

NEW UTILITY PATENT APPLICATION TRANSMITTAL <i>(Only for new nonprovisional applications under 37 C.F.R. 1.53(b))</i>	Docket No. 25300-003 Total pages in this submission _____
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TO THE HONORABLE COMMISSIONER FOR PATENTS
Mail Stop Patent Application
P.O. Box 1450
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Transmitted herewith for filing under 35 U.S.C. 111(a) and 37 C.F.R. 1.53(b) is a new utility patent application, for an invention entitled:

"MOBILE SYSTEMS AND METHODS FOR RESPONDING TO NATURAL LANGUAGE SPEECH UTTERANCE"

And invented by:

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Richard Kennewick, Tom Freeman, and Steven F. Elston**

IF A CONTINUATION APPLICATION, check appropriate box and supply requisite information:

☐ Continuation ☐ Divisional

☐ Continuation-in-part (CIP) of prior application Nos.: _____

Enclosed are:

Application Elements

1. ☒ Filing fee as calculated and transmitted as described below

2. ☒ Specification having 80 pages(s) and including the following:

- a. ☐ Related applications
- b. ☒ Claim to priority
- c. ☐ Statement regarding Federally-sponsored research/development (*if applicable*)
- d. ☒ Field of the invention
- e. ☒ Background of the invention
- f. ☒ Summary of the invention
- g. ☒ Brief descriptions of the drawings
- h. ☒ Detailed description of the preferred and alternative embodiments
- i. ☒ Claims as classified below
- j. ☒ Abstract of the disclosure

19972 U.S. PTO
10/618633

07/15/03

Application Elements (continued)

3. ☒ Drawing(s) (when necessary as prescribed by 35 U.S.C. 113)
☒ Formal ☐ Informal Number of sheets: 6 (Figs. 1-6)
4. ☒ Oath or Declaration
 a. ☐ Newly executed (original or copy) ☒ Unexecuted
 b. ☐ Copy from a prior application (37 C.F.R. 1.63(d) (for continuation/divisional applications only)
 c. ☒ With Power of Attorney ☐ Without Power of Attorney
5. ☐ Incorporation by reference (usable if Box 4b is checked)
 The entire disclosure of the prior application, from which a copy of the oath or declaration is Supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
6. ☐ Computer program in microfiche
7. ☐ Genetic sequence submission (if applicable, all must be included)
 a. ☐ Paper copy
 b. ☐ Computer readable copy
 c. ☐ Statement verifying identical paper and computer readable copies

Accompanying Application

8. ☐ Assignment papers (cover sheet & document(s))
9. ☐ 37 C.F.R. 3.73(b) statement (when there is an assignee)
10. ☐ English translation document (if applicable)
11. ☐ Information Disclosure Statement/PTO-1449 ☐ Copies of IDS citations
12. ☐ Preliminary Amendment
13. ☒ Acknowledgment postcard
14. ☐ Certified copy of priority document(s) (if foreign priority is claimed)
15. ☐ Certificate of Mailing
☐ First Class ☐ Express Mail (Label No.: _____)
16. ☐ Small Entity statement(s) -- # submitted _____ (if Small Entity status claimed)

Accompanying Application (continued)

- 17.
- ☒
- Additional enclosures (please identify below):

Application Data Sheet

Fee Calculation and Transmittal

The filing fee for this utility patent application is calculated and transmitted as follows:

☐ Large Entity ☒ Small Entity

CLAIMS AS FILED						
For	# Filed	# Allowed	# Extra	Rate	Fee	
Total Claims	55	- 20 =	35	x \$18.00	\$630.00	
Independent Claims	3	- 3 =	0	x \$84.00	\$0.00	
Multiple Dependent Claims (check if applicable)				☐		
Other Fees (specify purpose):						
				BASIC FEE	\$750.00	
				TOTAL FILING FEE	\$1,380.00	
Reduced by 1/2 for Small Entity					\$690.00	

☒ Check in the amount of \$690.00 to cover the total filing fee is enclosed.☒ The Commissioner is hereby authorized to charge and Deposit Account No. 50-0311 as described below. A duplicate copy of this sheet is enclosed.☐ Charge the amount of _____ as filing fee.☒ Credit any overpayment.☒ Charge any additional filing fees required under 37 C.F.R. 1.16 and 1.17.☐ Charge the issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance, pursuant to 37 C.F.R. 1.31(b).Dated: July 15, 2003James J. Namiki, Registration No. 51,148
(for James G. Gatto, Attorney Reg. No. 32,694)

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29315

PATENT & TRADEMARK OFFICE

MOBILE SYSTEMS AND METHODS FOR RESPONDING TO NATURAL LANGUAGE SPEECH UTTERANCE

5 This application claims priority from U.S. Provisional Patent Application Serial
No. 60/395,615 filed July 15, 2002, the disclosure of which is hereby incorporated by
reference by its entirety.

FIELD OF THE INVENTION

10 The present invention relates to the retrieval of online information and processing
of commands through a speech interface in a vehicle environment. More specifically, the
invention is a fully integrated environment allowing mobile users to ask natural language
speech questions or give natural language commands in a wide range of domains,
supporting local or remote commands, making local and network queries to obtain
information, and presenting results in a natural manner even in cases where the question
15 asked or the responses received are incomplete, ambiguous or subjective.

BACKGROUND OF THE INVENTION

 Telematics systems are systems that bring human-computer interfaces to
vehicular environments. Conventional computer interfaces use some combination of
keyboards, keypads, point and click techniques and touch screen displays. These
20 conventional interface techniques are generally not suitable for a vehicular environment,
owing to the speed of interaction and the inherent danger and distraction. Therefore,
speech interfaces are being adopted in many telematics applications.

However, creating a natural language speech interface that is suitable for use in the vehicular environment has proved difficult. A general-purpose telematics system must accommodate commands and queries from a wide range of domains and from many users with diverse preferences and needs. Further, multiple vehicle occupants may want to use such systems, often simultaneously. Finally, most vehicle environments are relatively noisy, making accurate speech recognition inherently difficult.

Human retrieval of both local and network hosted online information and processing of commands in a natural manner remains a difficult problem in any environment, especially onboard vehicles. Cognitive research on human interaction shows that a person asking a question or giving a command typically relies heavily on context and the domain knowledge of the person answering. On the other hand, machine-based queries of documents and databases and execution of commands must be highly structured and are not inherently natural to the human user. Thus, human questions and commands and machine processing of queries are fundamentally incompatible. Yet the ability to allow a person to make natural language speech-based queries remains a desirable goal.

Much work covering multiple methods has been done in the fields of natural language processing and speech recognition. Speech recognition has steadily improved in accuracy and today is successfully used in a wide range of applications. Natural language processing has previously been applied to the parsing of speech queries. Yet, no system developed provides a complete environment for users to make natural language speech queries or commands and receive natural sounding responses in a

vehicular environment. There remain a number of significant barriers to creation of a complete natural language speech-based query and response environment.

The fact that most natural language queries and commands are incomplete in their definition is a significant barrier to natural human query-response interaction. Further, some questions can only be interpreted in the context of previous questions, knowledge of the domain, or the user's history of interests and preferences. Thus, some natural language questions and commands may not be easily transformed to machine processable form. Compounding this problem, many natural language questions may be ambiguous or subjective. In these cases, the formation of a machine processable query and returning of a natural language response is difficult at best.

Even once a question is asked, parsed and interpreted, machine processable queries and commands must be formulated. Depending on the nature of the question, there may not be a simple set of queries returning an adequate response. Several queries may need to be initiated and even these queries may need to be chained or concatenated to achieve a complete result. Further, no single available source may include the entire set of results required. Thus multiple queries, perhaps with several parts, need to be made to multiple data sources, which can be both local or on a network. Not all of these sources and queries will return useful results or any results at all. In a mobile or vehicular environment, the use of wireless communications compounds the chances that queries will not complete or return useful results. Useful results that are returned are often embedded in other information, and from which they may need to be extracted. For example, a few key words or numbers often need to be "scraped" from a larger amount of

other information in a text string, table, list, page or other information. At the same time, other extraneous information such as graphics or pictures needs to be removed to process the response in speech. In any case, the multiple results must be evaluated and combined to form the best possible answer, even in the case where some queries do not return

5 useful results or fail entirely. In cases where the question is ambiguous or the result inherently subjective, determining the best result to present is a complex process.

Finally, to maintain a natural interaction, responses need to be returned rapidly to the user. Managing and evaluating complex and uncertain queries while maintaining real-time performance is a significant challenge.

10 These and other drawbacks exist in existing systems.

SUMMARY OF THE INVENTION

An object of the invention is to overcome these and other drawbacks of prior speech-based telematic systems.

According to one aspect of the invention, systems and methods are provided that
15 may overcome deficiencies of prior systems through the application of a complete speech-based information query, retrieval, presentation and command environment. This environment makes significant use of context, prior information, domain knowledge, and user specific profile data to achieve a natural environment for one or more users making queries or commands in multiple domains. Through this integrated approach, a speech-
20 based natural language query, response and command environment is created. Further, at each step in the process, accommodation may be made for full or partial failure and

graceful recovery. The robustness to partial failure is achieved through the use of probabilistic and fuzzy reasoning at several stages of the process. This robustness to partial failure promotes the feeling of a natural response to questions and commands.

According to another aspect of the invention, a mobile interactive natural language speech system (herein "the system") is provided that includes a speech unit. The speech unit may be incorporated into a vehicle computer device or system, or may be a separate device. If a separate device, the speech unit may be connected to the vehicle computer device via a wired or wireless connection. In some embodiments, the interactive natural language speech device can be handheld. The handheld device may interface with vehicle computers or other electronic control systems through wired or wireless links. The handheld device can also operate independently of the vehicle. The handheld device can be used to remotely control the vehicle through a wireless local area connection, a wide area wireless connection or through other communication links.

According to another aspect of the invention, the system may include a stand alone or networked PC attached to a vehicle, a standalone or networked fixed computer in a home or office, a PDA, wireless phone, or other portable computer device, or other computer device or system. For convenience, these and other computer alternatives shall be simply referred to as a computer. One aspect of the invention includes software that is installed onto the computer, where the software includes one or more of the following modules: a speech recognition module for capturing the user input; a parser for parsing the input, a text to speech engine module for converting text to speech; a network interface for enabling the computer to interface with one or more networks; a graphical

user interface module, an event manager for managing events and other modules. In some embodiments the event manager is in communication with a dictionary and phrases module, a user profile module that enables user profiles to be created, modified and accessed, a personality module that enables various personalities to be created and used, an agent module, an update manager and one or more databases. It will be understood that this software can be distributed in any way between a handheld device, a computer attached to a vehicle, a desktop computer or a server without altering the function, features, scope, or intent of the invention.

According to one aspect of the invention, and regardless of the distribution of the functionality, the system may include a speech unit interface device that receives spoken natural language queries, commands and/or other utterances from a user, and a computer device or system that receives input from the speech unit and processes the input (e.g., retrieves information responsive to the query, takes action consistent with the command and performs other functions as detailed herein), and responds to the user with a natural language speech response.

According to another aspect of invention, the system can be interfaced by wired or wireless connections to one or more vehicle-related systems. These vehicle-related systems can themselves be distributed between electronic controls or computers attached to the vehicle or external to the vehicle. Vehicle systems employed can include, electronic control systems, entertainment devices, navigation equipment, and measurement equipment or sensors. External systems employed include those used during vehicle operation, such as, weight sensors, payment systems, emergency

assistance networks, remote ordering systems, and automated or attended customer service functions. Systems on the vehicle typically communicate with external systems via wireless communications networks.

According to another aspect of the invention, the system can be deployed in a
5 network of devices using common base of agents, data, information, user profiles and histories. Each user can then interact with, and receive the same services and applications at any location equipped with the required device on the network. For example, multiple devices on which the invention is deployed, and connected to a network, can be placed at different locations throughout a home, place of business,
10 vehicle or other location. In such a case, the system can use the location of the particular device addressed by the user as part of the context for the questions asked.

According to some aspects of the invention, domain specific behavior and information are organized into agents. Agents are executables that receive, process and respond to user questions, queries and commands. The agents provide convenient and re-
15 distributable packages or modules of functionality, typically for a specific domain. Agents can be packages of executable code, scripts, links to information, data, and other data forms, required to provide a specific package of functionality, usually in a specific domain. In other words, an agent may include everything that is needed to extend the functionality of the invention to a new domain. Further, agents and their associated data
20 can be updated remotely over a network as new behavior is added or new information becomes available. Agents can use system resources and the services of other, typically more specialized, agents. Agents can be distributed and redistributed in a number of

ways including on removable storage media, transfer over networks or attached to emails and other messages. An update manger is used to add new agents to the system or update existing agents.

The software behavior and data in an agent can either be of a general-purpose

5 nature or specific to a domain or area of functionality. One or more system agents include general-purpose behaviors and data, which provide core or foundation services for more specialized domain or system agents. Examples of general-purpose functionality include transmitting and receiving information over data networks, parsing text strings, general commands to the interactive natural language telematics speech
10 interface, and other functions. For example, a specific system agent may be used to transmit and receive information over a particular type of network, and may use the services of a more general network agent. Domain specific agents include the behavior and data required for a specific area of functionality. More specialized domain agents can use the functionality of more generalized domain agents. Areas of functionality or
15 specific domains are broadly divided into two categories, query and response, and control. Examples of query and response domains include driving directions, travel services, entertainment scheduling, and other information. Agents may in turn query other agents. For example, a fast food ordering agent, may use the services of a restaurant ordering agent and payment agent, which may in turn, use the services of
20 location agent and a travel services agent. Control domains include control of specific devices on a vehicle. In each case, the agent includes or has access to the data and functionality required to control the device through the appropriate interfaces. For example, a specific domain agent may be used to control the windshield wipers on a

vehicle. In another example, a domain agent for controlling the vehicle's headlights may use the services of a lighting control agent, which may use the services of an electrical device control agent. Some domains, and therefore agents, may combine aspects of control with query and response functionality. For example, a user may wish to listen to a particular piece of music. In this case, the domain agent will make one or more queries, possibly using the services of other agents, to locate a source for the music and retrieve it. Next, the domain agent will activate a suitable player for the format of the music, again possibly using the services of other agents.

The invention may provide license management capability allowing the sale of agents by third parties to one or more users on a one time or subscription basis. In addition, users with particular expertise can create agents, update existing agents by adding new behaviors and information and making these agents to other users.

Given the desire for domain specific behavior, user specific behavior and domain specific information, the invention may allow both users and content providers to extend the system capabilities, add data to local data sources, and add references to network data sources. To allow coverage of the widest possible range of topics and support for the widest range of devices, the system may allow third party content developers to develop, distribute and sell specialized or domain specific system programs and information.

Content is created through creation of new agents, scripting existing agents, adding new data to agents or databases and adding or modifying links to information sources.

Distribution of this information is sensitive to the user's interests and use history and to their willingness to pay for it.

According to another aspect of the invention, the system may include mechanisms to allow users themselves to post and distribute agents and information in their particular areas of expertise, to improved system capability. Further, users can extend the system and configure it to their own preferences, add information to their profile to define new questions or queries, extend and modify existing questions and queries, add new data sources, update data sources, set preferences and specify presentation parameters for results.

According to one aspect of the invention, the system can be distributed between any combination of vehicle computers, handheld devices, server computers, desktop computers and other terminal devices. Each of these devices may have a local set of databases and agents, which may be specific to a user or users. If a given user is to see a uniform set of capability across the various platforms, the databases and agents can be synchronized. The synchronization of data and agents can be automatically or manually initiated. For example, changes to agents and databases can be automatically propagated to other platforms used by that user whenever and wherever network connections permit. In another example, changes on a handheld computer are propagated to a vehicle computer or vice versa when the handheld is connected to the vehicle computer on a wireless or wired link. Alternatively, a user may wish to block the synchronization of sensitive or personal information to certain platforms used by the user. For example, a user may choose to keep all of their personal and other sensitive information on their handheld device and use the computing power, databases and network connections of other platforms from their handheld device. In a further example, a vehicle operator can

carry their personal databases and agents from one vehicle to another, but keep their information within the handheld computer.

To further enhance the natural query and response environment, the system may format results in a manner enhancing the understandability to the user. The optimal
5 formatting and presentation depends on the context of the queries, the contents of the response being presented, the history of the interaction with the user, the user's preferences and interests and the nature of the domain.

Information presented in a rigid, highly formatted, or structured manner seems unnatural to most people. Thus the system may simulate some aspects of human
10 "personality." In some embodiments, the presentation of the response and the terms used are randomized so they do not appear rigidly formatted or mechanical. The use of simulated personality characteristics is also desirable. For example, a response that may be upsetting to the user is best presented in a sympathetic manner. In another example, information requiring immediate action or announcing a safety problem can be
15 delivered with a definite and authoritative personality.

The results of queries may be long text strings, lists, tables or other lengthy sets of data. Natural presentation of this type of information presents particular challenges. Simply reading the long response is generally not preferred. Therefore the system can parse the most important sections from the response and, at least initially, only report
20 these. Determining what parts of a long response are presented may depend on the context of the questions, the contents of the response being presented, the history of the

interaction with the user, the user's preferences and interests and the nature of the domain. At the same time, the system may give the user, interactive control over what information and how much information is being presented, to stop the response all together, or to take other actions.

5 The invention can be applied as a user interface to telematics systems in a wide variety of environments. These environments can include, but are not limited to, the following: 1) personal automobiles, rented automobiles, or fleet automobiles; 2) motorcycles, scooters, and other two wheeled or open-air vehicles; 3) commercial long-haul and short haul trucks; 4) delivery service vehicles; 5) fleet service vehicles; 6) 10 industrial vehicles; 7) agricultural and construction machinery; 8) water-borne vehicles; 9) aircraft; and, 10) specialized military, law enforcement and emergency vehicles.

 The system, according to one aspect of the invention, can process and respond to questions, queries and commands. Keywords or context can be used to determine if the user's utterance is a command or query. Some utterances can include both aspects of a 15 command and a query or question. For example, a user may say, "tune in my favorite radio station." A query may be required to determine the name, and/or the channel of the use's favorite station. If the programming on that station is of a type the user generally does not listen to, the system can suggest using an alternative, such as listening to a CD more likely to please the user.

20 The invention can be used for generalized local or network information query, retrieval and presentation in a mobile environment. For each user utterance including a

question or query or set of questions or queries, the system may perform multiple steps possibly including: 1) capturing the user's question or query through accurate speech recognition operating in a variety of real-world environments; 2) parsing and interpreting the question or query; 3) determining the domain of expertise required and context,

5 invoking the proper resources, including agents; 4) formulating one or more queries to one or more local and/or network data sources or sending appropriate commands to local or remote devices or the system itself; 5) performing required formatting, variable substitutions and transformations to modify the queries to a form most likely to yield desired results from the available sources; 6) executing the multiple queries or commands

10 in an asynchronous manner and dealing gracefully with failures; 7) extracting or scraping the desired information from the one or more results, which may be returned in any one of a number of different formats; 8) evaluating and interpreting the results, including processing of errors, gathered and combine them into a single best result judged to be "best" even if the results are ambiguous, incomplete, or conflicting; 9) performing

15 required formatting, variable substitutions and transformations to modify the results to a form most easily understood by the user; and, 10) presenting the compound result, through a text to speech engine, to the user in a useful and expected manner.

The above steps may be performed using the context of the domain of expertise required, the context for the question or command, domain specific information, the

20 history of the user's interaction, user preferences, information sources or commands available, and responses obtained from the sources. At each stage probabilistic or fuzzy set decision and matching methods can be applied to deal with inconsistent, ambiguous, conflicting and incomplete information or responses. In addition the use of asynchronous

queries, allowing rapid and graceful failure of some queries or commands, allows the system to robustly return results quickly, and in a manner that seems natural to the user.

Many everyday questions are inherently subjective and result in answers that are a matter of option or consensus as much as fact. Such questions are often ad hoc in their nature, as well. The invention may use probabilistic and fuzzy set decision and matching methods to first identify the subjective nature of the question and to evaluate a range of possible answers, selecting the one answer or few answers that best represent the type of result desired by the user.

The context and expected results from a particular question may be highly dependent on the individual asking the question. Therefore, the invention creates, stores and uses extensive personal profile information for each user. Information in the profile may be added and updated automatically as the user uses the system or can be manually added or updated by the user. Domain specific agents collect, store and use specific profile information, as required for optimal operations. Users can create commands for regularly used reports, automatically generated alerts, and other queries and for the formatting and presentation of results. The system may use profile data in interpreting questions, formulating queries, interpreting results of queries and presenting answers to the user. Examples of information in a user profile includes, history of questions asked, session histories, formatting and presentation preferences, vehicle type, special vehicle equipment, vehicle related data, special word spelling, terms of interest, special data sources of interest, age, sex, education level, location of vehicle, planned path or route,

specific addresses, commonly visited destinations, place of business, type of business, investments, hobbies, sports interests, news interests and other profile data.

To create a natural question and response environment, the invention can attempt to provide rapid responses without requiring any additional information. The invention
5 may determine the mostly likely context or domain for a user's question or command, for example, by using a real-time scoring system or other techniques. Based on this determination the system can invoke the correct agent. The agent may make one or more queries and may rapidly return a formatted response. Thus, a user can receive a direct response to a set of questions each with a different response or context. In some cases,
10 the available information, including the query results, may not adequately answer the question. The user can then be asked one or more questions to resolve the ambiguity. Additional queries may then be made before an adequate response is made. In these cases, the system can use context information, user profile information and domain specific information to minimize the interaction with the user required to deliver a
15 response.

If the confidence level of the domain or context score is not high enough to ensure a reliable response, the system can ask a question of the user to verify the question or command is correctly understood. In general the question may be phrased to indicate the context of the question including all criteria or parameters. If the user confirms that the
20 question is correct then the system may proceed to produce a response. Otherwise, either the user can rephrase the original question, perhaps adding additional information to

remove ambiguity, or the system can ask one or more questions to attempt to resolve the ambiguity or other actions may taken.

While the invention is intended to be able to accept most any natural language question or command, ambiguity can still be a problem. To assist users formulate
 5 concise questions and commands, the system can support a voice query language. The language helps users clearly specify the keywords or contexts of the question or command along with the parameters or criteria. The system may provide built in training capabilities to help the user learn the best methods to formulate their questions and commands.

10 To make the responses to user's questions and commands seem more natural, the invention may employ one or more dynamically invokeable personalities. Personalities have specific characteristics, which simulate the behavioral characteristics of real humans. Examples of these characteristics include, sympathy, irritation, and helpfulness. The personality also randomizes aspects of responses, just as a real human would do.

15 This behavior includes randomization of terms used and the order of presentation of information. Characteristics of the personality may be invoked using probabilistic or fuzzy set decision and matching methods, and using criteria including the context for the question, the history of the user's interaction, user preferences, information sources available, responses obtained from the sources.

20 The invention may use special procedures to present information that is in the form of long text strings, tables, lists or other long response sets. Simply presenting a

long set of information in an ordered manner may not be natural nor what most users have in mind. The system, using probabilistic or fuzzy set matching methods, may extract the most relevant information to the user and presents these subsets first. Further the system can provide commands allowing the user to skip through the list, find
5 keywords or key information in the list or stop processing the list altogether.

Multiple users can use the system at different times or during interleaved or overlapping sessions. The system may recognizes a user either by name or voice. Once the user is recognized, the system may invoke the correct profile. If multiple users are addressing the system in overlapping or interleaved sessions, the system can determine
10 which user is stating each question or command and apply the correct profile and context. For applications requiring security, the user is verified, typically by using voiceprint matching or requesting a password or pass-phrase from the user. When multiple users are engaged in interleaved sessions, the system may gracefully resolve conflicts using a probabilistic or fuzzy set decision method. This process simulates the manner in which a
15 human would address multiple questions. For example, the system may answer short questions first at times, while answering questions in the order received at other times.

Since the system may operate in noisy environments, typical of vehicles, including environments with background noise, point noise sources and people holding conversations, filtering of speech input may be advantageous. The system can use either
20 one-dimensional or two-dimensional array microphones (or other devices) to receive human speech. The array microphones can be fixed or employ dynamic beam forming techniques. The array pattern may be adjusted to maximize gain in the direction of the

user and to null point noise sources. Alternatively, microphones can be placed at particular locations within a vehicle near where occupants are likely to use the system. These microphones can be single microphones, directional microphones or an array of microphones. Speech received at the microphones may then be processed with analog or digital filters to optimize the bandwidth, cancel echoes, and notch-out narrow band noise sources. Following filtering, the system may use variable rate sampling to maximize the fidelity of the encoded speech, while minimizing required bandwidth. This procedure can be particularly useful in cases where the encoded speech is transmitted over a wireless network or link.

The invention can be applied to a wide range of telematics applications. General applications areas can include, but are not limited to remote or local vehicle control, information query, retrieval and presentation from local or network sources, safety applications, and security applications.

The system can provide local or remote control functions for the system or for other devices on the vehicle or off the vehicle. Users can initiate commands locally or remotely. Typically, remote operation may be through a telephone or other audio connection. Alternately, the user can address spoken commands to a handheld device or desktop unit, which may send the commands to controllers on the vehicle over wireless links. Other remote command techniques may be used. The system may process commands in a nearly identical manner to a query. One difference being that the result of the command is generally an action rather than a response. In many cases, the system may give the user a cue or response to indicate that the command has been successfully

executed or has failed. In cases of failure, an interactive session may be started to allow the user to resolve the difficulty or formulate a command more likely to succeed.

For each user command utterance, the system may execute a number of steps possibly including: 1) capture the user's command through accurate speech recognition
 5 operating in a variety of real-world environments; 2) parse and interpret the command; 3) determine the domain for the command and context, invoking the proper resources, including agents as required; 4) gather required data including, device settings, and measurement data; 5) formulate device specific commands for the system or external
 10 devices; 6) route command to system, or external devices, including external devices connected to data networks; 7) receive and process results of command, including errors; and, 8) optionally, provide response to user indicating the success or failure of the command, and possibly including state information.

The invention can provide to users, including vehicle operators, the capability to control most any vehicle system function using interactive speech. Generally, all controls
 15 of a critical nature or with safety implications may employ fail-safe checks, verify that a command will not create a hazardous condition before it is executed and have manual overrides. The invention can provide built in help and user guidance for the devices under control. This guidance can include step-by-step training for operators learning to use the features of the vehicle. The system can provide extensive interactive guidance when
 20 commands cannot be executed or fail. This advice can include, suggestions to reformulate the command so it can succeed, suggestions to work around a failure, and suggestions for alternative commands that may achieve a similar function. Examples of

control functions, which can be performed from local or remote locations by the invention include:

1. Control of vehicle multimedia entertainment electronics, such as radio, CD player, or video player. This control can be based on user specified play lists and is sensitive to the users profile information including, preferences and history. The invention includes the capability to control multiple or individual multimedia entertainment stations.

2. Control of communications devices such as cell phones, voice mail, fax systems, text or instant messaging systems, call and message forwarding capabilities, email systems and other communication devices. This control includes features including, address books, phone books, call forwarding, conference calling, and voice mail, among others.

3. Local or remote control of vehicle systems. Most any device on the vehicle can be under control and can include, door locks, window controls, interior temperature controls, shifting of the transmission, turn signals, lights, safety equipment, engine ignition, cruise control, fuel tank switches, seat adjustments, specialize equipment such as winches, lifting systems or loading systems, and other vehicle systems.

4. Control of systems external to the vehicle typically through wireless links and including, garage door openers, gate controllers, vehicle entry security passes,

automated toll collection systems, and vehicle weighing systems and other external systems.

5. Vehicle power management and systems control. The invention can provide the vehicle operator with information on limitations and on tips for better power management or fuel utilization or other systems control.

6. Diagnostic information management. The invention can provide diagnostic information announcements and warnings for the vehicle operator. These announcements and warnings are interactive allowing the operator to request additional information, or a suggested course of action. The invention can mediate a solution to the problem, including scheduling service, summoning help or providing instructions for remedial action until a permanent solution can be achieved. The system can ask the operator to authorize ordering likely needed parts, and provide cost estimates. The system can receive data for these announcements and warnings from a wide range of sources including sensors and vehicle control computers. Sensors can include fuel level sensors, coolant temperature sensors, oil temperature sensors, axle temperature sensors, tire pressure sensors, etc.

7. System status inquiry. Vehicle operators can use the interactive natural language interface of the invention to query and receive reports of the status of systems on the vehicle including, fuel level, interior temperature, outside temperature, engine or other vehicle systems. The operator can further query the

system to receive more information or determine a course of action if problem is detected.

8. Vehicle service history. The invention can provide the vehicle operator or other personnel with interactive access to the vehicle service history. The invention can provide announcements or warnings as the time for service draws near. The user can interact with the system to schedule the required service, order required parts, receive cost estimates, or update the service history. Users can customize the nature of this interaction to suite their desires or policies.

9. Diagnostic and service history. The invention can provide diagnostic and service history information to service personnel. This information can include vehicle fault codes and other information on devices under control of or measured by the system. Alternatively, the invention can receive information on the state and history of vehicle operation from other control computers. The invention can provide interactive service information and history. The service history can be queried and added to using the speech interface. The system can prompt service personnel for more information if the record is deemed incomplete. In other cases the invention can prompt service personnel for information on their actions if a change in system status, such as replacement of a part is detected.

The invention can provide users or operators of a vehicle with specialized safety functions through the interactive speech interface. The invention uses a dynamically evocable personality capability to create announcements that are appropriate for the

severity of the situation. The announcements and personalities can be under user control and configuration. Some examples of these safety applications can include:

1. The invention can provide automated detection and reporting of accident situations through the wireless communications link. Information on an accident situation can be gathered from airbag control systems or other sensors. Once an accident situation has been detected the invention uses the interactive speech interface to determine nature of accident and condition of victims. This information, along with location information, can then be reported over the wireless link. Alternatively, the invention can establish a voice channel communications between occupants of the vehicle and emergency personnel.

2. The invention can be used to store and retrieve medical information on vehicle occupants. Following an accident, emergency personnel can query the system for this information. Alternatively, the system can annunciate a warning to emergency personnel if a person has a special medical condition. The system maintains the security of medical information through a number of techniques, including not annunciating medical information unless an accident is detected, or not annunciating medical information unless that person or another authorized person gives permission.

3. Occupants of the vehicle can summon help in the event of a crime using the speech interface of the invention. Typical crimes include robberies and

hijackings. The invention allows vehicle occupants to set panic or emergency words or phrases that indicate to the system a crime is occurring.

4. The invention can provide the vehicle operator with safety announcements if an unsafe or potentially unsafe situation is detected. The operator can use the interactive speech interface to obtain more information on the situation or dismiss the alert. The operator can annunciate commands to remedy or mitigate the situation during this dialog. Conditions that can be announced include, following another vehicle too closely, too great a speed for the road or conditions, obstruction on roadway, a fire in some part of the vehicle, high cargo pressure or temperature, leaks, and other information.

5. The interactive speech interface of the invention can provide the operator with real-time assistance. This assistance can include, aid parking or backing, aid with complex maneuvers, aid with optimal operation of the vehicle, etc. The operator can ask the system for advice or assistance with a planned maneuver or operation. Alternatively, the invention can proactively offer assistance if certain situations are detected.

6. The interactive speech interface of the invention can be used to improve vehicle security. Voiceprints or voice authentication can be used to gain access to the vehicle or start the vehicle. Alternatively or in addition, a password or passphrase can be used. In another alternative speech security can be used as a supplement to other vehicle security techniques.

7. The invention can provide measurement of operator fatigue and alert the operator or remote personnel if unacceptable levels of fatigue are detected. The interactive speech interface can be used to query the operator to detect fatigue. Alternatively, or in addition, other measurements of operator fatigue can be used.

5 If a fatigue situation is detected the invention may initiate a dialog with the operator to determine the extent of the problem and if required, ask the operator to cease operation.

The invention can offer vehicle operators and occupants a variety of services, useful while in the vehicle or arriving at a destination. For any of these applications, the user can employ the interactive speech interface of the invention. Further, users can
10 employ the interactive natural language speech interface to customize these services to suite each individual. Some examples of services that can be supported by the natural-language interactive speech interface of the invention, include:

1. The invention can provide vehicle operators interactive directions to a
15 destination or waypoint. The user can specify a desired destination and any preferred waypoints. A destination can be specified in any manner including, the name of a place, an address, name of a person, name of a business, or type of business. As the trip progresses the system may provide the operator with continued directions and warnings if a mistake has been made. The operator can
20 query the system for additional information, or less information as required.

Generally, the system is interfaced with one or more navigation sensors and local or remote map databases. The invention provides can provide operators or

passengers with alerts of upcoming points or interest, required exits or stops, hazards, etc. The users can query the system for more specific information.

Alternatively, the invention can provide operators and occupants of the vehicle an interactive guided tour. The system's information query, retrieval and presentation capability can be employed by users to receive additional information or points or items of interest during the tour and may take into account stored personal profile information for a user.

2. The invention can provide the operator of a vehicle with interactive dynamic routing information. The routing can be updated based on traffic conditions, weather conditions, facilities availability, and information provided by the operator. Generally, the system is interfaced with one or more navigation sensors, local or remote map databases, and sources of traffic, weather, and facilities use data.

3. The direction, routing and communications capabilities of the invention can be combined in an Interactive system which helps one or more operator rendezvous at a predetermined destination or any other convenient midpoint. The operators used the interactive natural language interface to communicate with the system to arrange the rendezvous, receive directions as they travel to the rendezvous point and to communicate with the other operators.

4. The navigational capabilities of the invention can be used to place limits on where a vehicle is allowed to go or for how long. The system employs the

interactive natural language speech interface to inform the operator when the vehicle is approaching or has exceeded a limit. The operator can query the system to determine the best course of action to return to limits or prevent exceeding them. Alternatively, the system can query the operator to determine why they are exceeding the limits or to mediate a negotiation to extend the limits if this is required by circumstances. This capability is useful in several situations including, keeping a delivery or passenger vehicle on a regular route, setting and enforcing use limits on teenagers, and preventing an operator from using the vehicle in an unauthorized manner.

5 5. The interactive natural language interface of the invention can be used to provide Customer Relationship Management (CRM) services to vehicle operators and passengers. The user can interact with the services offered via data networks, video signals, or audio. The interaction can be with automated services or a live Customer Service Representative. Interactions with the customer service
10 representatives can be through any combination of possible techniques, such as, live audio, live video, electronic messaging or email, instant messaging, and other techniques. These services can be offered by a number of entities including, vehicle manufacturers, vehicle dealers, vehicle service organizations, automobile
15 or travel clubs, wireless carriers, travel service organizations, etc. The services offered can be personalized to the occupants of the vehicle using a variety of information including, user profile information, history, location, paths traveled, time of day, day of week, etc. In addition, the system can offer customized
20 services based on information about the vehicle including, paths traveled,

distance, service history, type of equipment on vehicle. These services can be access while a person is an occupant in a vehicle, while they are using a wireless or wired network equipped handheld device or while using a wired or wireless network desktop system. Examples of these services include:

5 a. Location based marketing programs wherein occupants of the vehicle receive promotional offers from merchants along a route of travel. Occupants can query the system for offers and promotions for goods and services along the travel route. The system may apply other available information to form a response, including, the users profile, history and
10 location. The system can provide optimized interactive routing assistance to the vehicle operator. Alternatively, the system can provide interactive offers and promotions for goods and services along the route, or in advance of a particular trip. Promotions can be offered for goods and services can include but are not limited to, travel services, groceries,
15 prepared foods, vehicle service, fuel, and entertainment.

 b. Remote ordering and payment for goods and services. The system can interactively present the menu or product catalog using the list and table presentation capabilities of the invention. The system facilitates remote ordering by using location information, customer preferences,
20 customer order history, etc. The system can manage a secure payment wallet for the users. Voiceprints, spoken passwords, and non-speech

security methods (i.e. PIN pad, etc.) can be combined to create the appropriate level of security.

5 c. Travel services for occupants of the vehicle. These services can include, directories of travel and entertainment services, or reservations for entertainment restaurants, hotels and other accommodation. The system may present directories, lists and menus using its interactive list and table presentation capabilities. The travel service capability can be used in conjunction with the remote ordering and payment capabilities and the dynamic interactive routing capability.

10 d. Answer specialized travel related questions in areas such as vehicle registration, taxes, safety laws, required inspections, weight limits, insurance coverage requirements, insurance policy provisions, etc.

15 6. The invention can provide an operator or other occupant of a vehicle with an interactive location sensitive shopping list or a location and time sensitive task reminder list using the natural language speech interface. Users can create the list while in the vehicle, while on foot using a handheld device, or at a fixed location using a handheld or desktop device. A user can grant permission to other users to add tasks or shopping items to their lists. Once in the vehicle the system provides occupants with routing assistance to optimize travel time and reminders of items to purchase and tasks to complete as the vehicle comes in close proximity to a

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particular location, a type of merchant or other service provider, or when a set time has been reached.

7. Automatic interactive dispatch and reporting for fleet vehicles. The vehicle operator or other vehicle occupants used the speech interface to interact with these services. These services can include, dynamic optimal routing, inventory of parts and other materials, ordering of required parts and materials, work orders, receipt generation, and payments.

8. Sales force automation, sales reporting, contact database management, calendar management, and call routing. The system may employ its interactive list and table presentation capabilities to supply catalog and pricing information. These services can use local or network data. Additional services can include, memos, reminders and activity lists. Dictation machine.

Vehicle operators and other occupants can use the interactive natural language interactive speech interface of the invention to perform many types of information query, retrieval and presentation operations. Using the natural language interactive speech interface users can modify the parameters of queries or specify the presentation formats for results. Data used to create a response can be from any combination of local and remote data sources. User specific data can be synchronized between systems fixed to one or more vehicles, handheld systems and desktop systems. Some examples of information query, retrieval and presentation applications for the invention include, but are not limited to the following:

1. White pages and yellow pages lookups to find, email addresses, telephone numbers, street addresses and other information for businesses and individuals. These services can be used in conjunction with other services, including remote ordering and payment, offers and promotions, mapping, and driving directions.

