IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

VB Assets, LLC, Plaintiff, v. Amazon.com, Inc.; Amazon.com LLC; Amazon Web Services, Inc.; A2Z Development Center, Inc. d/b/a Lab126; Rawles LLC; AMZN Mobile LLC; AMZN Mobile 2 LLC; Amazon.com Services, Inc. f/k/a Amazon Fulfillment Services, Inc.; and Amazon Digital Services LLC, Defendants.	**C.A. No.** **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT

VB Assets, LLC ("Plaintiff" or "VoiceBox") hereby alleges as follows for its complaint against Defendants Amazon.com, Inc.; Amazon.com LLC; Amazon Web Services, Inc.; A2Z Development Center, Inc. d/b/a Lab126; Rawles LLC; AMZN Mobile LLC; AMZN Mobile 2 LLC; Amazon.com Services, Inc. f/k/a Amazon Fulfillment Services, Inc.; and Amazon Digital Services LLC (collectively, "Defendants" or "Amazon"):

NATURE OF THE ACTION

1. VoiceBox, through its predecessor companies VoiceBox Technologies Corporation and VoiceBox Technologies, Inc. (collectively "VoiceBox Technologies"), pioneered voice-based search and commerce technology. It invented what Amazon itself has described as "Echo-like" products long before Amazon.

2. In recognition of its many innovations, the U.S. Patent & Trademark Office awarded and issued the VoiceBox Patents.[1] The innovations in these patents were fundamental to the development of voice commerce technology.

3. VoiceBox Technologies' opportunities to promote and build a business based on these patents were crushed when Amazon introduced the infringing Echo and Alexa Products[2] and used its enormous size and clout to poach dozens of VoiceBox Technologies' engineers and scientists.

4. VoiceBox has brought this case to hold Amazon accountable for its infringement of VoiceBox's patent rights.

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[1] "VoiceBox Patents" collectively refers to U.S. Patent Nos. 8,073,681 ("the '681 patent"); 9,015,049 ("the '049 patent"); 9,626,703 ("the '703 patent"); 7,818,176 ("the '176 patent"); 8,886,536 ("the '536 patent"); and 9,269,097 ("the '097 patent").

[2] "Alexa Products" collectively refers to Amazon's Alexa virtual assistant and offerings that include Alexa, including the Echo product line (such as Echo 1st Gen., Echo 2nd Gen., Echo Dot 1st Gen., Echo Dot 2nd Gen., Echo Dot 3rd Gen., Echo Dot Kids Edition, Echo Show 1st Gen., Echo Show 2nd Gen., Echo Show 5, Echo Spot, Echo Plus 1st Gen., Echo Plus 2nd Gen., Echo Auto, and Echo Look), Amazon's Alexa apps, Music apps, and Shopping apps on a smartphone or other mobile device, Amazon's Alexa cloud, Alexa Voice Services, and Amazon.com website, and any other device, app, or instrumentality that includes, provides access to, or works with Alexa (such as Amazon Tap, Amazon Dash Wand, Echo Wall Clock, AmazonBasics Microwave, Amazon SmartPlug, Amazon Fire TV Sticks, Amazon Fire TVs, Amazon Fire TV Cubes, and Amazon Fire and Fire HD tablets) as well as software, hardware, and cloud infrastructure associated with any of the foregoing.

THE PARTIES

5. VB Assets, LLC, VoiceBox, is a limited liability company organized under the laws of Delaware and has its principal place of business at 1229A 120th Ave. NE, Bellevue, WA 98005.

6. On information and belief, Amazon.com, Inc. is a corporation incorporated in Delaware and has a principal place of business at 410 Terry Avenue North, Seattle, WA, 98109. On information and belief, Amazon.com, Inc. is the ultimate parent company of the other companies that make up Amazon, and is responsible for making, using, selling, offering for sale and/or importing Alexa Products.

7. On information and belief, Amazon.com LLC is a limited liability company organized under the laws of Delaware and has a principal place of business at 410 Terry Avenue North, Seattle, WA, 98109. On information and belief, Amazon.com LLC includes as members various operating companies, which make, use, sell, offer for sale, and/or import Alexa Products.

8. On information and belief, Amazon Web Services, Inc. is a corporation incorporated in Delaware and has a principal place of business at 410 Terry Avenue North, Seattle, WA, 98109. On information and belief, Amazon Web Services, Inc. provides Alexa cloud computing platforms, that are Alexa Products or are for use with one or more Alexa Products.

9. On information and belief, A2Z Development Center, Inc. d/b/a Lab126 is a corporation incorporated in Delaware and has its principal place of business at 1120 Enterprise Way Sunnyvale, CA 94089. On information and belief, A2Z Development Center, Inc. d/b/a Lab126 performed research and development, including for one or more Alexa Products.

10. On information and belief, Rawles LLC is a limited liability company formed under the laws of Delaware and has its principal place of business at 103 Foulk Road, Suite 100,

Wilmington, DE 19803. On information and belief, Rawles LLC performed research and development, including for one or more Alexa Products.

