



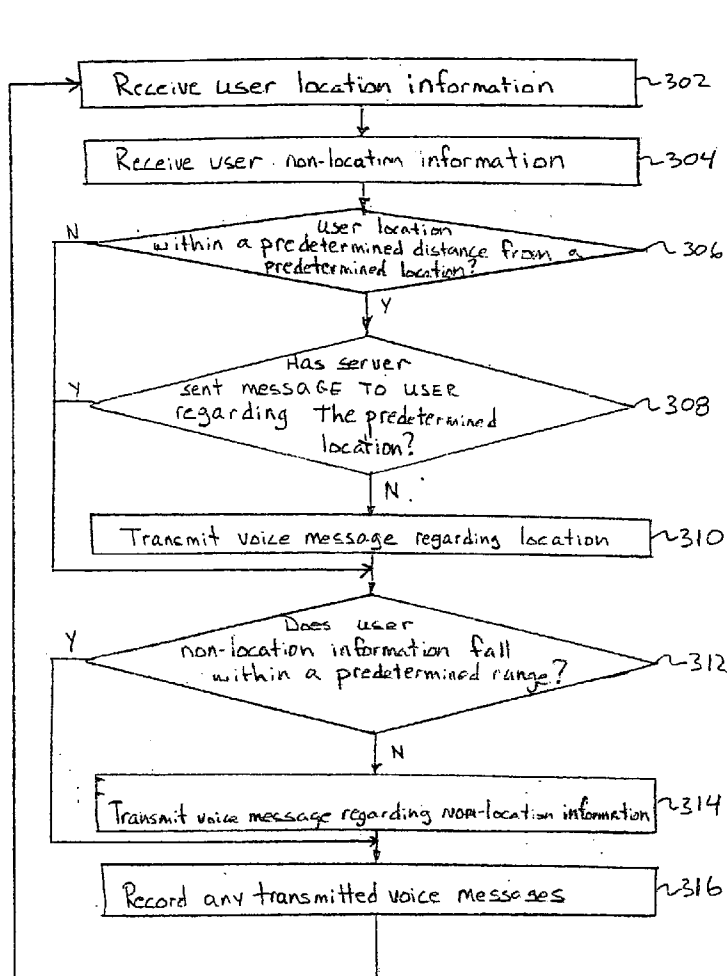
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(19) **United States**(12) **Patent Application Publication****Fan et al.**(10) **Pub. No.: US 2004/0162674 A1**(43) **Pub. Date: Aug. 19, 2004**(54) **VOICE INTERACTION FOR
LOCATION-RELEVANT MOBILE
RESOURCE MANAGEMENT****Publication Classification**(51) **Int. Cl.⁷ G01C 21/32**(52) **U.S. Cl. 701/211; 701/210; 340/996**(75) **Inventors: Rodric C. Fan, Fremont, CA (US);
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SAN JOSE, CA 95110 (US)**(57) **ABSTRACT**

A system and method for voice interaction for location-relevant mobile resource management are disclosed. In one embodiment, a network server transmits a voice message to a voice device at a mobile unit upon detection that the mobile unit is within a predetermined distance of a certain location. Pursuant to another embodiment, the network server receives a voice request for location-relevant information from a user at a mobile unit and transmits responsive location-relevant information to the user as a voice message. The network server may also conduct certain actions responsive to voice requests received from users at mobile units. Users may receive information from the server via voice devices even when not located at a mobile unit.

(73) **Assignee: At Road, Inc.**(21) **Appl. No.: 10/778,955**(22) **Filed: Feb. 12, 2004****Related U.S. Application Data**(62) **Division of application No. 09/931,845, filed on Aug. 16, 2001, now abandoned.**