5 2. Management and access to personal address book, calendars and reminders for each user.

3. Automatic telephone dialing, reading and sending emails, pages, instant messaging by voice, text or video and other communications control functions;

10 4. Selection, schedules and play list management for television, satellite broadcast, radio or other entertainment schedule. The available can include reviews and other information on programming. The system provides device control for users;

5. Weather information for the local area or other locations.

15 6. Stock and other investment information including, prices, company reports, profiles, company information, business news stories, company reports, analysis, price alerts, news alerts, portfolio reports, portfolio plans, etc.

7. Local, national and international news information including headlines of interest by subject or location, story summaries, full stories, audio and video retrieval and play for stories.

8. Sports scores, news stories, schedules, alerts, statistics, background and history information, and other information.
9. The ability to subscribe interactively to multimedia information channels, including sports, news, business, different types of music and entertainment, applying user specific preferences for extracting and presenting information.
10. Rights management for information or content used or published.
11. Horoscopes, daily jokes and comics, crossword puzzle retrieval and display and related entertainment or diversions;
12. Interactive educational programs using local and network material, with lesson material level set based on user's profile, location of the vehicle, planned route of the vehicle, planned activities during the trip and including, interactive multimedia lessons, religious instruction, calculator, dictionary and spelling, geographic information, instruction for specialized tasks planned during the trip, language training, foreign language translation, presentation of technical manuals, and encyclopedias and other reference material.

It will be appreciated that the foregoing statements of the features of the invention are not intended as exhaustive or limiting, the proper scope thereof being appreciated by reference to this entire disclosure and reasonably apparent variations and extensions thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described by reference to the preferred and alternative embodiments thereof in conjunction with the drawings in which:

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Fig. 1 is an overall block diagram of the system according to an embodiment of the invention;

Fig. 2 is an overall block diagram of the system according to an embodiment of the invention;

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Fig. 3. is an overall block diagram of a handheld computer according to an embodiment of the invention;

Fig. 4. is an overall block diagram of a fixed computer according to an embodiment of the invention;

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Fig 5 is an overall diagrammatic view of the interactive natural language speech processing system according to an embodiment of the invention; and,

Fig. 6 is a schematic block diagram showing the agent architecture according to an embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED AND ALTERNATIVE
EMBODIMENTS

The following detailed description refers to the accompanying drawings, and describes exemplary embodiments of the present invention. Other embodiments are possible and modifications may be made to the exemplary embodiments without departing from the spirit, functionality and scope of the invention. Therefore, the following detailed descriptions are not meant to limit the invention.

The Telematics natural language speech interface of the invention may be applicable to most any vehicle environment and telematic application. The same system or portions thereof can be used in a vehicle, while on foot through a handheld device or, at a fixed location such as an office or home using a desktop or handheld device, or through other devices. An overall block diagram of one embodiment of the invention is shown in Figure 1.

A speech unit 128 can be permanently attached to the vehicle 10 or can be part of a handheld device 36 or a fixed home or office computer system 44. The speech unit 128 may be interfaced to a Telematics Control Unit (TCU) 28 through one or more data interfaces 26. In some embodiments, the main speech-processing unit 98 may be embedded in one or more TCU 28. In some embodiments, the components of the speech unit 128 can also be distributed between one or more TCUs.

A speech-processing unit built into a handheld device 36 may be connected with the data interfaces 26 through a wireless or wired handheld interface 20. Other user

interface peripherals can be connected to the TCU through the data interfaces and can include, displays 18 including touch screen displays for text, graphics and video, keypads 14 for data input, video cameras 16 for multimedia communications or conferences, and a pointing device or stylus (not shown). Other devices connected to the TCU through the data interfaces can include wide-area RF transceivers 24, and navigation system components 22. The navigation system components can include a number of items, such as, a Global Positioning System (GPS) receiver or other radiolocation system receiver, gyroscope and other inertial measurement equipment, and distance measurement sensors such as odometers. Radiolocation equipment receives coded signals from one or more satellite or terrestrial sources 40. The one or more location service servers 48 may assist the navigation system. Other systems that can connect to the TCU through the data interfaces can include automotive control computers, digital control interfaces for devices such as media players or other electronic systems, measurement sensors, and specialized electronic equipment.

The control and device interfaces 30 may connect the TCU 28 to various devices on the vehicle 32. The control and device interfaces may be used to execute local or remote commands from users of the natural language speech interface. In some cases the control and device interfaces 30 may include specialized hardware required for interaction with each type of device. The hardware interfaces may include analog or digital signal interfaces for device control along with analog or digital interfaces for measurements required to control the device. These interfaces may also include specialized software encapsulating or abstracting specific behavior of each device. The interface software may include one or more drivers, specific to the hardware interface,

and one or more agents. The domain agents may include the specialized software behavior and data required for controlling a particular device or class of devices. New or updated behavior can be added to the system by updating the agents for a specific device or class of devices. For safety, and possibly operator convenience, some devices have manual controls or manual overrides **34**. For all safety related devices, the control and device interface may incorporate fail-safe systems, which, for example, may verify operating limits before changing settings, ensuring that commands do not conflict with settings from manual controls, and will not in some combination with other commands or device settings create an unsafe situation. The software behavior and data that may be required to ensure safe operations may be included within the domain agent specific to the device or class of devices. Examples of devices and system that can be controlled through the control and device interfaces include, power management systems, measurement sensors, door locks, window controls, interior temperature controls, shifting of the transmission, turn signals, lights, safety equipment, engine ignition, cruise control, fuel tank switches, seat adjustments, specialize equipment such as winches, lifting systems or loading system, and other systems.

The wide-area RF transceiver **24** may communicate with one or more wide-area wireless networks **38**, which are connected to data networks **42**, including the Internet, and the Public Switched Telephone Network (PSTN) **42**. The wide-area wireless

networks can be of any suitable terrestrial or satellite based type. Handheld systems **36** can communicate with one or more local or wide-area wireless networks. Home or office systems **44**, equipped with wired or wireless network interfaces communicate through the data networks or PSTN.

In cases where a user uses one or more main speech-processing units 98 attached to vehicles 10, handheld systems 36 or fixed systems 44, data and agents stored in these systems can be synchronized. The synchronization between these different systems can occur on the wide area wireless network 38, the data network 42, through the handheld interface 20, or other local data connections. The synchronization can be performed automatically when any two or more of the computers are connected to these networks. Alternatively the synchronization can be performed on demand under control of the user. The synchronization process attempts determine which version of a data element or an agent are the newest or most up to date and will propagate that element. Thus, synchronization is an incremental change processes. In some cases, a complete replacement of a database or portion of a database or of one or more agents may be performed rather than a series of incremental updates.

The wide-area wireless networks 38, the data networks 42 and PSTN, may connect the invention 98, 128 on vehicles 10, in handheld devices 36 and fixed computers 44 to one or more servers, which provide one or more services. In every case, the invention may provide an interactive natural language speech user interface to the services offered. Virtually any service, involving the transfer of data or transmission of speech and video, can be supported through the natural language speech interface. For data centric applications a standardized data transfer format is typically used, including for example, Hypertext Markup Language over Hypertext Transfer Protocol (HTTP), Extensible Markup Language (XML), possibly employing a variety of data formats or schemas, over HTTP or other transfer protocol, Electronic Data Interchange formats over a variety of transport protocols, etc. Examples of services being offered have already

been discussed. It will be understood that the exact configuration of the servers may be determined by many considerations including, the exact combinations of services being offered, the service providers providing the services, the contractual relationships between the service provider, and other factors, and that the invention can support most
5 any suitable configuration. In each case these servers may themselves be distributed over one or more public or private networks. Some examples the servers, which may be used to deliver these services, are given below:

1. One or more payment service providers 56 supply payment capabilities to users of the invention. These payment services can include electronic wallet
10 capabilities, for one or more payment accounts, and which can include, payment security information, payment account information, transaction histories, and account balance information. The payment services are used for any of the services supplied by the invention. Suitable payment types include, stored value accounts, promotional accounts, credit accounts, telecommunications billing
15 accounts, and debit accounts using online or offline methods. Payments can be computed in any manner including payment for a specific good or service, subscription payment or metered payment. The payment services can be distributed in a number of ways. Examples of computers and servers used to store and process payment transaction information include, smart cards, main speech
20 processing units 128, handheld computers 36, TCUs 28, fixed personal computers 44, payment gateways, and payment servers 56.

2. One or more Customer Relationship Management (CRM) systems **52** may supply any number of consumer and business customer services as has already been discussed above. The CRM system can supply automated services or services that are partly or completely manual. For manual services one or more customer service representatives use one or more service representative workstations **54**. The CRM system and the service representative workstation can be connected to one or more data networks **42** and the PSTN. Any other servers may also have connections to one or more service representative workstations, which may be in common or independent of each other.

3. One or more specialized service servers **50**, which support specialized consumer and business services. Examples of these specialized services have been presented in the foregoing discussion.

4. One or more location service servers **48**, which supply location information and location based services. The location data is used as a data input to the location services, which can then be distributed in any suitable manner including, on main speech processing units **128**, handheld computers **36**, TCUs **28**, fixed personal computers **44**, other servers (i.e. **46**, **50**, **52**, **56**) and the one or more location services servers **48**. Examples of possible location services have been presented in the previous discussion.

5. One or more emergency services servers 46, which supply both public and private emergency services to the users. Examples of possible emergency services have been presented in the previous discussion.

As has already been stated, the main speech processing unit 98 and the speech unit 128 can be distributed in a vehicle in a number of ways. For example, these units can be attached to the vehicle as independent components or as a single integrated component. Alternatively, some or all of the main speech processing unit 98 and speech unit 128 can be embedded in one or more of the TCUs 28, handheld computers 36 and fixed computer systems 44.

10 A block diagram of a second possible embodiment of the invention is shown Figure 2. In this embodiment, the main speech processing unit 98 and speech unit 128 are external to the TCU 28. These components can be housed in one or more packages or included in a single integrated package.

In all other respects, the second embodiment is identical to the first embodiment.

15 It will be understood that the exact distribution and packaging of the main speech processing unit 98 and speech unit 128, can be determined by the details of the deployment situation and will not change the functionality, capabilities or spirit of the invention in any way.

As has already been mentioned, a handheld computer 36 can be used as a component of the invention. A block diagram of one possible embodiment of the handheld computer is shown in Figure 3.

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In some embodiments, the main speech processing unit 98 and speech unit 128 may be embedded into the handheld computer 36. The main speech processing unit interfaces to the handheld computer's one or more processing units 70. The processing units may include one or more central processing units, one or more data and address busses, data interfaces and volatile memory. The processing unit 70 uses one of more types of nonvolatile memory 80 for software and data storage. Suitable types of nonvolatile memory 80 include flash memory and hard disk drives. In some embodiments, the main speech processing unit 98 can be integrated with the one or more processing units 70.

In some embodiments, users interact with the handheld computer 36 through the speech unit 128, the keypad 74 or keyboard, and a display 72 for text, graphics and video. In some embodiments the display is of a touch screen type. An optional pointing device (not shown) may be used as well.

The handheld computer 36 can connect to one or more wired or wireless wide-area or local-area networks through one or more interfaces. A wide-area network transceiver 78 can connect to the wide-area wireless network 38 or the data network 42, using a wireless or wired connection, including a dial PSTN network connection. The local-area network transceiver 76 connects to wired or wireless local area networks. These networks can include the handheld interface 20 or connections to fixed computer systems 44.

As has already been mentioned a fixed computer 44 can be used as a component of the invention. A block diagram of one possible embodiment of the fixed computer is shown in Figure 4.

In some embodiments, the main speech processing unit 98 and speech unit 128 may be embedded into the fixed computer 44. The main speech processing unit may interface to the fixed computer's one or more processing units 84. The processing units may include one or more central processing units, one or more data and address busses, data interfaces and volatile memory. The processing unit may use one of more types of nonvolatile memory 94 for software and data storage. Suitable types of nonvolatile memory include, for example, flash memory and hard disk drives. In some embodiments, the main speech processing unit 98 can be integrated with the one or more processing units 84.

In some embodiments, users may interact with the fixed computer 44 through the speech unit 128, the keyboard 88 or keypad, and a display 86 for text, graphics and video. In some embodiments the display is of a touch screen type. An optional pointing device (not shown) may be used as well.

The fixed computer 44 can connect to one or more wired or wireless wide-area or local-area networks through one or more interfaces. A wide-area transceiver 92 can connect to the wide-area wireless network 38 or the data network 42, using a wireless or wired connection, including a dial PSTN network connection. The local-area network

transceiver 90 connects to wired or wireless local area networks. These networks can include connections to the handheld computer 36.

The natural language interactive speech processing system may make maximum use of context, prior information, location information, domain information and user specific profile data to achieve a natural environment for one or more users making queries or stating commands across multiple domains. Through this integrated approach a complete speech-based natural language query and command environment for telematic applications is created. The telematic natural language speech interface can be deployed as part of or a peripheral to a TCU or other vehicle computer, as part of a handheld computer interfaced to vehicle computers and other system through wired, wireless, optical, or other types of connections or fixed computers interfaced to the vehicle computers or other systems through a combination of wired, wireless, optical and/or other types of connections. Alternatively, the components of the interactive natural language telematic speech interface can be distributed in any suitable manner between these multiple computing platforms. Regardless of the method of deployment the invention provides the required functionality. Figure 5 shows an overall diagrammatic view of the interactive natural language speech processing system according to one embodiment of the invention.

The event manager 100 may mediate interactions between other components of the invention. The event manager can provide a multi-threaded environment allowing the system to operate on multiple commands or questions from multiple user sessions without conflict and in an efficient manner, maintaining real-time response capabilities.

Agents **106** may include packages of both generic and domain specific behavior for the system. Agents may use the nonvolatile storage for data, parameters, history information, and locally stored content provided in the system databases **102** or other local sources. User specific data, parameters, session information, location data and
5 history information determining the behavior of agents are stored in one or more user profiles **110**. Agents for commands typically include domain knowledge specific to the device or devices under control. Data determining system personality characteristics for agents are stored in the one or more personalities **108**. The update manager **104** manages the automatic and manual loading and updating of agents and their associated data from
10 the Internet **42** or other network through the network interface **116**.

The main user interface for the invention is through one or more speech units **128**. The speech unit **128** includes one or more microphones, for example array microphone **134**, to receive the utterances of the user. Alternatively, one or more external microphones can be used. The speech received at the microphone **134** may be processed
15 by filters **132** and passed to the speech coder **138** for encoding and compression. In one preferred embodiment, a transceiver module **130** transmits the coded speech to the main unit **98**. Coded speech received from the main unit is detected by the transceiver **130**, then decoded and decompressed by the speech coder **138** and annunciated by the speaker **136**. The speech units can be attached to a vehicle **98**, **128**, in a handheld device **36**, or
20 embedded in or attached to a fixed system **44**.

The one or more speech units **128** and the main unit **98** may communicate over a communication link. The communication link can include a wired or wireless link.

According to one embodiment, the communication link having an RF link. The transceiver **130** on the speech unit communicates coded speech data bi-directionally over the communication link with the transceiver **126** on the main unit **98**. According to another embodiment, the RF link can use any standard local area wireless data protocols including the IEEE 802.11, Bluetooth or other standards. Alternatively, an infrared data link conforming to any suitable standard such as IrDA or other infrared standards can be used. In an alternative embodiment, wires, optical fibers or other connection techniques may connect the speech unit and the main unit, eliminating the need for a speech coder **138**. Other wired or wireless analog or digital transmission techniques can be used. The main speech processing unit **128** can be attached to a vehicle, embedded in one or more TUCs **28**, in a handheld computer **36**, attached as a peripheral to a fixed computer **44** or embedded in a fixed computer **44**. The speech unit can be integrated with the main unit or can be configured as a separate attachment.

Coded speech received at the transceiver **126** on the main unit **98** may be passed to the speech coder **122** for decoding and decompression. The decoded speech can be processed by the speech recognition engine **120** using data in the dictionary and phrases module **112** and received from the agents **106**. The recognized words and phrases may be processed by the parser **118**, which transforms them into complete commands and questions using data supplied by the agents. The agents can then process the commands or questions. The agents create queries to local databases **102** or through the network interface **116** to data sources on the Internet **42** or other networks. Commands typically result in actions taken by the system itself (i.e., pause or stop), or to a remote device or

data source (i.e., download data or program, or control a local or remote device), through the network interface to the Internet or other data interface.

The agents **106** may return results of questions as responses to users. The response can be created using the results of information queries, the system personality **108** and the user preferences or other data in the user profile **110**. The agents generally present these results using the speech unit **128**. The agent may create a response string, which may be sent to the text to speech engine **124**. The text to speech engine creates the required utterances, which may be encoded and compressed by the speech coder **122**. Once coded, the utterances may be transmitted from the main unit **98** by the transceiver **126** to the transceiver **130** on the speech unit **128**. The utterance may then be decoded and decompressed by the speech coder **138** and output by the speaker **136**.

The graphical user interface **114** can be used as a substitute or complement to the speech interface. For example, the graphical user interface can be used to view and interact with graphical or tabular information in a manner more easily digested by the user. The graphical user interface can include a display **18**, keypad **14**, and pointing device (not shown). Alternatively, the graphical user interface can be implemented using the capabilities of a handheld computer **36** or fixed computer **44**. The graphical user interface can show system state and history in a more concise manner than the speech interface. Users can use the graphical user interface to create or extend agents **106**. These operations can include scripting of agents, adding data to the agent or databases **102** used by the agent, adding links to information sources.

In some embodiments of the invention, generic and domain specific behavior and information is organized into agents. The system agent provides default functionality and basic services. The domain specific agents may provide complete, convenient and re-distributable packages or modules for each application area. In other words, an agent

5 may include everything needed to extend or modify the functionality of the system in a current or new domain. Further, agents and their associated data can be updated remotely over a network as new behavior is added or new information becomes available. Agents may access a plurality of sources that may provide various services. Agents can use the services of other, typically more specialized, agents and the system agent. Agents are

10 distributed and redistributed in a number of ways including on removable storage media, transfer over networks or attached to emails and other messages. The invention may provide license management capability allowing the sale of agents by third parties to one or more users on a one time or subscription basis. In addition, users with particular expertise can create agents, update existing agents by adding new behaviors and

15 information and making these agents to other users. A block diagram of the agent architecture according to an embodiment of the invention is shown in Figure 6.

Agents 106 may receive and return events to the event manager 100. Both system agents 150 and domain agents 156 receive questions and commands from the parser 118. Based on the keywords and command structure, the parser may invoke the required

20 agent. Agents may use the nonvolatile storage for data, parameters, history information and local content provided in the system databases 102. When the system starts-up or boots-up, the agent manager 154 may load and initialize the system agent 150 and the one or more domain agents 156. At shutdown the agent manager may unload the agents.

The agent manager may also performs license management functions for the domain agents and content in the databases **102**.

The system agent **150** may manage the criteria handlers **152**, which may handle specific parameters or values (criteria) used to determine context for questions and
5 commands. Both the system agent **150** and the domain agents **156** can use the criteria handlers **152**. The various domain agents **156** can use the services of the system agent **150** and of other, typically more specialized, domain agents **156**. The system agent **150** and the domain agents **156** can use the services of the agent library **158**, which may include utilities for commonly used functions. The library **158** may include utilities for
10 text and string handling, network communications, database lookup and management, fuzzy and probabilistic evaluation, text to speech formats, and other utilities.

Domain agents **156** can be data-driven, scripted or created with compiled code. A base of generic agent is used as the starting point for data-driven or scripted agents. Agents created with compiled code are typically built into dynamically linkable or
15 loadable libraries. Developers of agents **106** can add new functionality to the agent library **158** as required. Details of agent distribution and update, and agent creation or modification are discussed in sections below.

The invention provides capabilities to distribute and update system agents **150**, domain agents **156**, agent library components **158**, databases **102**, and dictionary and
20 phrase entries **112** over wireless or wired networks **42**, including dial-up networks using the update manager **104**. The network interface **116** may provide connections to one or

more networks. The update manager **104** may also manage the downloading and installation of core system updates. The agent manager **154** may perform license management functions for the domain agents and the databases. The update manager **104** and agent manager **154** may perform these functions for all agents and database content including, agents and content available to all users or agents and content only available to certain users. Examples of agent and database components added or updated on a periodic basis include: 1) agents for new domains; 2) agents for new commands; 3) agents for new devices added to the vehicle or remote devices; 4) agents for new or updated behavior for existing devices on the vehicle or remote devices; 5) additional domain knowledge for agents; 6) new keywords for a domain, which can include names of politicians, athletes, entertainers, names of new movies or songs, new command words, and or other names and words; 7) links to a preferred set of information sources for the domains covered including links for, entertainment, news, sports, weather, and other topical sites; 8) updates to domain information based on, for example, changes to tax laws, company mergers, changing political boundaries, new safety rules; 9) updates to content, including dictionaries, encyclopedias and almanacs; and 10) other content and database components.

When the user requires or selects a new agent **156** or database element **102**, the update manager **104** may connect to the source on the network **42** though the network interface **116**, and may download and install the agent and/or data. To save system resources and to comply with any license conditions, the update manager **104** may uninstall agents **106** that are no longer in use. In some embodiments, the update manager may periodically queries the one or more sources of the licensed agents and database

components to locate and down load updates to agent executables, scripts or data as they become available. In other embodiments, the agent sources may initiate the downloading of agent updates of the registered or licensed agents to the update manager **104** as they become available.

5 The agent manager **154** may provide a license management client capable of executing most any license terms and conditions. When a particular agent **106** or database elements **102** is required by a command, the agent manger may verify that the use of the agent or data element is within the allowed terms and conditions, and if so, invokes the agent or allows access to the data element. License management schemes
10 that can be implemented through the agent manager **154** includes out right purchase, subscription for updates, one time or limited time use. Use of shared agents and data elements (such as those down-loaded from web sites maintained by groups of domain experts) may also be managed by the agent manager.

 If a question or command requires an agent currently not loaded on the system,
15 the agent manager **154** can search the network **42** through the network interface **116** to find a source for a suitable agent. This process can be triggered, for example, when a query is made in a domain for which an agent is not available, or when a new device is added to a vehicle or the behavior of a device is updated. Once located, the agent can be loaded under control of the update manager **104**, within the terms and conditions of the
20 license agreement as enforced by the agent manger.

New commands, keywords, information, or information sources can be added to any domain agent **156** by changing agent data or scripting. These configuration capabilities allow users and content developers to extend and modify the behavior of existing agents or to create new agents from a generic agent without the need to create new compiled code. Thus, the modification of the agents can range from minor data-driven updates by even the most casual users, such as specifying the spelling of words, to development of complex behavior using the scripting language as would typically be done by a domain expert. The user can create and manage modifications to agents through speech interface commands or using a graphical user interface **114**. User-specific modifications of agents are stored in conjunction with the users profile and accessed by the agent at run-time.

The data used to configure data driven agents **156** may be structured in a manner to facilitate efficient evaluation and to help developers with organization. These data can be used not only by the agent, but also in the speech recognition engine **120**, the text to speech engine **124**, and the parser **118**. Examples of some major categories of data include:

1. Content packages may include questions or commands. Each command or question or group of commands or questions may include contexts used for creation of one or more queries. The agent **156** can pass a regular grammar expression to the parser **118** for evaluation of a context or question. An initial or default context is typically supplied for each command or question. The

command or question includes a grammar for the management and evaluation of the context stack.

2. Parameters and other operating data on devices that are under control of the natural language speech interface. The agent 156 may use these data and parameters to determine how to execute a command, how to formulate the command string for the parser 118, determine if the command is feasible, and determine if the command can be executed within safety and operating limits.

3. Page lists or pointers to other local or network content sources. For each page or content source there may be a pointer (e.g. URL, URI, or other pointer) to the page or source. Each page may have specific scraping information used to extract the data of interest. The scraping information may include, for example, matching patterns, HTML or other format parsing information.

4. A response list, determining the response of the agent to a particular command or question given the context, the user profile and the information retrieved. Responses can include diagnostic error messages or requests for more information if the question or command cannot yet be resolved from the known information. Responses can be based on or dependent on thresholds or probabilistic or fuzzy weights for the variables.

5. Substitution lists that include variable substitutions and transformations, often applied by the agents 150, 156 in the formatting of queries and results. For example, a stock domain specific agent 156 would use a substitution list of

company trading symbols, company names and commonly used abbreviations.

Substitutions and transformations can be performed on commands and questions to create precise queries, which can be applied against one or more information sources or to results for creating more meaningful output to the user. Substitution
5 lists also include information for optimally dealing with structured information, such as HTML formatted page parsing and evaluation.

6. Personalities used for responses. Personalities can be constructed by combining multiple traits in a weighted manner. Weights can be specified for each agent's domain area to create one or more specific personalities. Examples
10 of personality traits include, sarcasm, humor, irritation, and sympathy, and other traits.

7. Public and user specific parameters for sources, substitutions, transformations, variables or criteria. The public parameter lists are part of the agent package 156. The user specific parameters are included in the user profile
15 110.

Commands and questions are interpreted, queries formulated, responses created and results presented can be based on the user's personal or user profile 110 values.

Personal profiles may include information specific to the individual, their interests, their special use of terminology, the history of their interactions with the system, and domains
20 of interest. The personal profile data can be used by the agents 106, the speech recognition engine 120, the text to speech engine 124, and the parser 118. Preferences

can include, special (modified) commands, past behavior or history, questions, information sources, formats, reports, and alerts. User profile data can be manually entered by the user and/or can be learned by the system based on user behavior. User profile values can include: 1) spelling preferences; 2) date of birth for user, family and friends; 3) income level; 4) gender; 5) occupation; 6) location information such as, home address, neighborhood, and business address, paths traveled, locations visited; 7) vehicle type or types; 8) vehicle operator certifications, permits or special certificates; 9) history of commands and queries; 10) telecommunications and other service providers and services; 11) financial and investment information; 12) synonyms (i.e., a nick name for someone, different terms for the same item); 13) special spelling; 14) keywords; 15) transformation or substitution variables; 16) domains of interest; and, 17) other values.

End users can use the data driven agent 156 extension and modification facilities and values stored in user profiles 110 to create special reports, packages of queries, alerts and output formats. A single alert or report can be configured to use multiple data sources and other variables (i.e., time, location, measured value) value to condition to determine when alerts should be sent. For example, an alert can be generated by sampling a stock price every 15 min and sending an alert if the price drops below some value. In another example, a user can create an alert when a particular condition or combination of conditions occurs on the vehicles. Alerts and reports can be directed to a local or remote output.

To create a report, the user may first specify a set of commands or questions. Next, the user can create or select a format for the report. Finally the user may name the

report. A report can have variable parameters. For example, a user may create a company stock report, and execute the report by stating its name and the company name, which gives the user selected information and in a specified format for that company. In another example, a user can create a "morning" report, which presents selected multimedia information from different sources (news, sports, traffic, weather) in the order and formats desired. In yet another example, the user can create a report on the status of one or more vehicle systems. Alerts and reports can be created using only voice commands and responses, commands and responses through the graphical user interface 114, or a combination of the two. Reports can be run locally or remotely with respect to the vehicle. To create a report, alert, or other specialized behavior, the user performs a number of steps including: 1) specify the command to run a report or alert; 2) specify the question or questions, including keywords, used for a query; 3) set the criteria for running the report such as on command or when a particular condition is met; 4) define preferred information sources; 5) define preferences for order of result evaluation by source, value, and other parameters; 6) specify the presentation medium for a report or alert, such as an email, the text to speech engine, a message to a pager, or a text and graphics display; and, 7) specify the preferred format for the report, such as information to be presented, order of information to be presented, preferred abbreviations or other variable substitutions.

Filtering and noise elimination may be a key aspect of the invention allowing it to operate in noisy vehicle environments. The accurate recognition and parsing of the user's speech requires the best possible signal to noise ratio at the input to the speech recognition engine 120. To accomplish the required improvements an array microphone 134 and a filter 132 may be employed. In one embodiment the microphone array, filters

and speech coder 138 are physically separated from the main unit 98 into a speech unit 128, and connected using a wireless link. Since bandwidth on a wireless connection is at a premium the speech coder dynamically adapts the digitization rate and compression of the captured speech.

5 Some embodiments of the invention may use one or more arrays of microphones 134 to provide better directional signal capture and noise elimination than can be achieved with a single microphone. The microphone array can be one-dimensional (a linear array) or two-dimensional (a circle, square, triangle or other suitable shape). The beam pattern of the array can be fixed or made adaptive through use of analog or digital
10 phase shifting circuitry. The pattern of the active array is steered to point in the direction of the one or more users speaking. At the same time nulls can be added to the pattern to notch out point or limited area noise sources. The use of the array microphone also helps reduce the cross talk between output from the text to speech engine 124 through the speaker 136 or from another user talking and detection of the user's speech.

15 The invention may use an analog or digital filter 132 between the array microphone or conventional microphone 134 and the speech coder 138. The pass band of the filter can be set to optimize the signal to noise ratio at the input to the speech recognition engine 120. In some embodiments, the filter is adaptive, using band shaping combined with notch filtering to reject narrow-band noise. One embodiment employs
20 adaptive echo cancellation in the filter. The echo cancellation helps prevent cross talk between output from the text to speech engine and detection of the user's speech as well as suppression of environmentally caused echoes. Algorithms comparing the background

noise to the signal received from the users speech may be used to optimize the band-shaping parameters of the adaptive filter.

The speech received by the array microphone 134 and passed through the filter 132 may be sent to the speech digitizer or coder 138. The speech coder may use adaptive lossy audio compression to optimize bandwidth requirements for the transmission of the coded speech to the speech recognition engine 120 over a wireless link. The lossy coding is optimized to preserve only the components of the speech signal required for optimal recognition. Further, the lossy compression algorithms used are designed to prevent even momentary gaps in the signal stream, which can cause severe errors in the speech recognition engine. The digitized speech is buffered in the coder and the coder adapts the output data rate to optimize the use of the available bandwidth. The use of the adaptive speech coder is particularly advantageous when a band-limited wireless link is used between the coder and the speech recognition engine.

The microphone can be complemented with an analog or digital (i.e., Voice over IP) speech interface. This interface allows a remote user to connect to the system and interact with it in the same manner possible if they were physically present.

In an alternative embodiment, the array microphone can be replaced by a set of physically distributed microphones or headsets worn by the users. The distributed microphones can be placed in different parts of a vehicle or room or in different rooms of a building. The distributed microphones can create a three-dimensional array to improve signal to noise ration. The headset can use a wireless or wired connection.

While the invention is intended to be able to accept most any natural language question or command, ambiguity can still be a problem. To assist users formulate concise questions and commands, the system can support a voice query language. The language may be structured to allow a variety of queries and commands with minimal ambiguity.

5 Thus, the voice query language helps users clearly specify the keywords or contexts of the question or command along with the parameters or criteria. The language can provide a grammar to clearly specify the keyword used to determine the context and present a set of one or criteria or parameters. A user asking a question or stating a command in the voice query language may nearly always be guaranteed to receive a response.

10 The voice query language can be sensitive to the contents of the context stack. Thus, a following-on question or command can be asked using an abbreviated grammar, since key words and criteria can be inherited from the stack. For example, the user can simply asked about another keyword if the criteria of the question remain constant.

The system may provide built in training capabilities to help the user learn the
15 best methods to formulate their questions and commands. The interactive training allows the user to audibly or visibly see the machine interpretation of their queries and provides suggestions on how to better structure a query. Using the interactive training a user can quickly become comfortable with the voice query language and at the same time learn how to optimize the amount of information required with each step of a dialog.

20 The output of the speech coder 122 may be fed to the speech recognition engine 120. The speech recognition engine 120 may recognize words and phrases, using for

example, information in the dictionary and phrase tables **112**, and pass these to the parser **118** for interpretation. The speech recognition engine **120** may determine the user's identity by voice and name for each utterance. Recognized words and phrases are tagged with this identity in all further processing. Thus, as multiple users engage in overlapping sessions, the tags, added by the speech recognition engine **120** to each utterance, may allow other components of the system to tie that utterance to the correct user and dialog. The user recognition capability can also be used as a security measure for applications, such as auctions or online shopping, where this is required. Voice characteristics of each user may be included in the user profile **110**.

A dialog with the system may begin when a user first addresses it. This can be done by speaking a generic word ("computer") and/or addressing a specific name ("Fred"), which is generally tied to a system personality **108**. Once the user starts the dialog, they may be recognized by the speech recognition engine **120**, using unique characteristics of their speech. At the end of a dialog or to interrupt a dialog, the user may speak a dismissal word ("good by").

Some embodiments may employ a speech recognition engine **124** seeding for improved word recognition accuracy using, for example, data from the dictionary and phrase tables **112**, user profiles **110**, and the agents **106**. At the same time the fuzzy set possibilities or prior probabilities for the words in the dictionary and phrase tables may be dynamically updated to maximize the probability of correct recognition at each stage of the dialog. The probabilities or possibilities can be dynamically updated based on a number of criteria including the application domain, the questions or commands,

contexts, the user profile and preferences, user dialog history, the recognizer dictionary and phrase tables, and word spellings.

For uncommon words or new vocabulary words, the user may be given the option to spell the words. The spelling can be done by saying the names or the letters or using a
5 phonetic alphabet. The phonetic alphabet can be a default one or one of the user's choosing.

Alternatively, when a user speaks a word that is not recognized correctly or not recognized at all by the speech recognition engine **120**, then they may be asked to spell the word. The speech engine may determine this condition based on confidence level for
10 the scoring process. The word may be looked up in the dictionary **112** and the pronunciation for the word may be added to either the dictionary, the agent **106**, or the user's profile **110**. The word pronunciation can then be associated with the domain, the question, the context and the user. Though this process the speech recognition engine learns with time and improves accuracy. To assist users in spelling words an
15 individualized phonetic alphabet can be used. Each user can modify the standard phonetic alphabets with words, which they can remember more easily.

Once the words and phrases have been recognized by the speech recognition engine **120**, the tokens and user identification may be passed to the parser **118**. The parser examines the tokens for the questions or commands, context and criteria. The
20 parser may determine a context for an utterance by applying prior probabilities or fuzzy possibilities to keyword matching, user profile **110**, dialog history, and context stack

contents. The context of a question or command may determine the domain and thereby, the domain agent **156**, if any, to be invoked. For example, a question with the keywords “temperature” implies a context value of weather for the question. Within a different dialog, the keyword “temperature” can imply a context for a measurement. The parser

5 dynamically receives keyword and associated prior probability or fuzzy possibility updates from the system agent **150** or an already active domain agent **156**. Based on these probabilities or possibilities the possible contexts are scored and the top one or few are used for further processing.

The parser **118** may use a scoring system to determine the mostly likely context or

10 domain for a user’s question or command. The score can be determined from weighting a number of factors including, the user profile **110**, the domain agent’s **156** knowledge and previous context. Based on this scoring, the system may invoke the correct agent. If the confidence level of the score is not high enough to ensure a reliable response, the system can ask a question of the user to verify the question or command is correctly

15 understood. In general the question may be phrased to indicate the context of the question including all criteria or parameters. For example, the question can be in the form of: “Did I understand that you want such-and-such.” If the user confirms that the question is correct, the system may proceed to produce a response. Otherwise, either the user can rephrase the original question, perhaps adding additional information to remove

20 ambiguity, or the system can ask one or more questions to attempt to resolve the ambiguity.

Once the context for the question or command has been determined, the parser 118 can invoke the correct agent 156, 150. To formulate a question or command in the regular grammar used by agents, the parser will preferably determine required and optional values for the criteria or parameters. These criteria may have been explicitly supplied by the user or may need to be inferred. The parser may make use of the criteria handlers 152 supplied by the system agent. The criteria handlers can provide context sensitive procedures for extracting the criteria or parameters from the user's question or command. Some criteria may be determined by executing algorithms in the agent, while others may be determined by applying probabilistic or fuzzy reasoning to tables of possible values. Prior probabilities or fuzzy possibilities and associated values may be received from a number of sources including, for example, the history of the dialog, the user profile 110, and the agent. Based on user responses, the prior probabilities or fuzzy possibilities may be updated as the system learns the desired behavior. For a weather context, examples of criteria include, location, date and time. Other criteria can include command criteria (i.e., yes/no, on/off, pause, stop), and spelling. Special criteria handlers are available from the system agent for processing lists, tables, barge-in commands, long strings of text and system commands.

The criteria handlers 152 can operate iteratively or recursively on the criteria extracted to eliminate ambiguity. This processing may help reduce the ambiguity in the user's question or command. For example, if the user has a place name (or other proper noun) in their utterance the parser 118 can use services of the domain agent 156 to look up tables in the databases 102 for place names or can attempt to determine which word is the proper noun from the syntax of the utterance. In another example, the user asks,

“what about flight one hundred and twenty too?” The parser and domain agent use flight information in the database and network information along with context to determine the most plausible interpretation among; flight 100 and flight 20 also, flight 100 and flight 22, flight 122, etc.

5 Once the context and the criteria are determined, the parser **118** may form the question or command in a standard format or hierarchical data structure used for processing by the agents **150, 156**. The parser **118** may fill in all required and some optional tokens for the grammar of the context. Often the tokens must be transformed to values and forms acceptable to the agents. The parser obtains the required
10 transformations from the agents, dialog history or user profile **110**. Examples of transformations or substitutions performed by the parser on tokens include: 1) substituting a stock symbol for a company name or abbreviation; 2) substituting a numerical value for a word or words; 3) adding a zip code to an address; and, 4) changing a place or other name to a commonly used standard abbreviation.

15 The agents **150, 156** may receive a command or question once the parser **118** has placed it in the required standard format. Based on the context, the parser can evoke the correct agent to process the question or command.

Commands can be directed to the system or to an external entity. System commands are generally directed to the system agent **150**. Commands for external
20 entities are generally processed by a domain agent **156**, which includes the command context and behavior for the external entity.