11. On information and belief, AMZN Mobile LLC is a limited liability company organized under the laws of Delaware and has a principal place of business near Seattle, WA. On information and belief, AMZN Mobile LLC provides mobile apps that are Alexa Products or are for use with Alexa Products.

12. On information and belief, AMZN Mobile 2 LLC is a limited liability company organized under the laws of Delaware and has a principal place of business near Seattle, WA. On information and belief, AMZN Mobile 2 LLC provides mobile apps that are Alexa Products or are for use with Alexa Products.

13. On information and belief, Amazon.com Services, Inc. f/k/a Amazon Fulfillment Services, Inc. is a corporation incorporated in Delaware and has a principal place of business at 410 Terry Ave. N. Seattle, WA 98109. On information and belief, Amazon.com Services, Inc. f/k/a Amazon Fulfillment Services, Inc. participated in the sale or offer for sale of one or more Alexa Products.

14. On information and belief, Amazon Digital Services LLC is a limited liability company organized under the laws of Delaware and has a principal place of business at 410 Terry Ave. N, Seattle, WA 98109. On information and belief, Amazon Digital Services LLC has participated in the sale or offer for sale of one or more Alexa Products and/or has provided digital services and content for use by Alexa Products.

JURISDICTION AND VENUE

15. This Court has original jurisdiction over the subject matter of this action under 28 U.S.C. §§ 1331 and 1338(a) because the action arises under the patent laws of the United States.

16. Personal jurisdiction over each Defendant is proper in this District based on one or more of the following: its presence in this judicial district; it has availed itself of the rights and benefits of the laws of Delaware; or it has derived substantial revenue from sales of Alexa Products in Delaware and it has systematic and continuous business contacts with Delaware. Each Defendant was incorporated in Delaware and/or formed under the laws of Delaware and Amazon designs Alexa Products, which are advertised, offered for sale, sold, and used in Delaware.

17. Venue is proper in this district under 28 U.S.C. § 1400(b) and 28 U.S.C. §§ 1391(b)(1), (b)(2). For purposes of § 1400(b), each Defendant was incorporated in Delaware and/or formed under the laws of Delaware and therefore resides within this District. For purposes of § 1391(b)(1), (b)(2), Amazon resides in the District of Delaware by virtue of being incorporated in Delaware and/or formed under the laws of Delaware.

FACTUAL BACKGROUND

A. VoiceBox Technologies Invents Groundbreaking Voice Technology

18. In 2001, three brothers, Mike, Rich, and Bob Kennewick founded VoiceBox Technologies to bring natural language understanding ("NLU") to a wide array of computer applications. They recognized that the typical computer speech-recognition systems forced human operators to adhere to a limited number of rigid speech prompts. These rigid prompts limited how systems were used and inhibited the widespread adoption of speech-recognition systems. The brothers believed that VoiceBox Technologies could become the first company to enable people to naturally and effectively interact with computer speech systems.

19. From its inception, VoiceBox Technologies engaged in intense research efforts to develop its NLU technology. As part of these efforts, VoiceBox Technologies achieved a

significant milestone when it developed an early prototype called "Cybermind." As demonstrated on the King5 news, Cybermind was a voice-controlled speaker that could provide weather, recipes, sports scores, calendar updates, or play a song.[3]

Figure 1: Cybermind Prototype

20. VoiceBox Technologies' groundbreaking work did not go unrecognized. After learning about VoiceBox Technologies' technology, Toyota hired it to build a sophisticated NLU speech interface for its Lexus automobiles. VoiceBox Technologies built the voice and NLU capability for Toyota's award-winning Entune multimedia system.

21. As part of the development effort of an NLU interface for Lexus, VoiceBox Technologies demonstrated a personal assistant called "Alexus" that showcased the power of its Conversational Voice technology. On information and belief, the VoiceBox Technologies "Alexus" concept was introduced to the public more than six months before Amazon announced "Alexa."

[3] https://www.youtube.com/watch?v=DDcRyPnvWhw

Figure 2: "Alexus" Demonstration

22. Throughout its research and development efforts, VoiceBox Technologies realized that its technology could be deployed in a wide range of applications from connected home to mobile personal assistants.