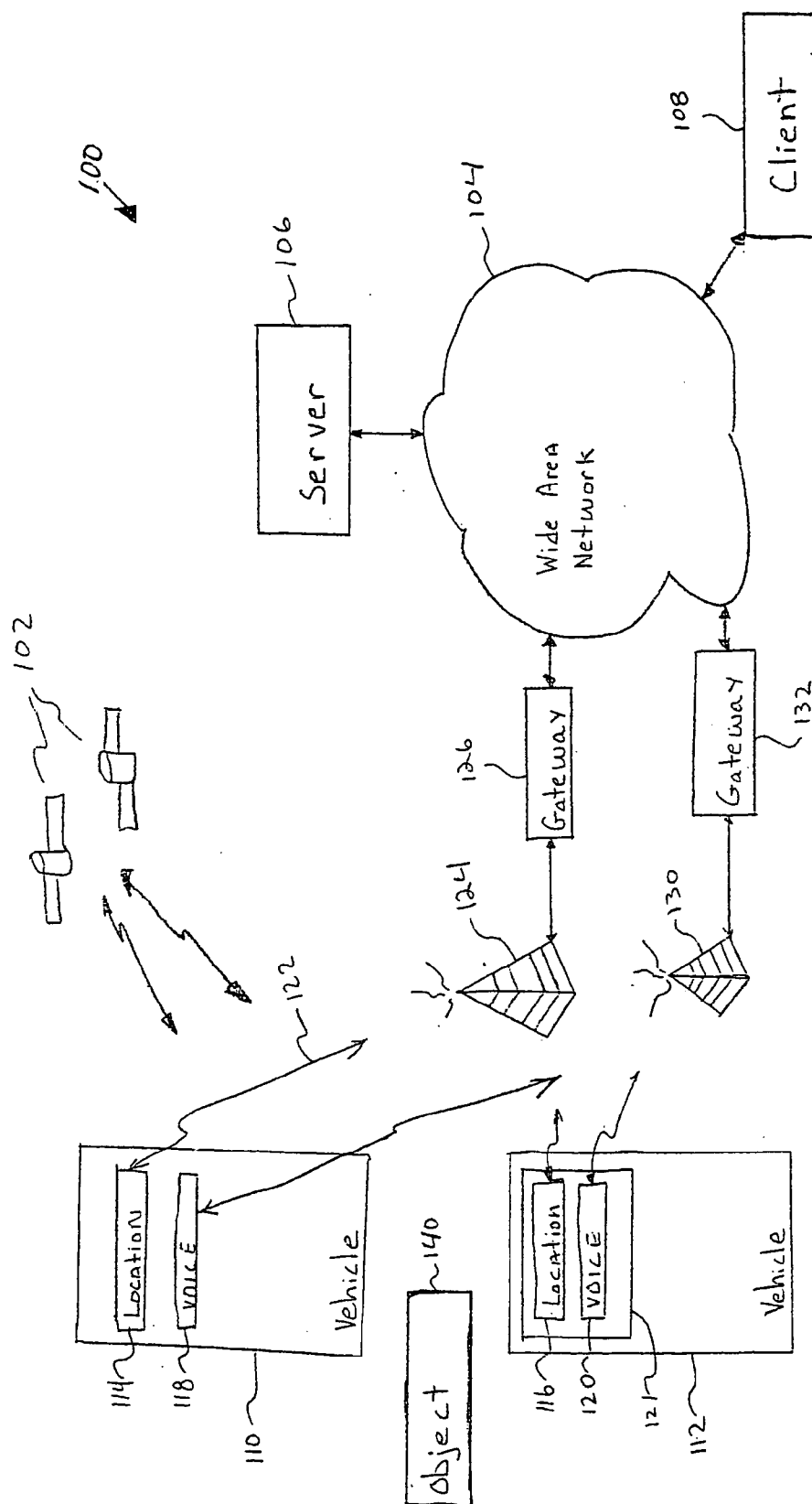


FIG. 1

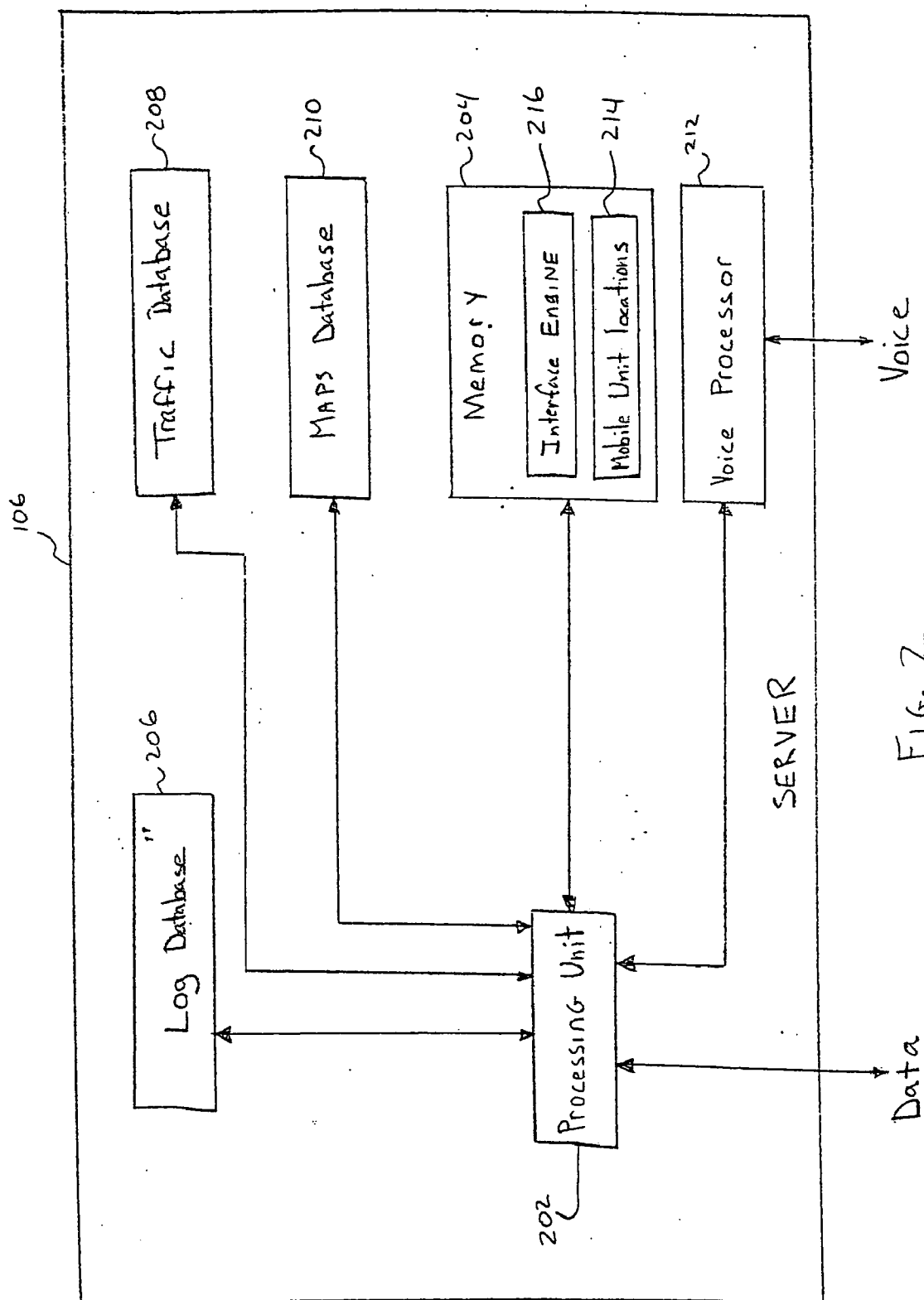


FIG. 2

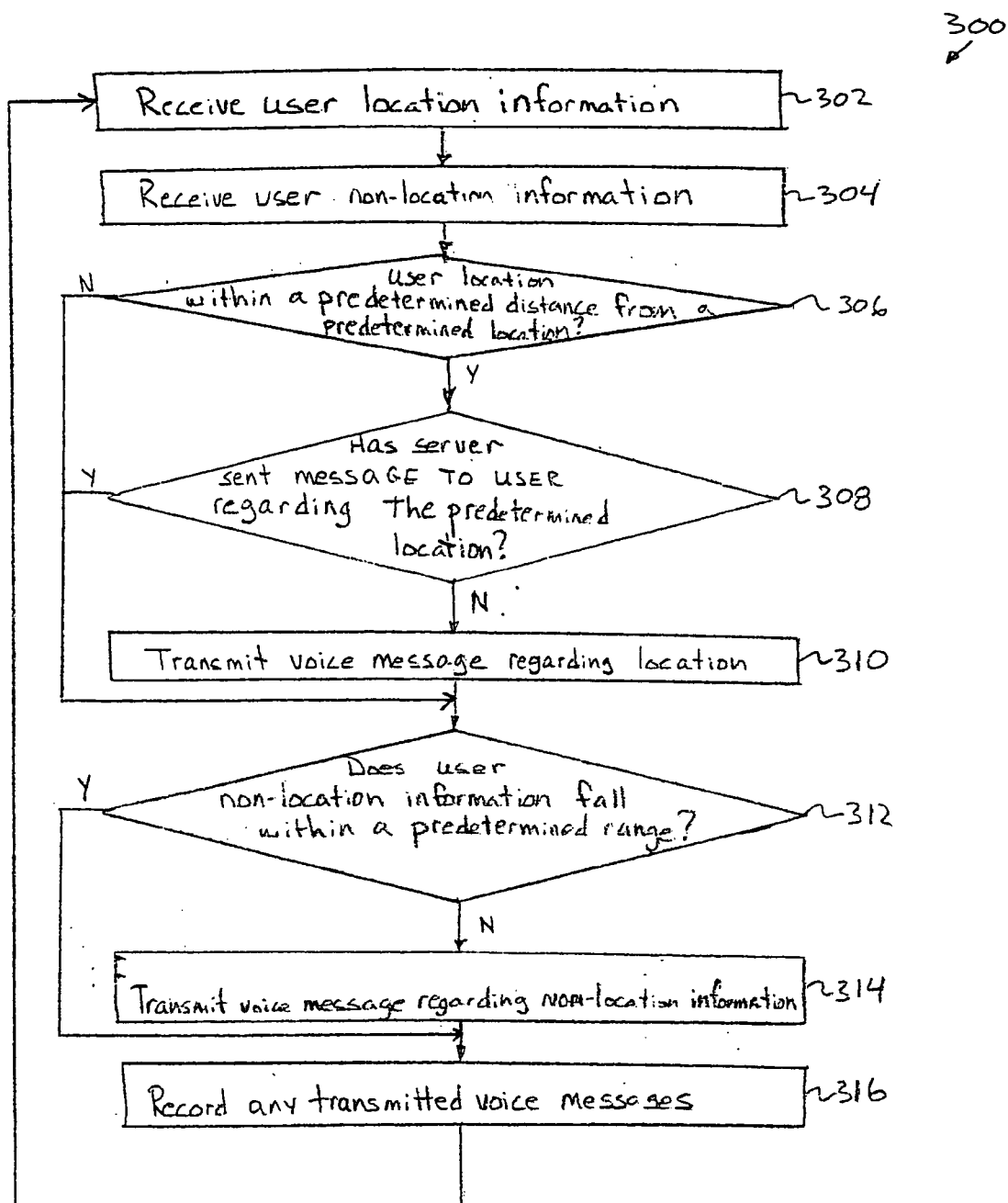


FIG. 3

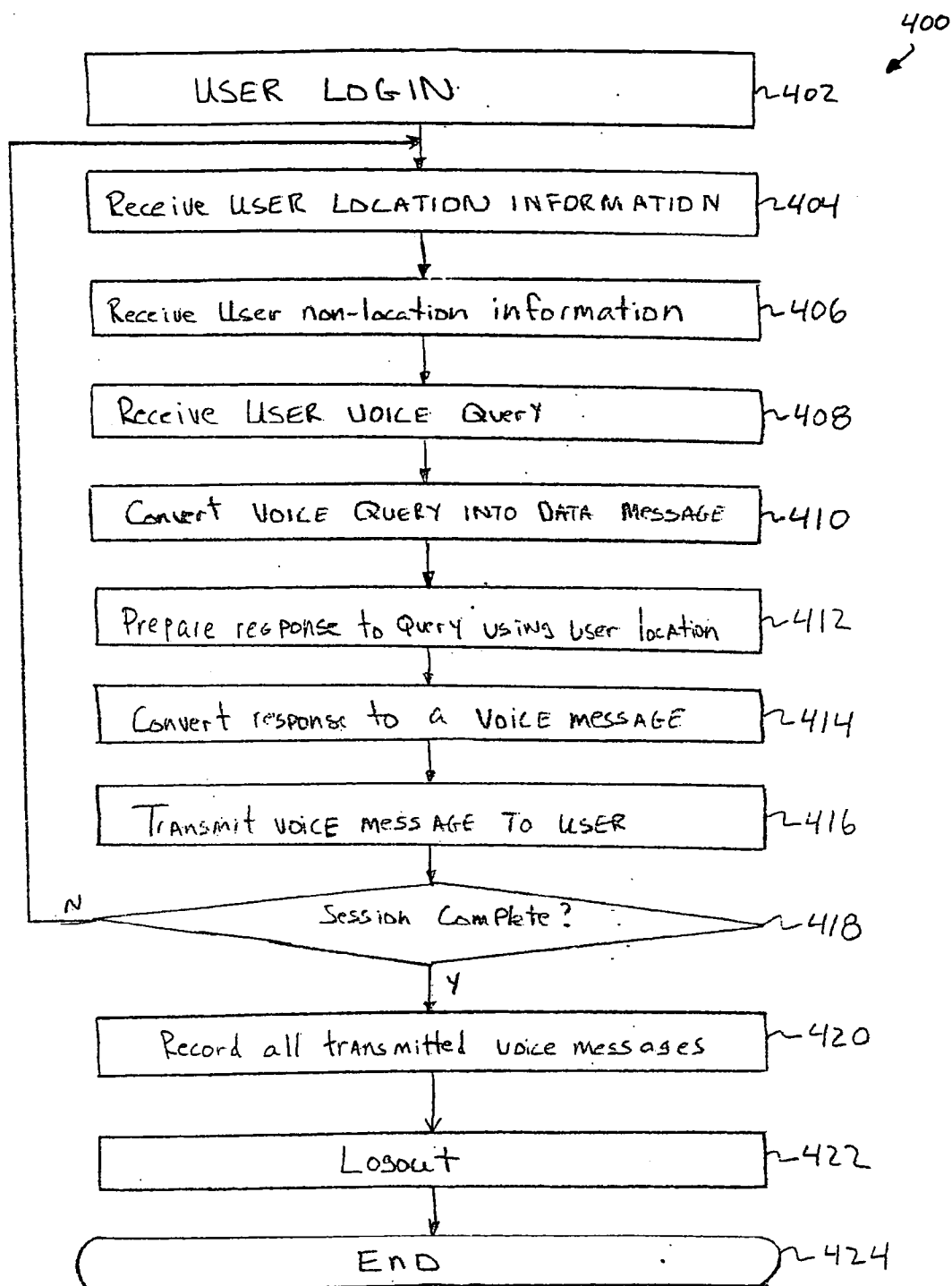


FIG. 4

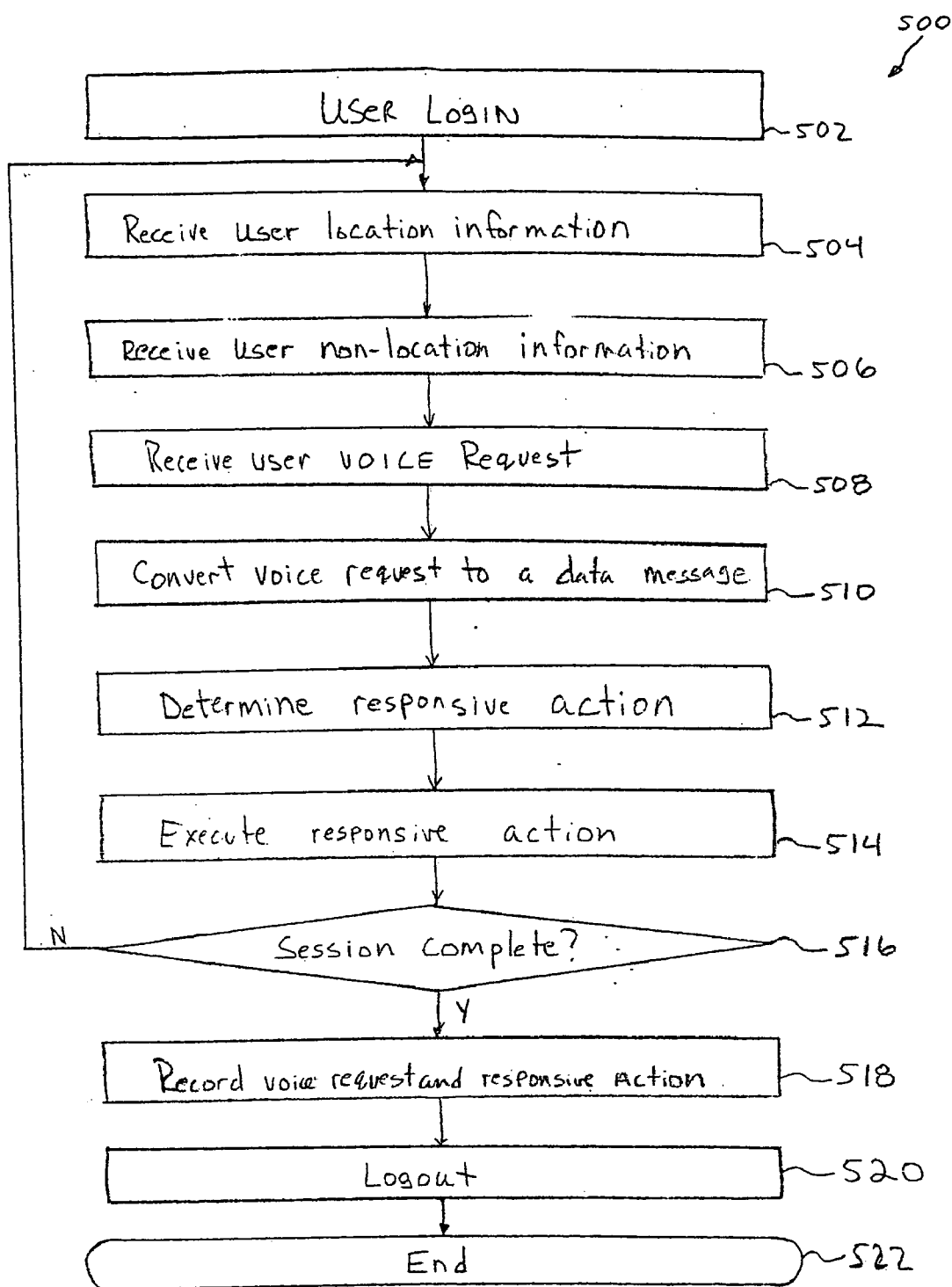


FIG. 5

VOICE INTERACTION FOR LOCATION-RELEVANT MOBILE RESOURCE MANAGEMENT

TECHNICAL FIELD

[0001] The invention relates to a system and a method for voice interaction for location relevant mobile resource management.

BACKGROUND

[0002] Methods for determining the position of mobile units such as vehicles, airplanes, and ships include time difference of arrival (TDOA), angle of arrival (AOA), ray tracing/pattern recognition, global positioning system (GPS), and hybrid methods using network connections. Among the available methods, GPS includes a plurality of satellites orbiting the earth and sending out positioning information that can be used to calculate vehicle positions. A GPS receiver receives the positioning information from the GPS satellites and uses the positioning information to obtain the position of the receiver. A more detailed discussion of a GPS receiver is found in U.S. Pat. No. 5,990,827 to Rodric C. Fan, et al. entitled "Structure of a Position Processing Apparatus," which is incorporated herein by reference in its entirety.

[0003] In using GPS to locate mobile units, such as vehicles, each mobile unit is equipped with a GPS receiver and a wireless transmitter. Using the GPS receiver and the transmitter, the mobile unit determines its position and transmits the position to a ground station. The ground station for a conventional mobile unit locating system normally includes a map database search system and some type of storage medium that stores digital maps and travel-related information. Thus, upon receiving the mobile unit positions from the mobile units, the ground station combines the stored data with the received information and displays the present mobile unit positions on a digital map.

[0004] In some cases, a data network, such as the Internet, is involved in locating mobile units. When a data network is involved, a location determination device at or in the mobile unit determines the position of the mobile unit and transmits the position information to a network server. This data transmission from a mobile unit to the network server is accomplished wirelessly by, for example, cellular digital packet data network (CDPD) that connects to a data network (e.g., the Internet), which in turn provides access to the network server.

[0005] Pursuant to some embodiments, the mobile units may transmit raw data to the network server so that the network server can make the position determination. In a system that involves a network server, the network server instead of the ground station may access the data storage medium. The data storage medium contains location-relevant information such as maps, locations of other mobile units, locations of service stations, and locations of other destinations of interest. Thus, the data processing unit organizes the measured position and generates an area map. The area map indicates by a position marker the position of each mobile unit.