Specific questions may be generally directed to one of the domain agents 156.

The real-time selection of the correct agent allows the invention to dynamically switch contexts. Based on the question, command or context and the parameters or criteria, the domain agent may create one or more queries to one or more local or external
 5 information sources. Questions can be objective or subjective in nature. Results for objective questions can often be obtained by structured queries to one or more local or network information sources. Even for objective questions, the system may need to apply probabilistic or fuzzy set analysis to deal with cases of conflicting information or incomplete information. Information to answer subjective questions is generally obtained
 10 by one or more ad-hoc queries to local or network data sources, followed by probabilistic or fuzzy set evaluation of the one results to determine a best answer.

Once the domain agent 156 has formulated the one or more queries, they may be sent to local and/or network information sources. The queries may be performed in an asynchronous manner to account for the fact that sources respond at different speeds or
 15 may fail to respond at all. Duplicate queries can be sent to different information sources to ensure that at least one source responds with a useful result in a timely manner.

Further, if multiple results are received in a timely manner, they can be scored by the system to determine which data is most reliable or appropriate. Examples of data sources accommodated include, HTTP data sources, sources with meta-data in various formats
 20 including XML, measurement data from sensors using various formats, device 32 setting parameters, entertainment audio, video and game files including MP3, databases using query languages and structured responses such as SQL, and other data sources.

The local information sources can be stored in one or more system databases **102** or can be on any local data storage such as a set of CDs or DVDs in a player or other local data storage. In other cases, local information can be obtained from vehicle system settings or measurement devices. Network information sources can be connected to, the control and device interfaces **30**, the data interfaces **26**, the Internet **42** or other network and accessed through a series of plug-ins or adaptors, known a pluggable sources, in the network interface **116**. The pluggable sources are capable of executing the protocols and interpreting the data formats for the data sources of interest. The pluggable source provides information scrapping forms and procedures for each source to the domain agents **156**. If a new type of data source is to be used a new plug-in or adaptor can be added to the appropriate interface.

The domain agent **156** can evaluate the results of the one or more queries as they arrive. The domain agent may score the relevance of the results based on results already received, the context, the criteria, the history of the dialog, the user profile **110** and domain specific information using probabilistic or fuzzy scoring techniques. Part of the dialog history is maintained in a context stack. The weight of each context for the scoring may be based on the relevance of one context to another and the age of the contexts. Other scoring variables can be associated through the context stack. Contexts can also be exclusive, so that previous contexts have no weight in the scoring.

Based on the on-going scoring processes, the domain agent **156** may determine if a single best answer can be extracted. For most questions, the desired result may include a set of tokens that may be found to formulate an answer. Once a value has been found

for each of these tokens, the results are ready for presentation to the user. For example, for a question on weather, the tokens can include the date, day of week, predicted high temperature, predicted low temperature, chance of precipitation, expected cloud cover, expected type of precipitation and other tokens. Results processed in this manner may
 5 include error messages. For subjective questions, this determination is made by determining a most likely answer or answers, extracted by matching of the results received. If no satisfactory answer can be inferred from the results of the query, the agent can do one of the following:

1. Ask the user for more information, typically through the speech interface,
 10 and based on the results obtained formulate new queries. This approach is applied when an irresolvable ambiguity arises in the formulation of a response.

2. Formulate new queries based on the results received from the first set of queries. This approach is typically applied in cases where the responses received do not include all the required information. Information sources to queries can be
 15 inferred from the results already obtained (i.e., links in an HTML document or measurements or settings from other devices 32) or from other sources. Using this approach one or more sets of queries and responses can be chained without the need for action by the user.

3. Wait for additional queries to return results.

20 In any case, the domain agent 156 may continue to make queries and evaluate results until a satisfactory response is constructed. In doing so, the agent can start several

overlapping query paths or threads of inquiry, typically mediated by the event manager
100. This technique, combined with the use of asynchronous queries from multiple data
sources provides the real-time response performance required for a natural interaction
with the user.

5 The domain agent **156** may apply conditional scraping operations to each query
response as it is received. The conditional scraping actions may depend on the context,
the criteria, user profile **110**, and domain agent coding and data. For each token to be
extracted a scraping criteria **152** can be created using the services of the system agent
150. The scraping criteria may use format specific scraping methods including, tables,
10 lists, text, and other methods. One or more scraping criteria can be applied to a page or
results set. Once additional results are received, the domain agent can create new
scraping criteria to apply to results already acquired. The conditional scraping process
removes extraneous information, such as graphics, which need not be further processed
or stored, improving system performance.

15 Specific commands are generally directed to one of the domain agents **156**. The
real-time selection of the correct agent allows the invention to dynamically switch
contexts. Command oriented domain agents **156** evaluate the command and the state of
vehicle systems, system capabilities, and measurements to determine if the command can
be executed at all or if doing so will exceed operating or safety limits. If the command is
20 ambiguous or cannot be executed for some other reason, the system may ask the user for
more information or may suggest what the problem is and a likely approach to the
solution. The domain agent may format the command for the specific device **32** and

control and device interface **30**. This formatting may involve variable substitution, inference of missing values and other formatting. Variable substitution and inference depends on the command context, the user profile **110**, command history, state of vehicle systems and measured values, and other factors. A complex command can result in more atomic commands being sent to multiple devices, perhaps in a sequence. The sequence and nature of subsequent commands may depend on the previous commands, results of previous commands, device settings and other measurements. As a command is executed, measurements are made and results collected to determine if the execution was correct and the desired state or states were reached.

Once the domain agent **156** has created a satisfactory response to a question, or to a command, the agent may format that response for presentation. Typically, the domain agent can format the response into the markup format used by the text to speech engine **124**. The domain agent may format the result presentation using available format templates and based on the context, the criteria, and the user profile **110**. The domain agent may perform variable substitutions and transformations to produce a response best understood and most natural to the user. The domain agent may vary the order of presentation of tokens and the exact terminology used to create a more natural response to the user. The domain agent may also select the presentation personality **108** to be used.

For both command and query responses, the domain agent **156** may select the presentation template, determine order of presentation for tokens and determine variable substitutions and transformations using probabilistic or fuzzy set decision methods. The template used to form the presentation can be from the domain agent itself or from the

user profile **110**. The user profile can completely specify the presentation format or can be used to select and then modify an existing presentation format. Selection and formatting of presentation template can also depend on the presentation personality **108**.

At the same time, the characteristics of the personality used for the response are
 5 dynamically determined using probabilities or fuzzy possibilities derived from the context, the criteria, the domain agent itself and the user profile **110**.

The domain agent **156** may apply a number of transformations to the tokens before presentation to the user. These variable substitutions and transformations may be derived from a number of sources including, domain information carried by the agent, the
 10 context, the token values, the criteria, the personality **108** to be used, and the user profile **110**. Examples of variable substitutions and transformations include: 1) substitution of words for numbers; 2) substitution of names for acronyms or symbols (i.e., trading symbols); 3) use of formatting information derived from the information sources (i.e., HTML tags); 4) nature of the response including, text, long text, list, table; 5) possible
 15 missing information or errors; 6) units for measurement (i.e., English or metric); and, 7) preferred terminology from the user profile or presentation personality **108**.

The invention may provide special purpose presentation capabilities for long text strings, tables, lists and other large results sets. Domain agents **156** may use special formatting templates for such results. The system agent **150** can provide special criteria
 20 handlers **152** for presentation and user commands for large results sets. The presentation templates used by the domain agents for large results sets typically include methods for summarizing the results and then allowing the user to query the result in more detail. For

example, initially only short summaries, such as headlines or key numbers, are presented.

The user can then query the results set further. The criteria handlers provide users with the capability to browse large results sets. Commands provided by the criteria handlers for large results sets include, stop, pause, skip, rewind, start, and forward.

5 Some information, in formats such as video, pictures and graphics, may be best presented in a displayed format. The domain agents 156 apply suitable presentation templates in these cases and present the information through the graphical user interface 114. The system agent 150 provides special criteria handlers 152 for presentation and user commands for display presentation and control.

10 Although particular embodiments of the invention have been shown and described, it will be understood that it is not intended to limit the invention to the embodiments that are disclosed and it will be obvious to those skilled in the art that various changes and modifications may be made without departing from the spirit and scope of the invention. Thus, the invention is intended to cover alternatives,
15 modifications, and equivalents, which may be included within the spirit and scope of the invention as defined by the claims.

We Claim:

1. A mobile system responsive to a user generated natural language speech utterance, comprising:
 - a speech unit that receives the user generated natural language speech utterance and converts the user generated natural language speech utterance into an electronic signal, said user generated natural language speech utterance having at least one of a query and a command;
 - a natural language speech processing system that receives the electronic signal, that retrieves said at least one of said query and said command from the electronic signal, that selects at least one domain agent associated with said at least one of said query and said command, that forwards said at least one of query and command to said at least one domain agent, wherein said at least one domain agent is an autonomous executable that receives, processes and responds to said at least one of said query and a said command; and
 - a transceiver, in communication with said at least one domain agent, that transmits an electronic message associated with said at least one of query and command.
2. The mobile system according to claim 1, wherein the natural language speech processing system further comprises an event manager, said event manager coordinating interaction between components of the natural language speech processing system.

3. The mobile system according to claim 1, wherein the natural language speech processing system further comprises a parser that determines a domain for the user generated natural language utterance based on the content and context of the user utterance.
4. The mobile system according to claim 1, further comprising a text to speech engine that converts a text message to a speech message.
5. The mobile system according to claim 1, wherein said at least one domain agent includes information for communicating with a remotely located service.
6. The mobile system according to claim 1, wherein said at least one domain agent includes data associated with at least one of driving directions, travel information, restaurant information, vehicle systems information, safety information and entertainment information.
7. The mobile system according to claim 1, wherein said at least one domain agent includes data for communicating with one or more devices.
8. The mobile system according to claim 7, wherein the data for communicating includes data for controlling the one or more devices.
9. The mobile system according to claim 7, wherein the transmitted electronic message is sent to the one or more devices.
10. The mobile system according to claim 9, wherein at least one of the devices is a device associated with a vehicle.

11. The mobile system according to claim 10, wherein the mobile system is located remotely from the vehicle.
12. The mobile system according to claim 10, wherein the device associated with the vehicle is at least one of a navigation system, a vehicle monitoring system, a security system, a vehicle control system and a vehicle media system.
13. The mobile system according to claim 1, wherein the transmitted message is sent to at least one remotely located service.
14. The mobile system according to claim 13, wherein the remotely located service is one of payment service provider, customer relationship management system, specialized service, location service and emergency service.
15. The mobile system according to claim 13, wherein the transceiver transmits the message via a communication network.
16. The mobile system according to claim 15, wherein the communication network is a wide area wireless network.
17. The mobile system according to claim 1, wherein the transceiver is a wide-area RF transceiver.
18. The mobile system according to claim 1, wherein the speech unit includes at least one of a speech coder, an array microphone and a filter.
19. The mobile system according to claim 18, wherein the filter employs adaptive echo cancellation.

20. The mobile system according to claim 18, wherein the array microphone is at least a one-dimensional array.

21. The mobile system according to claim 18, wherein the speech coder uses an adaptive lossy audio compression.

21. The mobile system according to claim 1, wherein the speech unit is located remotely from the natural language speech processing system and the transceiver.

23. The mobile system according to claim 1, further comprising at least one of a display and a keypad.

24. The mobile system according to claim 1, further comprising a telematics control unit.

25. The mobile system according to claim 1, wherein the mobile system is embedded in a telematic control unit.

26. The mobile system according to claim 1, wherein the mobile system is embedded into at least one of a vehicle, a handheld device, a fixed computer and a mobile computer device.

27. The mobile system according to claim 1, wherein the mobile system is deployed in a network of devices using a common base of at least one of agents, user profiles and event histories.

28. A method responsive to a user generated natural language speech utterance, comprising:

receiving the user generated natural language speech utterance, the user generated natural language speech utterance having at least one of a query and a command;

converting the user generated natural language speech utterance into an electronic signal;

retrieving said at least one of said query and said command from the electronic signal;

selecting a domain agent associated with said at least one of said query and said command;

forwarding said at least one of said query and said command to said domain agent, wherein said domain agent is an autonomous executable that receives, processes and responds to said at least one of said query and said command;

and

transmitting a message associated with said at least one of said query and said command to a remotely located service.

29. The method according to claim 28, further comprising coding the electronic signal.

30. The method according to claim 28, further comprising selecting a second domain agent, the second domain agent associated with at least one of a navigation system, a vehicle monitoring system, a security system, a vehicle control system and a vehicle media system; and forwarding a second message to said second domain agent.

31. The method according to claim 28, wherein said domain agent includes data associated with at least one of driving directions, travel information, restaurant information, vehicle systems information, safety information and entertainment information.

32. The method according to claim 28, wherein said domain agent includes information for communicating with the remotely located service.

33. The method according to claim 32, wherein the transmitting operation includes sending at least one of a query and a command to the remotely located service.

34. The method according to claim 28, wherein the device system is a remotely located device.

35. The method according to claim 28, wherein the transmitting operation with the remotely located service is via a network.

36. The method according to claim 28, wherein the remotely located service is one of a payment service provider, a customer relationship management system, a specialized service, a location service and a emergency service.

37. The method according to 28, wherein the transmitting operation with the remotely located service is via a wide-area RF transceiver.

38. The method according to 28, further comprising filtering-out background noise of the received user utterance.

39. The method according to 38, wherein the filtering-out operation is by at least using a filter employing adaptive echo cancellation.

40. The method according to claim 29, wherein the user generated natural language speech utterance is coded using an adaptive lossy audio compression.

41. The method according to claim 28, wherein the receiving operation of the user generated natural language speech utterance is remotely performed from the other operations.

42. The method according to claim 41, wherein the receiving operation of the user generated natural language speech utterance is performed in a vehicle.

43. The method according to claim 28, further comprising retrieving data from a network shared source, the network shared source is at least one of an agent, a user profile and a events history.

43. A mobile system responsive to a user generated natural language speech utterance, comprising:

receiving means that receives the user generated natural language speech

utterance, the user generated natural language speech utterance having at least one of a query and a command;

converting means that converts the user generated natural language speech utterance into an electronic signal;

retrieving means that retrieves said at least one of said query and said command

domain agent selecting means that selects a domain agent associated with said at least one of said query and said command;

forwarding means that forwards said at least one of said query and said command to said selected domain agent; and

transmitting means that transmits a message from said selected domain agent to a device system.

44. The mobile system according to claim 43, wherein the device system is at least one of a navigation system, a vehicle monitoring system, a security system, a vehicle control system and a vehicle media system.

45. The mobile system according to claim 43, wherein the at least one domain agent includes data associated with at least one of driving directions, travel information, restaurant information, vehicle systems information, safety information and entertainment information.

46. The mobile system according to claim 43, wherein the device system is a remotely located device.

47. The mobile system according to claim 43, wherein the device system is a remotely located service.

48. The mobile system according to claim 47, wherein the transmitting means communicates with the remotely located service via a network.

49. The mobile system according to claim 47, wherein the remotely located service is one of a payment service provider, a customer relationship management system, a specialized service, a location service and a emergency service.

50. The mobile system according to 43, wherein the transmitting means is a wide-area RF transceiver.

51. The mobile system according to 43, further comprising a filtering means that filters the received user generated natural language speech utterance.

52. The mobile system according to claim 43, further comprising a coder means that codes the user generated natural language speech utterance.

53. The mobile system according to claim 43, wherein the receiving means is remotely located from other mobile system components.

54. The mobile system according to claim 53, wherein the receiving means is located at a vehicle.

55. The mobile system according to claim 43, further comprising data retrieving means that retrieves data from a network shared source, the source is at least one of an agent, data, a user profile and a events history.

ABSTRACT

Mobile systems and methods that overcomes the deficiencies of prior art speech-based interfaces for telematics applications through the use of a complete speech-based information query, retrieval, presentation and local or remote command environment. This environment makes significant use of context, prior information, domain knowledge, and user specific profile data to achieve a natural environment for one or more users making queries or commands in multiple domains. Through this integrated approach, a complete speech-based natural language query and response environment can be created. The invention creates, stores and uses extensive personal profile information for each user, thereby improving the reliability of determining the context and presenting the expected results for a particular question or command. The invention may organize domain specific behavior and information into agents, that are distributable or updateable over a wide area network. The invention can be used in dynamic environments such as those of mobile vehicles to control and communicate with both vehicle systems and remote systems and devices.

RES-95050v2

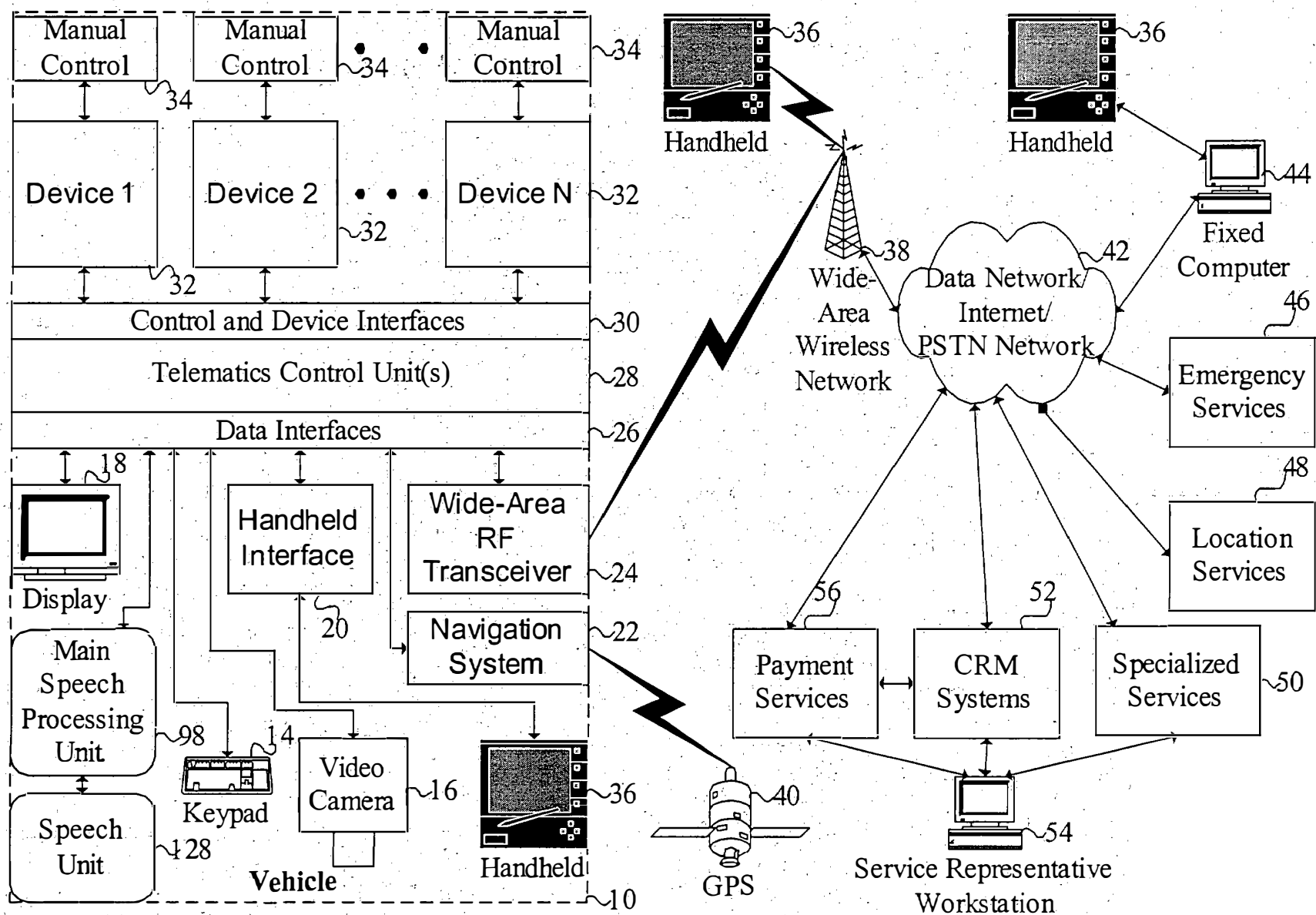


Figure 2. Second Embodiment System Block Diagram

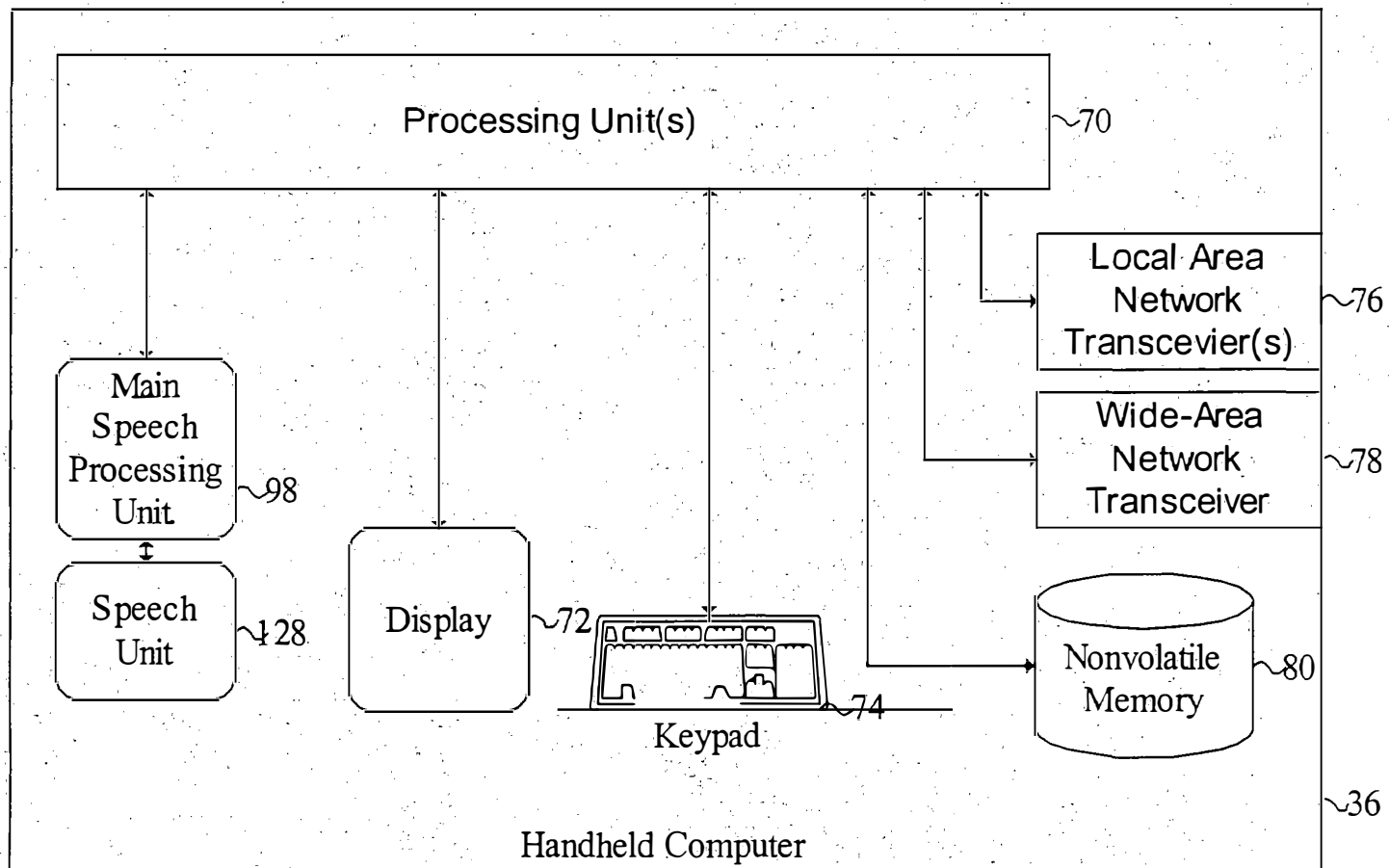


Figure 3. Handheld Computer Block Diagram.

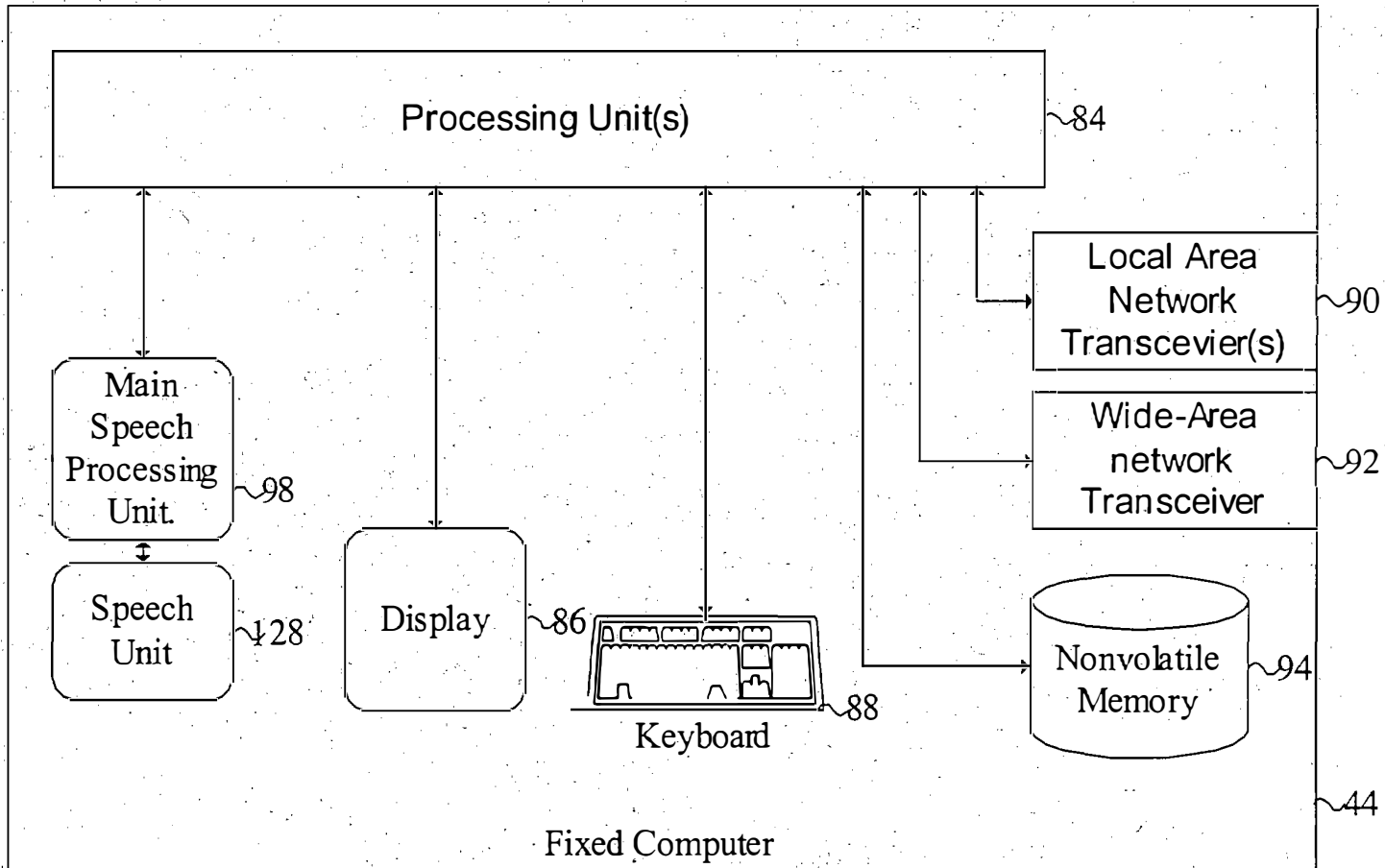


Figure 4. Fixed Computer Block Diagram.

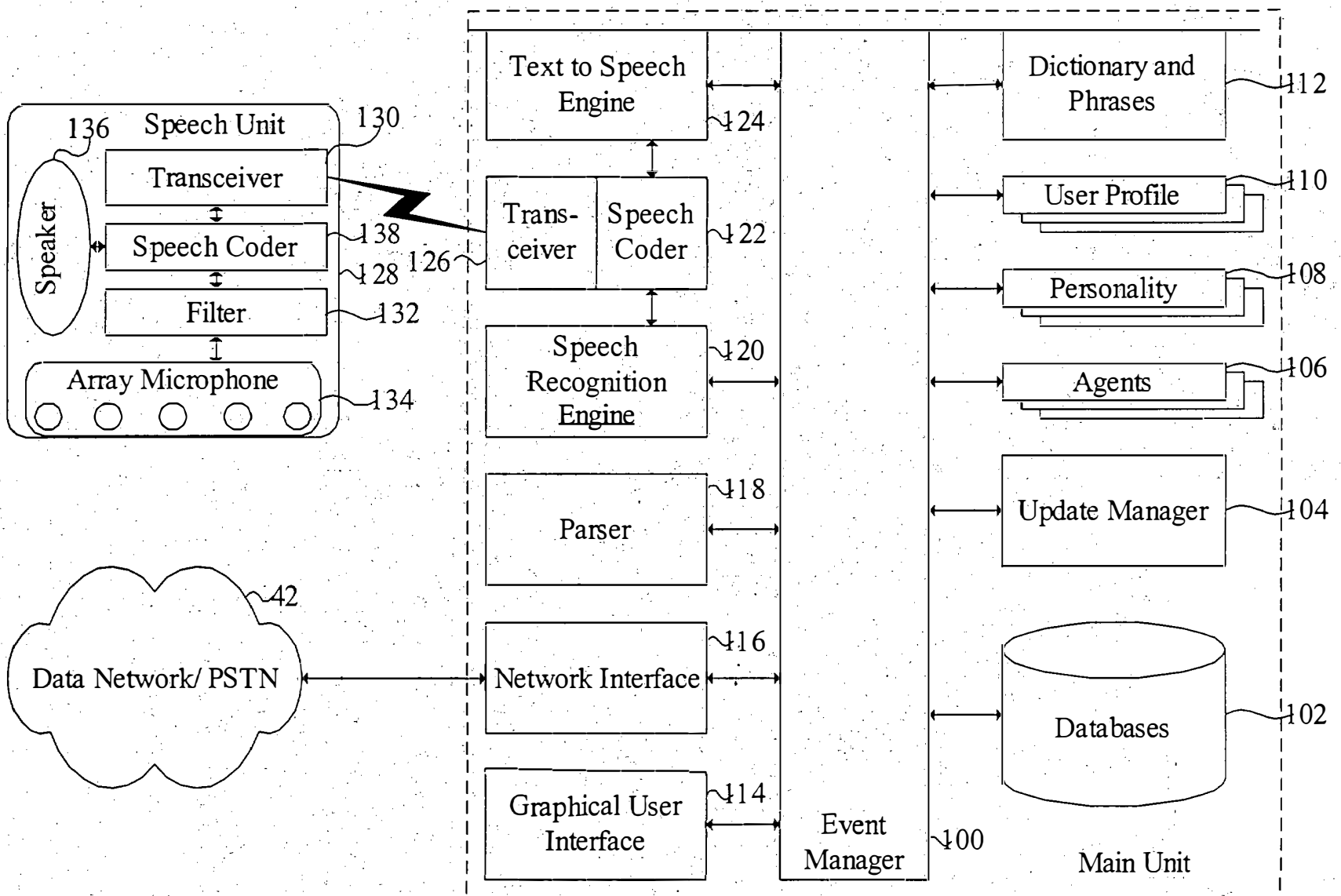


Figure 5. Speech Processing System Block Diagram

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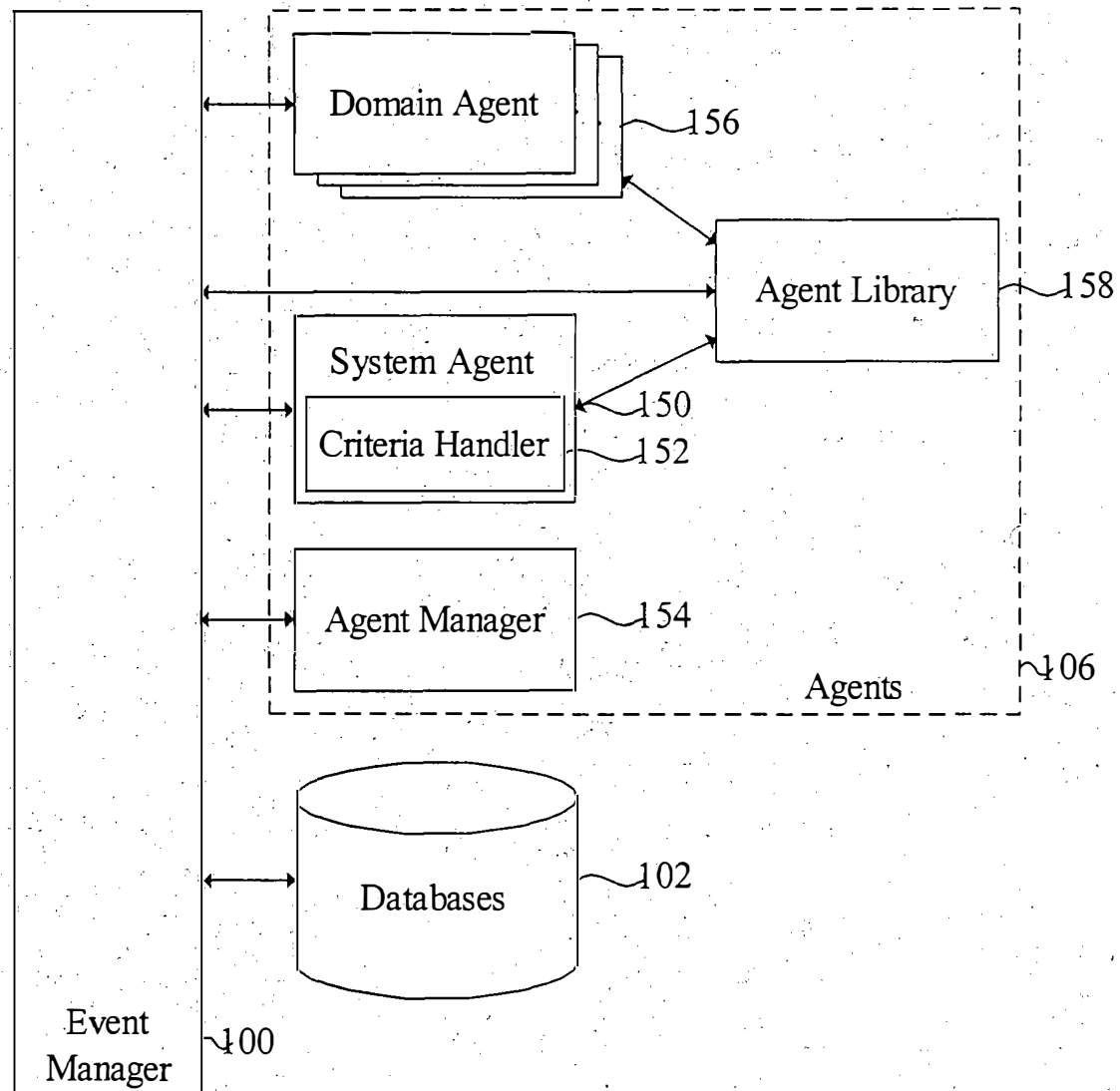


Figure 6. Agent Architecture

COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As below named inventors, we hereby declare that:

Our residences, post office addresses and citizenships are as stated below next to our names.

We believe we are the original, first and joint inventors which is claimed and for which a utility patent is sought on the invention entitled:

MOBILE SYSTEMS AND METHODS FOR RESPONDING TO NATURAL LANGUAGE SPEECH UTTERANCE

the specification of which is being filed herewith.

We hereby state that we have reviewed and understand the contents of the above-identified specification, including the claims.

We acknowledge the duty to disclose information that is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

We hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application designating at least one country other than the United States listed below and have also identified below any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Appln. Number	Country (if PCT, so indicate)	Filing Date (dd/mm/yy)	Priority Claimed	
			Yes	No
			☐	☐
			☐	☐

We hereby claim the benefit under Title 35, United States Code, § 119(e) or §120 of any United States application(s), or §365(c) of any PCT International application(s) designating the United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

Application No. <i>(U.S.S.N.)</i>	Filing Date <i>(dd/mm/yy)</i>
60/395,615	07/15/2002

We hereby appoint the attorneys and/or agents associated with Mintz Levin Cohn Ferris Glovsky & Popeo, Customer Number



29315

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to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Please address all telephone calls to James G. Gatto at telephone number 703-464-8182, and address all correspondence to:



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PATENT & TRADEMARK OFFICE

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or patent issued thereon.

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Date

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Fifth Inventor's Signature:	Date
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Residence:	Mercer Island, Washington

Seventh Inventor's Signature:	Date
Full Name of Inventor:	Stephen F. Elston
Citizenship:	U.S.A.
Residence:	Seattle, Washington

APPLICATION DATA SHEET

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State or Province:: Washington
Citizenship Country:: United States of America

Correspondence Information



29315

PATENT & TRADEMARK OFFICE

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Application Information

Title Line One:: Mobile Systems and Methods for Responding to Natural
Title Line Two:: Language Speech Utterance
Total Drawing Sheets:: 6
Formal Drawings?:: Yes
Application Type:: UTILITY
Docket Number:: 25300-003

Representative Information

Registration Number One:: 32,694

Priority Information

This application claims priority from U.S. Provisional Application Serial Number 60/395,615 filed July 15, 2002.

