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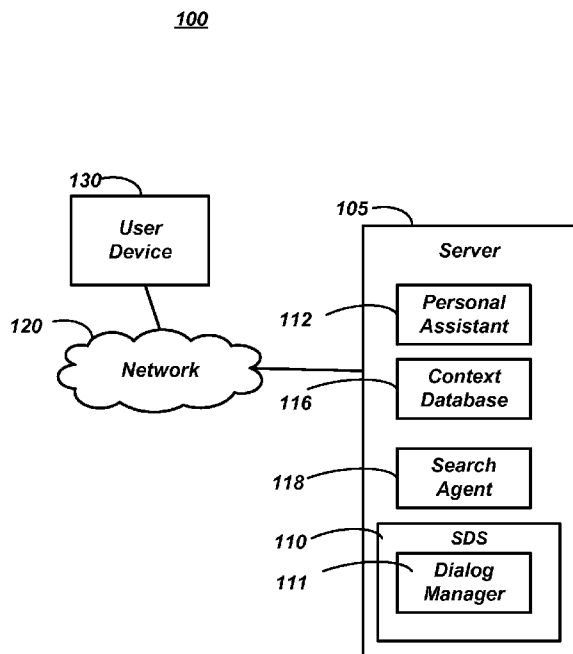(54) **Title:** AUGMENTED CONVERSATIONAL UNDERSTANDING ARCHITECTURE

(57) **Abstract**: An augmented conversational understanding architecture may be provided. Upon receiving a natural language phrase from a user, the phrase may be translated into a search phrase and a search action may be performed on the search phrase.

100

FIG. 1

WO 2012/135226 A1

MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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AUGMENTED CONVERSATIONAL UNDERSTANDING ARCHITECTURE

BACKGROUND

[001] An augmented conversational understanding architecture may provide a mechanism for facilitating natural language understanding of user queries and conversations. In some situations, personal assistant programs and/or search engines often require specialized formatting and syntax. For example, a user's query of "I want to go see 'Inception' around 7" may be ineffective at communicating the user's true intentions when provided to a conventional system. Such systems may generally be incapable of deriving the context that the user is referring to a movie, and that the user desires results informing them of local theatres showing that movie around 7:00.

SUMMARY

[002] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter. Nor is this Summary intended to be used to limit the claimed subject matter's scope.

[003] An augmented conversational understanding architecture may be provided. Upon receiving a natural language phrase from a user, the phrase may be translated into a search phrase and a search action may be performed on the search phrase.

[004] Both the foregoing general description and the following detailed description provide examples and are explanatory only. Accordingly, the foregoing general description and the following detailed description should not be considered to be restrictive. Further, features or variations may be provided in addition to those set forth herein. For example, embodiments may be directed to various feature combinations and sub-combinations described in the detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[005] The accompanying drawings, which are incorporated in and constitute a part of this disclosure, illustrate various embodiments of the present invention. In the drawings:

[006] FIG. 1 is a block diagram of an operating environment;

[007] FIGs. 2A-2B are block diagrams illustrating an interface for providing an augmented conversational understanding architecture;

[008] FIG. 3 is a block diagram illustrating an interface for providing feedback to an augmented conversational understanding architecture;

[009] FIG. 4 is a flow chart of a method for providing an augmented conversational understanding architecture; and

[010] FIG. 5 is a block diagram of a system including a computing device.

DETAILED DESCRIPTION

[011] The following detailed description refers to the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the following description to refer to the same or similar elements. While embodiments of the invention may be described, modifications, adaptations, and other implementations are possible. For example, substitutions, additions, or modifications may be made to the elements illustrated in the drawings, and the methods described herein may be modified by substituting, reordering, or adding stages to the disclosed methods. Accordingly, the following detailed description does not limit the invention. Instead, the proper scope of the invention is defined by the appended claims.

[012] An augmented conversational understanding architecture may facilitate natural language understanding of user queries and conversations. The architecture may allow for determining the context of the query and for inferring the user's intentions. The architecture may use the words of the natural language query to determine the context of the conversation, to estimate the user intents, and to form appropriate additional queries using a suitable search agent.

[013] Spoken dialog systems (SDS) enable people to interact with computers with their voice. The primary component that drives the SDS may comprise a dialog manager: this component manages the dialog-based conversation with the user. The dialog manager may determine the intention of the user through a combination of multiple sources of input, such as speech recognition and natural language understanding component outputs, context from the prior dialog turns, user context, and/or results returned from a knowledge base (e.g., search engine). After determining the intention, the dialog manager may take an action, such as displaying the final results to the user and/or continuing in a dialog with the user to satisfy their intent.

[014] FIG. 1 is a block diagram of an operating environment 100 comprising a server 105. Server 105 may comprise assorted computing resources and/or software modules such as a spoken dialog system (SDS) 110 comprising a dialog manager 111, a personal assistant program 112, a context database 116, and/or a search agent 118. SDS 110 may receive queries and/or action requests from users over network 120. Such queries may be transmitted, for example, from a user device 130 such as a computer

2

and/or cellular phone. Network 120 may comprise, for example, a private network, a cellular data network, and/or a public network such as the Internet.