[0006] As mentioned above, location determination devices in mobile units can connect to data networks (e.g.,

the Internet) wirelessly through communication networks, for example a CDPD network. Additional details regarding CDPD systems are further described in K. Budka et al., "Cellular Digital Packet Data Networks," Bell Labs Technical Journal, Vol. 2, No. 3 (Summer 1997); "Cellular Digital Packet Data Systems Specification: Releases 1.1," CDPD Forum, Inc., Chicago (1995); and M. S. Taylor et al., "Internet Mobility: The CDPD Approach," Prentice Hall PTR, Upper Saddle River, N.J. (1996).

[0007] In the past, however, the driver, or other occupant of a vehicle, has typically used a visual display device disposed within the vehicle to visually and manually access and interface with location-relevant information available from the data network. These conventional visual display devices provide limited visual display capability, which limits the quantity of location-relevant information and the speed at which the vehicle occupant may receive such information. Users usually enter information into the visual display device manually and receive information from the device visually, such as by reading. In some situations, or applications, such as when the user is driving, this method of interaction may be cumbersome, inefficient, or both. Due to the difficulty for the user in interfacing with information available from the data network, in the past, interaction between the user and such information has been limited.

[0008] Additionally, these conventional visual display devices are typically mounted on the vehicle. Thus, users may only access and interface with location-relevant information on the network at the vehicle and can not access or interface with the information when away from the visual display device.

[0009] A need exists, therefore, for an improved system and method for providing location-relevant information to mobile units, such as vehicles, which can provide the location-relevant information in an improved manner to overcome or alleviate limitations of conventional systems and methods.

SUMMARY

[0010] A system and method are provided for delivering location-relevant information to a user by receiving user location information at a network server and then using the user location information to create a user message at the network server. The network server may transmit the user message to the user as a voice message to permit the user to access location-relevant information in an audible manner.