RES 97239v1



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PATENT & TRADEMARK OFFICE

PATENT APPLICATION FEE DETERMINATION RECORD

Effective January 1, 2003

Application or Docket Number

25300-003

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	55	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	55 minus 20 =	* 35
INDEPENDENT CLAIMS	3 minus 3 =	* 0
MULTIPLE DEPENDENT CLAIM PRESENT ☐		

* If the difference in column 1 is less than zero, enter "0" in column 2

CLAIMS AS AMENDED - PART II

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	* Minus	**
	Independent	* Minus	***
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐		

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	* Minus	**
	Independent	* Minus	***
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐		

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	* Minus	**
	Independent	* Minus	***
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐		

SMALL ENTITY TYPE ☐ OR

OTHER THAN SMALL ENTITY

RATE	FEE
BASIC FEE	375.00
X\$ 9=	
X42=	
+140=	
TOTAL	690

RATE	FEE
BASIC FEE	750.00
X\$18=	
X84=	
+280=	
TOTAL	

SMALL ENTITY OR

OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE
X\$ 9=	
X42=	
+140=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
X\$18=	
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X\$ 9=	
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TOTAL ADDIT. FEE	

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RATE	ADDITIONAL FEE
X\$18=	
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+280=	
TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

NEW UTILITY PATENT APPLICATION TRANSMITTAL <i>(Only for new nonprovisional applications under 37 C.F.R. 1.53(b))</i>	Docket No. 25300-003 Total pages in this submission
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TO THE HONORABLE COMMISSIONER FOR PATENTS
Mail Stop Patent Application
P.O. Box 1450
Alexandria, VA 22313-1450

Transmitted herewith for filing under 35 U.S.C. 111(a) and 37 C.F.R. 1.53(b) is a new utility patent application, for an invention entitled:

"MOBILE SYSTEMS AND METHODS FOR RESPONDING TO NATURAL LANGUAGE SPEECH UTTERANCE"

And invented by:

Robert A. Kennewick, David Locke, Michael R. Kennewick, Sr., Michael R. Kennewick, Jr., Richard Kennewick, Tom Freeman, and Steven F. Elston

IF A CONTINUATION APPLICATION, check appropriate box and supply requisite information:

☐ Continuation ☐ Divisional

☐ Continuation-in-part (CIP) of prior application Nos.: _____

Enclosed are:

Application Elements

1. ☒ Filing fee as calculated and transmitted as described below
2. ☒ Specification having 80 pages(s) and including the following:
 - a. ☐ Related applications
 - b. ☒ Claim to priority
 - c. ☐ Statement regarding Federally-sponsored research/development *(if applicable)*
 - d. ☒ Field of the invention
 - e. ☒ Background of the invention
 - f. ☒ Summary of the invention
 - g. ☒ Brief descriptions of the drawings
 - h. ☒ Detailed description of the preferred and alternative embodiments
 - i. ☒ Claims as classified below
 - j. ☒ Abstract of the disclosure

 19972 U.S. PTO
 10/618633


Application Elements (continued)

3. ☒ Drawing(s) (when necessary as prescribed by 35 U.S.C. 113)
☒ Formal ☐ Informal Number of sheets: 6 (Figs. 1-6)
4. ☒ Oath or Declaration
a. ☐ Newly executed (original or copy) ☒ Unexecuted
b. ☐ Copy from a prior application (37 C.F.R. 1.63(d) (for continuation/divisional applications only)
c. ☒ With Power of Attorney ☐ Without Power of Attorney
5. ☐ Incorporation by reference (usable if Box 4b is checked)
The entire disclosure of the prior application, from which a copy of the oath or declaration is Supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
6. ☐ Computer program in microfiche
7. ☐ Genetic sequence submission (if applicable, all must be included)
a. ☐ Paper copy
b. ☐ Computer readable copy
c. ☐ Statement verifying identical paper and computer readable copies

Accompanying Application

8. ☐ Assignment papers (cover sheet & document(s))
9. ☐ 37 C.F.R. 3.73(b) statement (when there is an assignee)
10. ☐ English translation document (if applicable)
11. ☐ Information Disclosure Statement/PTO-1449 ☐ Copies of IDS citations
12. ☐ Preliminary Amendment
13. ☒ Acknowledgment postcard
14. ☐ Certified copy of priority document(s) (if foreign priority is claimed)
15. ☐ Certificate of Mailing
☐ First Class ☐ Express Mail (Label No.: _____)
16. ☐ Small Entity statement(s) -- # submitted _____ (if Small Entity status claimed)

Accompanying Application (continued)

- 17.
- ☒
- Additional enclosures (please identify below):

Application Data Sheet

Fee Calculation and Transmittal

The filing fee for this utility patent application is calculated and transmitted as follows:

☐ Large Entity ☒ Small Entity

CLAIMS AS FILED						
For	# Filed	# Allowed	# Extra	Rate	Fee	
Total Claims	55	- 20 =	35	x \$18.00	\$630.00	
Independent Claims	3	- 3 =	0	x \$84.00	\$0.00	
Multiple Dependent Claims (check if applicable)				☐		
Other Fees (specify purpose):						
				BASIC FEE	\$750.00	
				TOTAL FILING FEE	\$1,380.00	
Reduced by 1/2 for Small Entity					\$690.00	

☒ Check in the amount of \$690.00 to cover the total filing fee is enclosed.☒ The Commissioner is hereby authorized to charge and Deposit Account No. 50-0311 as described below. A duplicate copy of this sheet is enclosed.☐ Charge the amount of _____ as filing fee.☒ Credit any overpayment.☒ Charge any additional filing fees required under 37 C.F.R. 1.16 and 1.17.☐ Charge the issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance, pursuant to 37 C.F.R. 1.31(b).Dated: July 15, 2003James J. Namiki, Registration No. 51,148
(for James G. Gatto, Attorney Reg. No. 32,694)

Correspondence Information:



29315

PATENT & TRADEMARK OFFICE

PATENT APPLICATION FEE DETERMINATION RECORD

Effective January 1, 2003

Application or Docket Number

10/618,633

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	56	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	56 minus 20 = *	36
INDEPENDENT CLAIMS	3 minus 3 = *	0
MULTIPLE DEPENDENT CLAIM PRESENT ☐		

* If the difference in column 1 is less than zero, enter "0" in column 2

CLAIMS AS AMENDED - PART II

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	* Minus	** =
	Independent	* Minus	*** =
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐		

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	* Minus	** =
	Independent	* Minus	*** =
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐		

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	* Minus	** =
	Independent	* Minus	*** =
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐		

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

SMALL ENTITY TYPE ☒

OR OTHER THAN SMALL ENTITY

RATE	FEE
BASIC FEE	375.00
X\$ 9=	324
X42=	
+140=	
TOTAL	699

RATE	FEE
BASIC FEE	750.00
X\$18=	
X84=	
+280=	
TOTAL	

SMALL ENTITY

OR OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE
X\$ 9=	
X42=	
+140=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
X\$18=	
X84=	
+280=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
X\$ 9=	
X42=	
+140=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
X\$18=	
X84=	
+280=	
TOTAL ADDIT. FEE	

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X\$ 9=	
X42=	
+140=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
X\$18=	
X84=	
+280=	
TOTAL ADDIT. FEE	

Google Exhibit 1019

We Claim:

1. A mobile system responsive to a user generated natural language speech utterance, comprising:
 - a speech unit that receives the user generated natural language speech utterance and converts the user generated natural language speech utterance into an electronic signal, said user generated natural language speech utterance having at least one of a query and a command;
 - a natural language speech processing system that receives the electronic signal, that retrieves said at least one of said query and said command from the electronic signal, that selects at least one domain agent associated with said at least one of said query and said command, that forwards said at least one of query and command to said at least one domain agent, wherein said at least one domain agent is an autonomous executable that receives, processes and responds to said at least one of said query and a said command; and
 - a transceiver, in communication with said at least one domain agent, that transmits an electronic message associated with said at least one of query and command.
2. The mobile system according to claim 1, wherein the natural language speech processing system further comprises an event manager, said event manager coordinating interaction between components of the natural language speech processing system.

3. The mobile system according to claim 1, wherein the natural language speech processing system further comprises a parser that determines a domain for the user generated natural language utterance based on the content and context of the user utterance.

4. The mobile system according to claim 1, further comprising a text to speech engine that converts a text message to a speech message.

5. The mobile system according to claim 1, wherein said at least one domain agent includes information for communicating with a remotely located service.

6. The mobile system according to claim 1, wherein said at least one domain agent includes data associated with at least one of driving directions, travel information, restaurant information, vehicle systems information, safety information and entertainment information.

7. The mobile system according to claim 1, wherein said at least one domain agent includes data for communicating with one or more devices.

8. The mobile system according to claim 7, wherein the data for communicating includes data for controlling the one or more devices.

9. The mobile system according to claim 7, wherein the transmitted electronic message is sent to the one or more devices.

10. The mobile system according to claim 9, wherein at least one of the devices is a device associated with a vehicle.

11. The mobile system according to claim 10, wherein the mobile system is located remotely from the vehicle.
12. The mobile system according to claim 10, wherein the device associated with the vehicle is at least one of a navigation system, a vehicle monitoring system, a security system, a vehicle control system and a vehicle media system.
13. The mobile system according to claim 1, wherein the transmitted message is sent to at least one remotely located service.
14. The mobile system according to claim 13, wherein the remotely located service is one of payment service provider, customer relationship management system, specialized service, location service and emergency service.
15. The mobile system according to claim 13, wherein the transceiver transmits the message via a communication network.
16. The mobile system according to claim 15, wherein the communication network is a wide area wireless network.
17. The mobile system according to claim 1, wherein the transceiver is a wide-area RF transceiver.
18. The mobile system according to claim 1, wherein the speech unit includes at least one of a speech coder, an array microphone and a filter.
19. The mobile system according to claim 18, wherein the filter employs adaptive echo cancellation.

20. The mobile system according to claim 18, wherein the array microphone is at least a one-dimensional array.

21. The mobile system according to claim 18, wherein the speech coder uses an adaptive lossy audio compression.

21. The mobile system according to claim 1, wherein the speech unit is located remotely from the natural language speech processing system and the transceiver.

23. The mobile system according to claim 1, further comprising at least one of a display and a keypad.

24. The mobile system according to claim 1, further comprising a telematics control unit.

25. The mobile system according to claim 1, wherein the mobile system is embedded in a telematic control unit.

26. The mobile system according to claim 1, wherein the mobile system is embedded into at least one of a vehicle, a handheld device, a fixed computer and a mobile computer device.

27. The mobile system according to claim 1, wherein the mobile system is deployed in a network of devices using a common base of at least one of agents, user profiles and event histories.

28. A method responsive to a user generated natural language speech utterance, comprising:

receiving the user generated natural language speech utterance, the user generated natural language speech utterance having at least one of a query and a command;

converting the user generated natural language speech utterance into an electronic signal;

retrieving said at least one of said query and said command from the electronic signal;

selecting a domain agent associated with said at least one of said query and said command;

forwarding said at least one of said query and said command to said domain agent, wherein said domain agent is an autonomous executable that receives, processes and responds to said at least one of said query and said command;

and

transmitting a message associated with said at least one of said query and said command to a remotely located service.

29. The method according to claim 28, further comprising coding the electronic signal.

30. The method according to claim 28, further comprising

selecting a second domain agent, the second domain agent associated with at least one of a navigation system, a vehicle monitoring system, a security system, a vehicle control system and a vehicle media system; and

forwarding a second message to said second domain agent.

31. The method according to claim 28, wherein said domain agent includes data associated with at least one of driving directions, travel information, restaurant information, vehicle systems information, safety information and entertainment information.

32. The method according to claim 28, wherein said domain agent includes information for communicating with the remotely located service.

33. The method according to claim 32, wherein the transmitting operation includes sending at least one of a query and a command to the remotely located service.

34. The method according to claim 28, wherein the device system is a remotely located device.

35. The method according to claim 28, wherein the transmitting operation with the remotely located service is via a network.

36. The method according to claim 28, wherein the remotely located service is one of a payment service provider, a customer relationship management system, a specialized service, a location service and a emergency service.

37. The method according to 28, wherein the transmitting operation with the remotely located service is via a wide-area RF transceiver.

38. The method according to 28, further comprising filtering-out background noise of the received user utterance.

39. The method according to claim 38, wherein the filtering-out operation is by at least using a filter employing adaptive echo cancellation.

40. The method according to claim 29, wherein the user generated natural language speech utterance is coded using an adaptive lossy audio compression.

41. The method according to claim 28, wherein the receiving operation of the user generated natural language speech utterance is remotely performed from the other operations.

42. The method according to claim 41, wherein the receiving operation of the user generated natural language speech utterance is performed in a vehicle.

43. The method according to claim 28, further comprising retrieving data from a network shared source, the network shared source is at least one of an agent, a user profile and a events history.

R. 1126 44-45. A mobile system responsive to a user generated natural language speech utterance, comprising:

receiving means that receives the user generated natural language speech

utterance, the user generated natural language speech utterance having at least one of a query and a command;

converting means that converts the user generated natural language speech utterance into an electronic signal;

retrieving means that retrieves said at least one of said query and said command

domain agent selecting means that selects a domain agent associated with said at least one of said query and said command;

forwarding means that forwards said at least one of said query and said command to said selected domain agent; and

transmitting means that transmits a message from said selected domain agent to a device system.

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44. The mobile system according to claim 43, wherein the device system is at least one of a navigation system, a vehicle monitoring system, a security system, a vehicle control system and a vehicle media system.

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45. The mobile system according to claim 43, wherein the at least one domain agent includes data associated with at least one of driving directions, travel information, restaurant information, vehicle systems information, safety information and entertainment information.

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46. The mobile system according to claim 43, wherein the device system is a remotely located device.

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47. The mobile system according to claim 43, wherein the device system is a remotely located service.

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48. The mobile system according to claim 47, wherein the transmitting means communicates with the remotely located service via a network.

49. The mobile system according to claim 47, wherein the remotely located service is one of a payment service provider, a customer relationship management system, a specialized service, a location service and a emergency service.

50. The mobile system according to 44, wherein the transmitting means is a wide-area RF transceiver.

51. The mobile system according to 44, further comprising a filtering means that filters the received user generated natural language speech utterance.

R.1-126 52. The mobile system according to claim 43, further comprising a coder means that codes the user generated natural language speech utterance.

53. The mobile system according to claim 43, wherein the receiving means is remotely located from other mobile system components.

54. The mobile system according to claim 53, wherein the receiving means is located at a vehicle.

55. The mobile system according to claim 43, further comprising data retrieving means that retrieves data from a network shared source, the source is at least one of an agent, data, a user profile and a events history.

R-1126

PTO/SB/07 (08-03)

Approved for use through 7/31/2006. OMB 0651-0032

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET Substitute for Form PTO-1360 (For use with Form PTO/SB/06)							Application Number 10/618633		Filing Date		
							Applicant(s)				
							* May be used for additional claims or amendments				
CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT						
	Indep	Depend	Indep	Depend	Indep	Depend	Indep	Depend	Indep	Depend	
1	/	/					51	/	/		
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Total	2						Total	2			
Total	47						Total	6			
Depend							Depend				
Total	46						Total	6			
Claims							Claims				

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND ORIGINALS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

07/17/2003 BABRAH1 00000037 10618633

01 FC:2001	375.00 DP
02 FC:2202	315.00 DP

10/29/2003 TLUU11 00000025 500311 10618633

01 FC:2202	9.00 DA
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PTO-1556
(5/87)



UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
10/618,633	07/15/2003	Robert A. Kennewick	25300-003

CONFIRMATION NO. 5659

FORMALITIES LETTER



OC000000011157371

29315
 MINTZ LEVIN COHN FERRIS GLOVSKY AND POPEO PC
 12010 SUNSET HILLS ROAD
 SUITE 900
 RESTON, VA 20190

Date Mailed: 11/03/2003

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

*Filing Date Granted***Items Required To Avoid Abandonment:**

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is unsigned.
- To avoid abandonment, a late filing fee or oath or declaration surcharge as set forth in 37 CFR 1.16(e) of \$65 for a small entity in compliance with 37 CFR 1.27, must be submitted with the missing items identified in this letter.

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is **\$65** for a Small Entity

- **\$65** Late oath or declaration Surcharge.

Replies should be mailed to: Mail Stop Missing Parts
 Commissioner for Patents
 P.O. Box 1450
 Alexandria VA 22313-1450

*A copy of this notice **MUST** be returned with the reply.*

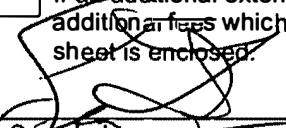


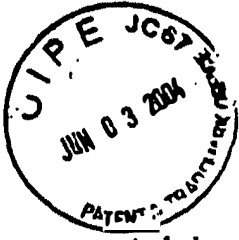
Customer Service Center

Initial Patent Examination Division (703) 308-1202

PART 3 - OFFICE COPY



PETITION FOR EXTENSION OF TIME UNDER 37 C.F.R. 1.136(a)			Docket No. 25300-003
In re Application of: Robert A. Kennewick, <i>et al.</i>			
Serial No. 10/618,633	Filing Date July 15, 2003	Examiner <i>Not yet assigned</i>	Group Art Unit 2681
Invention: MOBILE SYSTEMS AND METHODS FOR RESPONDING TO NATURAL LANGUAGE SPEECH UTTERANCE			
<u>TO THE ASSISTANT COMMISSIONER FOR PATENTS</u>			
This is a request under the provisions of 37 C.F.R. 1.136(a) to extend the period for filing a response to The Notice to File Missing Parts of <u>November 3, 2002</u> in the above-identified application.			
The requested extension is as follows:			
☐ One month ☐ Two months ☐ Three months ☐ Four months ☒ Five months			
The requested extension is as follows:			
☐ Large entity			
☒ Small entity			
Verified statement of small entity status as a small entity under 37 C.F.R. 1.27:			
☐ Is enclosed.			
☐ Has already been filed in this application.			
The fee for the extension of time is <u>\$1,005.00</u> and is to be paid as follows:			
☒ A check in the amount of the fee is enclosed.			
☐ Charge the amount of the fee to Deposit Account No. 50-0311. A duplicate copy of this sheet is enclosed			
☐ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account No. 50-0311.			
☐ If an additional extension of time is required, please consider this a petition therefor and charge any additional fees which may be required to Deposit Account No. 50-0311. A duplicate copy of this sheet is enclosed.			
 Sean L. Ingram Registration No. 48,283 MINTZ, LEVIN, COHN, FERRIS, GLOVSKY AND POPEO P.C. 12010 Sunset Hills Road, Suite 900 Reston, Virginia 20190 (703) 464-4800		Dated: <u>June 3, 2004</u>	
CUSTOMER NO. 29315			



COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As below named inventors, we hereby declare that:

Our residences, post office addresses and citizenships are as stated below next to our names.

We believe we are the original, first and joint inventors of the subject matter which is claimed and for which a utility patent is sought on the invention entitled:

MOBILE SYSTEMS AND METHODS FOR RESPONDING TO NATURAL LANGUAGE SPEECH UTTERANCE

the specification of which was filed on July 15, 2003, with the U.S. Patent and Trademark Office and assigned U.S. Application Serial No. 10/618,633.

We hereby state that we have reviewed and understand the contents of the above-identified specification, including the claims.

We acknowledge the duty to disclose information that is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

We hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application designating at least one country other than the United States listed below and have also identified below any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Appln. Number	Country (if PCT, so indicate)	Filing Date (dd/mm/yy)	Priority Claimed	
			Yes	No
			☐	☐
			☐	☐

We hereby claim the benefit under Title 35, United States Code, § 119(e) or §120 of any United States application(s), or §365(c) of any PCT International application(s) designating the United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

q.e.

Application No. (U.S.S.N.)	Filing Date (dd/mm/yy)
60/395,615	07/15/2002

We hereby appoint the attorneys and/or agents associated with Mintz Levin Cohn Ferris Glovsky & Popeo, Customer Number

29315

to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Please address all telephone calls to James G. Gatto at telephone number 703-464-8182, and address all correspondence to:

12010 Sunset Hills Road, Suite 900
Reston, VA 20190

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or patent issued thereon.

X Robert A. Kennewick X 12/23/03
First Inventor's Signature: **Date**
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Full Name of Inventor: Stephen F. Elston
Citizenship: U.S.A.
Residence: X _____
Seattle, Washington

3 of 3

X _____ X _____
Second Inventor's Signature: _____ Date _____

Full Name of Inventor: David Locke
Citizenship: U.S.A.
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Third Inventor's Signature: _____ Date _____

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Sixth Inventor's Signature: _____ Date _____

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6735 83rd Avenue, S.E.
Residence: Mercer Island, Washington 98040

X _____ X _____
Seventh Inventor's Signature: _____ Date _____

Full Name of Inventor: Stephen F. Elston
Citizenship: U.S.A.
X  _____
Residence: Seattle, Washington

5/27/2004



Customer No. 29315

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:	)	Docket No.: 25300-003
Robert A. KENNEWICK <i>et al.</i>	)	Confirmation No.: 5659
Serial No.: 10/618,633	)	Examiner: <i>Unassigned</i>
Filed: July 15, 2003	)	Group Art Unit: 2681

For: MOBILE SYSTEMS AND METHODS FOR RESPONDING TO NATURAL LANGUAGE SPEECH
UTTERANCE

INFORMATION DISCLOSURE STATEMENT (IDS)

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to the duty of disclosure under 37 C.F.R. §§ 1.56, 1.97 and 1.98, Applicants hereby make of record in the above-identified application the documents listed on the attached Form PTO-1449.

Applicants have listed publication dates on the attached PTO-1449 based on information presently available to the undersigned. However, the listed publication dates should not be construed as an admission that the information was actually published on the date indicated.

Applicants reserve the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior

art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

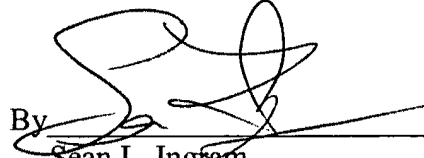
This Information Disclosure Statement is being filed before the mailing date of a first Office Action on the merits. No certification or fee is required. 37 C.F.R. 1.97(b).

A copy of each cited U.S. patent is not submitted herewith pursuant to the Official Gazette Notice of August 5, 2003, wherein the Office waived the requirement under 37 C.F.R. 1.98(a)(2)(i) for all U.S. national phase applications filed after June 30, 2003.

It is respectfully requested that the Examiner initial and return a copy of the enclosed PTO-1449.

Respectfully submitted,

MINTZ, LEVIN, COHN, FERRIS, GLOVSKY
and POPEO, P.C.

By 
Sean L. Ingram
Registration No.: 48,283

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Attorney for Applicants

Dated: June 28, 2004



INFORMATION DISCLOSURE CITATION IN AN APPLICATION Form PTO-1449	Docket Number	Application Number
	25300-003	10/618,633
	Applicant(s)	
	Robert A. KENNEWICK <i>et al</i>	
	Filing Date	Group Art Unit
	July 15, 2003	2681

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	REF	DOCUMENT NO.	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	1A	5,155,743	10/13/1992	Jacobs	375	28	
	1B	5,386,556	01/31/1995	Hedin et al.	395	600	
	1C	5,424,947	06/13/1995	Nagao et al.	364	419.08	
	1D	5,471,318	11/28/1995	Ahuja et al.	358	400	
	1E	5,475,733	12/12/1995	Eisdorfer et al.	379	52	
	1F	5,499,289	03/12/1996	Bruno et al.	379	220	
	1G	5,517,560	05/14/1996	Greenspan	379	114	
	1H	5,533,108	07/02/1996	Harris et al.	379	201	
	1I	5,537,436	07/16/1996	Bottoms et al.	375	222	
	1J	5,539,744	07/23/1996	Chu et al.	370	60	
	1K	5,557,667	09/17/1996	Bruno et al.	379	201	
	1L	5,563,937	10/08/1996	Bruno et al.	379	201	
	1M	5,590,039	12/31/1996	Ikeda et al.	395	759	
	1N	5,633,922	05/27/1997	August et al.	379	220	
	1O	5,675,629	10/07/1997	Raffel et al.	379	58	
	1P	5,708,422	01/13/1998	Blonder et al.	340	825.34	
	1Q	5,721,938	02/24/1998	Stuckey	395	754	
	1R	5,722,084	02/24/1998	Chakrin et al.	455	551	
	1S	5,742,763	04/21/1998	Jones	395	200.3	
	1T	5,752,052	05/12/1998	Richardson et al.	395	759	
	1U	5,754,784	05/19/1998	Garland et al.	395	200.49	
	1V	5,761,631	06/02/1998	Nasukawa	704	9	
	1W	5,794,050	08/11/1998	Dahlgren et al.	395	708	

FOREIGN PATENT DOCUMENTS

	REF	DOCUMENT NO.	DATE	COUNTRY	CLASS	SUBCLASS	Translations	
							YES	NO
	1X	WO 01/78065	10/18/2001	International				

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

	1Y	REUTERS, "IBM to Enable Honda Drivers to Talk to Cars", Charles Schwab & Co., Inc., July 28, 2002, 1 page.

EXAMINER	DATE CONSIDERED
EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP Section 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.	

INFORMATION DISCLOSURE CITATION IN AN APPLICATION Form PTO-1449	Docket Number	Application Number
	25300-003	10/618,633
	Applicant(s)	
	Robert A. KENNEWICK <i>et al</i>	
	Filing Date	Group Art Unit
	July 15, 2003	2681

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	REF	DOCUMENT NO.	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	2A	5,802,510	09/01/1998	Jones	707	2	
	2B	5,832,221	11/03/1998	Jones	375	200.36	
	2C	5,878,386	03/02/1999	Coughlin	704	10	
	2D	5,895,466	04/20/1999	Goldberg et al.	707	5	
	2E	5,911,120	06/08/1999	Jarett et al.	455	417	
	2F	5,926,784	07/20/1999	Richardson et al.	704	9	
	2G	5,933,822	08/03/1999	Braden-Harder et al.	707	5	
	2H	5,953,393	09/14/1999	Culbreth et al.	379	88.25	
	2I	5,963,894	10/05/1999	Richardson et al.	704	9	
	2J	5,963,940	10/05/1999	Liddy et al.	707	5	
	2K	5,987,404	11/16/1999	Della Pietra et al.	704	9	
	2L	5,991,721	11/23/1999	Asano et al.	704	257	
	2M	5,995,119	11/30/1999	Cosatto et al.	345	473	
	2N	6,009,382	12/28/1999	Martino et al.	704	1	
	2O	6,014,559	01/11/2000	Amin	455	413	
	2P	6,021,384	02/01/2000	Gorin et al.	704	1	
	2Q	6,044,347	03/28/2000	Abella et al.	704	272	
	2R	6,049,602	04/11/2000	Foladare et al.	379	265	
	2S	6,058,187	05/02/2000	Chen	380	21	
	2T	6,078,886	06/20/2000	Dragosh et al.	704	270	
	2U	6,081,774	06/27/2000	De Hita et al.	704	9	
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							YES	NO

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EXAMINER	DATE CONSIDERED
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INFORMATION DISCLOSURE CITATION IN AN APPLICATION Form PTO-1449	Docket Number	Application Number
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(54) Title: **NATURAL LANGUAGE AND DIALOGUE GENERATION PROCESSING**

(57) Abstract: A system and method for interacting with objects, via a computer using utterances, speech processing and natural language processing. A Dialogue Generation Log provides a conversational memory by relating earlier generated utterances with possible new utterances. The Dialogue Generation Log encompasses a memory structure relating the prior spoken utterances with objects, and conversational contexts. The speech processor searches the Dialogue Generation Log for a matching phrase for the proposed utterance, and determines whether the utterance should be repeated. The determination may be made on a case-by-case basis, depending upon the context of the conversational utterance. Custom user information may be stored globally using a global user registry for remote access. The system reduces the repetitive nature of computer generated conversation by not voicing utterances that have been generated recently, and by learning user preferences from already voiced conversations.

NATURAL LANGUAGE AND DIALOGUE GENERATION PROCESSING

5

BACKGROUND OF THE INVENTION

I. Field of the Invention

The present invention relates to speech recognition for an object-based computer user interface. More specifically, the embodiments relate to a novel method and system for user interaction with a computer using speech recognition and natural language processing.

10

II. Description of the Related Art

As computers have become more prevalent it has become clear that many people have great difficulty understanding and communicating with computers. A user must often learn archaic commands and non-intuitive procedures in order to operate the computer. For example, most personal computers use windows-based operating systems that are largely menu-driven. This requires that the user learn which menu commands or sequence of commands produce the desired results.

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Furthermore, traditional interaction with a computer is often slowed by manual input devices such as keyboards or mice. Many computer users are not fast typists. As a result, much time is spent communicating commands and words to the computer through these manual input devices. It is becoming clear that an easier, faster and more intuitive method of communicating

with computers and networked objects, such as web-sites, is needed.

One proposed method of computer interaction is speech recognition. Speech recognition involves software and hardware that act together to audibly detect human speech and translate the detected speech into a string of words. As is known in the art, speech recognition works by breaking down sounds the hardware detects into smaller, non-divisible sounds called phonemes. Phonemes are distinct units of sound. For example, the word "those" is made up of three phonemes; the first is the "th" sound, the second is the "o" sound, and the third is the "s" sound. The speech recognition software attempts to match the detected phonemes with known words from a stored dictionary. An example of a speech recognition system is given in U.S. Patent No. 4,783,803, entitled "SPEECH RECOGNITION APPARATUS AND METHOD", issued November 8, 1998, assigned to Dragon Systems, Inc., and incorporated herein by reference. Presently, there are many commercially available speech recognition software packages available from such companies as Dragon Systems, Inc. and International Business Machines, Inc.

One limitation of these speech recognition software packages or systems is that they typically only perform command and control or dictation functions. Thus, the user is still required to learn a vocabulary of commands in order to operate the computer.

A proposed enhancement to these speech recognition systems is to process the detected words using a natural language processing system. Natural language processing generally involves determining a conceptual "meaning" (e.g., what meaning the speaker intended to convey) of the detected words by analyzing their grammatical relationship and relative context. For example, U.S. Patent No. 4,887,212, entitled "PARSER FOR NATURAL LANGUAGE TEXT", issued December 12, 1989, assigned to International Business Machines Corporation

and incorporated by reference herein teaches a method of parsing an input stream of words by using word isolation, morphological analysis, dictionary look-up and grammar analysis.

Natural language processing used in concert with speech recognition provides a powerful tool for operating a computer using spoken words rather than manual input such as a keyboard or mouse. However, one drawback of a conventional natural language processing system is that it may fail to determine the correct "meaning" of the words detected by the speech recognition system. In such a case, the user is typically required to recompose or restate the phrase, with the hope that the natural language processing system will determine the correct "meaning" on subsequent attempts. Clearly, this may lead to substantial delays as the user is required to restate the entire sentence or command. Another drawback of conventional systems is that the processing time required for the speech recognition can be prohibitively long. This is primarily due to the finite speed of the processing resources as compared with the large amount of information to be processed. For example, in many conventional speech recognition programs, the time required to recognize the utterance is long due to the size of the dictionary file being searched.

An additional drawback of conventional speech recognition and natural language processing systems is that they are not interactive, and thus are unable to cope with new situations. When a computer system encounters unknown or new networked objects, new relationships between the computer and the objects are formed. Conventional speech recognition and natural language processing systems are unable to cope with the situations that result from the new relationships posed by previously unknown networked objects. As a result, a conversational-style interaction with the computer is not possible. The user is required to

communicate complete concepts to the computer. The user is not able to speak in sentence fragments because the meaning of these sentence fragments (which is dependent on the meaning of previous utterances) will be lost.

Moreover, conventional speech recognition and natural language processing systems fail to generate intelligent conversations because they lack a conversational memory. In other words, conventional systems do not remember the contents of their conversations with users. As a result, conversations with such system are repetitive, and may result in users repeatedly telling the systems the same facts over-and-over, or worse, have systems fail to learn and remember simple concepts.

Another drawback of conventional speech recognition and natural language processing systems is that once a user successfully "trains" a computer system to recognize the user's speech and voice commands, the user cannot easily move to another computer without having to undergo the process of training the new computer. As a result, changing a user's computer workstations or location results in wasted time by users that need to re-train the new computer to the user's speech habits and voice commands.

What is needed is an interactive user interface for a computer that utilizes speech recognition and natural language processing which avoids the drawbacks mentioned above.

BRIEF DESCRIPTION OF THE DRAWINGS

The features, objects and advantages of the embodiments discussed herein will become more apparent from the detailed description set forth below when taken in conjunction with the

drawings in which like reference characters identify correspondingly throughout and wherein:

FIG. 1 is a functional block diagram of an exemplary computer system;

FIG. 2 is an expanded functional block diagram of the CPU and storage medium of the computer system of FIG. 1;

5 FIGS. 3A-D are a flowchart of the method of providing interactive speech recognition and natural language processing to a computer;

FIG. 4 is a diagram of selected columns of an exemplary natural language processing (NLP) database;

FIG. 5 is a diagram of an exemplary Database Definition File (DDF);

10 FIG. 6 is a diagram of selected columns of an exemplary object table;

FIGS. 7A-D are a flowchart illustrating the linking of interactive speech recognition and natural language processing to a networked object, such as a web-page;

FIG. 8 is a diagram depicting a computer system connecting to other computers, storage media, and web-sites via the Internet;

15 FIG. 9 is a diagram of an exemplary user global user registry;

FIGS. 10A-B are flowcharts illustrating alternate embodiments of the retrieval and enabling of an individual's user global user registry during login at a computer workstation; and

FIG. 11 is a diagram depicting an exemplary Dialogue Generation Log.

20 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The embodiments discussed herein will now be disclosed with reference to a functional

block diagram of an exemplary computer system 100 of FIG. 1. In FIG. 1, computer system 100 includes a central processing unit (CPU) 102. The CPU 102 may be any general purpose microprocessor or microcontroller as is known in the art, appropriately programmed to perform the method described herein with reference to FIGS. 3A-D. The software for programming the CPU can be found at storage medium 108 or alternatively from another location across a computer network. For example, the CPU 102 may be a conventional microprocessor such as the Pentium III™ processor manufactured by Intel Corporation or the like.

CPU 102 communicates with a plurality of peripheral equipment, including a display 104, manual input 106, storage medium 108, microphone 110, speaker 112, data input port 114 and network interface 116. Display 104 may be a visual display such as a CRT, LCD screen, touch-sensitive screen, or other monitors as are known in the art for visually displaying images and text to a user. Manual input 106 may be a conventional keyboard, keypad, mouse, trackball, or other input device as is known in the art for the manual input of data. Storage medium 108 may be a conventional read/write memory such as a magnetic disk drive, floppy disk drive, CD-ROM drive, silicon memory or other memory device as is known in the art for storing and retrieving data. Significantly, storage medium 108 may be remotely located from CPU 102, and be connected to CPU 102 via a network such as a local area network (LAN), or a wide area network (WAN), or the Internet. Microphone 110 may be any suitable microphone as is known in the art for providing audio signals to CPU 102. Speaker 112 may be any suitable speaker as is known in the art for reproducing audio signals from CPU 102. It is understood that microphone 110 and speaker 112 may include appropriate digital-to-analog and analog-to-digital conversion circuitry as appropriate. Data input port 114 may be any data port as is known in the art for

interfacing with an external accessory using a data protocol such as RS-232, Universal Serial Bus, or the like. Network interface 116 may be any interface as known in the art for communicating or transferring files across a computer network, examples of such networks include TCP/IP, ethernet, or token ring networks. In addition, on some systems, a network
5 interface 116 may consist of a modem connected to the data input port 114.

Thus, FIG. 1 illustrates the functional elements of a computer system 100. Each of the elements of computer system 100 may be suitable off-the-shelf components as described above. The present embodiment provides a method and system for human interaction with the computer system 100 using speech.

10 As shown in FIG. 8, the computer system 100 may be connected to the Internet 700, a collection of computer networks. To connect to the Internet 700, computer system 100 may use a network interface 116, a modem connected to the data input port 114, or any other method known in the art. Web-sites 710, other computers 720, and storage media 108 may also be connected to the Internet through such methods known in the art.

15 Turning now to FIG. 2, an expanded functional block diagram of CPU 102 and storage medium 108 is illustrated. It is understood that the functional elements of FIG. 2 may be embodied entirely in hardware, firmware, or as software instructions encoded on a computer-readable medium. In the case of a software embodiment, the software may be found at storage medium 108 or at an alternate location across a computer network. CPU 102 includes speech
20 recognition processor 200, data processor 201, natural language processor 202, and application interface 220. The data processor 201 interfaces with the display 104, storage medium 108, microphone 110, speaker 112, data input port 114, and network interface 116. The data

processor 201 allows the CPU to locate and read data from these sources. Natural language processor 202 further includes variable replacer 204, string formatter 206, word weighter 208, boolean tester 210, pronoun replacer 211, and search engine 213. Storage medium 108 includes a plurality of context-specific grammar files 212, general grammar file 214, dictation grammar 216, context-specific dictation model 217, natural language processor (NLP) database 218, and a dialogue generation log (DGL) file 219. In the preferred embodiment, the grammar files 212, 214, and 216 are Bakus-Naur Form (BNF) files, which describe the structure of the language spoken by the user. BNF files are well known in the art for describing the structure of language, and details of BNF files will therefore not be discussed herein. One advantage of BNF files is that hierarchical tree-like structures may be used to describe phrases or word sequences, without the need to explicitly recite all combinations of these word sequences. Thus, the use of BNF files in the preferred embodiment minimizes the physical sizes of the files 212, 214, and 216 in the storage medium 108, increasing the speed at which these files can be enabled and searched as described below. However, in alternate embodiments, other file structures are used.

The context-specific dictation model 217 is an optional file that contains specific models to improve dictation accuracy. These models enable users to specify word orders and word models. The models accomplish this by describing words and their relationship to other words, thus determining word meaning by contextual interpretation in a specific field or topic. Take for example, the phrase "650 megahertz microprocessor computer." A context-specific dictation model 217 for computers may indicate the likelihood of the word "microprocessor" being associated with "computer," and that a number, such as "650" is likely to be found near the word "megahertz." By interpreting the context of the words, via a context-specific dictation model

217, a speech recognition processor would analyze the phrase, interpret a single object, i.e. the computer, and realize that “650 megahertz microprocessor” are adjectives or traits describing the type of computer.