[015]   FIG. 2A is a block diagram of an interface 200 for providing an augmented conversational understanding architecture. Interface 200 may comprise a user input panel 210 and a personal assistant panel 220. User input panel 210 may display translated user queries and/or action request such as a user statement 230. User statement 230 may comprise, for example, a result from a speech-to-text conversion received from a user of user device 130. Personal assistant panel 220 may comprise a plurality of action suggestions 240(A)-(C) derived from a context state associated with the user and user statement 230.

[016]   FIG. 2B is a further illustration of interface 200 comprising an updated display after a user selects one of plurality of action suggestions 240(A). For example, plurality of action suggestions 240(A)-(C) may comprise suggested activities in response to a user's expressed intent to "go out tonight." Upon selection of action suggestion 240(A), indicating the user's intent to go out to eat in this example, personal assistant panel 220 may be updated with a second plurality of action suggestions 250(A)-(C) associated with further defining the user's intent. For example, second plurality of action suggestions 250(A)-(C) may comprise different suggested cuisines that the user may want to eat. Consistent with embodiments of the invention, a context state associated with the user may be used to provide and/or order second plurality of action suggestions 250(A)-(C). For example, the context state may comprise a history of previous restaurants visited and/or liked by the user, and the types of cuisine may be ordered according to those preferences.

[017]   FIG. 3 is a block diagram of interface 200 illustrating the provision of feedback to an augmented conversational understanding architecture. The user may change all and/or a portion of user statement 230 into a modified user statement 310. For example, the user may use a mouse, stylus, keyboard, voice command, and/or other input mechanism to select the previously translated word "out" and modify that word to "outside." Personal assistant panel 220 may then be updated with an updated plurality of suggested actions 320(A)-(B) according to modified user statement 310.

[018]   FIG. 4 is a flow chart setting forth the general stages involved in a method 400 consistent with an embodiment of the invention for providing an augmented conversational understanding architecture. Method 400 may be implemented using a computing device 400 as described in more detail below with respect to FIG. 4. Ways to

implement the stages of method 400 will be described in greater detail below. Method 400 may begin at starting block 405 and proceed to stage 410 where computing device 500 may receive an action request. For example, SDS 110 may receive a request from user device 130 comprising a user's spoken query to "find a place to eat."

[019]   Method 400 may then advance to stage 415 where computing device 500 may gather a context state associated with the user. The context state may comprise, for example, a role associated with the user, at least one previous user objective, at least one previous user action request, a location of the user, a time, a date, a category associated with the first action request from the user, a data type associated with the first action request from the user, and/or a data category associated with previous user action requests. Such information may be stored in context database 116 of SDS 110.

[020]   Method 400 may then advance to stage 420 where computing device 500 may create a plurality of objectives according to the context state. For example, SDS may identify "dining" as a domain associated with the query "find a place to eat." Objectives such as finding a nearby restaurant according to the user's location and/or creating reservations according to a number of users involved in a conversation may thus be generated.

[021]   Method 400 may then advance to stage 425 where computing device 500 may execute the requested action according to the context state. For example, in response to the user query "find a place to eat", translator module 114 may command search agent 118 to search for nearby restaurants to the user. The results of this search my be transmitted back to user device 130 by personal assistant program 112 and displayed, for example, in personal assistant panel 220 of interface 200.

[022]   Method 400 may then advance to stage 430 where computing device 500 may update the context state. For example, the current selection of choices comprising plurality of action suggestions 240(A)-(C) may each be associated with a predicted probability in the user's context state. The user's next action may be used to adjust these predicted probabilities for application to future queries.

[023]   Method 400 may then advance to stage 435 where computing device 500 may determine whether the next requested action is associated with accomplishing the current objective. For example, SDS 110 may compare the user's context state to a plurality of user context states each associated with the current objective. Previous users who issued the same action/query request may have taken similar next actions, and a different action by the user at this stage may indicate that an incorrect objective has been

predicted. If the user's next action does not comport with the predicted objective, method 400 may return to stage 420 where a new set of objectives may be generated.

[024] Otherwise, method 400 may advance to stage 440 where computing device 500 may determine if the predicted objective is completed. For example, if SDS 110 receives a requested action to finalize a dinner reservation and arrange a taxi, the objective of making dinner plans may be determined to be complete and method 400 may end at stage 442. If the action comprises selecting a restaurant to make reservations at, but a time has not been selected, the predicted objective may be determined not to be complete.

[025] If the predicted objective is incomplete at stage 440, method 400 may then advance to stage 445 where computing device 500 may provide a next suggested action. For example, where a restaurant is selected but a time is not, personal assistant program 112 may request a reservation time from the user.

[026] Method 400 may then advance to stage 450 where computing device 500 may receive a next action from the user. For example, the user may input a selection of 7:00 for the reservation time and transmit it to SDS 110. Method 400 may then return to stage 425 and execute the next requested action as described above.