[0011] Another embodiment provides a system and method for delivering location-relevant information by receiving user location information at a network server and receiving a voice query from the user at the network server. A voice processor at the network server converts the voice query to a corresponding data message. The network server uses the user location information to create a response to the data message and transmits the response as a voice message.

[0012] Accordingly, the present system and method permit a user to receive location-relevant information audibly over a voice-enabled device and to make queries for location-relevant information via a voice-enabled device. The voice-enabled device may comprise, for example, a cellular telephone or a voice-enabled personal digital assistant (PDA). Receiving such location-relevant information in this manner

may be more efficient and less cumbersome, in some applications, than using a visual or manual interface device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] **FIG. 1** illustrates a system for providing voice interaction for location-relevant mobile resource management according to one embodiment of the present invention.

[0014] **FIG. 2** illustrates details of the server of **FIG. 1** according to one embodiment of the present invention.

[0015] **FIG. 3** is a flowchart illustrating a method according to one embodiment of the present invention.

[0016] **FIG. 4** is a flowchart illustrating a method according to one embodiment of the present invention.

[0017] **FIG. 5** is a flowchart illustrating a method according to one embodiment of the present invention.

[0018] In the various drawings of the various embodiments, similar features of the various embodiments typically have the same reference numbers.

DETAILED DESCRIPTION

[0019] **FIG. 1** provides an overview of one embodiment of a location-based information system **100** in accordance with the present invention. The embodiment of **FIG. 1** includes GPS satellites **102**, a wide area network **104**, a server computer **106**, a client computer **108**, and mobile units, such as vehicles, **110** and **112**. The mobile units **110** and **112** have location devices **114** and **116** respectively disposed therein. Additionally, the mobile units **110** and **112** also have voice devices **118** and **120** respectively disposed therein. The voice devices **118** and **120** may comprise hands-free cellular device systems, which may be operated by voice commands in a hands-free manner.

[0020] The mobile unit **112** illustrates the location device **116** and the voice device **120** being disposed in a common housing **121**. In one embodiment, the common housing **121** is that of a cellular telephone device. Because the device enclosed by the housing **121** is not necessarily mounted on the vehicle **112**, the device may be used outside of and away from the vehicle **112** in an independent manner.