Topics for context-specific dictation models 217 vary widely, and may include any topic area of interest to a user—both broad and narrow. Broad topics may include: history, law, 5 medicine, science, technology, or computers. Specialized topics, such as a particular field of literature encountered at a book retailer’s web-site are also possible. Such a context-specific dictation model 217 may contain text for author and title information, for example.

The context-specific dictation model 217 format relies upon the underlying speech 10 recognition processor 200, and is specific to each type of speech recognition processor 200.

A dialogue generation log 219 is a file, database table, or any other log known in the art that contains a memory of the conversations between a computer or system practicing the present embodiment, and a user of such a system. The purpose behind the dialogue generation log 219 is to create a conversational memory by storing a log of what is spoken. The log is also used to 15 avoid repetitive speech generation.

An exemplary dialogue generation log 219 is shown in FIG. 11. In this example, the dialogue generation log 219 is comprised of individual dialogue generation log entries 1112A-x, each entry representing a line of dialogue or statement exchanged between the system and a user. Although the format of each entry may vary from embodiment to embodiment, an example 20 dialogue generation log entry would contain information such as a log entry identifier (ID) 1102, a user identifier 1104, a statement 1106, the context of the statement 1108, and a date/time stamp 1110. The log entry ID 1102 uniquely identifies each entry 1112. A user ID 1104 represents

each user of the system. Statements made by the system itself are also recorded in the log, and a special user ID 1104 is given to the system. In the example illustrated in FIG 11, the system is designated as user "-1," and other users are given positive numbers as their user ID 1104. Other formats to represent users are certainly possible likely. The important part is that the system is uniquely identified with a user ID 1104 different from system users. Next, each entry contains a statement of what was spoken 1106, and preferably the context 1108 in which the statement was spoken. For example, the statement "I would like to see movies," would be linked to the context of "movies" or "film." Lastly, a date-time-stamp 1110 may be recorded with each entry to identify the time frame (i.e. how recent) the statement was last made.

The operation and interaction of these functional elements of FIG. 2 will be described with reference to the flowchart of FIGS. 3A-3D. In FIG. 3A, the flow begins at block 300 with the providing of an utterance to speech processor 200. An utterance is a series of sounds having a beginning and an end, and may include one or more spoken words. A microphone 110 may capture the spoken words in block 300. Alternately, the utterance may be provided to the speech processor 200 over data input port 114, or from storage medium 108. Preferably, the utterance is in a digital format such as the well-known ".wav" audio file format.

The flow proceeds to decision 302 where the speech processor 200 determines whether one of the context-specific grammars 212 has been enabled. If the context-specific grammars 212 are enabled, the context-specific grammars 212 are searched at block 304. In the preferred embodiment, the context-specific grammars 212 are BNF files that contain words and phrases which are related to a parent context. In general, a context is a subject area. For example, in one embodiment applicable to personal computers, examples of contexts may be "news", or

"weather", or "stocks". In such a case, the context-specific grammars 212 would each contain commands, control words, descriptors, qualifiers, or parameters that correspond to a different one of these contexts. The use of contexts provides a hierarchal structure for types of information. Contexts and their use will be described further below with reference to the NLP database 218.

5 If a context-specific grammar 212 has been enabled, the context-specific grammar 212 is searched for a match to the utterance provided at block 300. However, if a context-specific grammar 212 has not been enabled, the flow proceeds to block 308 where the general grammar 214 is enabled.

10 In the preferred embodiment, the general grammar 214 is a BNF file which contains words and phrases which do not, themselves, belong to a parent context, but may have an associated context for which a context-specific grammar file 212 exists. In other words, the words and phrases in the general grammar 214 may be at the root of the hierarchal context structure. For example, in one embodiment applicable to personal computers, the general grammar 214 would contain commands and control phrases.

15 In block 310, the general grammar 214 is searched for a matching word or phrase for the utterance provided at block 300. A decision is made, depending on whether the match is found, at block 312. If a match is not found, then the dictation grammar 216 is enabled at block 314. In the preferred embodiment, the dictation grammar 216 is a BNF file that contains a list of words that do not, themselves, have either a parent context or an associated context. For example, in
20 one embodiment applicable to a personal computer, the dictation grammar 216 contains a relatively large list of general words similar to a general dictionary.

 In block 316 the dictation grammar is searched for matching words for each word of the

utterance provided at block 300. At decision block 318, if no matching words are found, any relevant context-specific dictation model 217 is enabled at block 317.

At decision block 319, if no matching words are found, a visual error message is optionally displayed at the display 104 or an audible error message is optionally reproduced
5 through speaker 112, at block 320. The process ends until another utterance is provided to the speech processor 200 at block 300.

Thus, as can be seen from the above description, when an utterance is provided to the speech processor 200, the enabled context-specific grammar 212, if any, is first searched. If there are no matches in the enabled context-specific grammar 212, then the general grammar 214
10 is enabled and searched. If there are no matches in the general grammar 214, then the dictation grammar 316 is enabled and searched. Finally, if there are no matches in the dictation grammar 316, a context-specific dictation model 217 is enabled 317 and used to interpret the utterance.

In the preferred embodiment, when the speech recognition processor 200 is searching either the context-specific grammar 212 or the general grammar 214, it is said to be in the
15 “command and control” mode. In this mode, the speech recognition processor 200 compares the entire utterance as a whole to the entries in the grammar. By contrast, when the speech recognition processor 200 is searching the dictation grammar, it is said to be in the “dictation” mode. In this mode, the speech recognition processor 200 compares the utterance to the entries in the dictation grammar 216 one word at a time. Finally, when the speech recognition processor
20 200 is matching the utterance with a context-specific dictation model 217, it is said to be in “model matching” mode. It is expected that searching for a match for an entire utterance in the command and control mode will generally be faster than searching for one word at a time in

dictation or model matching modes.

It is further expected that any individual context-specific grammar 212 will be smaller in size (i.e., fewer total words and phrases) than the general grammar 214, which in turn will be smaller in size than the dictation grammar 216. Thus, by searching any enabled context-specific grammar 212 first, it is likely that a match, if any, will be found more quickly, due at least in part to the smaller file size. Likewise, by searching the general grammar 214 before the dictation grammar 216, it is likely that a match, if any, will be found more quickly.

Additionally, as will be explained further below with regard to the ability of the present embodiment to adaptively add to both the context-specific grammar 212 and the general grammar 214, they will contain the most common utterances. As such, it is expected that a match is more likely to be found quickly in the context-specific grammar 212 or the general grammar 214 than in the dictation grammar 216.

Finally, as will be explained further below, the words and phrases in the enabled context-specific grammar 212 are more likely to be uttered by the user because they are words that are highly relevant to the subject matter about which the user was most recently speaking. This also allows the user to speak in a more conversational style, using sentence fragments, with the meaning of his words being interpreted according to the enabled context-specific grammar 212.

By searching in the above-described sequence, the present embodiment may search more efficiently than if the searching were to occur one entry at a time in a single, large list of all expected words and phrases.

Referring back to decision 306, if a match is found in the context-specific grammar 212, then there are three possible next alternatives shown in FIG. 3A. For each matching entry in the

enabled context-specific grammar 212, there may be an associated action to be taken by the speech recognition processor 200. Block 322 shows that one action may be to direct application interface 220 to take some action with respect to a separate software application or entity. For example, application interface 220 may use the Speech Application Programming Interface (SAPI) standard by Microsoft to communicate with an external application. The external application may be directed, for example, to access a particular Internet web site URL or to speak a particular phrase by converting text to speech. Other actions may be taken as will be discussed further below with reference to the NLP database 218 of FIG. 4.

Block 324 shows that another action may be to access a row in the natural language processing (NLP) database 218 directly, thereby bypassing the natural language processing method described further below. Block 326 shows that another action may be to prepend a word or phrase for the enabled context to the matching word or phrase found in the context-specific grammar 306. For example, if the enabled context were "movies" and the matching utterance were "8 o'clock," the word "movies" would be prepended to the phrase "8 o'clock" to form the phrase "movies at 8 o'clock."

Likewise, if a match is found in the general grammar 214, then the flow may proceed to block 322 where the application interface 220 is directed to take an action as described above, or to block 324 where a row in the NLP database is directly accessed. However, if a match is found in the general grammar 214, no prepending of a context occurs because, as stated above, the entries in the general grammar 214 do not, themselves, have a parent context.

Alternatively, manually entered words may be captured, at block 301, and input into the natural language processor.

Finally, with reference to FIG. 3A, words may be entered manually via manual input 106. In this case, no speech recognition is required, and yet natural language processing of the entered words is still desired. Thus, the flow proceeds to FIG. 3B.

In FIG. 3B, at block 328, the natural language processor 202 formats the phrase for
5 natural language processing analysis. This formatting is accomplished by string formatter 206 and may include such text processing as removing duplicate spaces between words, making all letters lower case (or upper case), expanding contractions (e.g., changing "it's" to "it is"), and the like. The formatting prepares the phrase for parsing.

The flow continues to block 330 where certain "word-variables" are replaced with an
10 associated wildcard function by variable replacer 204 in preparation for accessing the NLP database 218. As used herein, the term "word-variables" refers to words or phrases that represent amounts, dates, times, currencies, and the like. For example, in one embodiment the phrase "what movies are playing at 8 o'clock" would be transformed at block 330 to "what movies are playing at \$time" where "\$time" is a wildcard function used to represent any time value. As
15 another example, in one embodiment the phrase "sell IBM stock at 100 dollars" would be transformed at block 330 to "sell IBM stock at \$dollars" where "\$dollars" is a wildcard function used to represent any dollar value. This block may be accomplished by a simple loop that searches the phrase for key tokens such as the words "dollar" or "o'clock" and replaces the word-variables with a specified wildcard function. In order to keep track of the location in the phrase
20 where the substitution was made, an array may be used. This allows re-substitution of the original word-variable back into the phrase at the some position after the NLP database 218 has been searched.

The purpose of replacing word-variables with an associated wildcard function at block 330 is to reduce the number of entries that must be present in the NLP database 218. For example, the NLP database 218 would only contain the phrase "what movies are playing at \$time" rather than a separate entry for 8 o'clock, 9 o'clock, 10 o'clock, and so on. The NLP database 218 will be described further below.

At block 332, pronouns in the phrase are replaced with proper names by pronoun replacer 211. For example, in one embodiment the pronouns "I," "my," or "mine" would be replaced with the speaker's name. Block 332 allows user-specific facts to be stored and accessed in the NLP database 218. For example, the sentence "who are my children" would be transformed into "who are Dean's children" where "Dean" is the speaker's proper name. Again, this block may be performed in a simple loop that searches the phrase for pronouns, and replaces the pronouns found with an appropriate proper name. In order to keep track of the locations in the phrase where a substitution was made, an array may be used.

In block 334, the individual words in the phrase are weighted according to their relative "importance" or "significance" to the overall meaning of the phrase by word weighter 208. For example, in one embodiment there are three weighting factors assigned. The lowest weighting factor is assigned to words such as "a," "an," "the," and other articles. The highest weighting factor is given to words that are likely to have a significant relation to the meaning of the phrase. For example, these may include all verbs, nouns, adjectives, and proper names in the NLP database 218. A medium weighting factor is given to all other words in the phrase. The purpose of this weighting is to allow for more powerful searching of the NLP database 218.

An example of selected columns of the NLP database 218 of one embodiment is shown in

FIG. 4. The NLP database 218 comprises a plurality of columns 400-410, and a plurality of rows 412A-412N. In column 400, the entries represent phrases that are "known" to the NLP database. In column 402, a number of required words for each entry in column 400 is shown. In column 404, an associated context or subcontext for each entry in column 400 is shown. In columns 408 and 410, one or more associated actions are shown for each entry in column 400. It should be noted that the NLP database 218 shown in FIG. 4 is merely a simplified example for the purpose of teaching the present embodiment. Other embodiments may have more or fewer columns with different entries.

Referring back to FIG. 3B, at block 336, the NLP database 218 is searched for possible matches to the phrase, based on whether the entry in column 400 of the NLP database 218 contains any of the words in the phrase (or their synonyms), and the relative weights of those words. At block 338, a confidence value is generated for each of the possible matching entries based on the number of occurrences of each of the words in the phrase and their relative weights. Weighted word searching of a database is well known in the art and may be performed by commercially available search engines such as the product "dtsearch" by DT Software, Inc. of Arlington, Virginia. Likewise, searching using synonyms is well known in the art and may be accomplished using such publicly available tools such as "WordNet," developed by the Cognitive Science Laboratory of Princeton University in Princeton, New Jersey. The search engine may be an integral part of the natural language processor 202.

At decision 340, the natural language processor 202 determines whether any of the possible matching entries has a confidence value greater than or equal to some predetermined minimum threshold, T. The threshold T represents the lowest acceptable confidence value for

which a decision can be made as to whether the phrase matched any of the entries in the NLP database 218. If there is no possible matching entry with a confidence value greater than or equal to T, then the flow proceeds to block 342 where an optional error message is either visually displayed to the user over display 104 or audibly reproduced over speaker 112. In one embodiment, the type of error message, if any, displayed to the user may depend on how many “hits” (i.e., how many matching words from the phrase) were found in the highest-confidence NLP database entry. A different type of error message would be generated if there was zero or one hits, than if there were two or more hits.

If, however, there is at least one entry in the NLP database 218 for which a confidence value greater than or equal to T exists, then the flow proceeds to block 344 where the “noise” words are discarded from the phrase. The “noise” words include words that do not contribute significantly to the overall meaning of the phrase relative to the other words in the phrase. These may include articles, pronouns, conjunctions, and words of a similar nature. “Non-noise” words would include words that contribute significantly to the overall meaning of the phrase. “Non-noise” words would include verbs, nouns, adjectives, proper names, and words of a similar nature.

The flow proceeds to FIG. 3C where the non-noise word requirement is retrieved from column 402 of the NLP database 218 for the highest-confidence matching entry at block 346. For example, if the highest-confidence matching phrase was the entry in row 412A, (e.g., “what movies are playing at \$time”), then the number of required non-noise words is 3.

At decision 348, a test is made to determine whether the number of required non-noise words from the phrase is actually present in the highest-confidence entry retrieved from the NLP

database 218. This test is a verification of the accuracy of the relevance-style search performed at block 336, it being understood that an entry may generate a confidence value higher than the minimum threshold, T, without being an acceptable match for the phrase.

5 The nature of the test performed at decision 348 is a boolean "AND" test performed by boolean tester 210. The test determines whether each one of the non-noise words in the phrase (or its synonym) is actually present in the highest-confidence entry. If there are a sufficient number of required words actually present in the highest-confidence entry, then the flow proceeds to block 350, where the natural language processor 202 directs application interface 220 to take an associated action from column 408 or 410. It is understood that additional action
10 columns may also be present.

For example, if the highest confidence entry was the entry in row 412A, and the boolean test of decision 348 determined that there actually were 3 non-noise words from the phrase in the entry in column 400, then the associated action in column 408 (e.g., access movie web site) would be taken. Other entries in the NLP database have other associated actions. For example,
15 if the highest-confidence entry is that in row 412E (e.g., "what time is it"), the associated action may be for natural language processor 202 to direct a text-to-speech application (not shown) to speak the present time to the user through the speaker 112. As another example, if the highest-confidence entry is that in row 412F (e.g., "show me the news"), the first associated action may be to access a predetermined news web site on the Internet, and a second associated action may
20 be to direct an image display application (not shown) to display images associated with the news. Different or additional actions may also be performed.

Also, if the highest-confidence entry contains the required number of non-noise words

from the phrase as determined at decision 348, the natural language processor 202 instructs the speech recognition processor 200 to enable the context-specific grammar 212 for the associated context of column 404. Thus, for row 412A, context-specific grammar 212 for the context "movies" would be enabled. Thus, when the next utterance is provided to the speech recognition processor 200 in block 300 of FIG. 3A, it would search the enabled context-specific grammar 212 for "movies" before searching the general grammar 214. As previously stated, enabling the appropriate context-specific grammar 212 greatly increases the likelihood of fast, successful speech recognition, and enhances the user's ability to communicate with the computer in a conversational style.

If, however, back at decision 348, the required number of non-noise words from the phrase is not actually present in the highest-confidence entry retrieved from the NLP database 218, then the flow proceeds to block 354 where the user is prompted over display 104 or speaker 112 whether the highest-confidence entry was meant, and record the inquiry in the dialogue generation log 219. For example, if the user uttered "How much is IBM stock selling for today," the highest-confidence entry in the NLP database 218 may be the entry in row 412B. In this case, although the relevance factor may be high, the number of required words (or their synonyms) may not be sufficient. Thus, the user would be prompted at block 354 whether he meant "what is the price of IBM stock on August 28, 1998."

The user may respond either affirmatively or negatively. If it is determined at decision 356 that the user has responded affirmatively, then the action associated with the highest-confidence entry is taken at block 350, and the associated context-specific grammar 212 enabled at block 352. The speech made by the user is also recorded as an entry of the dialogue generation

log 219.

If, however, it is determined at decision 356 that the user has responded negatively, then the flow proceeds to FIG. 3D where the associated context from column 404 of NLP database 218 is retrieved for the highest-confidence entry, and the user is prompted for information using a context-based interactive dialog at block 360. For example, if the user uttered "what is the price of XICOR stock today," and the highest confidence entry from the NLP database 218 was row 412B (e.g., "what is the price of IBM stock on \$date"), then the user would be prompted at block 354 whether that was what he meant.

If the user responds negatively, then the context "stock" is retrieved from column 404 at block 358, and the context-based interactive dialog for the stock context is presented to the user over the display 104 and speaker 112. Such a context-based interactive dialog may entail prompting the user for the name and stock ticker symbol of XICOR stock. The user may respond by speaking the required information. A different context-based interactive dialog may be used for each of the possible contexts. For example, the "weather" context-based interactive dialog may entail prompting the user for the name of the location (e.g., the city) about which weather information is desired. Also, the "news" context-based interactive dialog may entail prompting the user for types of articles, news source, Internet URL for the news site, or other related information.

Upon completion of the context-based interactive dialog, the NLP database 218, general grammar 214, and context-specific grammar 212 are updated to include the new information, at block 362. In this way, the next time the user asks for that information, a proper match will be found, and the appropriate action taken without prompting the user for more information. Thus,

the present embodiment adaptively “learns” to recognize phrases uttered by the user.

In one embodiment, one or more of the NLP database 218, context-specific grammar 212, general grammar 214, and dictation grammar 216 also contain time-stamp values (not shown) associated with each entry. Each time a matching entry is used, the time-stamp value associated with that entry is updated. At periodic intervals, or when initiated by the user, the entries that
5 have a time-stamp value before a certain date and time are removed from their respective databases/grammars. In this way, the databases/grammars may be kept to an efficient size by “purging” old or out-of-date entries. This also assists in avoiding false matches.

In an alternate embodiment, the updates to the NLP database 218, general grammar 214, and context-specific grammar 212 are stored in a user global user registry 800, shown in FIG. 9.
10 A global user registry entry 800a would be comprised of any general grammar additions 214a, context-specific grammar additions 212a, and NLP database additions 218a created by the user training. Since each user of the system would have a different global user registry entry 800a, the embodiment would be flexible enough to allow for special customizations and could adapt to the idiosyncrasies of individual users.
15

In yet another embodiment, the updates to global user registry entry 800 also contain dialogue generation log additions 219a, user preferences 802, and remembered information 804, as shown in FIG. 9. The dialogue generation log additions 219a would be comprised of the dialogue exchanged between the system and an individual user. The addition of dialogue
20 generation log additions 219a allow the system greater intelligence in its conversations with an individual user, to be transparent and mobile across different computers. User preferences 802 represents the stored system preferences of an individual user. Examples of such user preferences

802, include, but are not limited to: window color and placement, system sounds, font preferences, and other user-interface preferences. Remembered information 804 includes user schedule information, learned facts derived from the dialogue generation log 219, and any other user (but non-user-interface) stored data not included in user preferences. For example, if the system is told, "I own a dog," the remembered information will include that fact. Remembered information may be stored or represented by any information storage format known in the art, including any database format.

Moreover, in some embodiments, the global user registry 800 would be stored locally and mirrored at known server locations. The mirrored copy, referred to as the "travelling" global user registry entry, enables users to access their phrases "adaptively" learned by the embodiment, even when the user is logged into a different location. FIG. 10A illustrates an embodiment that accesses customized global user registry entries 800a at local and remote (travelling) locations. Initially, a valid system user is verified, by any means known in the art, and then the system searches for a locally stored global user registry entry. For example, the system queries users for their login ID and password as shown in block 900. If the password and login ID match, as determined by decision block 905, the user is deemed to be a valid user. It is well understood that this login ID and password are but one of many methods known in the art to verify valid users, and that all such validation systems could be easily substituted. If no local global user registry entry is found, block 910, the system searches for a travelling global user registry entry, block 920. If either search turns up a global user registry entry, the global user registry entry is loaded, blocks 915 and 925, respectively. Provided that the retrieval of the global user registry entry 800a is successful, blocks 930 and 935, the global user registry entry 800a is enabled at block

940 by extracting the general grammar additions 214a, context-specific grammar additions 212a, NLP database additions 218a, dialogue generation log additions 219a, user preferences 802, and remembered information 804. These “learned” adaptations are then used by the system, as discussed earlier with the method of FIGS 3A-3D. If the retrieval of the travelling global user registry entry 800a is unsuccessful, standard (non-custom user) processing is performed as reflected at block 945.

Alternatively, in some embodiments, the user only logs into the system when accessing a terminal that does not recognize the user as a local user. This embodiment is shown in FIG. 10B. From this remote system, the user is required to specify an ID and a password. Initially, the system determines whether the user has a locally stored voice profile, block 910. If the user has a local voice profile, it is loaded at block 915, and flow continues at decision block 950. If the user does not have a locally stored global user registry entry, the system queries the user for a login identifier and a password at block 900. If the user is valid, the travelling global user registry entry is retrieved at block 925, and flow continues at block 950. Otherwise, the user is treated as a user with standard (non-custom) processing, at block 945. Provided that the retrieval of the global user registry entry 800a is successful, block 950, the global user registry entry 800a is enabled at block 940 by extracting the general grammar additions 214a, context-specific grammar additions 212a, NLP database additions 218a, dialogue generation log additions 219a, user preferences 802, and remembered information 804. These “learned” adaptations are then used by the system, as discussed earlier with the method of FIGS 3A-3D.

In one embodiment, speech recognition and natural language processing may be used to interact with objects, such as help files (“.hlp” files), World-Wide-Web (“WWW” or “web”)

pages, or any other objects that have a context-sensitive voice-based interface.

FIG. 5 illustrates an exemplary Dialog Definition File (DDF) 500 which represents information necessary to associate the speech recognition and natural language processing to an internet object, such as a text or graphics file or, in the preferred embodiment, a web-page or help file. Although in its simplest embodiment the Dialog Definition File 500 consists of an object table 510, the DDF may also contain additional context-specific grammar files 214 and additional entries for the natural language processing (NLP) database 218, as illustrated in FIG.

5 The preferred embodiment of the DDF 500 includes an object table 510, a context-specific grammar file 214, a context-specific dictation model 217, and a file containing entries to the natural language processing database 218. These components may be compressed and combined into the DDF file 500 by any method known in the art, such as through Lempel-Ziv compression.

10 The context-specific specific grammar file 214 and the natural language processing database 218 are as described in earlier sections. The object table 510 is a memory structure, such as a memory tree, chain or table, which associates an address of a resource with various actions, grammars, or entries in the NLP database 218.

15 An exemplary embodiment of the object table 510 is illustrated in FIG. 6. FIG. 6 illustrates a memory table which may contain entry columns for: an object 520, a Text-to-Speech (TTS) flag 522, a text speech 524, a use grammar flag 526, an append grammar flag 528, an "is yes/no?" flag, and "do yes" 532 and "do no" 534 actions. Each row in the table 540A-540n would represent the grammar and speech related to an individual object. The exemplary embodiment would refer to objects 520 through a Universal Resource Locator (URL). A URL is a standard method of specifying the address of any resource on the Internet that is part of the

World-Wide-Web. As this standard is well known in the art for describing the location of Internet resources and objects, the details of URLs will therefore not be discussed herein. One advantage of URLs is that they can specify information in a large variety of object formats, including hypertext, graphical, database and other files, in addition to a number of object devices and communication protocols. However, as shown in FIG. 6, URLs and other method of specifying objects can be used.

When combined with the text speech 524, the Text-to-Speech (TTS) flag 522 indicates whether an initial statement should be voiced over speaker 112 when the corresponding object is transferred. For example, when transferring the web page listed in the object column 520 of row 540A (<http://www.our-pet-store.com>), the TTS flag 522 is marked, indicating the text speech 524, "Hello, welcome to...", is to be voiced over speaker 112.

In some embodiments, the utterance of the initial statement may be dependent on the dialogue generation log 219. In these embodiments, the system first checks to see if the statement was made recently to a user, before re-voicing the statement. There are several advantages in doing this. By consulting the dialogue generation log 219, a conversation can be made more intelligent by using the dialogue generation log 219 as a "conversational memory." Moreover, a conversational memory formed by the dialogue generation log 219 also acts as a "sanity check" to make sure conversations do not become repetitive.

The use of the dialogue generation log 219 is best illustrated by example. Suppose a user was examining a speech-enhanced pet-store web-site using the present embodiment. Initially, an object table 510 is transferred from the web-site to the user's computer system 100. When transferring the web page listed in the object column 520, the system notes that the TTS flag 522

is marked, indicating the text speech 524, "Hello, welcome to our pet store, would you like to see our dog specials?" Since this is the user's first visit to the web page, no context or statement-related entries are found in the dialogue generation log 219, so the statement is to be voiced over speaker 112. The user responds, "no," and decides to surf a different web page instead.

5 Transparent to the user, the system records both statements in the dialogue generation log 219. Moments later, the user presses the web-browser "back" key, returning to the original pet-store web page. At this time, the user returns to the web page, and again, the system notes that the TTS flag 522 is marked, indicating the text speech 524, "Hello, welcome to our pet store, would you like to see our dog specials?" Since this is the user's subsequent visit to the web page, a
10 statement-related entry is found in the dialogue generation log 219. Since statement was recently voiced over the speaker, it is not voiced on again on a subsequent visit.

The next three object table 510 flags relate to the use of grammars associated with this object. The affirmative marking of the "use grammar" 526 or "append grammar" 528 flags indicate the presence of a content-specific grammar file 214 related to the indicated object. The
15 marking of the "use grammar" flag 526 indicates that the new content-specific grammar file 214 replaces the existing content-specific grammar file, and the existing file is disabled. The "append grammar" flag 528 indicates that the new content-specific grammar file should be enabled concurrently with the existing content-specific grammar file.

Lastly, the remaining column entries relate to a "yes/no" grammar structure. If the "Is
20 yes/no?" flag 530 is marked, then a standard "yes/no" grammar is enabled. When a standard "yes/no" grammar is enabled, affirmative commands spoken to the computer result in the computer executing the command indicated in the "Do Yes" entry 532. Similarly, a negative

command spoken to the computer results in the computer executing the command indicated in the "Do No" entry 534. The entries in the "Do Yes" 532 and "Do No" 534 columns may either be commands or pointers to commands imbedded in the NLP Database 218. For example, as shown in row 540B, the "Is Yes/No?" flag is marked. An affirmative answer, such as "yes,"
5 given to the computer, would result in executing the corresponding command in the "Do Yes" entry 532; in this specific case, the entry is the number "210," a reference to the 210th command in the NLP database. An answer of "no" would result in the computer executing the 211th command in the NLP database.

Turning now to FIG. 7A, a method and system of providing speech and voice commands
10 to objects, such as a computer reading a help file or browsing the World-Wide-Web, is illustrated. The method of FIGS. 7A-7D may be used in conjunction with the method of FIGS 3A-3D and FIG. 10. In block 602, an object location is provided to a help file reader or World-Wide-Web browser. A help file reader/browser is a program used to examine hypertext documents that are written to help users accomplish tasks or solve problems, and is well known
15 in the art. The web browser is a program used to navigate through the Internet, and is well known in the art. Block 602, which providing an object location to the browser, can be as simple as a user clicking on a program "help" menu item, manually typing in a URL, or having a user select a "link" at a chosen web-site. It also may be the result of a voiced command as described earlier with reference to the action associated with each entry in the NLP database 218. Given
20 the object location, the computer must decide on whether it can resolve object location specified, at block 604. This resolution process is a process well known in the art. If the computer is unable to resolve the object location or internet address, an error message is displayed in the

browser window, at block 605, and the system is returned to its initial starting state 600. If the object location or Internet address is resolved, the computer retrieves the object at block 606. For a networked object, for example, a web browser sends the web-site a request to for the web page, at block 606. For a help file application, the help reader reads the help file off of storage media 108, at block 606.

A decision is made, depending upon whether the object is retrieved, at block 608. If the object cannot be retrieved, an error message is displayed in the browser window, at block 605, and the system is returned to its initial starting state 600. If the object is retrieved, it is displayed in the help-reader or web-site browser, as appropriate, at block 610.

In decision block 612, the computer 100 determines whether the DDF file 500 corresponding to the object is already present on the computer 100. If the DDF file is present, the flow proceeds to FIG. 7C, if not the flow proceeds to FIG. 7B.

Moving to FIG. 7B, if the DDF file 500 is not present, the computer examines whether the DDF file 500 location is encoded within the object. For example, the DDF file location could be encoded within web page HyperText Markup Language (HTML) as a URL. (Note that HTML is well known in the art, and the details of the language will therefore not be discussed herein.) Encoding DDF file location within HTML code may be done either through listing the DDF file location in an initial HTML meta-tag such as:

```
<meta DDF= "http://www.our-pet-store.com/ConverseIt.ddf">
```

or directly through a scripting tag written into the variation of HTML supported by the browser,

```
<!--
```

```
<DDF= "http://www.our-pet-store.com/ConverseIt.ddf">
```

```
-->
```

If the DDF file location information is encoded within the web page, the location's Internet address is resolved, at block 616, and the computer requests transfer of the DDF file 500, at block 626. An equivalent encoding scheme could be used within help file hypertext.

Alternatively, if the DDF file 500 location is not encoded within the object, there are
5 several alternate places that it may be stored. It may be stored in a pre-defined location at a web-site, such as a certain file location in the root directory, or at a different centralized location, such as another Internet server or the storage medium 108 of FIG. 1. Blocks 618 and 620 test for these possibilities. Block 618 determines whether the DDF file is located at the web-site. At block 618, the computer sends query to the web-site inquiring about the presence of the DDF file
10 500. If the DDF file 500 is present at the web-site, the computer requests transfer of the DDF file 500, at block 626. If the DDF file 500 is not located at the web-site, the computer queries the centralized location about the presence of a DDF file for the web-site, at block 620. If the DDF file is present at the web-site, the computer requests transfer of the DDF file, at block 626. If the DDF file 500 cannot be found, the existing components of any present DDF file, such as the
15 object table 510, context-specific dictation model 217, NLP database 218 associated with the object, and context-specific grammar 214 for any previously-viewed object, are deactivated in block 622. Furthermore, the object is treated as a non-voice-activated object, and only standard grammar files are used, at block 624. Standard grammar files are the grammar files existing on the system excluding any grammars associated with the content-specific grammar file associated
20 with the object.

If the DDF file 500 is requested at block 626, and its transfer is unsuccessful, any existing components of any present DDF file 500 are deactivated, at block 622, and the web-site is treated

as a non-voice-activated object, and only standard grammar files are used, at block 624.

If the DDF file 500 is requested at block 626 and its transfer is successful at block 628, it replaces any prior DDF file, at block 630. Any components of the DDF file 500, such as the object table 510, context-specific-grammar files 214, context-specific-dictation models 217, and
5 NLP database 218 are extracted at block 632. A similar technique may be used for obtaining the software necessary to implement the method illustrated in FIGS. 3A-3D, comprising the functional elements of FIG. 2.

The flow moves to FIG. 7C. The object table 510 is read into memory by the computer in block 634. If the object is present in the site object table 510, as determined by block 636, it
10 will be represented by a row 540A-540n of the table, as shown in FIG. 6. Each row of the object table represents the speech-interactions available to a user for that particular object. If no row corresponding to the object exists, then no-speech interaction exists for the web page, and processing ends.

If the object location is present in the site object table 510, as determined by block 636,
15 the computer checks if the TTS flag 522 is marked, to determine whether a text speech 524 is associated with the web-page, at block 638. If there is a text speech 524, a decision must be made on whether it is appropriate to play the spoken statement 639. For example, if a user was queried, "Would you like to hear about the history of Mars?" in the past five minutes, it would be inappropriate, and probably annoying, to ask the user the same question again. In making such a
20 determination, the system checks whether the statement has been made to the user recently by examining the dialogue generation log 219.

An individual user may be matched with a statement or statement context within a recent

interval. Suppose the system asked, "Do you own a cat?" and the user replied, "No, I hate cats." The conversation would be recorded in the dialogue generation log 219, noting that the context of the conversation is about cats. On a subsequent visit to a pet-store web-site, the system notes that the TTS flag 522 is marked, indicating the text speech 524, "Hello, welcome to our pet store, would you like to see our cat specials?" Since the text-to-speech statement is an inquiry about cats, the system performs a check in the dialogue generation log 219 to see if there are past conversations with a context 1108 of "cat." The context of "cat" is located, and the system notes that the user responded "no," therefore the user does not own a cat. Consequently, the system realizes that a negative match has been made, and it would be inappropriate to voice the question to the user.

Thus, since dialogue generation log entries 1112 are time dependent, they must be kept up-to-date by the system, and old entries should be culled and removed on a periodic basis. After all, in the case of the above example, it is possible that the user eventually acquires a cat. Old entries may be removed after a certain time-period expires, or after the dialogue generation log 219 reaches a specific size. Dialogue generation log entries 1112 for each user can be removed on a first-in-first-out (FIFO) basis, so that older entries are removed before more recent entries.

If it is appropriate, the statement is voiced at block 640, and flow continues on to FIG 7D.

If there is a context-specific grammar file associated with the object, as determined by decision block 642, it is enabled at block 644, and then the NLP database 218 is enabled at block 646. If no context-specific grammar file is associated with the object, only the NLP database 218 is enabled at block 646. Once the NLP database is enabled 646, the system behaves as shown in FIG. 3A-3C, as described above.

In summary, the present embodiment provides a method and system for an object interactive user-interface for a computer. By the use of context-specific grammars that are tied to internet-objects through a Dialog Definition File, the present embodiment decreases speech recognition time and increases the user's ability to communicate with local and networked objects, such as help files or web-pages, in a conversational style. Adaptive updating of the various grammars and the NLP database, the present embodiment further increases interactive efficiency. The adaptive updates can be incorporated into global user registry entries that can be stored locally and remotely, to allow users access to the global user registry entries at various locations.

The previous description of the embodiments is provided to enable any person skilled in the art to make or use the present invention. The various modifications to these embodiments will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments without the use of inventive faculty. Thus, the present invention is not intended to be limited to the embodiments shown herein, but is to be accorded the widest scope consistent with the principles and novel features disclosed herein.

I CLAIM:

CLAIMS

- 1 1. A method for interacting with an object via a computer using utterances, the method
2 comprising:
3 retrieving an object table associated with the object;
4 searching the object table for a matching entry for the object;
5 locating an action associated with the matching entry, if the matching entry is found in the
6 object table;
7 determining whether the action associated with the matching entry is appropriate;
8 performing the action associated with the matching entry, if the action is deemed
9 appropriate.
- 1 2. The method of claim 1 wherein the action associated with the matching entry is voicing a
2 text statement.
- 1 3. The method of claim 2 wherein the process of determining whether the action associated
2 with the matching entry is appropriate further comprises:
3 identifying a context of the voiced text statement associated with the matching entry;
4 searching a log containing log entries with context and timestamp information to locate
5 matching log entries with the same context as the voiced text statement;
6 determining whether the voiced text statement is appropriate based on the timestamp of the
7 matching log entries.
- 1 4. The method of claim 2 wherein the process of determining whether the action associated
2 with the matching entry is appropriate further comprises:

3 searching a log containing log entries with statement and timestamp information to locate
4 matching log entries with the same voiced text statement;

5 determining whether the voiced text statement is appropriate based on the timestamp of the
6 matching log entries.

1 5. The method of claim 3 or 4 wherein the object table is read from a web-site.

1 6. The method of claim 3 or 4 wherein the object table is read from a location that stores
2 object tables for multiple objects.

1 7. A method for interacting with an object via a computer using utterances, the method
2 comprising:

3 searching a context-specific grammar file for a matching phrase for the utterance;

4 searching a general grammar file for the matching phrase if the matching phrase is not
5 found in the context-specific grammar file;

6 searching a dictation grammar for the matching phrase if the matching phrase is not found
7 in the general grammar file;

8 searching a context-specific dictation model for the matching phrase if the matching phrase
9 is not found in the dictation grammar file;

10 searching a database for a matching entry for the matching phrase; and

11 performing an action associated with the matching entry and saving the utterances to a log
12 file if the matching entry is found in the database.

1 8. The method of claim 7 the log is a dialogue generation log.

1 9. The method of claim 8 further comprising:

2 replacing at least one word in the matching phrase prior to the searching the database.

1 10. The method of claim 9 wherein the replacing the at least one word comprises substituting a
2 wildcard for the at least one word.

1 11. The method of claim 10 wherein the replacing at least one word comprises substituting a
2 proper name for the at least one word.

1 12. The method of claim 11 further comprising:
2 text formatting the matching phrase prior to the searching of the database.

1 13. The method of claim 12 further comprising:
2 weighting individual words in the matching phrase according to a relative significance of
3 the individual words prior to the searching of the database.

1 14. The method of claim 13 further comprising:
2 updating a global user registry entry with the dialogue generation log with utterances
3 spoken by a user.

