Also, these IVR systems are designed specifically for audio  
interaction.

In contrast, audio/visual information on an audio/visual server in a computer network

may be accessed using a personal computer. For example, a World Wide Web (Web) page on the Internet may be accessed using a computer linked through an Internet access provider, such as America On Line™, or Prodigy™, to a Web server.

5 The Internet has emerged as a mass communications, commerce and entertainment medium. Worldwide, people are enabled to interact, distribute and collect information, create community with individuals sharing similar interests and make purchases electronically. According to International Data Corporation (“IDC”), worldwide e-commerce totaled approximately \$32 billion in 1998 and is expected to  
10 total over \$425 billion in 2002. IDC also projects that worldwide Internet use will grow from approximately 142 million users in 1998 to 502 million users in 2003. In light of the proliferation of Internet usage, Forrester Research projects that global online advertising spending will reach \$33 billion by 2004, while online advertising in the U.S. will grow from \$2.8 billion in 1999 to \$22 billion in 2004.

15

The growth of the Internet over the past five years has been nothing short of spectacular, particularly in the U.S. This proliferation however, is largely confined to westernized countries. Recent studies by Commerce Net and the Stanford Institute for the Quantitative Study of Society have yielded some startling results:

- 20
- 92% of the world’s population has no access to the Internet
  - 90% of the U.S. population also has no access to the Internet at least half of the time
  - People are more mobile than ever before
  - Cell phone penetration is rapidly increasing
- 25
- A quarter of the U.S. population is apprehensive about or experiences difficulty using computers and the Internet

Further, in certain situations, however, use of a computer may not be feasible or access to a computer may not be possible. For example, a cellular telephone user  
30 driving an automobile may want to know about traffic in the surrounding area, however, the user cannot operate a computer while in the car. In situations such as this, an audio interface may be useful for obtaining information from the Internet or another computer network.

Other situations where an audio interface to a computer network may be useful include accessing an electronic calendar on a local area network (LAN) to receive or modify an itinerary, accessing E-mail on the Internet or a wide-area network (WAN) while away from a computer, and requesting a telephone number from an electronic yellow pages or white pages while at a pay phone. An audio interface to the Web could also be used to traverse the Internet and obtain information residing on various Web servers.

10 The telecommunications industry has experienced strong growth over the last decade. Despite its growth, the highly fragmented telecommunications industry is being changed by the emergence of the Internet as a global medium for communication, news, information and commerce. Substantial portions of the commerce and advertising markets remain uncaptured. The proliferation of Internet, cellular and telecommunications users, combined with the global reach and lower cost of distribution in such arenas, have created a powerful channel for delivering entertainment and information and conducting related advertising and commerce.

It is interesting to note that each area code enables nearly 8 million separate telephone numbers and the total number of area codes in service has nearly doubled since 1991, growing from 119 to 215, according to the FCC. In California alone, the California Public Utilities Commission expects the number of area codes in service to increase from 13 in January 1997, to 40 by 2002. A significant portion of this growth is due to the rapid proliferation of cellular and PCS telephone service. The number of U.S. wireless subscribers is expected to grow to 149 million in 2003, representing a wireless market penetration of 53%. The global wireless penetration is expected to increase from 425 million in 1999 to 953 million in 2003.

U.S. Patent No. 5,884,262 discloses a computer document audio access and conversion system that allows a user to access information originally formatted for audio/visual interfacing on a computer network via a simple telephone. Of course, files formatted specifically for audio interfacing can also be accessed by the system. A user can call a designated telephone number and request a file via dual-tone multi-frequency (DTMF) signaling or through voice commands. The system analyzes the

request and accesses a predetermined document. The document may be in a standard document file format, such as hyper-text mark-up language (HTML) which is used on the World Wide Web. The document is analyzed by the system, and depending on the different types of formats used in the document, information is translated from an  
5 audio/visual format to an audio format and played to the user via the telephone interface. The document may contain links to other documents that can be invoked to access such other documents. In addition, the system can have a native command capability that allows the system to act independently of the accessed document contents to replay a document or carry out functions similar to those available in  
10 conventional web browsers.

The system disclosed in U.S. Patent No. 5,884,262 is limited to handling information originally formatted for audio/visual interfacing to a computer network via a telephone. There is a need for flexible interactive access to information that is not  
15 originally formatted for audio interfacing to a computer network via telephony devices. There is a need for interactive telephony access to a computer network, such as the Internet, to expand and enrich usage with unique and compelling content and products.

20

### SUMMARY OF THE INVENTION

The present invention is directed to an interactive voice response system that permits users to access information that is not originally formatted for audio interfacing to an  
25 information exchange network, such as a computer network. Users spoken utterance is analyzed and matched with an index of destinations. A list of valid destinations is produced and the user is the guided along the path with pre-recorded voice prompts. The user accessing the system can control the navigation via more speech and/or telephone keypad entry. The intent of the system is to be able to come up with a  
30 single choice destination amongst the many offered within the system.

The decision to choose a valid destination is driven by a variety of factors

User preferences

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