[027] An embodiment consistent with the invention may comprise a system for providing a context-aware environment. The system may comprise a memory storage and a processing unit coupled to the memory storage. The processing unit may be operative to receive a natural language phrase from a user, translate the natural language phrase into a search phrase, and perform a search action according to the search phrase. The natural language phrase may be received, for example, as a plurality of text words and/or as an audio stream. The search phrase may comprise at least one contextual semantic concept not contained in the natural language phrase. The processing unit may be further operative to receive a plurality of search results according to the search action and provide the plurality of search results to the user. The processing unit may be further operative to provide the plurality of results to a plurality of users. The natural language phrase may be derived, for example, from a conversation among the plurality of users. The processing unit may be further operative to analyze a plurality of application programming interfaces (APIs) and identify at least one required parameter for each of the plurality of APIs. Each of the plurality of APIs may be associated with a website search function. Being operative to translate the natural language phrase into the search phrase may comprise the processing unit being operative to identify a context associated with the natural language phrase, determine whether at least one of the plurality of APIs is associated with the

identified context, and, if so, translate at least one word of the natural language phrase into the at least one required parameter associated with the at least one of the plurality of APIs. Being operative to perform the search action may comprise the processing unit being operative to call the at least one of the plurality of APIs with the at least one required

5   parameter.

[028]   Another embodiment consistent with the invention may comprise a system for providing a context-aware environment. The system may comprise a memory storage and a processing unit coupled to the memory storage. The processing unit may be operative to receive a natural language phrase from a user, create a context state associated

10   with the natural language phrase, translate the natural language phrase into an executable action, identify a domain associated with the executable action according to the identified context, and performing the executable action within the identified domain. The executable action may comprise, for example, a search action, a data creation action, a data modification action, and a communication action. The processing unit may be further

15   operative to provide at least one suggested next action to the user. The processing unit may be further operative to receive a second natural language phrase from the user, determine whether the second natural language phrase is associated with the at least one suggested next action, and, if so, perform the at least one suggested next action. In response to determining that the second natural language phrase is not associated with the

20   at least one suggested next action, the processing unit may be operative to providing at least one second suggested next action to the user. The processing unit may be further operative to update the context state according to the second natural language phrase.

[029]   Yet another embodiment consistent with the invention may comprise a system for providing a context-aware environment. The system may comprise a memory

25   storage and a processing unit coupled to the memory storage. The processing unit may be operative to create a plurality of objectives, gather a context state associated with a user, provide a suggested action associated with at least one of the plurality of objectives according to the context state, receive an action request from the user, execute the requested action according to the context state, and determine whether the action is

30   associated with accomplishing the at least one of the plurality of objectives. In response to determining that the action is associated with accomplishing the at least one of the plurality of objectives, the processing unit may be operative to update the context state, update a probability associated with the suggested action, and determine whether the context state comprises a completed objective of the plurality of objectives. In response to

determining that the context state does not comprise the completed objective, the processing unit may be operative to provide at least one second suggested action.

[030] The context state may comprise, for example, a role associated with the user, at least one previous user objective, at least one previous user action request, a location of the user, a time, a date, a category associated with the first action request from the user, a data type associated with the first action request from the user, and a data category associated with previous user action requests. Being operative to determine whether the context state is associated with accomplishing the at least one predicted objective may comprise the processing unit being operative to compare the context state to a plurality of user context states each associated with the at least one of the plurality of objectives.

[031] FIG. 5 is a block diagram of a system including computing device 500. Consistent with an embodiment of the invention, the aforementioned memory storage and processing unit may be implemented in a computing device, such as computing device 500 of FIG. 5. Any suitable combination of hardware, software, or firmware may be used to implement the memory storage and processing unit. For example, the memory storage and processing unit may be implemented with computing device 500 or any of other computing devices 518, in combination with computing device 500. The aforementioned system, device, and processors are examples and other systems, devices, and processors may comprise the aforementioned memory storage and processing unit, consistent with embodiments of the invention. Furthermore, computing device 500 may comprise an operating environment for system 100 as described above. System 100 may operate in other environments and is not limited to computing device 500.

[032] With reference to FIG. 5, a system consistent with an embodiment of the invention may include a computing device, such as computing device 500. In a basic configuration, computing device 500 may include at least one processing unit 502 and a system memory 504. Depending on the configuration and type of computing device, system memory 504 may comprise, but is not limited to, volatile (e.g., random access memory (RAM)), non-volatile (e.g., read-only memory (ROM)), flash memory, or any combination. System memory 504 may include operating system 505, one or more programming modules 506, and may include personal assistant program 112. Operating system 505, for example, may be suitable for controlling computing device 400's operation. Furthermore, embodiments of the invention may be practiced in conjunction with a graphics library, other operating systems, or any other application program and is

not limited to any particular application or system. This basic configuration is illustrated in FIG. 5 by those components within a dashed line 508.