1 15. The method of claim 13 further comprising:
2 updating the global user registry entry with at least one of the database, the context-specific
3 grammar file and the general grammar file with the matching phrase if the matching entry is not
4 found in the database.

1 16. The method of claim 15 further comprising:
2 generating a confidence values for the matching entry;
3 comparing the confidence value with a threshold value;
4 determining whether a required number of words from the matching phrase are present in
5 the matching entry;
6 determining the utterance has been spoken before by examining the dialogue generation

7 log; and

8 prompting a user whether the matching entry is a correct interpretation of the utterance if
9 the required number of words from the matching phrase are not present in the matching entry, nor
10 present in the dialogue generation log.

1 17. The method of claim 16 further comprising:

2 prompting a user for additional information if the matching entry is not a correct
3 interpretation of the utterance.

1 18. The method of claim 17 further comprising:

2 updating at least one of the database, the context-specific grammar file, the general
3 grammar file, and the dialogue generation log with the additional information.

1 19. A system for interacting with a computer using utterances, the system comprising:

2 a speech processor for searching a context-specific grammar file for a matching phrase for
3 the utterance, for searching a general grammar file for the matching phrase if the matching phrase is
4 not found in the context-specific grammar file, for searching a dictation grammar for the matching
5 phrase if the matching phrase is not found in the general grammar file, and for searching a context-
6 specific dictation model if the matching phrase is not found in the dictation grammar;

7 a natural language processor for searching a database for a matching entry for the matching
8 phrase and for searching a dialogue generation log for a matching log entry for the utterance; and

9 an application interface for performing an action associated with the matching entry if the
10 matching entry is found in the database and the action is appropriate if the matching log entry is
11 found in the dialogue generation log.

1 20. A computer readable medium encoded with executable program code, the code comprising:

2 retrieving an object table associated with the object;
3 searching the object table for a matching entry for the object;
4 locating an action associated with the matching entry, if the matching entry is found in the
5 object table;
6 determining whether the action associated with the matching entry is appropriate;
7 performing the action associated with the matching entry, if the action is deemed
8 appropriate.

1 21. The computer readable medium of claim 20 wherein the action associated with the
2 matching entry is voicing a text statement.

1 22. The computer readable medium of claim 21 wherein the process of determining whether the
2 action associated with the matching entry is appropriate further comprises:

3 identifying a context of the voiced text statement associated with the matching entry;
4 searching a log containing log entries with context and timestamp information to locate
5 matching log entries with the same context as the voiced text statement;
6 determining whether the voiced text statement is appropriate based on the timestamp of the
7 matching log entries.

1 23. The computer readable medium of claim 21 wherein the process of determining whether the
2 action associated with the matching entry is appropriate further comprises:

3 searching a log containing log entries with statement and timestamp information to locate
4 matching log entries with the same voiced text statement;
5 determining whether the voiced text statement is appropriate based on the timestamp of the
6 matching log entries.

1 24. The computer readable medium of claim 22 or 23 wherein the object table is read from a
2 web-site.

1 25. The computer readable medium of claim 22 or 23 wherein the object table is read from a
2 location that stores object tables for multiple objects.

1 26. A computer readable medium encoded with executable program code, the code
2 comprising:

3 searching a context-specific grammar file for a matching phrase for the utterance;

4 searching a general grammar file for the matching phrase if the matching phrase is not
5 found in the context-specific grammar file;

6 searching a dictation grammar for the matching phrase if the matching phrase is not found
7 in the general grammar file;

8 searching a context-specific dictation model for the matching phrase if the matching phrase
9 is not found in the dictation grammar file;

10 searching a database for a matching entry for the matching phrase; and

11 performing an action associated with the matching entry and saving the utterances to a log
12 file if the matching entry is found in the database.

1 27. The computer readable medium of claim 26 wherein the log is a dialogue generation log.

1 28. The computer readable medium of claim 27 further comprising:

2 replacing at least one word in the matching phrase prior to the searching the database.

1 29. The computer readable medium of claim 28 wherein the replacing the at least one word
2 comprises substituting a wildcard for the at least one word.

1 30. The computer readable medium of claim 29 wherein the replacing at least one word

2 comprises substituting a proper name for the at least one word.

1 31. The computer readable medium of claim 30 further comprising:

2 text formatting the matching phrase prior to the searching of the database.

1 32. The computer readable medium of claim 31 further comprising:

2 weighting individual words in the matching phrase according to a relative significance of
3 the individual words prior to the searching of the database.

1 33. The computer readable medium of claim 32 further comprising:

2 updating a global user registry entry with the dialogue generation log with utterances
3 spoken by a user.

1 34. The computer readable medium of claim 32 further comprising:

2 updating the global user registry entry with at least one of the database, the context-specific
3 grammar file and the general grammar file with the matching phrase if the matching entry is not
4 found in the database.

1 35. The computer readable medium of claim 34 further comprising:

2 generating a confidence values for the matching entry;

3 comparing the confidence value with a threshold value;

4 determining whether a required number of words from the matching phrase are present in
5 the matching entry;

6 determining the utterance has been spoken before by examining the dialogue generation
7 log; and

8 prompting a user whether the matching entry is a correct interpretation of the utterance if
9 the required number of words from the matching phrase are not present in the matching entry, nor

10 present in the dialogue generation log.

1 36. The computer readable medium of claim 35 further comprising:

2 prompting a user for additional information if the matching entry is not a correct
3 interpretation of the utterance.

1 37. The computer readable medium of claim 36 further comprising:

2 updating at least one of the database, the context-specific grammar file, the general
3 grammar file, and the dialogue generation log with the additional information.

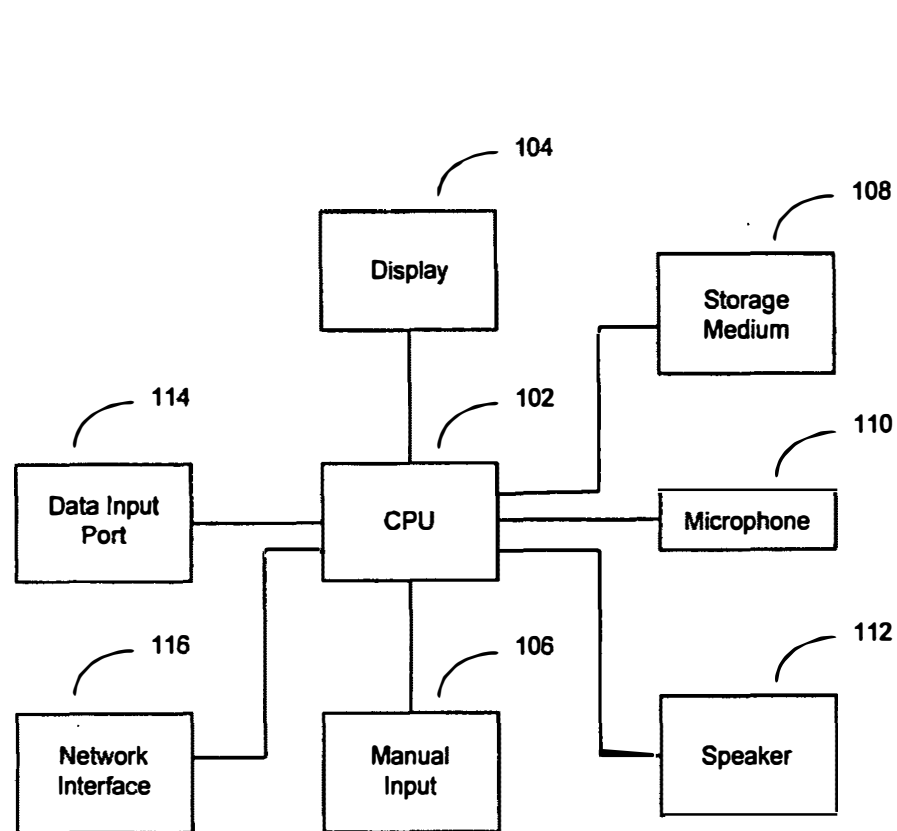


FIG. 1

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PCT/US01/11138

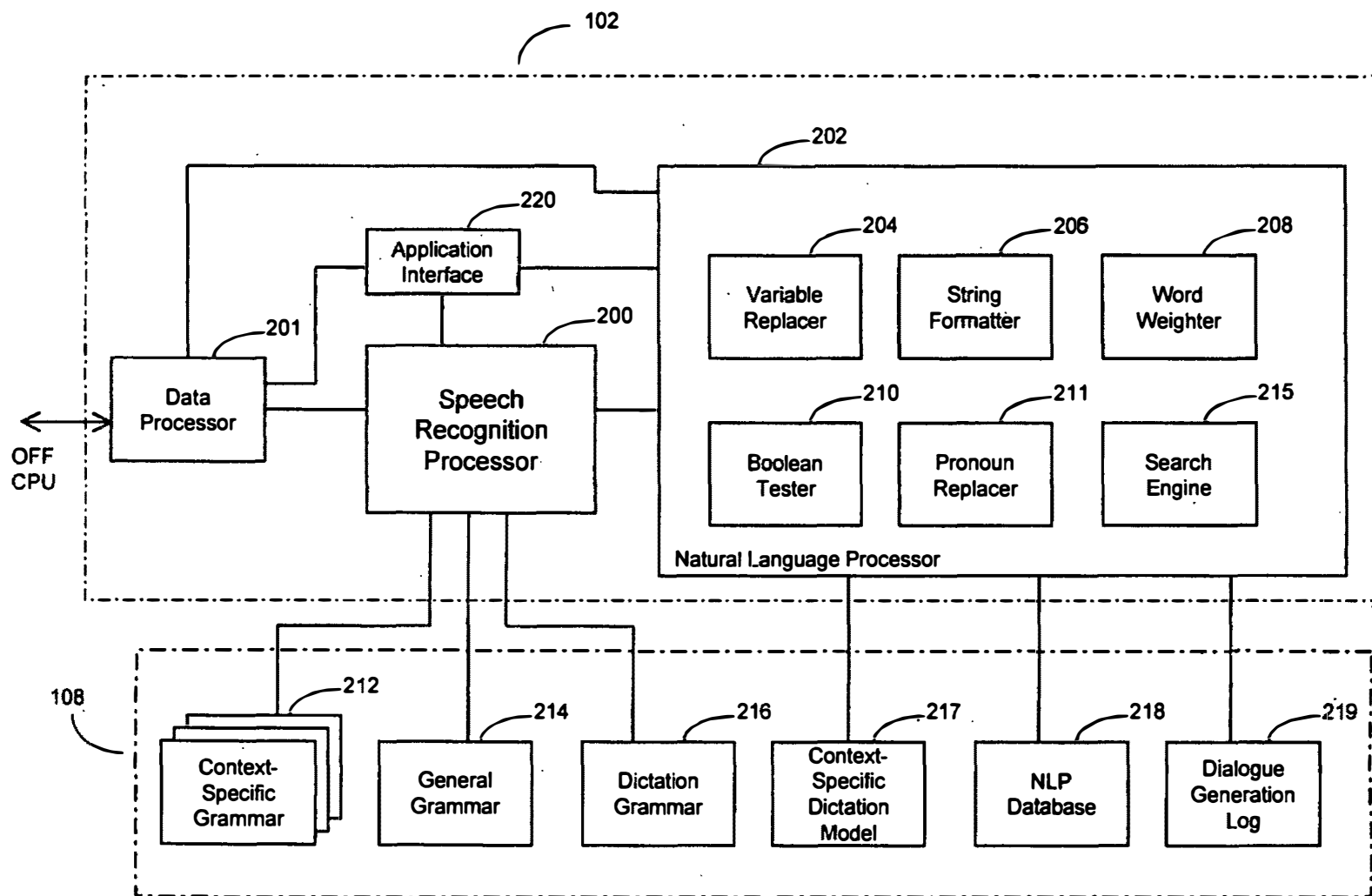


FIG. 2

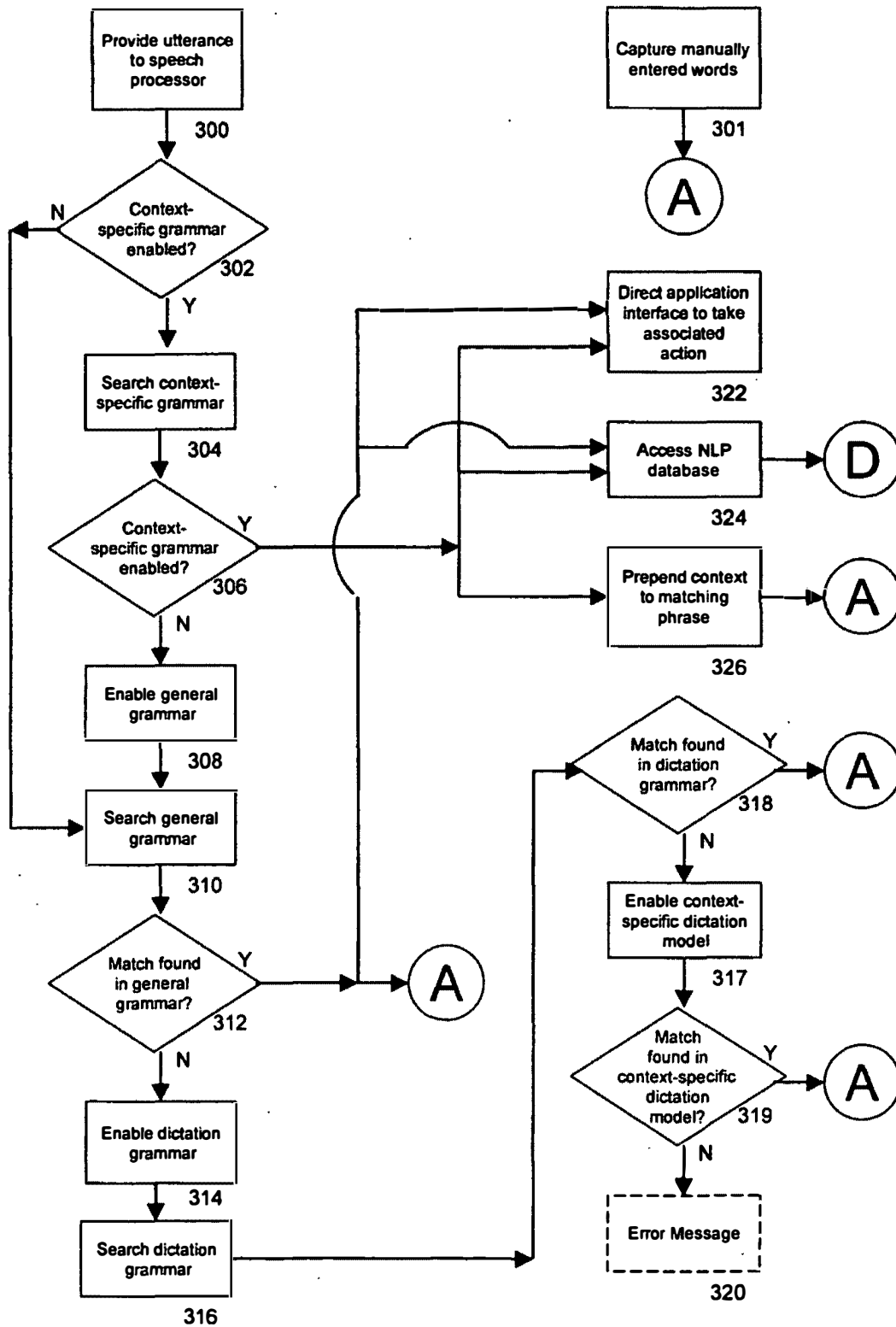


FIG. 3A

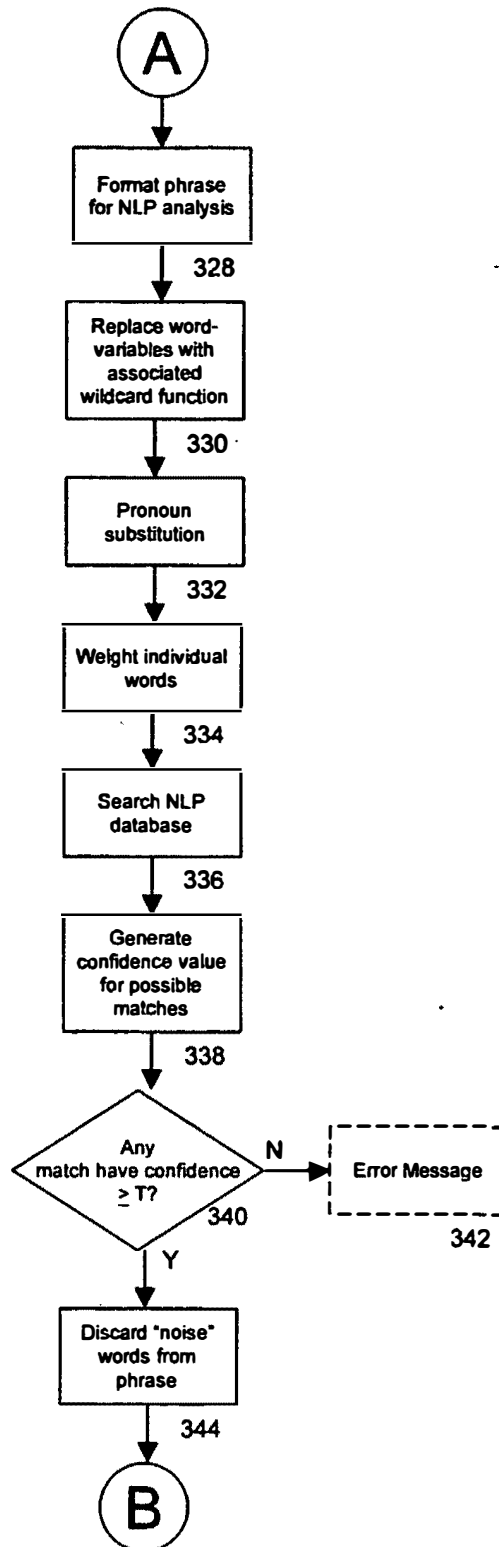


FIG. 3B

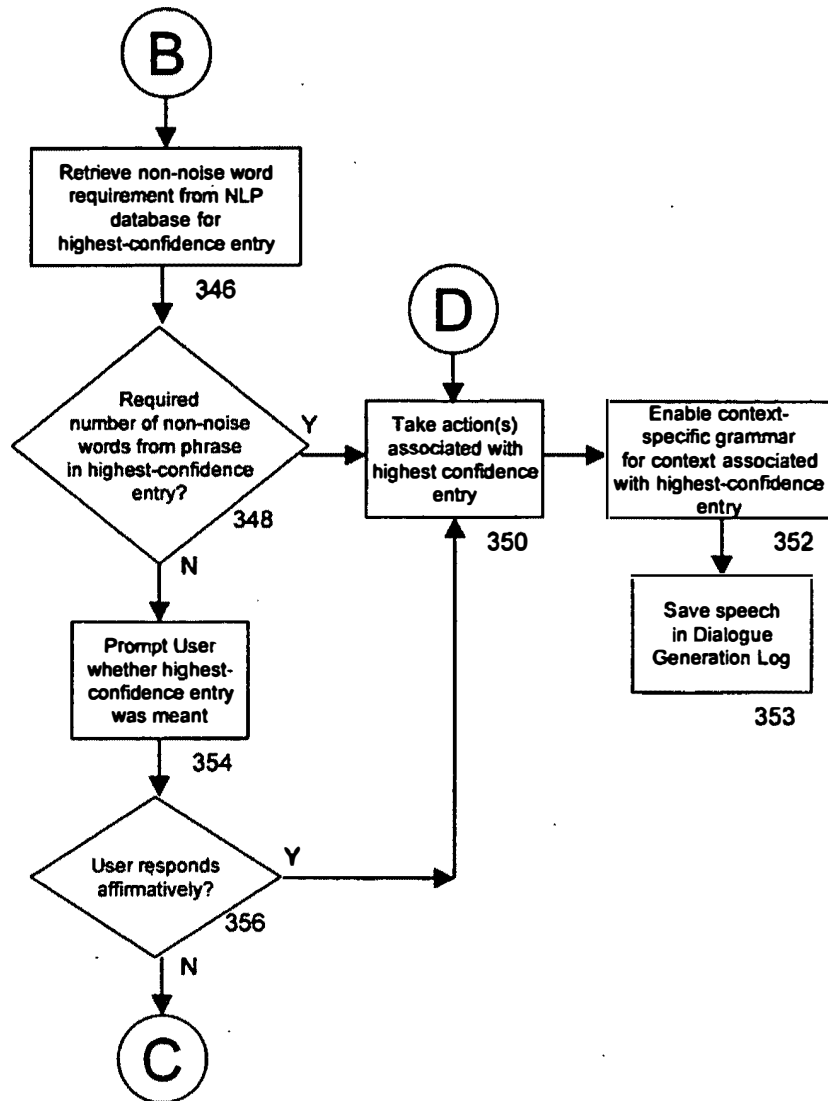


FIG. 3C

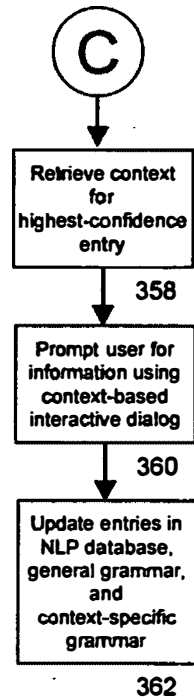


FIG. 3D

218

Phrase (400)	Required words (402)	Context/Subcontext (404)	Action 1 (408)	Action 2 (410)
What movies are playing at \$time	3	movies	Access movie web site	N/A
What is the price of IBM stock on \$date	4	stocks	Access stock price web site	N/A
Sell IBM stock at \$dollars	4	stocks	Access stock price web site	N/A
What is the weather at \$location	3	weather	Access weather web site	N/A
What time is it	2	time	N/A	Text-to-Speech of Time
Show me the news	2	news	Access news web site	Display Images
How do I format this paragraph	2	Word Processor	Locate Word Processor Help	Format Paragraph Help
⋮				
How do I insert a table	2	Spreadsheet	Locate Spreadsheet Help	Insert Table Help

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FIG. 4

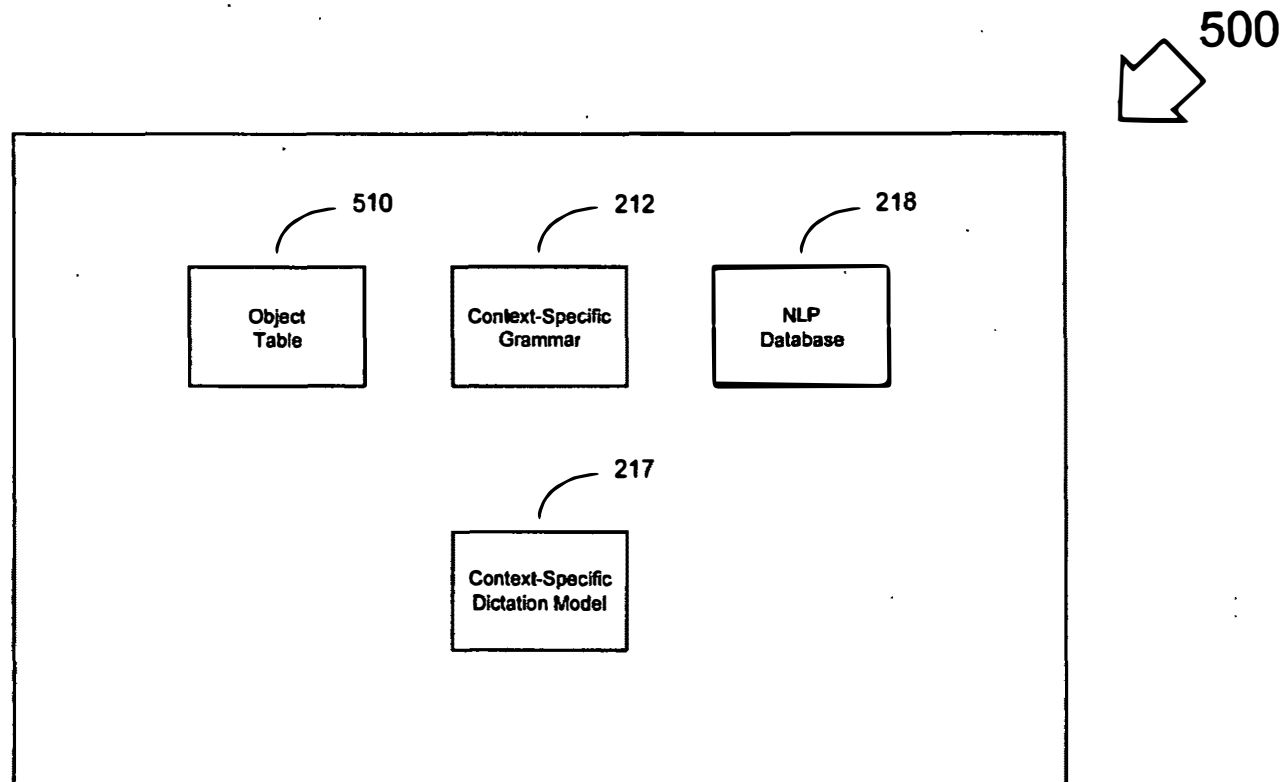


FIG. 5



object	TTS Flag	Text Speech	Use Grammar	Append Grammar	Is Yes/No?	Do Yes	Do No
http://www.our-pet-store.com	x	"Hello, welcome to..."		x	x	200	205
http://www.our-pet-store.com/inquiry	x	"Would you like to learn..."			x	210	211
http://www.our-pet-store.com/products	x	"Our current sale is..."	x				
http://www.our-pet-store.com/dogs	x	"Good news dog lovers!..."					
http://www.our-pet-store.com/cats	x	"Cat products..."			x	254	213
WPHelp:Format:Paragraph	x	"To format paragraphs..."					
⋮							
SpreadsheetHelp:Insert:Table	x	"Inserting Tables is easy..."					