[0021] The location devices **114** and **116** may comprise any of a variety of conventional location determination devices. For example, the devices **114** and **118** may use location determination techniques including global positioning system (GPS), time difference of arrival (TOA), angle of arrival (AOA), ray tracing/pattern recognition, hybrid methods of the foregoing, and the like to determine the location of the device. Each of the location devices **114** and **118** includes a wireless transmitter, such as a CDPD modem, to periodically and wirelessly transmits user location data **122** to the server **106** via a base station **124**, a gateway **126**, and the wide area network **104**. In one embodiment, the wide area network comprises the Internet. Additional details regarding one embodiment of a location device **114**, **118** are disclosed in U.S. Pat. No. 5,990,827, which is hereby incorporated herein by reference in its entirety.

[0022] Each of the voice devices **118** and **120** may comprise a cellular telephone, a voice-enabled PDA, or the like and may be used by a user to wirelessly communicate by voice with the server **106**. In particular, the voice devices

118 and **120** communicate wirelessly with the server **106** via a base station **130**, a gateway **132**, and the wide area network (WAN) **104**. Other voice devices (not shown) may also communicate with the server **106** even when not located at a mobile device. Alternatively, the server **106** could be directly coupled to the base station **130** to eliminate use of the gateway **132** and WAN **104**.

[0023] The location devices **114** and **116** and the voice devices **118** and **120** respectively communicate with corresponding base stations, such as the base stations **124**, **130** using conventional protocols and techniques, including CDPD, GSM, iDEN, AMPS, CDMA, or the like.

[0024] In this configuration, the location devices **114** and **116** periodically and continuously transmit user location information to the server **106**. Alternatively, or additionally, the location devices **114** and **116** may transmit the user location information to the server **106** on demand by the user, upon request by the server **106**, or both. The user location information comprises information indicating the location of the transmitting location device **114**, **116**.

[0025] Pursuant to one embodiment, and as discussed in more detail below, by using one of the voice devices **118**, **120**, or another voice device, a user may obtain a variety of location-relevant information from the server **106**. As discussed in more detail below, the server **106** includes a voice processor of conventional design that receives a voice query from a voice device and converts the received voice query into a corresponding data message. The server **106** then determines a response to the voice query and transmits a responsive voice message to the user via the voice processor. Thus, this embodiment permits the user to obtain location-relevant information from the server **106** in an audible manner by sending and receiving voice messages wirelessly using a voice device. Alternatively, the user may transmit a query using a keypad device, the voice devices **118**, **120** comprise keypad devices in that they include keypads to enable telephone number dialing. Also, the server **106** may respond to the user query by transmitting a non-voice message to a display device at the associated mobile unit **110**, **112**.

[0026] The responsive voice message may comprise, for example, driving directions from the current location of the user to a particular location, such as to the object **140**. Additional details regarding this embodiment and the server **106** are described below.

[0027] In another embodiment, the server **106** monitors the location of each mobile unit, by periodically and continually receiving user location information from a location device disposed within the associated mobile unit. Using the received user location information from the location device **114**, the server **106** generates a telephone call to the associated voice device **118** when the user location information indicates that the mobile unit, such as the vehicle **110**, is, for example, within a predetermined distance to an object **140**. The server **106** may deliver a voice message to the user within the vehicle **110** regarding the object **140**. The object **140** may comprise, for example, a geographical location, a business, another mobile unit, or the like. Additional details regarding this embodiment are described below.

[0028] According to yet another embodiment, a user may transmit a voice message to the server **106** requesting that

the server **106** execute a particular action. For example, a user may send a voice message from the voice device **118** to the server **106** requesting that the server **106** execute a business transaction or send a voice message to all mobile devices currently located in a particular geographical area. In one embodiment, the voice message comprises driver instructions. Additional details regarding this embodiment are described below.

[0029] As discussed in more detail below, the server **106** also maintains a log of the various mobile unit locations as well as all of the received and transmitted voice messages.

[0030] In addition, the client computer **108** may also access information stored on the server **106** and may supply information to the server **106** over the network **104**.

[0031] Additional details regarding features of the system **100** and the location devices **114** and **116** are described in U.S. patent application Ser. No. 09/697,690, entitled "System and Method for Providing Mobile Location-Relevant Commerce" filed Oct. 25, 2000, and U.S. patent application Ser. No. 09/599,053 entitled "Dual Platform Location-Relevant Service" filed Jun. 21, 2000, both of which are hereby incorporated herein by reference in their respective entireties.

[0032] FIG. 2 illustrates details of the server **106**. As shown, the server **106** includes a processing unit **202**, a memory **204**, a log database **206**, a traffic database **208**, a maps database **210**, and a voice processor **212**. The processing unit **202** may comprise a general-purpose computer, such as a mainframe computer, or a computer system including a database server and a web page server.

[0033] The voice processor **212** receives voice messages from voice devices, such as the voice devices **118** and **120** (FIG. 1) and converts the received voice messages to corresponding data messages and passes the corresponding data messages to the processing unit **202** for processing. The voice processor **212** also receives outgoing data messages from the processing unit **202** and converts the outgoing data messages into corresponding voice messages and transmits the corresponding voice messages to one or more voice devices, such as the voice devices **118** and **120**.

[0034] The voice processor **212** is of conventional design and may comprise components such as, for example, a Global SCSA 4-Port Voice Processing Board and SingleSpan Series ISDN PRI Boards available from Intel Corporation, Santa Clara, Calif. Other voice processing equipment may also be employed. Additional details regarding voice processing equipment and methods are disclosed in U.S. Pat. No. 5,991,739, to Cupps et al., and entitled "Internet Online Order Method and Apparatus" which is hereby incorporated by reference in its entirety.

[0035] In another embodiment, the functions of the voice processor **212** are performed at the various voice devices **118** and **120**. Pursuant to this embodiment, each voice device converts received voice messages into corresponding data messages readable by the processing unit **202** and converts received data messages into corresponding voice messages.

[0036] The processing unit **202** also receives location and non-location information from the location devices **114** and **116** as data over the network **104** (FIG. 1). In one embodi-

ment, the processing unit **202** uses the received location information to compute the location and velocity of each mobile unit. The respective location and, optionally, velocity, of each of the mobile units are stored in the mobile unit locations **214** portion of the memory **204**. Alternatively, the mobile unit locations **214** portion of the memory **204** may comprise a database. Details regarding a method of determining location data using GPS code sequences are described in U.S. Pat. No. 5,959,577 to R. Fan, et al., and entitled "Method and Structure for Distribution of Travel Information Using Network," which is hereby expressly incorporated herein by reference in its entirety.

[0037] Interface engine **216** is stored in memory **216** and manages the interaction between one or more users and the server **106**. In one embodiment, when a user sends a voice message to the server **106**, the voice message is received at the voice processor **212** and converted to a corresponding data message, which is then received by the interface engine **216** via the processing unit **202**. The interface engine **216** then calculates, or determines a response to the message using the mobile unit locations **214** and the data stored in the various databases **206**, **208**, and **210**. If the determined response is a voice message, then the interface engine **216** generates a data message corresponding with the responsive voice message and passes the data message to the voice processor **212** via the processing unit **202** for transmission to the user.