[033] Computing device 500 may have additional features or functionality. For example, computing device 500 may also include additional data storage devices (removable and/or non-removable) such as, for example, magnetic disks, optical disks, or tape. Such additional storage is illustrated in FIG. 5 by a removable storage 509 and a non-removable storage 510. Computer storage media may include volatile and nonvolatile, removable and non-removable media implemented in any method or technology for storage of information, such as computer readable instructions, data structures, program modules, or other data. System memory 504, removable storage 509, and non-removable storage 510 are all computer storage media examples (i.e., memory storage). Computer storage media may include, but is not limited to, RAM, ROM, electrically erasable read-only memory (EEPROM), flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store information and which can be accessed by computing device 500. Any such computer storage media may be part of device 500. Computing device 500 may also have input device(s) 512 such as a keyboard, a mouse, a pen, a sound input device, a touch input device, etc. Output device(s) 514 such as a display, speakers, a printer, etc. may also be included. The aforementioned devices are examples and others may be used.

[034] Computing device 500 may also contain a communication connection 516 that may allow device 500 to communicate with other computing devices 518, such as over a network in a distributed computing environment, for example, an intranet or the Internet. Communication connection 516 is one example of communication media. Communication media may typically be embodied by computer readable instructions, data structures, program modules, or other data in a modulated data signal, such as a carrier wave or other transport mechanism, and includes any information delivery media. The term "modulated data signal" may describe a signal that has one or more characteristics set or changed in such a manner as to encode information in the signal. By way of example, and not limitation, communication media may include wired media such as a wired network or direct-wired connection, and wireless media such as acoustic, radio frequency (RF), infrared, and other wireless media. The term computer readable media as used herein may include both storage media and communication media.

[035]   As stated above, a number of program modules and data files may be stored in system memory 504, including operating system 505. While executing on processing unit 502, programming modules 506 (e.g., personal assistant program 112) may perform processes including, for example, one or more of method 500's stages as described above. The aforementioned process is an example, and processing unit 502 may perform other processes. Other programming modules that may be used in accordance with embodiments of the present invention may include electronic mail and contacts applications, word processing applications, spreadsheet applications, database applications, slide presentation applications, drawing or computer-aided application programs, etc.

[036]   Generally, consistent with embodiments of the invention, program modules may include routines, programs, components, data structures, and other types of structures that may perform particular tasks or that may implement particular abstract data types. Moreover, embodiments of the invention may be practiced with other computer system configurations, including hand-held devices, multiprocessor systems, microprocessor-based or programmable consumer electronics, minicomputers, mainframe computers, and the like. Embodiments of the invention may also be practiced in distributed computing environments where tasks are performed by remote processing devices that are linked through a communications network. In a distributed computing environment, program modules may be located in both local and remote memory storage devices.

[037]   Furthermore, embodiments of the invention may be practiced in an electrical circuit comprising discrete electronic elements, packaged or integrated electronic chips containing logic gates, a circuit utilizing a microprocessor, or on a single chip containing electronic elements or microprocessors. Embodiments of the invention may also be practiced using other technologies capable of performing logical operations such as, for example, AND, OR, and NOT, including but not limited to mechanical, optical, fluidic, and quantum technologies. In addition, embodiments of the invention may be practiced within a general purpose computer or in any other circuits or systems.

[038]   Embodiments of the invention, for example, may be implemented as a computer process (method), a computing system, or as an article of manufacture, such as a computer program product or computer readable media. The computer program product may be a computer storage media readable by a computer system and encoding a computer program of instructions for executing a computer process. The computer program product may also be a propagated signal on a carrier readable by a computing

system and encoding a computer program of instructions for executing a computer process. Accordingly, the present invention may be embodied in hardware and/or in software (including firmware, resident software, micro-code, etc.). In other words, embodiments of the present invention may take the form of a computer program product on a computer-usable or computer-readable storage medium having computer-usable or computer-readable program code embodied in the medium for use by or in connection with an instruction execution system. A computer-usable or computer-readable medium may be any medium that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device.

[039]   The computer-usable or computer-readable medium may be, for example but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific computer-readable medium examples (a non-exhaustive list), the computer-readable medium may include the following: an electrical connection having one or more wires, a portable computer diskette, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), an optical fiber, and a portable compact disc read-only memory (CD-ROM). Note that the computer-usable or computer-readable medium could even be paper or another suitable medium upon which the program is printed, as the program can be electronically captured, via, for instance, optical scanning of the paper or other medium, then compiled, interpreted, or otherwise processed in a suitable manner, if necessary, and then stored in a computer memory.

[040]   Embodiments of the present invention, for example, are described above with reference to block diagrams and/or operational illustrations of methods, systems, and computer program products according to embodiments of the invention. The functions/acts noted in the blocks may occur out of the order as shown in any flowchart. For example, two blocks shown in succession may in fact be executed substantially concurrently or the blocks may sometimes be executed in the reverse order, depending upon the functionality/acts involved.

[041]   While certain embodiments of the invention have been described, other embodiments may exist. Furthermore, although embodiments of the present invention have been described as being associated with data stored in memory and other storage mediums, data can also be stored on or read from other types of computer-readable media,

such as secondary storage devices, like hard disks, floppy disks, or a CD-ROM, a carrier wave from the Internet, or other forms of RAM or ROM. Further, the disclosed methods' stages may be modified in any manner, including by reordering stages and/or inserting or deleting stages, without departing from the invention.