540A-n

FIG. 6

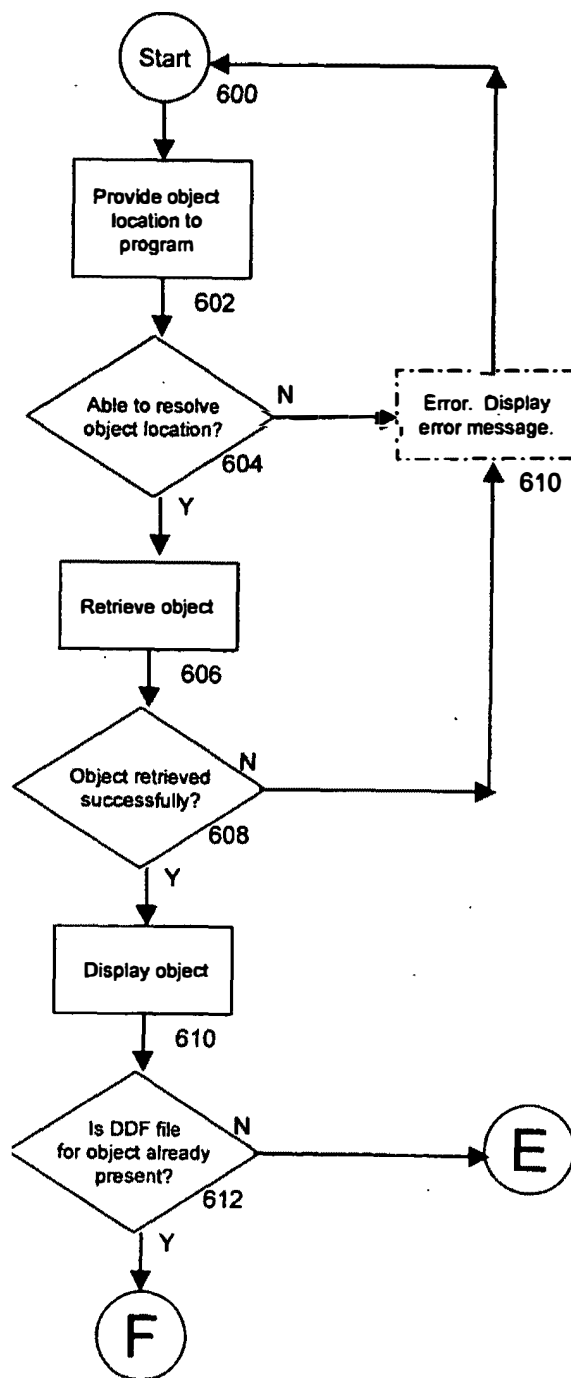


FIG. 7A

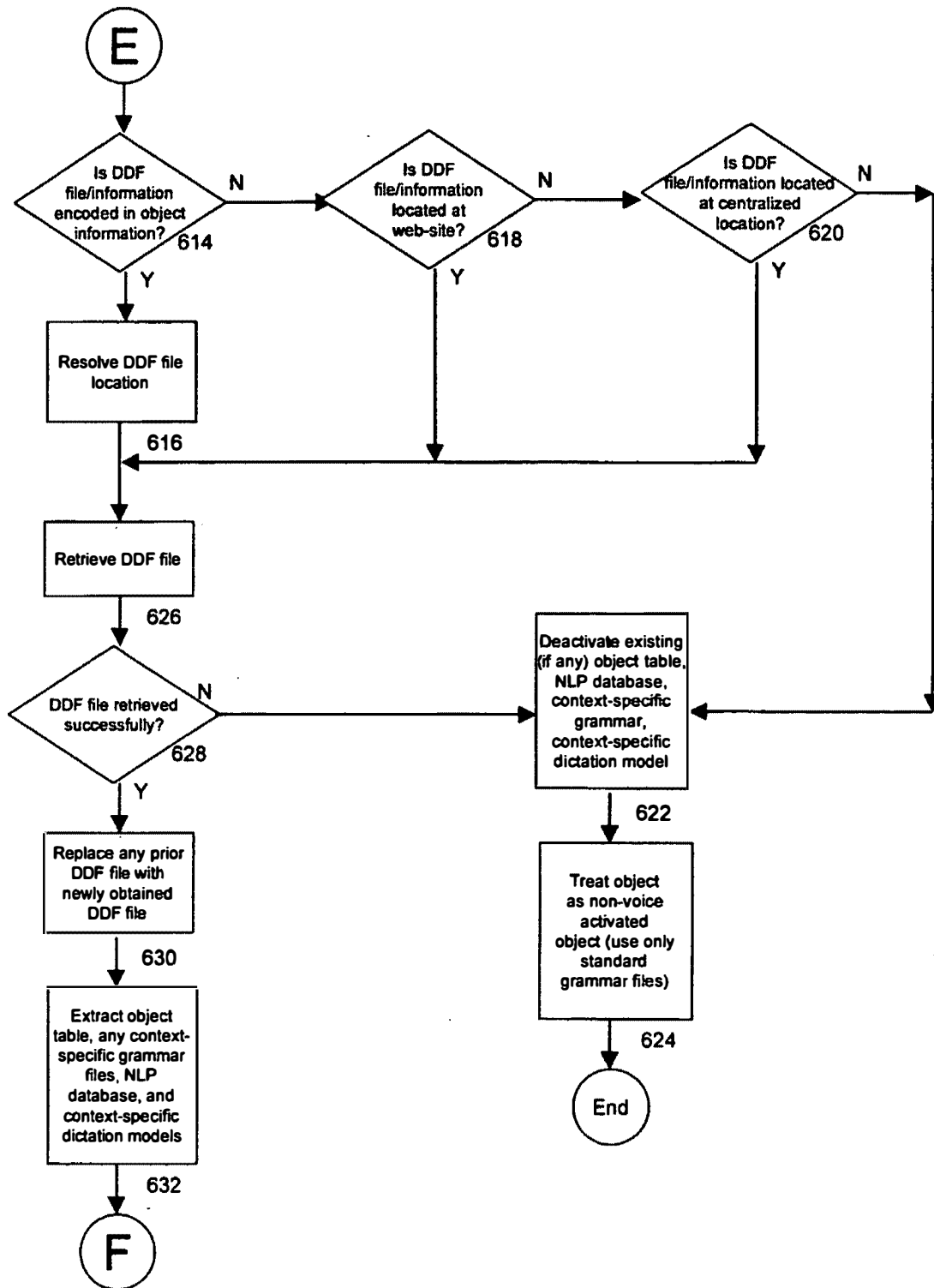


FIG. 7B

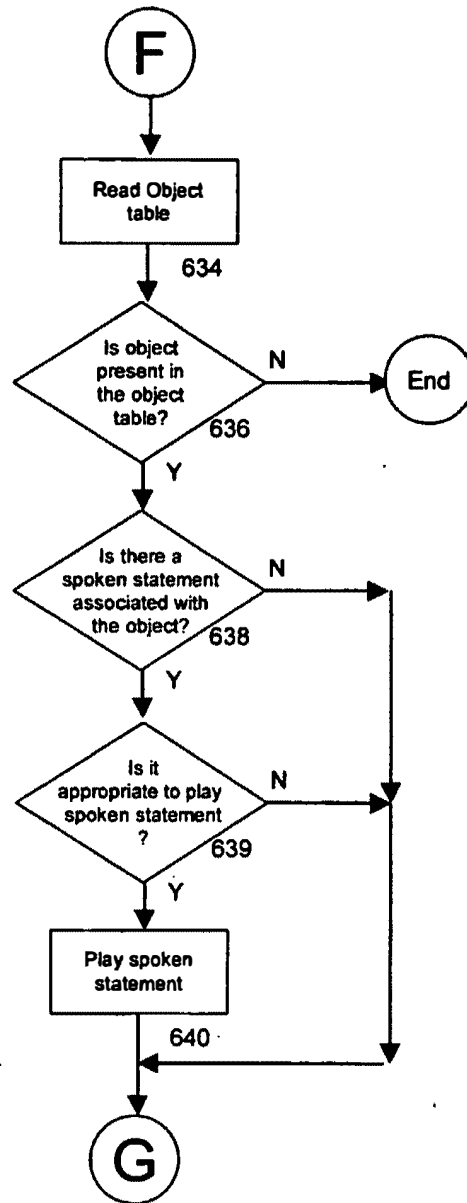


FIG. 7C

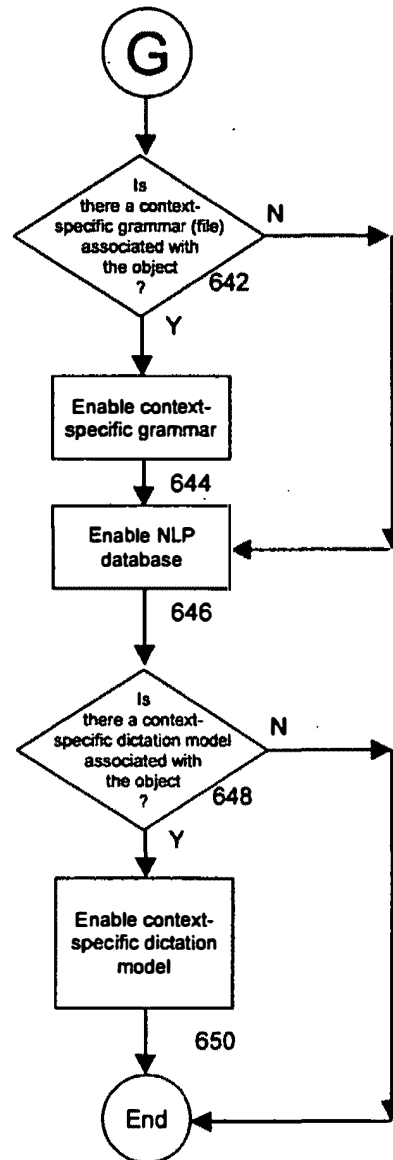


FIG. 7D

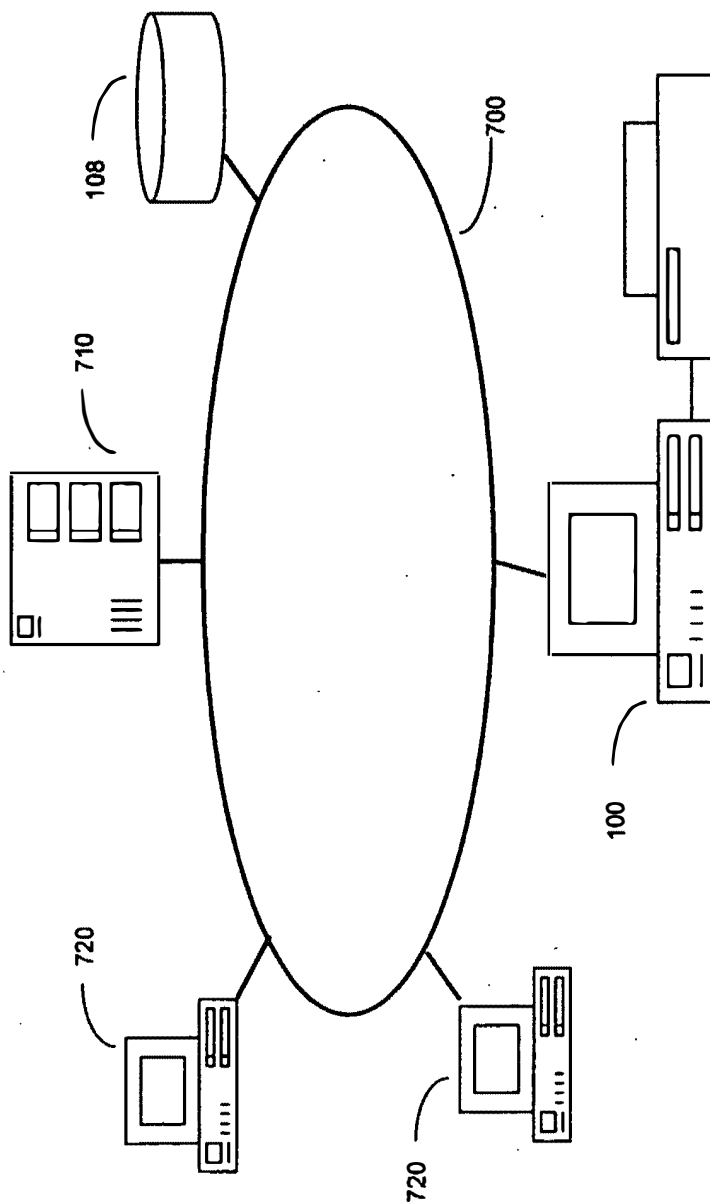


FIG. 8

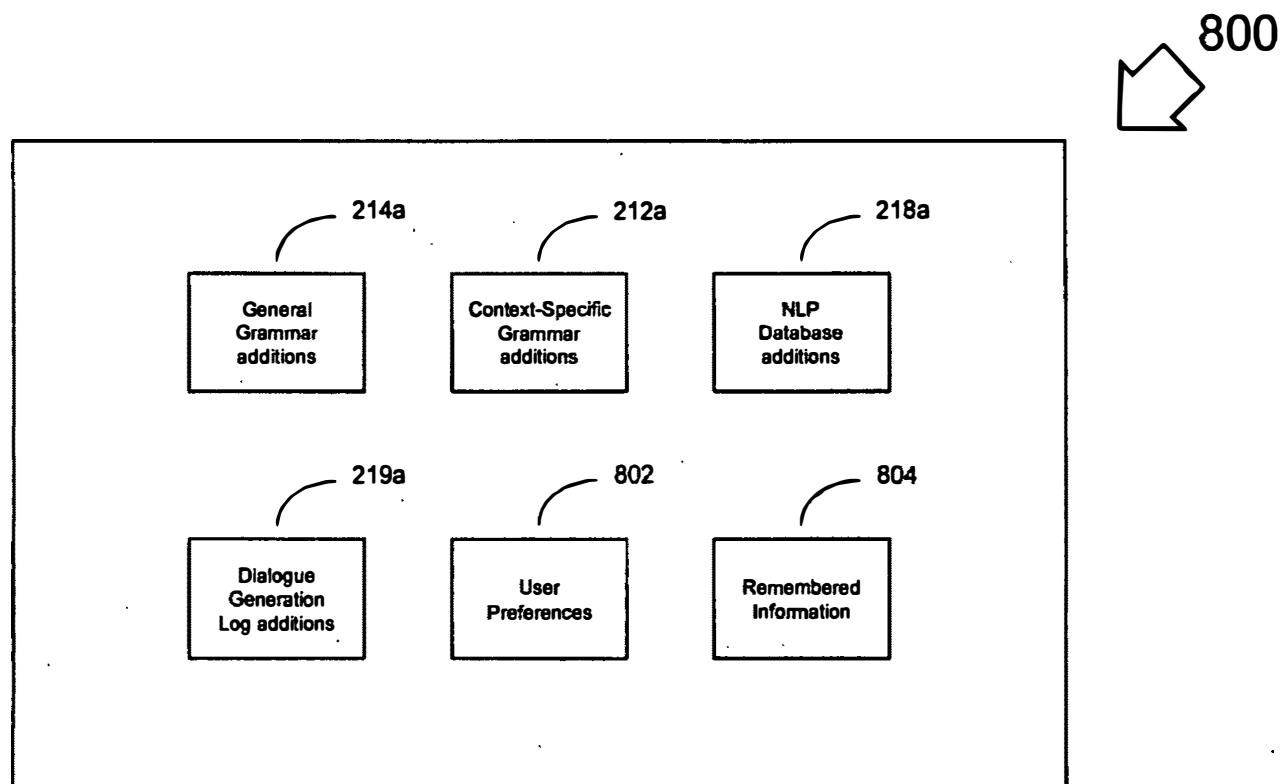


FIG. 9

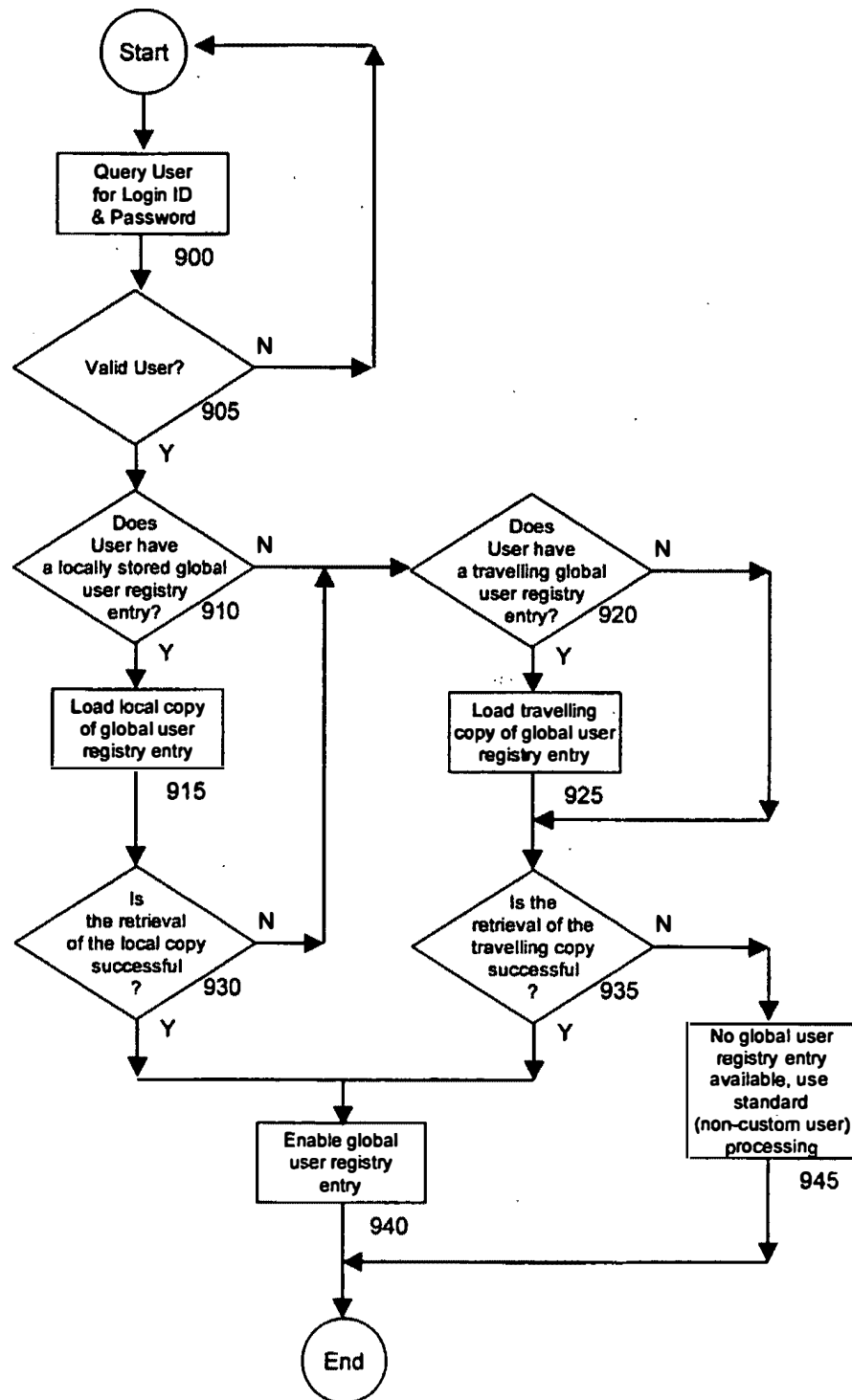


FIG. 10A

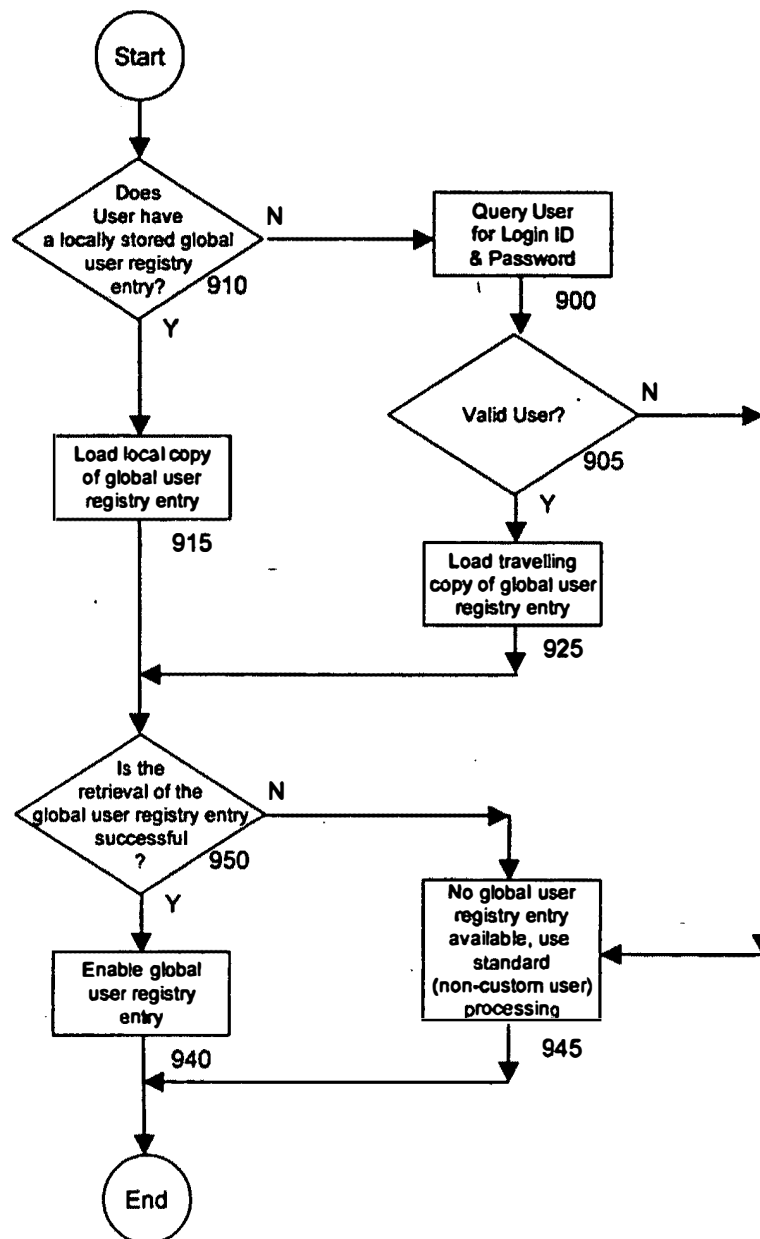


FIG. 10B



1112A-x {

Log ID	User ID	Statement	Context	Date/Time
1686	42	www.pg.com		12/28/99 10:42am
1687	-1	"Would you like to hear about our products?"		12/28/99 10:42am
1688	42	"No."		12/28/99 10:43am
1689	42	"I would like to see movies."	Movies	12/29/99 03:42pm
1690	-1	"Would you like to see a theater listing?"		12/29/99 03:42pm
1691	42	"Yes."		12/29/99 03:42pm
1692	42	"How do I format this paragraph?"	Word processing	01/28/99 10:42am
⋮				
1832	42	"Do you want to hear the news?"	News	01/28/00 10:11am

FIG. 11

INTERNATIONAL SEARCH REPORT

In national Application No.

PCT/US 01/11138

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G10L15/22 G10L15/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G10L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 00 14728 A (WEBER DEAN C ;ONE VOICE TECHNOLOGIES INC (US)) 16 March 2000 (2000-03-16) the whole document ---	1-37
X	WO 00 14727 A (WEBER DEAN C ;ONE VOICE TECHNOLOGIES INC (US)) 16 March 2000 (2000-03-16) the whole document ---	1,2, 5-21, 24-37
A	US 5 761 631 A (NASUKAWA) 2 June 1998 (1998-06-02) abstract --- -/--	3-5, 15-18, 22-24, 34-37

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents :

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

S document member of the same patent family

Date of the actual completion of the international search

29 August 2001

Date of mailing of the international search report

06/09/2001

Name and mailing address of the ISA

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Fax: (+31-70) 340-3016

Authorized officer

Quélavoine, R

INTERNATIONAL SEARCH REPORT

In International Application No.

PCT/US 01/11138

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WYARD P J ET AL: "SPOKEN LANGUAGE SYSTEMS - BEYOND PROMPT AND RESPONSE" BT TECHNOLOGY JOURNAL, BT LABORATORIES, GB, vol. 14, no. 1, 1996, pages 187-207, XP000554648 ISSN: 1358-3948 abstract -----	1-8, 19-27
A	US 5 311 429 A (TOMINAGA) 10 May 1994 (1994-05-10) abstract -----	15-18, 34-37

INTERNATIONAL SEARCH REPORT
Information on patent family members

International Application No
PCT/US 01/11138

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 0014728	A	16-03-2000	AU 5813099 A	27-03-2000
			AU 6243999 A	27-03-2000
			EP 1110206 A	27-06-2001
			EP 1110205 A	27-06-2001
			WO 0014727 A	16-03-2000
WO 0014727	A	16-03-2000	AU 5813099 A	27-03-2000
			AU 6243999 A	27-03-2000
			EP 1110206 A	27-06-2001
			EP 1110205 A	27-06-2001
			WO 0014728 A	16-03-2000
US 5761631	A	02-06-1998	JP 2855409 B	10-02-1999
			JP 8147299 A	07-06-1996
US 5311429	A	10-05-1994	JP 2301869 A	13-12-1990



DRW

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE PATENT
APPLICATION OF:

Robert A. KENNEWICK *et al.*

SERIAL No.: 10/618,633

FILING DATE: July 15, 2003

FOR: MOBILE SYSTEMS AND METHODS FOR RESPONDING TO
NATURAL LANGUAGE SPEECH UTTERANCE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL LETTER

Sir:

Transmitted herewith for filing in the present application are the following documents:

1. Revocation and New Power of Attorney with Schedule A; and
2. Associate Power of Attorney with Schedule A.

If the enclosed papers are considered incomplete, the Mail Room is respectfully requested to contact the undersigned at (703) 905-2120.

Respectfully submitted,

Rick A. Toering
Registration No. 43,195
PILLSBURY WINTHROP SHAW PITTMAN LLP
P.O. Box 10500
McLean, Virginia 22102
703-905-2000

Customer No.
00909

Dated: July 14, 2005



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Assignee : VoiceBox Technologies, Inc.

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

REVOCATION AND NEW POWER OF ATTORNEY

VoiceBox Technologies, Inc., owner of the entire right, title and interest in, to and under the listed patent applications attached hereto under Schedule A, by virtue of assignments, hereby revokes any and all former powers of attorney and appoints the attorneys

James G. Gatto	Registration No. 32,694
Rick A. Toering	Registration No. 43,195
Bradford C. Blaise	Registration No. 47,429
Sean L. Ingram	Registration No. 48,283

as Assignee's attorneys with full power of substitution and revocation to take any and all action necessary with regard to the patent applications listed on the attached Schedule A.

Address all telephone calls to James G. Gatto at telephone number 703-905-2054.

Address all correspondence to Customer Number

00909

The undersigned hereby declares that all statements made herein of his/her own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001 and

that such willful false statements may jeopardize the validity of the patent applications or any patents issuing therefrom.

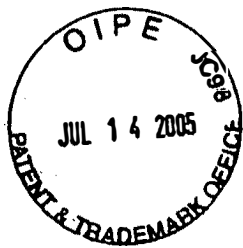
VOICEBOX TECHNOLOGIES, INC.

By: 
Name: Mike Kennebeck
Title: CEO
Date: July 11, 2005



SCHEDULE A

Serial No.	Filing Date	Title
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
10/618,633	07/15/2003	MOBILE SYSTEMS AND METHODS FOR RESPONDING TO NATURAL LANGUAGE SPEECH UTTERANCE



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Assignee : VoiceBox Technologies, Inc.

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

ASSOCIATE POWER OF ATTORNEY

The undersigned holder of a Power of Attorney for the listed patent applications attached hereto under Schedule A, grants an Associate Power of Attorney to the attorneys and agents associated with Customer Number:

00909

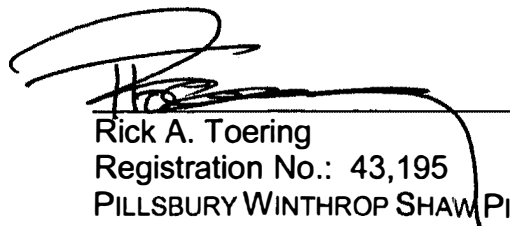
to take any and all action necessary with regard to the patent applications listed on the attached Schedule A.

Address all telephone calls to James G. Gatto at telephone number 703-905-2054.

Address all correspondence to Customer Number:

00909

Respectfully submitted,



Rick A. Toering
Registration No.: 43,195
PILLSBURY WINTHROP SHAW PITTMAN LLP
P.O. Box 10500
McLean, Virginia 22102
703-905-2000

**Customer No.
00909**

Dated: July 14, 2005



SCHEDULE A

Serial No.	Filing Date	Title
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
10/618,633	07/15/2003	MOBILE SYSTEMS AND METHODS FOR RESPONDING TO NATURAL LANGUAGE SPEECH UTTERANCE

Attorney's Docket No. 090611-0312470
Client Reference: 25300-003



ITW
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Robert A. KENNEWICK *et al.*

Confirmation No.: 5659

Application No.: 10/618,633

Group No.: 2687

Filed: July 15, 2003

Examiner: Khai Minh Nguyen

For: MOBILE SYSTEMS AND METHODS FOR RESPONDING TO NATURAL LANGUAGE SPEECH
UTTERANCE

**Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450**

STATUS INQUIRY

1. Over twenty-four months have passed since the filing of this application on July 15, 2003. No communication has been received from the Patent and Trademark Office indicating action on this application.
2. Kindly advise the undersigned of the present status of this application, by checking the appropriate box on the next page.

Respectfully submitted,

PILLSBURY WINTHROP SHAW PITTMAN LLP

By 
Sean L. Ingram
Registration No.: 48,283

P. O. Box 10500
McLean, Virginia 22102
Telephone: (703) 905-2000
Telefax: (703) 905-2500

Dated: July 18, 2005

STATUS INQUIRY REPLY

APPLICATION NO. 10/618,633 IS CURRENTLY

[] ASSIGNED TO GROUP _____ AND AWAITS:

[] ACTION BY THE EXAMINER. EXPECTED ACTION IN _____ MONTHS.

[] APPLICANT'S RESPONSE TO THE OFFICE ACTION MAILED

PILLSBURY WINTHROP SHAW PITTMAN LLP
P.O. Box 10500
McLean, VA 22102

Status Inquiry--page 2 of 2

30540410v1

Google Exhibit 1019
Page 00194



UNITED STATES PATENT AND TRADEMARK OFFICE

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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/618,633	07/15/2003	Robert A. Kennewick	25300-003

29315
MINTZ LEVIN COHN FERRIS GLOVSKY AND POPEO PC
12010 SUNSET HILLS ROAD
SUITE 900
RESTON, VA 20190

CONFIRMATION NO. 5659



OC000000016674604

Date Mailed: 08/02/2005

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/14/2005.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

M. Stephanos
MENBE STEPHANOS
SALLY ()-

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APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
10/618,633	07/15/2003	Robert A. Kennewick	25300-003

00909
PILLSBURY WINTHROP SHAW PITTMAN, LLP
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CONFIRMATION NO. 5659

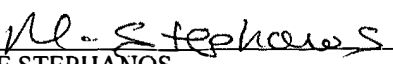


Date Mailed: 08/02/2005

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/14/2005.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.



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EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	183	("5155743" "5386556" "5424947" "5471318" "5475733" "5499289" "5517560" "5533108" "5537436" "5539744" "5557667" "5563937" "5590039" "5633922" "5675629" "5708422" "5721938" "5722084" "5742763" "5752052" "5754784" "5761631" "5794050" "5802510" "5832221" "5878386" "5895466" "5911120" "5926784" "5933622" "5953393" "5963894" "5963940" "5987404" "5991721" "5995119" "6009382" "6014559" "6021384" "6044347" "6049602" "6058187" "6078886" "6081774" "6101241" "6119087" "6134235" "6144667" "6160883" "6173279" "6175858" "6192110" "6192338" "6219346" "6219643" "6233556" "6246981" "6272455" "6292767" "6314402" "6366886" "6385646" "6393428" "6404878" "6411810" "6418210" "6430285" "6434523" "6434524" "6442522" "6446114" "6453153" "6453292" "6456711" "6498797" "6499013" "6501834" "6523061" "6532444" "6539348" "6553372" "6560576" "6567778" "6570964" "6574624" "6594257" "6604077" "6611692" "6614773" "6629066" "6650747" "6691151").pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/10 08:51
S1	1	10/618633	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 14:01
S2	21	(telematic) and ((speech voice) near7 (recogni\$5)) and (natural near6 language)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/08 11:47

EAST Search History

S3	26	(informatic) and ((speech voice) near7 (recogni\$5)) and (natural near6 language)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 14:19
S4	625	(vehicle automobile) and ((speech voice) near7 (recogni\$5)) and (natural near6 language)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 14:19
S5	266	(vehicle automobile) and ((speech voice) near7 (recogni\$5)) and (natural near6 language) and (coding encoding encoder coder)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 14:41
S6	264	S5 and (server internet network)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 14:20
S7	413	(natural near6 language near7 (command query question)) and (coding encoding encoder coder)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 14:53
S8	37	S7 and (704/270.1 704/275 704/270). ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 17:26
S9	648	(natural near6 language) and ((voice speech spoken) near6 (command question query)) and ((server remote network) same ((speech voice) near6 recogni\$6)) and (cod\$3 encod\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 15:34

EAST Search History



S10	309	S9 and "704"/\$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 15:23
S12	984	(natural near6 language) and ((voice speech spoken) near6 (command question query)) and (forward\$4 rout\$4 determin\$4 decid\$4 send\$4) near7 (application program dialog agent)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/08 10:21
S13	224	(natural near6 language) and ((voice speech spoken) near6 (command question query)) and (forward\$4 rout\$4 determin\$4 decid\$4 send\$4) near7 (query question command) near7 (application program dialog agent)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 15:37
S14	320	(natural near6 language) and ((voice speech spoken) near6 (command question query)) and (forward\$4 rout\$4 determin\$4 decid\$4 send\$4 select\$4) near7 (query question command) near7 (application program dialog agent)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/09 11:20
S15	195	S14 and "704"/\$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 15:37
S16	127	S14 and (encod\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 15:38
S17	308	(natural near6 language) and ((voice speech spoken) near6 (command question query)) and (forward\$4 rout\$4 determin\$4 decid\$4 send\$4 select\$4) near7 (dialog IVR) near7 (application program dialog agent)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 16:00

EAST Search History

S18	90	S17 and (704/270.1 704/275 704/270).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/09 17:59
S19	489	(natural near6 language) and ((voice speech spoken) near6 (command question query)) and (forward\$4 rout\$4 send\$4 access\$4) near7 (command question query request) near7 (application program dialog agent server)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 16:15
S20	98	S19 and (704/270.1 704/275 704/270).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 16:16
S21	522	(natural near6 language) and ((voice speech spoken language) near6 (command question query)) and (forward\$4 rout\$4 send\$4) near7 (command question query request) near7 (server source resource)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 16:25
S22	57	S21 and (704/270.1 704/275 704/270).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 16:19
S23	4	"6604077".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 16:20
S24	118	(natural near6 language) and ((voice speech spoken language) near6 (command question query)) and (forward\$4 rout\$4 transmit\$4) near7 (command question query request) near7 (page site)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 16:35

EAST Search History

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S25	93	(natural near6 language) and ((voice speech spoken language) near6 (command question query)) and (encod\$4 compress\$4) near7 (speech voice) and (forward\$4 send\$4 rout\$4 transmit\$4) near6 (query command question request) near7 (server application resource database program agent)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 16:48
S26	493	(natural near6 language) and ((voice speech spoken language) near6 (command question query)) and (forward\$4 send\$4 rout\$4 transmit\$4) near6 (query command question request voice speech) near7 (application executable program agent)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 17:24
S27	162	S26 and "704"/\$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 17:04
S28	19	704/275.ccls. and balakrishnan	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 17:05
S29	483	(natural near6 language) and ((voice speech spoken language) near6 (command question query)) and (dialog dialogue) near6 (module agent application)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 17:24
S30	144	S29 and (704/270.1 704/275 704/270).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/07 17:26
S31	77	(natural near6 language) and ((voice speech spoken) near6 (command question query)) same (server) and (vehicle automobile car)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/08 10:28

EAST Search History

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S32	12	S31 and 704/275.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/08 10:22
S33	52	((voice speech spoken) near6 (command question query)) same (server) and (vehicle automobile car) and 704/275.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/08 10:33
S34	459	((voice speech spoken) near6 (recogni\$5)) and (telematics) and server	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/08 10:51
S35	55	((voice speech spoken) near6 (recogni\$5)) near8 (telematics) and server	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/08 10:52
S36	7	((voice speech spoken) near6 (recogni\$5)) and (telematics) near8 mirror and server	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/08 10:54
S37	60	((voice speech spoken) near6 (recogni\$5)) and (telematics) near8 mirror	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/08 10:52
S38	204	((voice speech spoken) near6 (recogni\$5)) same (server) and (vehicle automobile car) and 704/270-275.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/08 10:55

EAST Search History

S39	120	((voice speech spoken) near6 (recogni\$5)) near8 (server) and (vehicle automobile car) and 704/270-275.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/08 11:01
S40	144	((voice speech spoken) near6 (recogni\$5)) near10 (server) and (vehicle automobile car) near7 (navigat\$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/08 11:02
S41	513	((speech voice spoken) near7 (command control\$4)) near8 (vehicle automobile car) and server	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/08 11:48
S42	93	((speech voice spoken) near7 (command control\$4)) near8 (vehicle automobile car) and server near7 (recogni\$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/08 11:49
S43	555	((voice speech) near6 recogni\$4) near8 server and (service) and "704"/\$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/08 13:58
S44	126	((voice speech) near6 recogni\$4) near8 server and (service) and "704"/275.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/08 13:58
S45	2	10/607861	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/09 17:31
S49	1	"6208972".pn.	USPAT	OR	OFF	2007/03/09 17:50

EAST Search History

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S50	61	704/275.ccls. and bluetooth	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/09 18:33
S51	2	(704/270.1 704/275).ccls. and bluetooth same (encod\$4 compress\$4 coding codec compress\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/09 18:00
S52	26	"704"/\$.ccls. and bluetooth same (encod\$4 compress\$4 coding codec compress\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/09 18:00
S53	123	((robert near3 kennewick) (david near3 locke) (michael near3 kennewick) (richard near3 kennewick) (tom near3 freeman) (stephen near3 elston)).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/09 18:35
S54	8	S53 and ((speech voice) near6 recogni\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/09 18:39
S55	6880	(704/270 704/270.1 704/275 701/36 701/200).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/09 18:41
S56	3793	(704/270 704/270.1 704/275 704/257).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/03/09 18:41



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/618,633	07/15/2003	Robert A. Kennewick	25300-003	5659
909 7590 04/30/2007 PILLSBURY WINTHROP SHAW PITTMAN, LLP P.O. BOX 10500 MCLEAN, VA 22102			EXAMINER WOZNIAK, JAMES S	
			ART UNIT 2626	PAPER NUMBER
			MAIL DATE 04/30/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/618,633	Applicant(s) KENNEWICK ET AL.	
	Examiner James S. Wozniak	Art Unit 2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-56 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-56 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) ☒ Notice of References Cited (PTO-892) | 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) ☐ Notice of Informal Patent Application |
| 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) ☐ Other: _____ |

DETAILED ACTION

Claim Objections

1. **Claims 3, 21, 34 and 43-55** are objected to because of the following informalities:

In claim 3, line 3, “the content and context” should be changed to --a content and context-- in order to provide proper antecedent basis.

Claim 21 (second claim 21) is misnumbered and should be renumbered to claim 22.

Claim 43 (second claim 43) is misnumbered and should be renumbered to claim 44. Also, as a result of misnumbered claim 44, the subsequent claims 44-55 are misnumbered and should be respectively renumbered to claims 45-56.

In claim 34, line 1, “the device system” should be changed to --a device system-- in order to provide proper antecedent basis.

Appropriate correction is required.

Double Patenting

2. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-

type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-55 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-40 of copending Application No. 10/452,147. Although the conflicting claims are not identical, they are not patentably distinct from each other because both applications essentially refer to the same system/method. Although application 10/452,147 additionally recites a parser and event manager in the independent claims, these elements would be inherently included in

the structure of the independent claims of the present application because the present application includes natural language understanding features (which requires parsing) and speech forwarding (which requires the use of an event manager). Thus, both claimed systems/methods are not patentably distinct from each other.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 1-4, 6, 17-18, 21-23, and 27** are rejected under 35 U.S.C. 103(a) as being unpatentable over Bennett et al (*U.S. Patent: 6,615,172*) in view of Lin et al ("*A Distributed Architecture for Cooperative Spoken Dialogue Agents with Coherent Dialogue State and History*," 1999).

With respect to **Claim 1**, Bennett discloses:

A speech unit that receives the user generated natural language speech utterance and converts the user generated natural language speech utterance into an electronic signal, said user generated natural language speech utterance having at least one of a query and a command (*coding a spoken query, Col. 10, Line 54- Col. 11, Line 17; and Col. 15, Line 53- Col. 16, Line 21*);

A natural language speech processing system that receives the electronic signal, that retrieves said at least one of said query and said command from the electronic signal, that selects at least one application portion associated with said at least one of said query and said command, that forwards said at least one of query and command to said at least one application portion, wherein said at least one application portion receives, processes and responds to said at least one of said query and a said command (*natural language speech recognizer that retrieves a query from a speech signal and forwards the question to a specific application portion to retrieve an answer, Col. 24, Line 46- Col. 25, Line 67; Col. 27, Lines 17-51; and Col. 29, Line 30- Col. 30, Line 7*); and

A transceiver, in communication with said at least one application portion, that transmits an electronic message associated with said at least one of query and command (*server capable of receiving coded speech queries (as noted in the above cited columns) and transmitting retrieved answers, Col. 29, Lines 21-29, which would inherently require transceiving means*).

Although Bennett discloses processing a natural language query, forwarding the query to a specific application portion based on context, and method use with multiple application domains (Col. 29, Line 47-Col. 30, Line 2), Bennett does not explicitly disclose the use of arbitrating means for selecting and forwarding a query to an executable dialog agents associated with different domains. Lin, however discloses a user interface agent that enables query forwarding to a particular dialog agent for answer retrieval (*Sections 2.2- 3.1 and Fig. 3*).

Bennett and Lin are analogous art because they are from a similar field of endeavor in information retrieval systems utilizing speech recognition. Thus, it would

have been obvious to a person of ordinary skill in the art, at the time of invention, to modify the teachings of Bennett with the interface agent taught by Lin in order to handle dialog across multiple subject domains (or applications) efficiently and intelligently (*Lin, Section 1*).

With respect to **Claim 2**, Lin further discloses:

The natural language speech processing system further comprises an event manager, said event manager coordinating interaction between components of the natural language speech processing system (*user interface agent, Fig. 3*).

With respect to **Claim 3**, Bennett further discloses:

The natural language speech processing system further comprises a parser that determines a domain for the user generated natural language utterance based on the content and context of the user utterance (*natural language understanding means utilizing parsing to determine an application domain based on user speech content and context, Col. 11, Line 59- Col. 12, Line 10; Col. 17, Lines 28-36; and Col. 27, Lines 17-51*).

With respect to **Claim 4**, Bennett further discloses:

A text to speech engine that converts a text message to a speech message (*text-to-speech engine, Col. 10, Lines 54-67*).

With respect to **Claim 6**, Lin further discloses dialog domain agents associated with travel information (*Fig. 3*).

With respect to **Claim 17**, Bennett further discloses:

The transceiver is a wide-area RF transceiver (*RF link over a cellular network, Col. 10, Lines 33-53*).

With respect to **Claim 18**, Bennett further discloses:

The speech unit includes a speech coder (*speech coding means, Col. 15, Line 53-Col.16, Line 21*).

With respect to **Claim 21** (first claim 21), Bennett further discloses:

The speech coder uses an adaptive lossy audio compression (*speech encoding that includes only the least amount of information necessary to adequately and quickly complete speech recognition, Col. 15, Line 543- Col. 16, Line 21*).

With respect to **Claim 22** (*second claim 21*), Bennett further shows:

The speech unit is located remotely from the natural language speech processing system and the transceiver (*Fig. 1*).

With respect to **Claim 23**, Bennett further discloses a display (*Col. 10, Lines 54-65*).

With respect to **Claim 27**, Bennett discloses a network for cellular phones (*Col. 10, Lines 33-53*), while Lin recites a common database of dialog states/histories shared across multiple common agents (*Fig. 3*).

5. **Claims 7-12, 19, 43 (second claim 43)-45, and 50-55** are rejected under 35 U.S.C. 103(a) as being unpatentable over Bennett et al in view of Lin et al and further in view of Gerson (*U.S. Patent: 6,937,977*).

With respect to **Claims 7-10**, Bennett in view of Lin discloses dialog agents capable of retrieving responses to speech inputs for a number of different applications, as applied to Claim 1. Bennett in view of Lin does not specifically disclose an application domain related to communicating with a vehicle device in order to enable device control.

Gerson, however, discloses a vehicle control server application that recognizes a control command and communicates a command message back to a vehicle device to enable device control (*Col. 6, Line 66-Col. 7, Line 15*).

Bennett, Lin, and Gerson are analogous art because they are from a similar field of endeavor in speech-controlled systems. Thus, it would have been obvious to a person of ordinary skill in the art, at the time of invention, to modify the teachings of Bennett in view of Lin with the vehicle device control application taught by Gerson in order to increase system applicability by enabling its use for hands-free control of vehicle devices (*Gerson, Col. 6, Line 66- Col. 7, Line 15; and Col. 9, Lines 5-8*).

With respect to **Claim 11**, Gerson further shows the vehicle control application located remotely from a vehicle (*Fig. 1*).

With respect to **Claim 12**, Gerson further discloses control of a vehicle entertainment system and other vehicle devices (*Col. 6, Line 66- Col. 7, Line 15*).

With respect to **Claim 19**, Gerson further discloses an echo canceling block capable of eliminating echoes and noise in varying conditions that provides the benefit of preventing an echo from being recognized at a speech recognizer (*Col. 9, Line 24-Col. 10, Line 10*).

Claim 43 (second claim 43) contains subject matter similar to Claims 1 and 7-10, and thus, is rejected for the same reasons.

Claim 44 contains subject matter similar to Claim 12, and thus, is rejected for the same reasons.

Claim 45 contains subject matter similar to Claim 6, and thus, is rejected for the same reasons.

Claim 50 contains subject matter similar to Claim 17, and thus, is rejected for the same reasons.

With respect to **Claim 51**, Bennett discloses a speech filtering means (*Col. 15, Line 53- Col. 16, Line 14*).

Claim 52 contains subject matter similar to Claim 18, and thus, is rejected for the same reasons.

Claim 53 contains subject matter similar to Claim 21, and thus, is rejected for the same reasons.

With respect to **Claim 54**, Gerson further discloses receiving a speech utterance in a vehicle (*Col. 9, Lines 5-22*).

Claim 55 contains subject matter similar to Claim 27, and thus, is rejected for the same reasons.

6. **Claims 5, 13-16, 28-29, 31-37, 40-41, and 43 (first claim 43)** are rejected under 35 U.S.C. 103(a) as being unpatentable over Bennett et al in view of Lin et al and further in view of Hedin et al (U.S. Patent: 6,185,535).

With respect to **Claims 5 and 13**, Bennett in view of Lin discloses dialog agents capable of retrieving responses to speech inputs for a number of different applications, as applied to Claim 1. Bennett in view of Lin does not specifically disclose the communication of a recognized command with a remotely located service, however, Hedin discloses a speech recognizer that sends a recognized speech command message to an external service (*Col. 9, Line 36- Col. 10, Line 24; and Fig. 3, Elements 205, 207 and 307*).

Bennett, Lin, and Hedin are analogous art because they are from a similar field of endeavor in speech-controlled systems. Thus, it would have been obvious to a person of ordinary skill in the art, at the time of invention, to modify the teachings of Bennett in view of Lin with the remote service communication means taught by Hedin in order to enable access and control of remote server applications (*Hedin, Col. 2, Lines 39-42*).

With respect to **Claim 14**, Hedin discloses the remotely located specialized services as applied to Claim 13.

With respect to **Claim 15**, Hedin further discloses:

The transceiver transmits the message via a communication network (*wireless communication network, Col. 5, Lines 34-55*).

With respect to **Claim 16**, Bennett further discloses:

The communication network is a wide area wireless network (*cellular network, Col. 10, Lines 33-53*).

Claim 28 recites subject matter similar to Claims 1 and 5, and thus, is rejected for the same reasons.

With respect to **Claim 29**, Bennett discloses the speech coding process as applied to Claim 18.

Claim 31 contains subject matter similar to Claims 1 and 6, and thus, is rejected for the same reasons.

Claims 32-33 contains subject matter similar to Claim 5, and thus, is rejected for the same reasons.

With respect to **Claim 34**, Hedin further discloses the remotely located server device as shown in Fig. 1b.

Claim 35 contains subject matter similar to Claim 15, and thus, is rejected for the same reasons.

Claim 36 contains subject matter similar to Claim 14, and thus, is rejected for the same reasons.

Claim 37 contains subject matter similar to Claim 17, and thus, is rejected for the same reasons.

Claim 40 contains subject matter similar to Claim 21 (first claim 21), and thus, is rejected for the same reasons.

Claim 41 contains subject matter similar to Claim 22 (second claim 21), and thus, is rejected for the same reasons.

Claim 43 (first claim 43) contains subject matter similar to Claim 27, and thus, is rejected for the same reasons.