[0038] The log database **206** includes a record of the locations and velocities of the various mobile units, such as the vehicles **110** and **112** (FIG. 1). In addition, the log database includes a record of the interactions, including voice interactions, between users and the server **106**. Thus, when a user makes a voice request or query to the server **106** via the voice processor **212**, the interface engine **216** records data representative of the voice request or query in the log database **206**. The log database **206** is useful in tracking the history of movements of the various mobile units as well as tracking the messages sent between the server **106** and the users.

[0039] The traffic database **208** contains traffic information. The traffic information may include, for example, historical traffic data for a predetermined time frame (e.g., three days) and traffic pattern data under typical conditions. This historical traffic data permits the interface engine **216** to provide users with specific traffic information regarding specific streets at certain times of the day. Moreover, the traffic information may also include marketplace traffic data obtained from real time traffic reports, such as those available on traffic and news websites. The marketplace traffic data may be supplemented with traffic data received by the various mobile units reporting user location information to the server **106**. Additional details regarding the traffic database **208** are described in U.S. patent application Ser. No. 09/898,682, entitled "Using Location Data to Determine Traffic Information," by Rodric C. Fan, Xinnong Yang, James D. Fay, filed Jul. 3, 2001.

[0040] The maps database **210** includes maps, road segments, and road data for use by the interface engine **216** in providing information to user via voice messages. The road segments comprise information regarding a strip or portion of a street having a same continuous speed limit and may be useful in determining an estimated travel time between two

locations. The road data may include data such as speed limits, locations of traffic lights, stop signs, one-way streets, and toll road information. Moreover, the maps database 210 includes location information for many businesses, such as gas stations and restaurants, as well as other geographical locations.

[0041] The current locations of the various mobile units, such as the vehicles 110 and 112 (FIG. 1), are stored in memory 204 at mobile unit locations 214. The mobile unit locations 214 are periodically and continually updated by the receipt of new user location information from location devices 114 and 116 at the various mobile units. Each mobile unit includes a location device, such as the location devices 114 and 116.

[0042] Additional details regarding the operation of the interface engine 216, the server 106, and the system 100 (FIG. 1) are described below with reference to FIGS. 3-6.

[0043] FIG. 3 is a flowchart illustrating a method 300 according to one embodiment of the present invention. As shown, the method 300 commences at block 302 with the server 106 receiving user location information. In particular, the location devices 114 and 116 (FIG. 1) periodically and continually transmit user location information in a wireless manner to the server 106 via the base station 124, the gateway 126, and the network 104. The server 106 receives these periodic transmissions of user location information and stores such information in the mobile unit locations 214 and in the log database 206.

[0044] The server 106 may also receive non-location information from a location device 114, pursuant to block 304. The non-location information may include vehicle status information such as engine temperature, fuel tank level, oil pressure, vehicle speed, tire pressure, and the like, where the location device 114 is coupled to a vehicle data bus of the associated vehicle 110. The non-location information may also contain other, non-vehicle-related information, such as, for example, the time of day or some other information. This non-location information may be wirelessly transmitted by the location device 114 using the wireless modem disposed therein. Thus, similar to the user location information, the location device 114 may periodically and continually transmit non-location information to the server 106 in a wireless manner to the server 106 via the base station 124, the gateway 126, and the network 104. The non-location information may also be stored by the server 106 in the log database 206 and in the mobile unit locations 214 of the memory 204.

[0045] Next, pursuant to block 306, the interface engine 216 determines for a particular user whether the user location is within a predetermined distance from a predetermined location using the maps database 210 and the mobile unit locations 214. For example, the interface engine 216 may determine the driving distance between the object 140 (FIG. 1) and the vehicle 110 using the maps database 210 and the mobile unit locations 214. If the interface engine 216 determines that the driving distance between the location of the vehicle 110 and the object 140 is within (e.g., less than or equal) a predetermined distance (e.g., two miles) then execution proceeds to block 308, else execution proceeds to block 312 as illustrated in FIG. 3.

[0046] At block 308, the interface engine 216 determines whether the server 106 has sent a message to the user at the

vehicle 110 regarding the predetermined location, such as the object 140 (FIG. 1) within a predetermined time. If the server 106 has not sent a message to the user at the vehicle 110 within a predetermined time (e.g., one hour), execution proceeds to block 310, else execution proceeds to block 312.

[0047] At block 310, the server 106 transmits a voice message regarding the predetermined location 140 to the user at the vehicle 110 via the voice device 118. In particular, the interface engine 216 generates a data message corresponding to a voice message regarding the predetermined location 140 to be sent to the user at the vehicle 110 via the voice device 118. The interface engine 216 passes the data message to the processing unit 202, which causes the data message to be transmitted to the voice device 118 via the voice processor 212. Thus, the user at the vehicle 110 will receive a telephone call on voice device 118 with a voice message regarding the predetermined location 140. For example, the voice message might state "You are presently within two kilometers from the ABC Company. Would you like driving directions to this location?"

[0048] The specific content of the voice message may, however, vary. In one embodiment, the voice message may include a notification regarding the proximity of the vehicle 110 to the predetermined location 140. In another embodiment, the voice message may include instructions for the user to take some action regarding the predetermined location, such as to effect a particular transaction at the predetermined location 140. The voice message may also include driving directions for the user to drive from the current location of the user to the predetermined location. Thus, the user, such as the driver or other occupant of the vehicle 110, may receive a telephone call on a voice device 118 and listen to a voice message regarding the predetermined location. The user may also send voice messages to the server 106 and receive further information from the server 106 as described below with reference to FIG. 4.

[0049] At block 312, the interface engine 216 determines whether the user non-location information falls within a predetermined range of acceptable values. As mentioned above, the user non-location information may comprise information regarding the status of the vehicle 110, such as the engine temperature, fuel level, oil pressure, tire pressure, vehicle speed, or the like. If one or more of these parameters is outside the range of predetermined values for the parameter, execution proceeds to block 314, else execution proceeds to block 316.

[0050] At block 314, the server 106 transmits a voice message to the user at the vehicle 110 regarding the non-location information. For example, if the non-location information was the amount of fuel in the vehicle 110 and that amount was less than a predetermined amount, then the server 106 would transmit a voice message to the user at the vehicle 110 via the voice device 118 regarding the amount of fuel remaining in the vehicle 110. In particular, the voice message might contain information regarding the distance the vehicle will be able travel without refueling and the identification of gas stations within a predetermined distance from the current location of the vehicle 110. Thus, the user, such as the driver or other occupant of the vehicle 110 may receive a telephone call on a voice device 118 and listen to a voice message regarding the non-location information. The user may also send voice messages to the server 106 and

receive further information from the server **106** as described below with reference to **FIG. 4**.

[0051] At block **316**, the server **106** records the content and time of any voice messages transmitted or received at the server **106** in the log database **206**. The server **106** also records the user location information in the log database **206**. The server **106** may alternatively record the content and time of the voice messages transmitted or received at the server **106** at the time of their transmission or reception, respectively.

[0052] Execution then returns to block **302**. In this manner, the server **106** monitors the location of the various mobile units relative to certain predetermined locations and sends a voice message to a mobile unit when the server **106** determines that the mobile unit is within a predetermined distance from one or more of the predetermined locations. In addition, the server **106** monitors user non-location information and transmits a voice message to the user when the non-location information is outside a predetermined range.