[042]   All rights including copyrights in the code included herein are vested in and the property of the Applicant. The Applicant retains and reserves all rights in the code included herein, and grants permission to reproduce the material only in connection with reproduction of the granted patent and for no other purpose.

[043]   While the specification includes examples, the invention's scope is indicated by the following claims. Furthermore, while the specification has been described in language specific to structural features and/or methodological acts, the claims are not limited to the features or acts described above. Rather, the specific features and acts described above are disclosed as example for embodiments of the invention.

WHAT IS CLAIMED IS:

1.   A method for providing an augmented conversational understanding architecture, the method comprising:

5   receiving a natural language phrase from a user;

translating the natural language phrase into a search phrase; and

performing a search action according to the search phrase, wherein performing the search action according to the search phrase comprises mapping the natural language phrase to at least one node of an ontology.

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2.   The method of claim 1, wherein the search phrase comprises at least one semantic concept.

3.   The method of claim 2, wherein the at least one contextual semantic

15   concept comprises a word not contained in the natural language phrase.

4.   The method of claim 1, further comprising:

receiving a plurality of search results according to the search action; and

providing the plurality of search results to the user; and

20   providing the plurality of search results to a plurality of users, wherein the natural language phrase is derived from a conversation among the plurality of users.

5.   The method of claim 1, further comprising:

analyzing a plurality of application programming interfaces (APIs), wherein each

25   of the plurality of APIs is associated with a website search function; and

identifying at least one required parameter for each of the plurality of APIs.

6.   A computer-readable medium which stores a set of instructions which when executed performs a method for providing an augmented conversational

30   understanding architecture, the method executed by the set of instructions comprising:

receiving a natural language phrase from a user;

creating a context state associated with the natural language phrase;

translating the natural language phrase into an executable action;

identifying a domain associated with the executable action according to the identified context; and

performing the executable action within the identified domain.

5   7.   The computer-readable medium of claim 6, further comprising:

providing at least one suggested next action to the user;

receiving a second natural language phrase from the user;

determining whether the second natural language phrase is associated with the at least one suggested next action; and

10   in response to determining that the second natural language phrase is associated with the at least one suggested next action, performing the at least one suggested next action.

8.   The computer-readable medium of claim 7, further comprising:

15   in response to determining that the second natural language phrase is not associated with the at least one suggested next action, providing at least one second suggested next action to the user.

9.   The computer-readable medium of claim 8, further comprising:

20   updating the context state according to the second natural language phrase.

10.   A system for providing a context-aware environment, the system comprising:

a memory storage; and

25   a processing unit coupled to the memory storage, wherein the processing unit is operative to:

receive an action request from the user,

gather a context state associated with a user, wherein the context state comprises at least one of the following: a role associated with the user, at least one previous user

30   objective, at least one previous user action request, a location of the user, a time, a date, a category associated with the first action request from the user, a data type associated with the first action request from the user, and a data category associated with previous user action requests,

create a plurality of objectives according to the context state,

execute the requested action according to the context state,

determine whether the requested action is associated with accomplishing the at least one of the plurality of objectives, wherein being operative to determine whether the context state is associated with accomplishing the at least one predicted objective

5 comprises being operative to compare the context state to a plurality of user context states each associated with the at least one of the plurality of objectives,

in response to determining that the action is associated with accomplishing the at least one of the plurality of objectives, update the context state,