7. **Claim 20** is rejected under 35 U.S.C. 103(a) as being unpatentable over Bennett et al in view of Lin et al and further in view of DeLine et al (*U.S. Patent: 6,420,975*).

With respect to **Claim 20**, Bennett in view of Lin discloses the dialog agent system capable of receiving and encoding a user speech input, as applied to Claim 18. Bennett in view of Lin does not specifically suggest that a speech input from a user is received via a one-dimensional microphone array, however DeLine discloses the use of such an array in a speech-enabled control system (*lined array of microphones, Col. 48, Lines 53-63*).

Bennett, Lin, and DeLine are analogous art because they are from a similar field of endeavor in speech-controlled systems. Thus, it would have been obvious to a person

of ordinary skill in the art, at the time of invention, to modify the teachings of Bennett in view of Lin with the one dimensional microphone array taught by DeLine in order to enhance vocal signal content and eliminate acoustic noise (*DeLine, Col. 48, Lines 53-63*).

8. **Claims 24-26** are rejected under 35 U.S.C. 103(a) as being unpatentable over Bennett et al in view of Lin et al and further in view of Turnbull et al (*U.S. Patent: 6,980,092*).

With respect to **Claims 24-25**, Bennett in view of Lin discloses the speech interactive system, as applied to Claim 1. Bennett in view of Lin does not specifically suggest system implementation in a telematics control unit. Turnbull, however, discloses implementation of a speech interactive system embedded in a telematics device (*speech recognition processing, Col. 30, Line 43- Col. 31, Line 2, in an in-vehicle telematics assembly, Col. 29, Lines 56-63; controlling in-vehicle devices in response to recognized voice commands, Col.28, Line 53- Col. 29, Line 36, Col. 30, Line 43- Col. 31, Line 2, and Col. 36, Lines 57-63; and control bus for sending control signals to the various vehicle devices, Fig. 11, Element 102*).

Bennett, Lin, and Turnbull are analogous art because they are from a similar field of endeavor in speech-controlled systems. Thus, it would have been obvious to a person of ordinary skill in the art, at the time of invention, to modify the teachings of Bennett in view of Lin with the telematics unit taught by Turnbull in order to implement a speech communication and control system that can be readily installed in a vehicle (*Turnbull, Col. 3, Lines 20-22*).

With respect to **Claim 26**, Turnbull discloses the in-vehicle telematics unit as applied to Claims 24-25.

9. **Claims 30, 38-39, and 42** are rejected under 35 U.S.C. 103(a) as being unpatentable over Bennett et al in view of Lin et al further in view of Hedin et al and further in view of Gerson.

With respect to **Claim 30**, Bennett in view of Lin and further in view of Hedin discloses dialog agents capable of retrieving responses to speech inputs for a number of different applications, as applied to Claim 28. Bennett in view of Lin and further in view of Hedin does not specifically disclose an application domain related to communicating with a vehicle device in order to enable device control. Gerson, however, discloses a vehicle control server application that recognizes a control command and communicates a command message back to a vehicle device to enable device control (*Col. 6, Line 66-Col. 7, Line 15*).

Bennett, Lin, Hedin, and Gerson are analogous art because they are from a similar field of endeavor in speech-controlled systems. Thus, it would have been obvious to a person of ordinary skill in the art, at the time of invention, to modify the teachings of Bennett in view of Lin and further in view of Hedin with the vehicle device control application taught by Gerson in order to increase system applicability by enabling its use for hands-free control of vehicle devices (*Gerson, Col. 6, Line 66-Col. 7, Line 15; and Col. 9, Lines 5-8*).

With respect to **Claims 38-39**, Gerson further discloses an echo canceling block capable of eliminating echoes and noise in varying conditions that provides the benefit of

preventing an echo from being recognized at a speech recognizer (*Col. 9, Line 24-Col. 10, Line 10*).

With respect to **Claim 42**, Gerson further discloses receiving a speech utterance in a vehicle (*Col. 9, Lines 5-22*).

10. **Claims 46-49** are rejected under 35 U.S.C. 103(a) as being unpatentable over Bennett et al in view of Lin et al further in view of Gerson and further in view of Hedin et al.

With respect to **Claims 46-47**, Bennett in view of Lin and further in view of Gerson discloses dialog agents capable of retrieving responses to speech inputs for a number of different applications, as applied to Claim 43. Bennett in view of Lin and further in view of Gerson does not specifically disclose the communication of a recognized command with a remotely located service device, however, Hedin discloses a speech recognizer that sends a recognized speech command message to an external service (*Col. 9, Line 36- Col. 10, Line 24; and Fig. 3, Elements 205, 207 and 307*).

Bennett, Lin, Gerson, and Hedin are analogous art because they are from a similar field of endeavor in speech-controlled systems. Thus, it would have been obvious to a person of ordinary skill in the art, at the time of invention, to modify the teachings of Bennett in view of Lin and further in view of Gerson with the remote service communication means taught by Hedin in order to enable access and control of remote server applications (*Hedin, Col. 2, Lines 39-42*).

Claim 48 contains subject matter similar to Claim 15, and thus, is rejected for the same reasons.

Claim 49 contains subject matter similar to Claim 14, and thus, is rejected for the same reasons.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Balakrishnan (*U.S. Patent: 6,233,559*)- discloses an arbitrator that forwards a speech command to specific applications.

White et al (*U.S. Patent: 6,408,272*)- discloses a voice user interface featuring a transceiver for communicating voice commands to a remote system.

Grant et al (*U.S. Patent: 6,523,061*)- discloses a method for voice control of processes and applications.

Kohut et al (*U.S. Patent: 6,741,931*)- discloses a vehicle navigation system that communicates with a remote navigation server that includes voice recognition, voice generation, and general application software.

Niemoeller (*U.S. Patent Application Publication: 2003/0182132*)- communicates between voice input and voice-controlled devices according to the Bluetooth standard.

Lind et al ("The Network Vehicle- A Glimpse into the Future of Mobile Multi-Media," 1999)- discloses a vehicle system having features as part of a client/server network architecture.

Kuhn et al (*"Hybrid In-Car Speech Recognition for Mobile Multimedia Applications," 1999*)- discloses a vehicle-based system connected to a server capable of performing speech recognition and enabling information resource access.

Belvin et al (*"Development of the HRL Route Navigation Dialog System," 2001*)- discloses a route navigation system utilizing natural language processing.

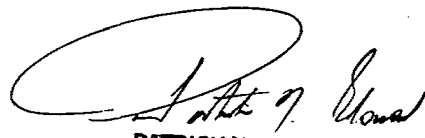
Zhao (*"Telematics: Safe and Fun Driving," 2002*)- discloses the use of speech recognition in an in-vehicle telematics system.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to James S. Wozniak whose telephone number is (571) 272-7632. The examiner can normally be reached on M-Th, 7:30-5:00, F, 7:30-4, Off Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Edouard can be reached at (571) 272-7603. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

James S. Wozniak
4/16/2007



PATRICK N. EDOUARD
SUPERVISORY PATENT EXAMINER



INFORMATION DISCLOSURE CITATION IN AN APPLICATION Form PTO-1449	Docket Number	Application Number
	25300-003	10/618,633
	Applicant(s)	
	Robert A. KENNEWICK <i>et al</i>	
Filing Date	Group Art Unit	
July 15, 2003	2681	

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	1B	5,386,556	01/31/1995	Hedin et al.	395	600	
	1C	5,424,947	06/13/1995	Nagao et al.	364	419.08	
	1D	5,471,318	11/28/1995	Ahuja et al.	358	400	
	1E	5,475,733	12/12/1995	Eisdorfer et al.	379	52	
	1F	5,499,289	03/12/1996	Bruno et al.	379	220	
	1G	5,517,560	05/14/1996	Greenspan	379	114	
	1H	5,533,108	07/02/1996	Harris et al.	379	201	
	1I	5,537,436	07/16/1996	Bottoms et al.	375	222	
	1J	5,539,744	07/23/1996	Chu et al.	370	60	
	1K	5,557,667	09/17/1996	Bruno et al.	379	201	
	1L	5,563,937	10/08/1996	Bruno et al.	379	201	
	1M	5,590,039	12/31/1996	Ikeda et al.	395	759	
	1N	5,633,922	05/27/1997	August et al.	379	220	
	1O	5,675,629	10/07/1997	Raffel et al.	379	58	
	1P	5,708,422	01/13/1998	Blonder et al.	340	825.34	
	1Q	5,721,938	02/24/1998	Stuckey	395	754	
	1R	5,722,084	02/24/1998	Chakrin et al.	455	551	
	1S	5,742,763	04/21/1998	Jones	395	200.3	
	1T	5,752,052	05/12/1998	Richardson et al.	395	759	
	1U	5,754,784	05/19/1998	Garland et al.	395	200.49	
	1V	5,761,631	06/02/1998	Nasukawa	704	9	
TW	1W	5,794,050	08/11/1998	Dahlgren et al.	395	708	

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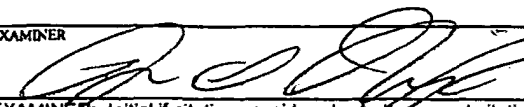
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	2B	5,832,221	11/03/1998	Jones	375	200.36	
	2C	5,878,386	03/02/1999	Coughlin	704	10	
	2D	5,895,466	04/20/1999	Goldberg et al.	707	5	
	2E	5,911,120	06/08/1999	Jarett et al.	455	417	
	2F	5,926,784	07/20/1999	Richardson et al.	704	9	
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	2I	5,963,894	10/05/1999	Richardson et al.	704	9	
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	2K	5,987,404	11/16/1999	Della Pietra et al.	704	9	
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	2M	5,995,119	11/30/1999	Cosatto et al.	345	473	
	2N	6,009,382	12/28/1999	Martino et al.	704	1	
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	2S	6,058,187	05/02/2000	Chen	380	21	
	2T	6,078,886	06/20/2000	Dragosh et al.	704	270	
	2U	6,081,774	06/27/2000	De Hita et al.	704	9	
	2V	6,101,241	08/08/2000	Boyce et al.	379	88.01	
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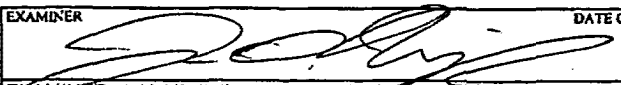
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	3K	6,246,981	06/12/2001	Papineni et al.	704	235		
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	3O	6,366,886	04/02/2002	Dragosh et al.	704	270.1		
	3P	6,385,646	05/07/2002	Brown et al.	709	217		
	3Q	6,393,428	05/21/2002	Miller et al.	707	102		
	3R	6,404,878	06/11/2002	Jackson et al.	379	221.01		
	3S	6,411,810	06/25/2002	Maxemchuk	455	453		
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3U	6,430,285	08/06/2002	Bauer et al.	379	265.01			
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	4F	6,498,797	12/24/2002	Anerousis et al.	370	522	
	4G	6,499,013	12/24/2002	Weber	704	257	
	4H	6,501,834	12/31/2002	Milewski et al.	379	93.24	
	4I	6,523,061	02/18/2003	Halverson et al.	709	202	
	4J	6,532,444	03/11/2003	Weber	704	257	
	4K	6,539,348	03/25/2003	Bond et al.	704	9	
	4L	6,553,372	04/22/2003	Brassell et al.	707	5	
	4M	6,560,576	05/06/2003	Cohen et al.	704	270	
	4N	6,567,778	05/20/2003	Chao Chang et al.	704	257	
	4O	6,570,964	05/27/2003	Murveit et al.	379	67.1	
	4P	6,574,624	06/03/2003	Johnson et al.	707	5	
	4Q	6,594,257	07/15/2003	Doshi et al.	370	352	
	4R	6,604,077	08/05/2003	Dragosh et al.	704	270.1	
	4S	6,611,692	08/26/2003	Raffel et al.	455	552	
	4T	6,614,773	09/02/2003	Maxemchuk	370	337	
	4U	6,629,066	09/30/2003	Jackson et al.	704	9	
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	Examiner James S. Wozniak	Art Unit 2626	Page 1 of 2

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*	B	US-6,420,975	07-2002	DeLine et al.	340/815.4
*	C	US-6,615,172	09-2003	Bennett et al.	704/257
*	D	US-6,937,977	08-2005	Gerson, Ira A.	704/201
*	E	US-6,980,092	12-2005	Turnbull et al.	340/425.5
*	F	US-6,233,559	05-2001	Balakrishnan, Sreeram	704/275
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	M	US-			

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	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Lin et al., "A Distributed Architecture for Cooperative Spoken Dialogue Agents With Coherent Dialogue State and History", ASRU'99, 1999.
	V	Kuhn et al. "Hybrid in-car speech recognition for mobile multimedia applications", Vehicular Technology Conference, 1999, IEEE, July 1999, pp. 2009-2013.
	W	Belvin et al. "Development of the HRL Route Navigation Dialogue System", Proceedings of the first international conference on Human language technology research, San Diego, 2001, pp. 1 - 5.
	X	Lind et al. "The network vehicle- A glimpse into the future of mobile multimedia," IEEE Aerosp. Electron. Syst. Mag., vol. 14, no. 9, September 1999, pp. 27-32.

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Notice of References Cited	Application/Control No. 10/618,633	Applicant(s)/Patent Under Reexamination KENNEWICK ET AL.	
	Examiner James S. Wozniak	Art Unit 2626	Page 2 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-			
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
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	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Zhao, "Telematics: Safe and Fun Driving," IEEE Intelligent Systems, vol. 17, Issue 1, 2002, pp. 10-14.
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
 Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims



Application/Control No.

10/618,633

Examiner

James S. Wozniak

Applicant(s)/Patent under Reexamination

KENNEWICK ET AL.

Art Unit

2626

✓	Rejected
=	Allowed

—	(Through numeral) Cancelled
÷	Restricted

N	Non-Elected
I	Interference

A	Appeal
O	Objected

Claim		Date									
Final	Original	3/20/07									
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Search Notes

Application/Control No.

10/618,633

Examiner

James S. Wozniak

Applicant(s)/Patent under
Reexamination

KENNEWICK ET AL.

Art Unit

2626

SEARCHED

Class	Subclass	Date	Examiner
704	270	3/9/2007	Jw
704	270.1	3/9/2007	1
704	275	3/9/2007	1
704	257	3/9/2007	Jw

INTERFERENCE SEARCHED

Class	Subclass	Date	Examiner

**SEARCH NOTES
(INCLUDING SEARCH STRATEGY)**

	DATE	EXMR
EAST Search (see attached printout)	3/8/2007	Jw
Google Scholar Search	3/8/2007	1
IEEE Search	3/8/2007	1
Inventor Search (see attached printout)	3/9/2007	Jw



Application Serial No.: 10/618,633
Attorney Docket No.: 090611-0312470
Response to April 30, 2007 Office Action

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANTS : Robert A. KENNEWICK et al. CONFIRMATION NO.: 5659
SERIAL NUMBER : 10/618,633 EXAMINER: James S. Wozniak
FILING DATE : July 15, 2003 ART UNIT: 2626
FOR : MOBILE SYSTEMS AND METHODS FOR RESPONDING TO NATURAL LANGUAGE SPEECH UTTERANCE

RESPONSE TO NON-FINAL OFFICE ACTION

Mail Stop Amendment

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Non-Final Office Action mailed **April 30, 2007**, please amend the above-identified application as follows:

Amendments to the Claims begin on page **2** of this paper.

Remarks/Arguments begin on page **13** of this paper.

It is not believed that extensions of time or fees for net addition of claims are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned for under 37 C.F.R. § 1.136(a), and any fees required therefore (including fees for net addition of claims) are hereby authorized to be charged to our Deposit Account No. 033975 (Ref. No. 090611-0312470).

AMENDMENT

Please replace all prior versions and listings of claims with the following listing of claims.

LISTING OF CLAIMS:

1. (Currently Amended) A mobile system responsive to a user generated natural language speech utterance, comprising:

a speech unit that receives the user generated natural language speech utterance and converts the received user generated natural language speech utterance into an electronic signal, ~~said user generated natural language speech utterance having at least one of a query and a command;~~

a natural language speech processing system that receives the electronic signal, that identifies ~~retrieves said~~ at least one of a ~~said~~ query ~~and said~~ or a command from the received electronic signal using data supplied by a plurality of domain agents, that selects at least one domain agent associated with ~~said at least one of said~~ the identified query ~~or and said~~ command from among the plurality of domain agents, and that forwards ~~said the identified~~ at ~~least one of~~ query ~~or and~~ command to ~~said at least one~~ the selected domain agent, wherein ~~said at least one~~ the selected domain agent is an autonomous executable that receives, processes, and responds to ~~said at least one of said~~ the identified query ~~and a said or~~ command, the selected domain agent having access to services associated with each of the plurality of domain agents; and

a transceiver[[,]] in communication with ~~said at least one~~ the selected domain agent, wherein the transceiver receives that transmits an electronic message associated with said at least one of a response to the identified query and or command from the selected domain agent and transmits an electronic message associated the received response.

2. (Currently Amended) The mobile system according to claim 1, wherein the natural language speech processing system ~~further comprises~~ includes an ~~event manager, said event~~

manager that coordinates ~~coordinating~~ interaction ~~between~~ among a plurality of components of ~~associated with~~ the natural language speech processing system.

3. (Currently Amended) The mobile system according to claim 1, wherein the natural language speech processing system ~~further comprises~~ includes:

a speech recognition engine that uses the data supplied by the plurality of domain agents to determine at least one of words or phrases included in the user generated natural language speech utterance; and

a parser that uses the data supplied by the plurality of domain agents to determine ~~determines a domain~~ context for the determined words or phrases, and to transform the determined words or phrases into ~~for the identified query or command user-generated natural language utterance~~ based on the content and context of the user utterance the determined context, wherein the parser invokes the selected domain agent based on the determined context.

4. (Currently Amended) The mobile system according to claim ~~[[1]]~~ 3, wherein the received response includes a text string, and wherein the natural language speech processing system further includes ~~comprising~~ a text to speech engine that uses the data supplied by the plurality of domain agents to convert the ~~converts a~~ text string message to a speech message to be included in the transmitted electronic message.

5. (Currently Amended) The mobile system according to claim 1, wherein ~~said-at-least one~~ the selected domain agent includes ~~information~~ data for controlling or communicating with a remotely located service.

6. (Currently Amended) The mobile system according to claim 1, wherein ~~said-at-least one~~ the selected domain agent includes data associated with at least one of driving directions, travel information, restaurant information, vehicle systems information, safety information, or ~~and~~ entertainment information.

7. (Currently Amended) The mobile system according to claim 1, wherein ~~said at least one~~ the selected domain agent includes data for communicating with one or more devices.
8. (Currently Amended) The mobile system according to claim 7, wherein the data for communicating with the one or more devices includes data for controlling the one or more devices.
9. (Original) The mobile system according to claim 7, wherein the transmitted electronic message is sent to the one or more devices.
10. (Currently Amended) The mobile system according to claim 9, wherein at least one of the one or more devices is ~~a device~~ associated with a vehicle.
11. (Currently Amended) The mobile system according to claim 10, wherein at least one of the speech unit, the natural language speech processing system, or the transceiver mobile system is located remotely from the vehicle.
12. (Currently Amended) The mobile system according to claim 10, wherein the device associated with the vehicle is at least one of a navigation system, a vehicle monitoring system, a security system, a vehicle control system, or ~~and~~ a vehicle media system.
13. (Currently Amended) The mobile system according to claim 1, wherein the transmitted electronic message is sent to at least one remotely located service.
14. (Currently Amended) The mobile system according to claim 13, wherein the remotely located service ~~is~~ includes at least one of a payment service provider, a customer relationship management system, a specialized service, a location service, or an ~~and~~ emergency service.

15. **(Currently Amended)** The mobile system according to claim 13, wherein the ~~transceiver transmits~~ the transmitted electronic message is transmitted via a communication network.

16. **(Original)** The mobile system according to claim 15, wherein the communication network is a wide area wireless network.

17. **(Original)** The mobile system according to claim 1, wherein the transceiver is a wide-area RF transceiver.

18. **(Currently Amended)** The mobile system according to claim 1, wherein the speech unit includes at least one of a speech coder, an array microphone, or ~~and~~ a filter.

19. **(Original)** The mobile system according to claim 18, wherein the filter employs adaptive echo cancellation.

20. **(Original)** The mobile system according to claim 18, wherein the array microphone is at least a one-dimensional array.

21. **(Original)** The mobile system according to claim 18, wherein the speech coder uses an adaptive lossy audio compression.

~~21~~ 22. **(Currently Amended)** The mobile system according to claim 1, wherein the speech unit is located remotely from at least one of the natural language speech processing system ~~and~~ or the transceiver.

23. **(Currently Amended)** The mobile system according to claim 1, further comprising at least one of a display ~~and~~ or a keypad.

24. (Original) The mobile system according to claim 1, further comprising a telematics control unit.

25. (Currently Amended) The mobile system according to claim ~~[[1]]~~ 24, wherein at least one of the speech unit, the natural language speech processing system, or the transceiver ~~mobile-system~~ is embedded in a telematic the telematics control unit.

26. (Currently Amended) The mobile system according to claim 1, wherein at least one of the speech unit, the natural language speech processing system, or the transceiver ~~mobile system~~ is embedded into at least one of a vehicle, a handheld device, a fixed computer, or ~~and~~ a mobile computer device.

27. (Currently Amended) The mobile system according to claim 1, ~~wherein the mobile system is deployed in a~~ further comprising at least one network ~~[[of]]~~ resource shared by a plurality of devices, the shared network resource including ~~using a common base of~~ at least one of the speech unit, the natural language speech processing system, the transceiver, the plurality of agents, user profiles, ~~and~~ event histories, or dialogue histories.

28. (Currently Amended) A method responsive to a user generated natural language speech utterance, comprising:

receiving the user generated natural language speech utterance, ~~the user generated natural language speech utterance having at least one of a query and a command;~~

converting the received user generated natural language speech utterance into an electronic signal;

identifying ~~retrieving said~~ at least one of said a query and said ~~or a~~ command from the electronic signal using data supplied by a plurality of domain agents;

selecting ~~[[a]]~~ at least one domain agent from among the plurality of domain agents, the selected domain agent associated with the identified ~~said at least one of said~~ query ~~and said~~ or command;

forwarding ~~said at least one of said~~ the identified query ~~and said or~~ command to ~~said~~ the selected domain agent, wherein ~~said~~ the selected domain agent is an autonomous executable that receives, processes, and responds to ~~said at least one of said~~ the forwarded query ~~and said or~~ command, the selected domain agent having access to services associated with each of the plurality of domain agents; ~~and~~

receiving a response to the forwarded query or command from the selected domain agent; and

transmitting [[a]] an electronic message associated with the received response ~~said at least one of said query and said command to a remotely located service.~~

29. (Currently Amended) The method according to claim 28, further comprising coding the electronic signal using at least one of a speech coder, an array microphone, or a filter, the electronic signal coded using an adaptive lossy audio compression.

30. (Currently Amended) The method according to claim 28, ~~further comprising selecting a second domain agent, the~~ second wherein the selected domain agent includes data for controlling or communicating associated with at least one of a navigation system, a vehicle monitoring system, a security system, a vehicle control system, or and a vehicle media system; ~~and forwarding a second message to said second domain agent.~~

31. (Currently Amended) The method according to claim 28, wherein ~~said~~ the selected domain agent includes data associated with at least one of driving directions, travel information, restaurant information, vehicle systems information, safety information, or and entertainment information.

32. (Currently Amended) The method according to claim 28, wherein ~~said~~ the selected domain agent includes ~~information~~ data for controlling or communicating with ~~the~~ a remotely located service.

33. (Currently Amended) The method according to claim 32, wherein forwarding the transmitting operation includes sending at least one of a identified query and a or command to the selected domain agent includes transmitting a request to the remotely located service.

34. (Currently Amended) The method according to claim [[28]] 33, wherein the remotely located service device-system is associated with a remotely located device.

35. (Currently Amended) The method according to claim [[28]] 33, wherein the transmitted request is transmitted ~~transmitting operation with the remotely located service is~~ via a communication network.

36. (Currently Amended) The method according to claim [[28]], wherein the remotely located service ~~is~~ includes at least one of a payment service provider, a customer relationship management system, a specialized service, a location service, or an ~~and a~~ emergency service.

37. (Currently Amended) The method according to [[28]], wherein the request is transmitted to ~~transmitting operation with~~ the remotely located service is via a wide-area RF transceiver.

38. (Currently Amended) The method according to 28, further comprising filtering the received user generated natural language speech utterance to remove ~~filtering-out~~ background noise ~~of the received user utterance.~~

39. (Original) The method according to 38, wherein filtering the received user generated natural language speech utterance includes ~~the filtering-out operation is by at least using a~~ ~~filter~~ employing adaptive echo cancellation.

40. (Cancelled)

41. (Currently Amended) The method according to claim 28, ~~wherein the receiving operation of the user generated natural language speech utterance is remotely performed from the other operations~~ further comprising retrieving data from a network resource shared by a plurality of devices, the shared network resource including at least one of a speech unit, a natural language speech processing system, a transceiver, the plurality of agents, user profiles, event histories, or dialogue histories.

42. (Currently Amended) The method according to claim 41, wherein the shared network resource is associated with ~~the receiving operation of the user generated natural language speech utterance is performed in a vehicle.~~

43. (Currently Amended) The method according to claim ~~[[28]]~~ 42, wherein ~~further comprising retrieving data from a~~ the shared network shared source, the network shared source is at least one of an agent, a user profile and a events history resource is located remotely from the vehicle.

~~43~~ 44. (Currently Amended) A mobile system responsive to a user generated natural language speech utterance, comprising:

first receiving means for receiving ~~that receives~~ the user generated natural language speech utterance, ~~the user generated natural language speech utterance having at least one of a query and a command;~~

converting means that converts for converting the received user generated natural language speech utterance into an electronic signal;

identifying retrieving means that retrieves for identifying ~~said~~ at least one of a said query and said or a command from the electronic signal using data supplied by a plurality of domain agent selecting means that selects a domain agent associated with said at least one of said query and said command agents;

selecting means for selecting at least one domain agent from among the plurality of domain agents, the selected domain agent associated with the identified query or command;

forwarding means for forwarding that forwards said at least one of said the identified query and said or command to said the selected domain agent, wherein the selected domain agent is an autonomous executable that receives, processes, and responds to the forwarded query or command, the selected domain agent having access to services associated with each of the plurality of domain agents, wherein the receiving means further receives; and

second receiving means for receiving a response to the forwarded query or command from the selected domain agent; and

transmitting means for transmitting that transmits a an electronic message associated with the received response from said selected domain agent to a device system.

44 45. (Currently Amended) The mobile system according to claim 43 44, wherein the selected domain agent includes data for controlling or communicating with device-system-is at least one of a navigation system, a vehicle monitoring system, a security system, a vehicle control system, or and a vehicle media system.

45 46. (Currently Amended) The mobile system according to claim 43 44, wherein the selected at least one domain agent includes data associated with at least one of driving directions, travel information, restaurant information, vehicle systems information, safety information, or and entertainment information.

46 47. (Currently Amended) The mobile system according to claim 43 44, wherein the selected domain agent includes data for controlling or communicating with device-system-is a remotely located device.

47 48. (Currently Amended) The mobile system according to claim 43 44, wherein the selected domain agent includes data for controlling or communicating with device-system-is a remotely located service.

~~48~~ 49. (Currently Amended) The mobile system according to claim ~~47~~ 48, wherein the forwarding transmitting means forwards the identified query or command to the selected domain agent by transmitting a request to communicate with the remotely located service via a communication network.

~~49~~ 50. (Currently Amended) The mobile system according to claim ~~47~~ 48, wherein the remotely located service ~~[[is]]~~ includes at least one of a payment service provider, a customer relationship management system, a specialized service, a location service, or an and-a emergency service.

~~50~~ 51. (Currently Amended) The mobile system according to ~~43~~ 44, wherein the transmitting means is a wide-area RF transceiver.

~~51~~ 52. (Currently Amended) The mobile system according to ~~43~~ 44, further comprising ~~[[a]]~~ filtering means that filters for filtering the received user generated natural language speech utterance to remove background noise.

~~52~~ 53. (Currently Amended) The mobile system according to claim ~~43~~ 44, further comprising a ~~coder~~ coding means for coding that codes the user-generated natural language speech utterance electronic signal using at least one of a speech coder, an array microphone, or a filter.

~~53~~ 54. (Currently Amended) The mobile system according to claim ~~43~~ 44, wherein the ~~receiving means is remotely located from other mobile system components~~ further comprising retrieving means for retrieving data from a network resource shared by a plurality of devices, the shared network resource including at least one of a speech unit, a natural language speech processing system, a transceiver, the plurality of agents, user profiles, event histories, or dialogue histories.

~~54~~ 55. (Currently Amended) The mobile system according to claim ~~53~~ 54, wherein the shared network resource is associated with the receiving means is located at a vehicle.

~~55~~ 56. (Currently Amended) The mobile system according to claim ~~43~~ 55, wherein the shared further comprising data retrieving means that retrieves data from a network shared source, the source is at least one of an agent, data, a user profile and a events history resource is located remotely from the vehicle.

REMARKS

Upon entry of the foregoing Amendment, claims 1-56 are pending in the application. Claims 1-8, 10-15, 18, 22-23, 25-39, and 41-56 have been amended. Claim 40 is cancelled. No claims are newly added. Applicants believe that this Amendment does not add new matter. In view of the foregoing Amendment and following Remarks, allowance of all the pending claims is requested.

EXAMINER INTERVIEW

Applicants thank Examiner Wozniak for granting Applicants' representative the courtesy of an Examiner Interview on August 20, 2007. During the Examiner interview, Applicants' representative discussed the claims in light of the rejections as set forth below in further detail.

Applicants also note that the Examiner has suggested correcting the previous misnumbering of the claims by amending the claim numbering, as provided by the foregoing Amendment. As a result, the following discussion of the objections and rejections raised by the Examiner are based on the renumbered, amended claims.

CLAIM OBJECTIONS

The Examiner has objected to claims 3, 22, 34, and 44-56 because of alleged informalities. Applicants note that the claims have been amended as indicated above, and that the amended claims fully address the objections that the Examiner has raised. Accordingly, Applicants request that the Examiner withdraw this objection to the claims.

NON-STATUTORY DOUBLE PATENTING REJECTION

The Examiner has provisionally rejected claims 1-56 under the judicially created doctrine of obviousness-type double patenting as allegedly being unpatentable over claims 1-40 of copending Application No. 10/452,147.

Applicants will consider filing a terminal disclaimer to overcome this rejection once otherwise patentable subject matter has been determined. Applicants note that the filing of a

terminal disclaimer to obviate a rejection based on non-statutory double patenting is not an admission of the propriety of the rejection. See *Quad Environmental Technologies Corp. v. Union Sanitary District*, 946 F.2d 870 (Fed. Cir. 1991).

REJECTION UNDER 35 U.S.C. § 103

The Examiner has rejected claims 1-4, 6, 17-18, 21-23, and 27 under 35 U.S.C. § 103 as allegedly being unpatentable over U.S. Patent No. 6,615,172 to Bennett et al. ("Bennett") in view of "A Distributed Architecture for Cooperative Spoken Dialogue Agents with Coherent Dialogue State and History to Lin et al. ("Lin"). This rejection is improper for at least the reason that the Examiner has failed to establish a *prima facie* case of obviousness, as Bennett and Lin, either alone or in combination, fail to disclose, teach, or suggest all the features of the claimed invention.

More particularly, neither Bennett nor Lin, either alone or in combination, disclose, teach, or suggest at least the feature of "a natural language speech processing system that . . . selects at least one domain agent . . . having access to services associated with each of [a] plurality of domain agents," as recited in claim 1, for example. The Examiner acknowledges that "Bennett does not explicitly disclose . . . selecting and forwarding a query to . . . executable dialog agents associated with different domains." Office Action at 5. However, the Examiner alleges that "Lin . . . discloses a user interface agent that enables query forwarding to a particular dialog agent." Office Action at 5. Applicants disagree with the Examiner's assessment.

Specifically, Lin does not disclose, teach, or suggest the aforementioned feature for at least the reason that Lin expressly disavows centralized multi-domain spoken dialogue systems that include agents having access to each other's services. In particular, Lin expresses concern regarding such systems because "it will be very difficult to extend . . . to new domains," for example, "because the dialogue has to be switched across many different domains smoothly." Lin at Section 2.1. As a result, Lin takes a contrary approach, implementing a distributed architecture in which "domain switching should be executed" whenever a "new [spoken

dialogue agent] . . . is different from the current [spoken dialogue agent].” Lin at Section 3.3. Thus, Lin specifically relates to a system in which domain agents operate independently of each other, and in which a current agent is disconnected whenever domain switching occurs. Accordingly, for at least these reasons, Lin fails to disclose, teach, or suggest at least the feature of “a natural language speech processing system that . . . selects at least one domain agent . . . having access to services associated with each of [a] plurality of domain agents,” as recited in claim 1, for example.

Accordingly, for at least the foregoing reasons, Bennett and Lin, either alone or in combination, fail to disclose, teach, or suggest every feature recited in claim 1. Accordingly, the rejection is improper and must be withdrawn. Claims 2-4, 6, 17-18, 21-23, and 27 depend from and add features to claim 1. Thus, the rejection of these claims is likewise improper and must be withdrawn for at least the same reasons.

The Examiner has also rejected claims 7-12, 19, 44-46, and 51-56 as allegedly being unpatentable over Bennett in view of Lin, and further in view of U.S. Patent No. 6,937,977 to Gerson (“Gerson”), claims 5, 13-16, 28-29, 31-37, 40-41, and 43 as allegedly being unpatentable over Bennett in view of Lin, and further in view of U.S. Patent No. 6,185,535 to Hedin et al. (“Hedin”), claim 20 as allegedly being unpatentable over Bennett in view of Lin, and further in view of U.S. Patent No. 6,420,975 to DeLine et al. (“DeLine”), claims 24-26 as allegedly being unpatentable over Bennett in view of Lin, and further in view of U.S. Patent No. 6,980,092 to Turnbull et al. (“Turnbull”), claims 30, 38-39, and 42 as allegedly being unpatentable over Bennett in view of Lin, further in view of Hedin and further in view of Gerson, and claims 47-50 as allegedly being unpatentable over Bennett in view of Lin, further in view of Gerson and further in view of Hedin. These rejections are improper for at least the reason that the Examiner has failed to establish a *prima facie* case of obviousness, as the references relied upon, either alone or in combination, fail to disclose, teach, or suggest all the features of the claimed invention.

More particularly, for at least the reasons given above, neither Bennett nor Lin, either alone or in combination, disclose, teach, or suggest at least the feature of “a natural language speech processing system that . . . selects at least one domain agent . . . having access to

services associated with each of [a] plurality of domain agents," as recited in claim 1, for example. None of Gerson, Hedin, DeLine, or Turnbull cure the deficiencies of Bennett and Lin discussed above. For at least this reason, the references relied upon, either alone or in combination, fail to disclose, teach, or suggest all of the features recited in claim 1.

Claims 28 and 44 include features similar to those set forth in claim 1. Claims 5, 7-16, 19-20, 24-26, 28-39, 40-43, 45-56 depend from and add features to one of claims 1, 28, and 44. Thus, the rejections of these claims are likewise improper and must be withdrawn for at least the same reasons.

CONCLUSION

Having addressed each of the foregoing rejections, it is respectfully submitted that a full and complete response has been made to the outstanding Office Action and, as such, the application is in condition for allowance. Notice to that effect is respectfully requested.

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Date: August 30, 2007

Respectfully submitted,

By:



Syed Jafar Ali
Registration No. 58,780

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Fax: 703-770-7901



Application Serial No.: 10/618,633
Attorney Docket No.: 090611-0312470
Supplemental Information Disclosure Statement

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANTS : Robert A. KENNEWICK *et al.* CONFIRMATION NO.: 5659
SERIAL NUMBER : 10/618,633 EXAMINER: James S. Wozniak
FILING DATE : July 15, 2003 ART UNIT: 2626
FOR : MOBILE SYSTEMS AND METHODS FOR RESPONDING TO NATURAL LANGUAGE SPEECH
UTTERANCE

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to the duty of disclosure under 37 C.F.R. §§ 1.56, 1.97 and 1.98, Applicants hereby make of record in the above-identified application the documents listed on the attached Form PTO-1449.

Applicants reserve the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

This Supplemental Information Disclosure Statement is being filed more than three months after the filing date of a national application other than a continued prosecution application under 37 C.F.R. §1.53(d), or more than three months after the date of entry of the

national stage as set forth in 37 C.F.R. §1.491 in an international application, and after the mailing date of the first Office Action on the merits, but before the mailing date of any of a Final Action under 37 C.F.R. §1.113, a Notice of Allowance under 37 C.F.R. §1.311, or an action that otherwise closes prosecution in the application. 37 C.F.R. §1.97(c).

Documents B and G were cited by the U.S. Patent Office in co-pending Application Serial No. 10/452,147, filed June 3, 2003, in an Office Action dated May 30, 2007. Documents A, C-F, and H-J were cited by the U.S. Patent Office in co-pending Application Serial No. 11/197,504, filed August 5, 2005, in an Office Action dated August 24, 2007. I hereby certify that no item of information contained in this Supplemental Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to my knowledge after making reasonable inquiry, no item of information contained in this Supplemental Information Disclosure Statement was known to any individual designated in 37 C.F.R. §1.56(c) more than three months prior to the filing of this Supplemental Information Disclosure Statement. 37 C.F.R. §1.97(e)(2).

A copy of each cited U.S. patent is not submitted herewith pursuant to the Official Gazette Notice of August 5, 2003, wherein the Office waived the requirement under 37 C.F.R. §1.98(a)(2)(i) for all U.S. national phase applications filed after June 30, 2003.

It is respectfully requested that the Examiner initial and return a copy of the enclosed
PTO-1449.

Respectfully submitted,

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