[0053] **FIG. 4** is a flowchart illustrating a method **400** according to one embodiment of the present invention. As shown, the method **400** commences at block **402** with the user placing a telephone call from a voice device, such as the voice device **118** (**FIG. 1**) to the server **106** and performing a login operation. In one embodiment, the user speaks a voice login access code. In another embodiment, the user enters a login access code using dialing buttons or another input mechanism on the voice device.

[0054] Next, the server **106** receives user location information pursuant to block **404**. As discussed above, the location devices **114** and **116** (**FIG. 1**) periodically and continually transmit user location information in a wireless manner to the server **106** via the base station **124**, the gateway **126**, and the network **104**. The server **106** receives these periodic transmissions of user location information and stores such information in the mobile unit locations **214** and in the log database **206**.

[0055] The server **106** may also receive non-location information from a location device **114** where the location device **114** is coupled to a vehicle data bus (not shown) of the associated vehicle **110**, pursuant to block **406**.

[0056] At block **408**, the server **106** receives a voice message such as a query or request from the user at the mobile unit **110** via the voice device **118**. In particular, with a telephone call between the server **106** and the voice device **118** initiated and in progress, the user speaks a voice message into the voice device **118**, which then wirelessly transmits the voice message to the server **106** via the base station **130**, the gateway **132**, the wide area network **104**. The server **106** receives the voice message via the voice processor **212**.

[0057] Next, pursuant to block **410**, the voice processor converts the received voice message to a corresponding data message and sends the data message to the processing unit **202**.

[0058] At block **412**, the interface engine **216** receives the data message corresponding to the voice message from the user and determines a response to the message using the user location information, the user non-location information, or both. In addition, the interface engine **216** may access

information stored in one or more of the databases **206**, **208**, and **210** in determining the response. The voice processor **212** then converts the response to a voice message at block **414** and transmits the voice message to the user at the voice device **118**, pursuant to block **416**.

[0059] As mentioned above, the user's voice message may comprise a query or request for information and, as such, the content of the voice message may vary. In one embodiment, the voice message may include a request for traffic information. In response, the interface engine **216** accesses the traffic database **208** as well as the user location information to generate a response to the user's voice message. The response may include traffic information relevant to the current location of the user as indicated by the user location information.

[0060] In another embodiment, the user's voice message may comprise a request for driving or routing directions from the user's current location to a particular destination. In response, the interface engine **216** accesses the maps database as well as the user location information to generate a response to the user's voice message. The response thus may include point-to-point directions to a particular location identified in the user's voice message from the current location of the user as indicated by the user location information.

[0061] Pursuant to another embodiment, the user's voice message may comprise a request for location information of the user. In response, the interface engine **216** accesses the maps database as well as the user location information to determine the location of the user. The server **106** may then communicate, via a voice message, to the user the location of the user, such as by identifying the street on which the user is traveling, the direction of travel, the nearest cross-streets, or the like.

[0062] In another embodiment, the user's voice message may comprise a request for location information of one or more other mobile units. The user's voice message may specifically request the location of a particular mobile unit or the user's voice message may request the location, identity, or both for all mobile units within a particular geographical region. The particular geographical region may comprise an area defined by a specific radius or distance from a certain location. In response, the interface engine **216** may access the maps database **210** as well as the mobile unit locations **214** to generate a response. The server **106** may then communicate to the user the location of a specific other mobile unit or the location and identity of all mobile units located within a particular geographical region.

[0063] Pursuant to yet another embodiment, the user's voice message may comprise a request for information at least partially based on non-location information. For example, the user's voice message may comprise a request for the distance the vehicle **110** is able to travel without refueling. In response, the interface engine **216** calculates this distance using the user non-location information, which may include the type of vehicle and the amount of fuel in the fuel tank of the vehicle. Based on these parameters and stored information relating to the fuel efficiency or miles/gallon of the particular vehicle type, the interface engine **216** calculates the distance the vehicle may travel without refueling. The server **106** then communicates this distance to the user as a voice message via the voice processor **212**.

[0064] In another embodiment, the user's voice message may comprise a request that the server **106** save, or store in memory, a request for point-to-point directions. The server **106**, in turn, monitors the user's progress along the path defined by the point-to-point directions and transmits a voice message to the user if the user ventures more than a predetermined distance from the path. For example, such a message may notify the user that the user is more than a predetermined distance from the path and may ask user if the user would like updated directions based on the user's current location, or both.

[0065] At block **418**, the interface engine **216** determines whether the user session is complete, such as by detecting that the voice device **118** has gone on-hook or has been hung-up, thus terminating the telephone call or by receiving a termination message from the user via the voice device **118**. If the interface engine **216** determines that the session is complete, execution proceeds to block **420**, else execution returns to block **404**.

[0066] At block **420**, the server **106** records information regarding all transmitted and received voice messages during the session and also records user location information and user non-location information in the log database **206**. At block **422**, the interface engine **216** performs a logout operation, which terminates the user session with the server **106**. The method **400** ends at block **424**.

[0067] FIG. 5 is a flowchart illustrating a method **500** according to one embodiment of the present invention. As shown, the method **500** commences at block **502** with the user placing a telephone call from a voice device, such as the voice device **118** (FIG. 1) to the server **106** and performing a login operation. In one embodiment, the user speaks a voice login access code. In another embodiment, the user enters a login access code using dialing buttons on the voice device.

[0068] Next, the server **106** receives user location information pursuant to block **504**. As discussed above, the location devices **114** and **116** (FIG. 1) periodically and continually transmit user location information in a wireless manner to the server **106** via the base station **124**, the gateway **126**, and the network **104**. The server **106** receives these periodic transmissions of user location information and stores such information in the mobile unit locations **214** and in the log database **206**.

[0069] The server **106** may also receive non-location information from a location device **114** where the location device **114** is coupled to, for example, a vehicle data bus (not shown) of the associated vehicle **110**, a PDA handheld supply chain management device, or some other mobile device pursuant to block **506**.

[0070] At block **508**, the server **106** receives a voice message such as request from the user at the mobile unit **110** via the voice device **118**. In particular, with a telephone call between the server **106** and the voice device **118** initiated and in progress, the user speaks a voice message into the voice device **118**, which then wirelessly transmits the voice message to the server **106** via the base station **130**, the gateway **132**, the wide area network **104**. The server **106** receives the voice message via the voice processor **212**.

[0071] Next, pursuant to block **510**, the voice processor converts the received voice message to a corresponding data message and sends the data message to the processing unit **202**.

[0072] At block **512**, the interface engine **216** receives the data message corresponding to the voice message from the user and determines an action responsive to the message using the user location information, the user non-location information, or both. In addition, the interface engine **216** may access information stored in one or more of the databases **206**, **208**, and **210** in determining the responsive action. The interface engine **216** then executes the determined responsive action pursuant to block **512**.

[0073] In this embodiment, the user's voice message may comprise a request for a particular action and, as such, the content of the voice message may vary. In one embodiment, the voice message may include a request for a broadcast voice message to be delivered to set of mobile units. For example, the user's voice message may specify that all mobile units within a predetermined distance of a certain location will receive a particular broadcast message. In response, the interface engine **216** accesses mobile unit locations **214** and the maps database **210** to identify the mobile units within the specified area. The interface engine **216** then executes the responsive action by sending a voice message to each of the identified mobile units.