determine whether the context state comprises a completed objective of the

10 plurality of objectives, and

in response to determining that the context state does not comprise the completed objective, provide a suggested next action.
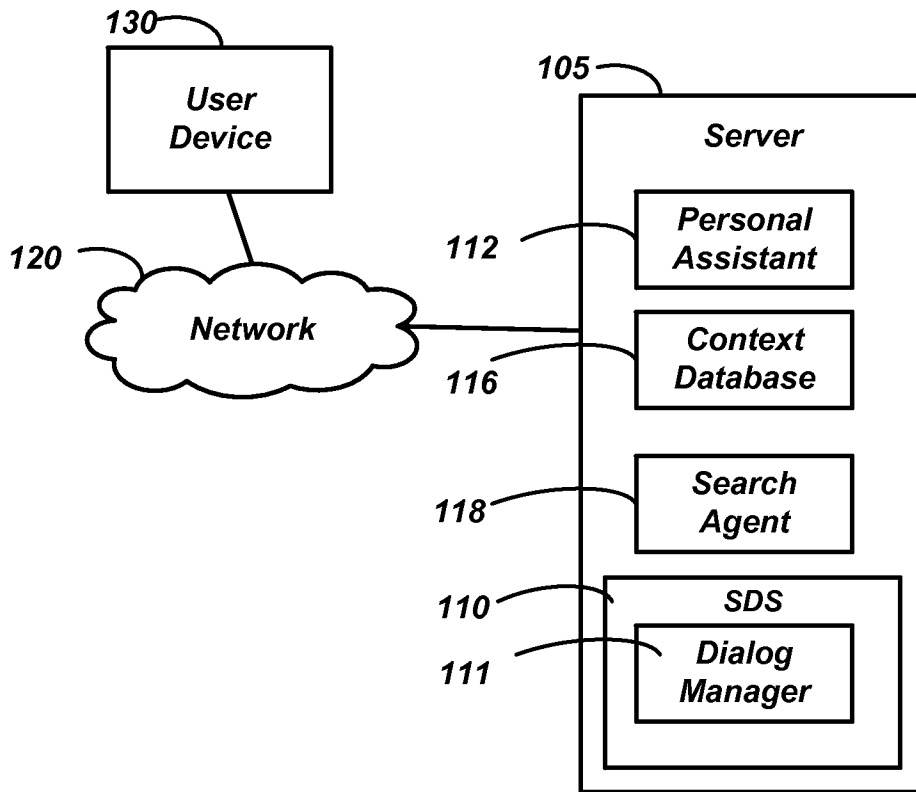
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FIG. 1
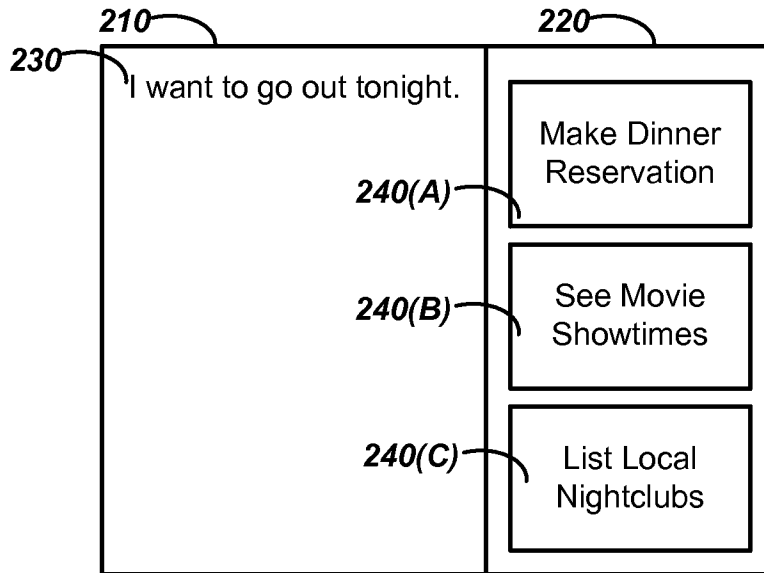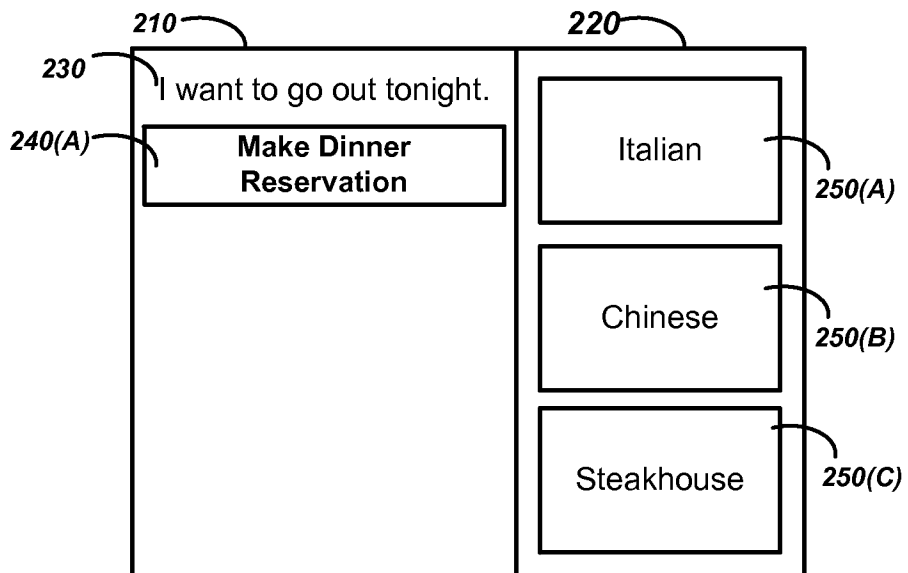
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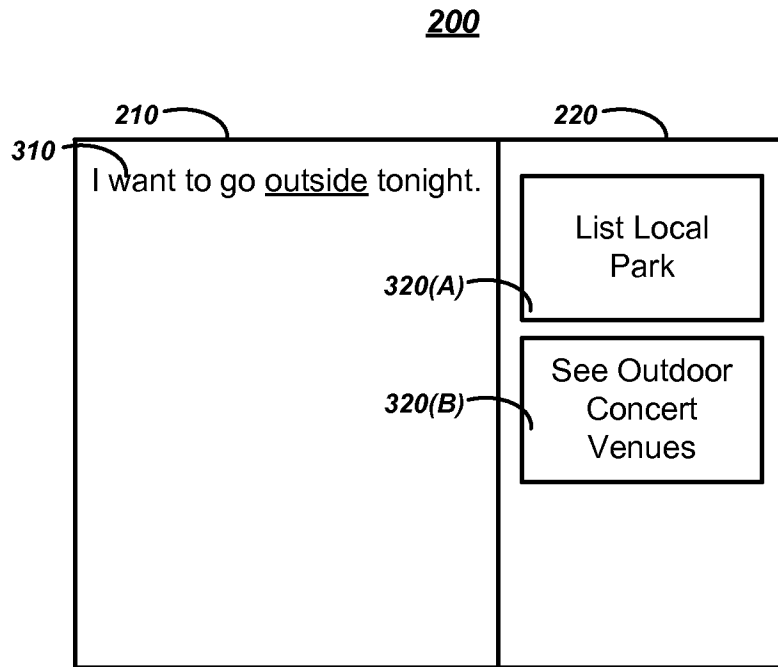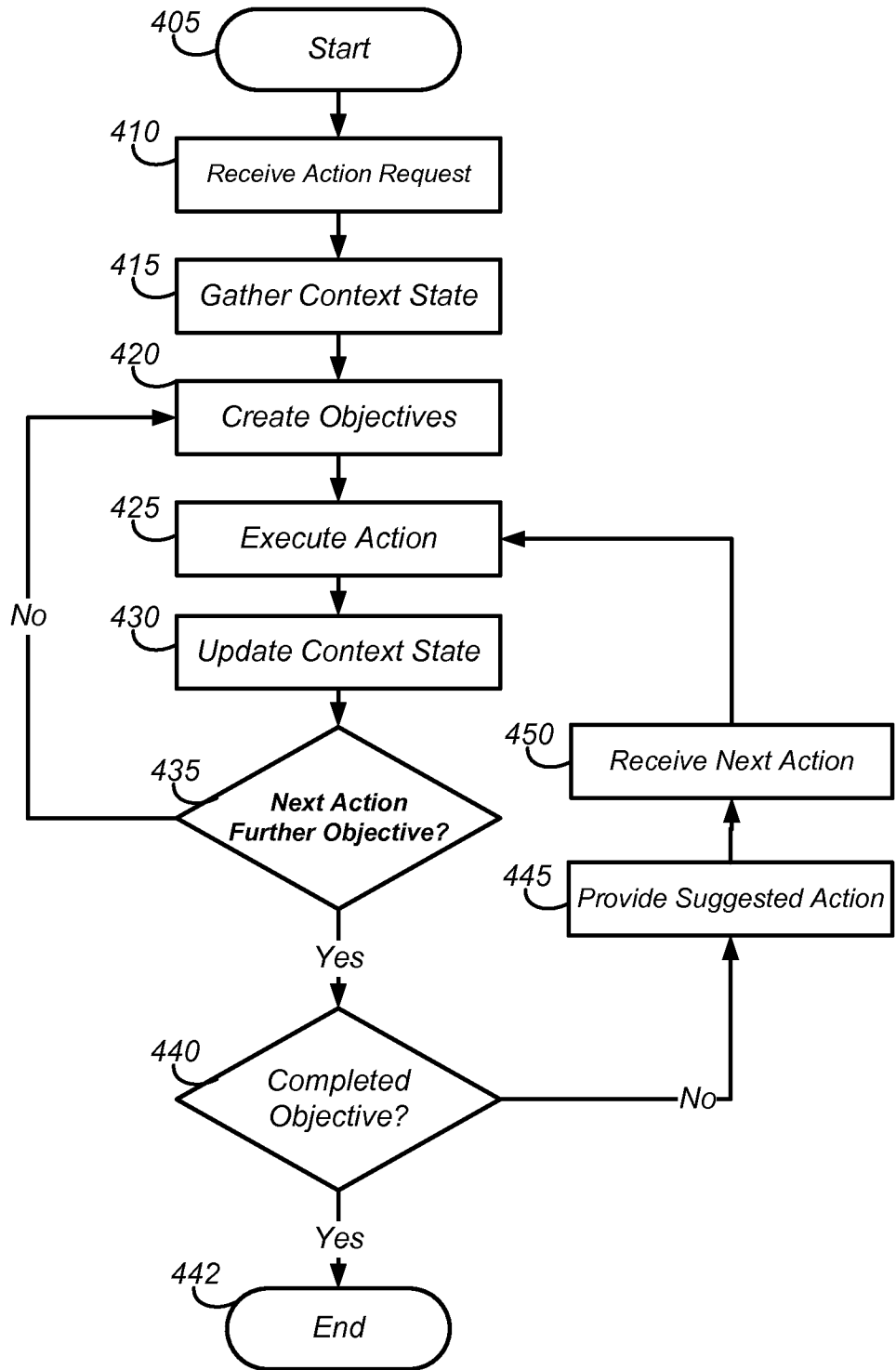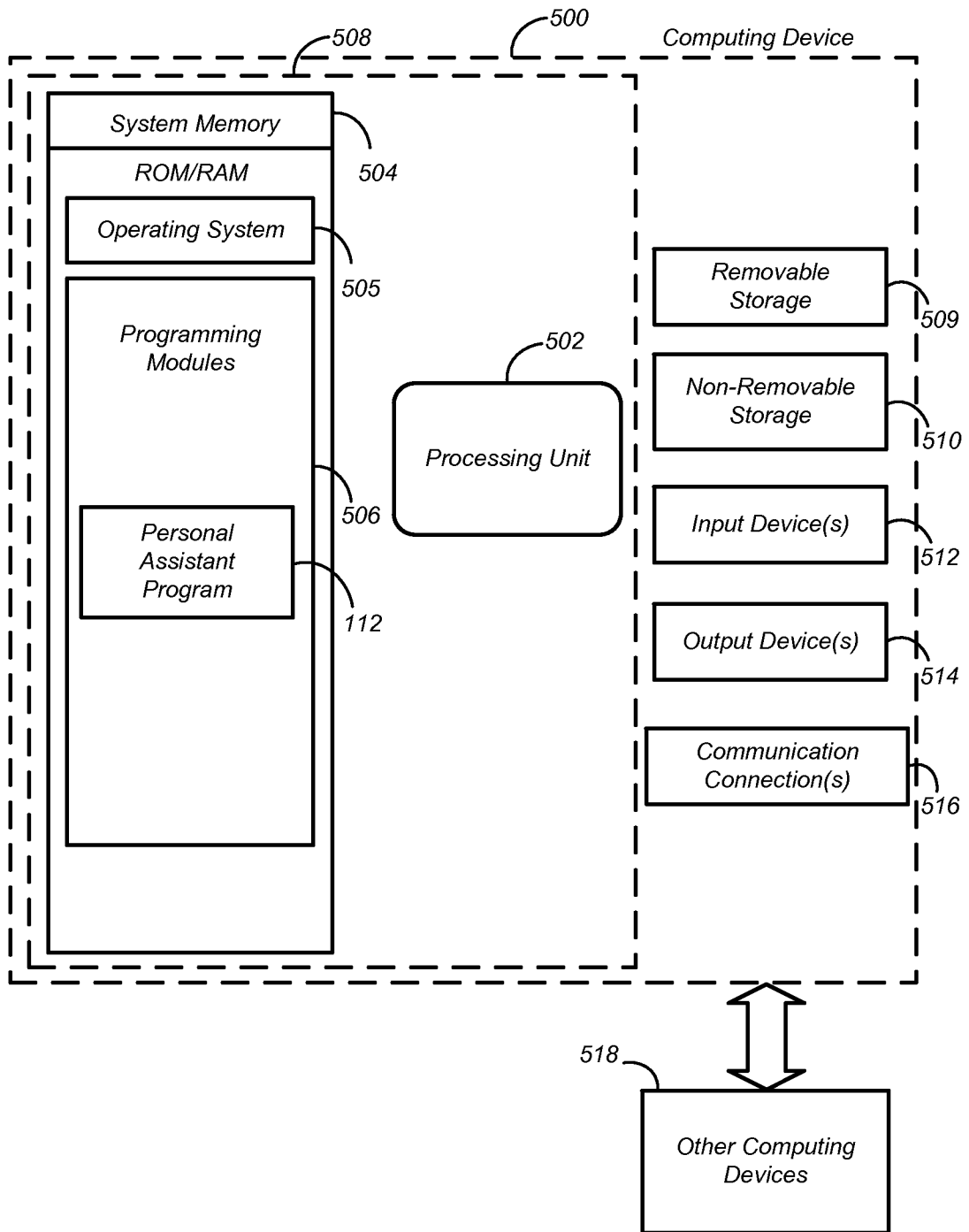
FIG. 2A