[0074] In another embodiment, the user's voice message may comprise a request for the execution of a business transaction. For example, the voice request may comprise a request for a tow truck, where the server **106** requests or schedules a tow truck, such as from a third party to arrive at the user's current location as stored in the mobile unit locations **214**. The scheduling of the tow truck may be via the voice processor or as a data transmission.

[0075] At block **516**, the interface engine **216** determines whether the user session is complete, such as by detecting that the voice device **118** has gone on-hook or has been hung-up, thus terminating the telephone call or by receiving a termination message from the user via the voice device **118**. If the interface engine **216** determines that the session is complete, execution proceeds to block **518**, else execution returns to block **504**.

[0076] At block **518**, the server **106** records information regarding all transmitted and received voice messages and responsive actions during the session and also records user location information and user non-location information in the log database **206**. At block **520**, the interface engine **216** performs a logout operation, which terminates the user session with the server **106**. The method **500** ends at block **522**.

[0077] The above detailed description and accompanying drawings are provided to illustrate the specific embodiments of the present invention and are not intended to be limiting. Numerous modifications and variations within the scope of the present invention are possible. The present invention is particularly pointed out and distinctly claimed in the following claims.

What is claimed is:

1. A method for providing location-relevant information to a user, the method comprising:

receiving user location information at a network server from a location device;

receiving a voice query;

converting the voice query to a corresponding data message;

using the user location information to create a response to the data message at the network server;

transmitting the response as a voice message.

2. The method of claim 1, wherein a user transmits the voice query via a telephone handset.

3. The method of claim 1, wherein the network server effects a business transaction in response to the voice message.

4. The method of claim 1, wherein the network server effects a business transaction in response to the voice message by transmitting a network server voice message to a third party.

5. The method of claim 1, wherein the response comprises routing information based on the user location information.

6. The method of claim 1, wherein the response comprises location information of at least one other location device.

7. The method of claim 1, wherein the response comprises location information of at least one business enterprise.

8. The method of claim 1, wherein the response comprises the identity of at least one mobile unit within a predetermined distance from the user location.

9. The method of claim 1, wherein the voice query includes a specified distance and the response comprises the identity of at least one mobile unit within the specified distance from the user location.

10. The method of claim 1, wherein the voice query includes identification information relating to a single mobile unit and the response comprises the location of the single mobile unit.

11. The method of claim 1, wherein the transmitting the response as a voice message comprises transmitting a voice message to a set of mobile units located within a predefined distance from the user.

12. The method of claim 1, wherein the voice query includes a specified distance and the transmitting the response as a voice message comprises transmitting a voice message to a set of mobile units located within the specified distance from the user.

13. The method of claim 1, wherein the user transmits the user location information via a first device and the user transmits the voice query via a second device, the first and second devices being separately housed.

14. The method of claim 1, wherein the user transmits the user location information and the voice query via a single device housed in a single housing.

15. The method of claim 1, wherein the network server maintains a log of the user location information, the voice query, the time of the voice query, and the response.

16. A method for providing location-relevant information to a user, the method comprising:

receiving user location information from a location device at a network server;

using the user location information to create a user message at the network server;

transmitting the user message to the user as a voice message.

17. The method of claim 16, wherein the network server selectively transmits the user message based on the user location information.

18. The method of claim 16, wherein the user message comprises traffic information.

19. The method of claim 16, wherein the user message comprises at least a portion of the user location information.

20. The method of claim 16, wherein the user message comprises instructions.

21. The method of claim 16, wherein the network server maintains a log of the user location information, the voice query, the time of the voice query, and the response.

22. The method of claim 16 wherein the user message comprises business location information of at least one business.

23. The method of claim 16 further comprising:

receiving user location information for multiple users at the network server;

selectively transmitting the user message to each of the multiple users as a voice message based on the user location information for each user.

24. The method of claim 16 further comprising:

receiving user vehicle status information at a network server;

selectively transmitting a voice message to the user based on the vehicle status information.

25. A method for providing location-relevant information to a user, the method comprising:

receiving user location information at a network server from a location device;

receiving a user query;

using the user location information to create a response to the user query at the network server;

transmitting the response as a voice message.

26. The method of claim 25, wherein the user query comprises a voice query.

27. The method of claim 25, wherein the user query is transmitted via a keypad device.

28. The method of claim 25, wherein the user query is comprises voice and a keypad-generated components.

29. The method of claim 25, wherein the response comprises routing information based on the user location information.

30. The method of claim 25, wherein the response comprises location information of at least one other location device.

31. The method of claim 25, wherein the response comprises location information of at least one business enterprise.

32. The method of claim 25, wherein the response comprises the identity of at least one mobile unit within a predetermined distance from the user location.

33. The method of claim 25, wherein the query includes a specified distance and the response comprises the identity of at least one mobile unit within the specified distance from the user location.

34. The method of claim 25, wherein the query includes identification information relating to a single mobile unit and the response comprises the location of the single mobile unit.

35. The method of claim 25, wherein the transmitting the response as a voice message comprises transmitting a voice message to a set of mobile units located within a predefined distance from the user.

36. The method of claim 25, wherein the query includes a specified distance and the transmitting the response as a voice message comprises transmitting a voice message to a set of mobile units located within the specified distance from the user.

37. The method of claim 25, wherein the network server maintains a log of the user location information, the voice query, the time of the voice query, and the response.

38. A method for providing location-relevant information to a user, the method comprising:

receiving user location information at a network server from a location device;

receiving a voice query;

converting the voice query to a corresponding data message;

using the user location information to create a response to the data message at the network server;

transmitting the response.

39. The method of claim 38, wherein the transmitting the response further comprises transmitting the response as a voice message.

40. The method of claim 38, wherein a user transmits the voice query via a telephone handset.

41. The method of claim 38, wherein the network server effects a business transaction in response to the voice message.

42. The method of claim 38, wherein the network server effects a business transaction in response to the voice message by transmitting a network server voice message to a third party.

43. The method of claim 38, wherein the response comprises routing information based on the user location information.

44. The method of claim 38, wherein the response comprises location information of at least one other location device.

45. The method of claim 38, wherein the response comprises location information of at least one business enterprise.

46. The method of claim 38, wherein the response comprises the identity of at least one mobile unit within a predetermined distance from the user location.

47. A system for providing location-relevant information to a user, the system comprising:

means for receiving user location information at a network server from a location device;

means for receiving a voice query;

means for converting the voice query to a corresponding data message;

means for using the user location information to create a response to the data message at the network server;

means for transmitting the response as a voice message.

48. A system for providing location-relevant information to a user, the system comprising:

means for receiving user location information from a location device at a network server;

means for using the user location information to create a user message at the network server;

means for transmitting the user message to the user as a voice message.

49. A system for providing location-relevant information to a user, the method comprising:

means for receiving user location information at a network server from a location device;

means for receiving a user query;

means for using the user location information to create a response to the user query at the network server;

means for transmitting the response as a voice message.

50. A system for providing location-relevant information to a user, the method comprising:

means for receiving user location information at a network server from a location device;

means for receiving a voice query;

means for converting the voice query to a corresponding data message;

means for using the user location information to create a response to the data message at the network server;

means for transmitting the response.

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