FIG. 2B

200

I want to go <u>outside</u> tonight.

List Local Park

See Outdoor Concert Venues

FIG. 3

_400_

FIG. 4

FIG. 5

A. CLASSIFICATION OF SUBJECT MATTER

G06F 17/30(2006.01)i, G06F 17/28(2006.01)i, G06Q 50/10(2012.01)i

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)
G06F 17/30; G06F 7/00; G06F 17/28

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: natural language, query, search phrase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2005-0289124 A1 (MATTHIAS KAISER et al.) 29 December 2005	1-9
A	See abstract; paragraph[0085]; claims 1,6,8,28 and figures 1-5,7.	10
A	US 2009-0055380 A1 (FUCHUN PENG et al.) 26 February 2009 See abstract; paragraph[0064]; claims 1,12,15 and figures 1-5.	1-10
A	US 2006-0293874 A1 (ZHENGYOU ZHANG et al.) 28 December 2006 See abstract; paragraph[0058-0060]; claims 1,12 and figures 15-16.	1-10
A	US 7720856 B2 (GOEDECKE MICHAEL et al.) 18 May 2010 See abstract; claim 1 and figures 1-2.	1-10

☐ Further documents are listed in the continuation of Box C.　　☒ See patent family 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 application or patent 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 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 "&"　document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 AUGUST 2012 (30.08.2012)	**05 SEPTEMBER 2012 (05.09.2012)**

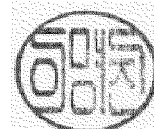| Name and mailing address of the ISA/KR	Authorized officer
Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea Facsimile No. 82-42-472-7140	LEE, Myung Jin Telephone No. 82-42-481-8474

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