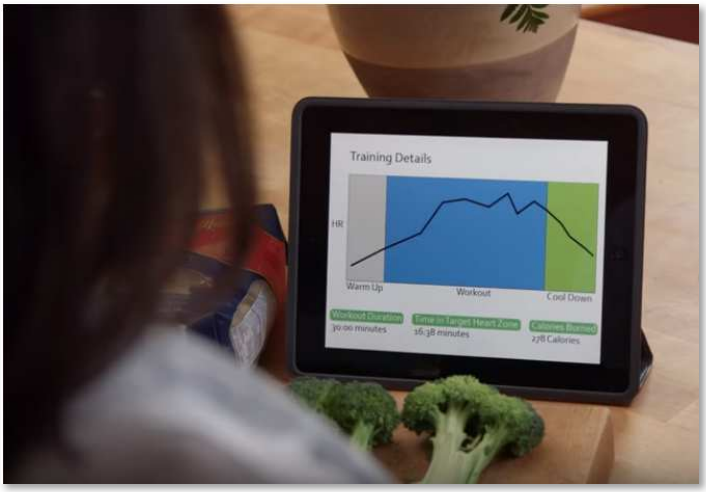

Figure 3: Connected Home

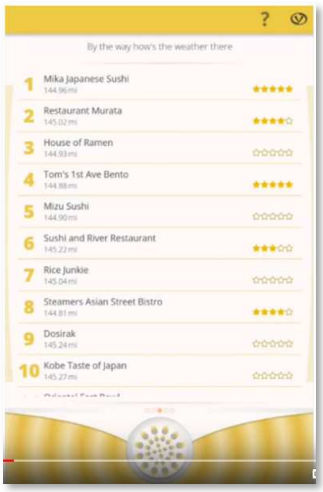

Figure 4: Mobile

23. By January 2012, VoiceBox Technologies was a leader in NLU and conversational voice technology. Leading companies throughout the world, including Toyota, Lexus, TomTom, Pioneer, Chrysler, Dodge, and Magellan used VoiceBox Technologies' award-winning and patented contextual speech technology. VoiceBox Technologies had software

applications that ran on smart speakers, in-car systems, smartphones, smart TVs, computers, tablets, e-readers, and personal navigation devices.

24. In 2013, the Institute of Electrical and Electronics Engineers ("IEEE") ranked VoiceBox Technologies number 13 in patent power for the computer software industry. VoiceBox Technologies had become the leader in conversational Artificial Intelligence ("AI"), including Voice Recognition (VR), NLU, and AI services.

B. Amazon Takes VoiceBox's Technology

25. In 2011, VoiceBox Technologies contacted Amazon to explore a potential business relationship where VoiceBox Technologies would provide core NLU services to Amazon. Amazon's corporate development department expressed interest and asked for "company and/or product overview slides" to facilitate an October 7, 2011 teleconference. In response, VoiceBox Technologies provided Amazon with a presentation that described its award-winning patented technology and explicitly referred to VoiceBox Technologies' "patented Contextual Speech Technology." Slides from that presentation are reproduced below:

Figure 5: 2011 Slides

26. Amazon was so impressed by the technology VoiceBox Technologies presented on October 7, 2011 that its representative emailed VoiceBox Technologies the next business day

to invite VoiceBox to visit Amazon's offices on October 19, 2011. That meeting was with Douglas Booms, Amazon's Vice President of Worldwide Corporate Development, as well as engineers and product/business development members of Amazon's devices and digital teams. The email from Amazon stated that this was "the right audience to discuss [VoiceBox Technologies'] personal digital assistant and underlying conversational voice technology." On information and belief, in addition to Mr. Booms, the following Amazon personnel attended the meeting: Nick Komorous (Director, Corporate Development), Ian Freed (VP, Amazon Devices), Greg Hart (VP, Digital), Al Lindsay (Director, Software Engineer), Frederic Deramat (Senior Principal Engineer), and John Thimsen (Software Developer). On information and belief, another Amazon engineer from Cupertino attended by teleconference.

27. Two days after the meeting at Amazon, on Friday October 21, 2011, Amazon's Mr. Komorous emailed VoiceBox Technologies and asked to visit the company's office for a "deeper dive." Mr. Komorous requested that this meeting occur the very next week. VoiceBox Technologies agreed to host Amazon's personnel for a meeting at VoiceBox Technologies' office on October 26, 2011. On information and belief, from Amazon, Marcello Typrin (Product Management / Business Development), Frederic Deramat (Senior Principal Engineer), John Thimsen (Software Developer), and Sean Fitz (Software Developer) joined Mr. Komorous at the meeting.

28. In advance of the meeting, Mr. Komorous sent a detailed set of technical questions that would help Amazon's "tech team understand the scope and [r]ange of things [Amazon] can try to tackle with VoiceBox[] as a partner." Mr. Komorous also indicated that Amazon's culture was "engineering heavy" and asked that VoiceBox Technologies "have engineering and speech representation at the meeting."

29. The October 26, 2011 meeting at VoiceBox Technologies' office ran from 10 am until 12 noon with some Amazon engineers staying even later until around 2:30 pm. The meeting included a tour with additional demos, a review of the technical architecture for VoiceBox Technologies' server software, and plans for next generation products.

30. During the meeting, VoiceBox Technologies presented a deck of 42 slides to the visiting Amazon personnel. The slides provided even more detail about VoiceBox Technologies' patented technology and informed Amazon that VoiceBox Technologies had 12 patents at the time with an additional 14 pending applications. The slide deck included the following slide regarding the '176 patent, which is asserted in this lawsuit.

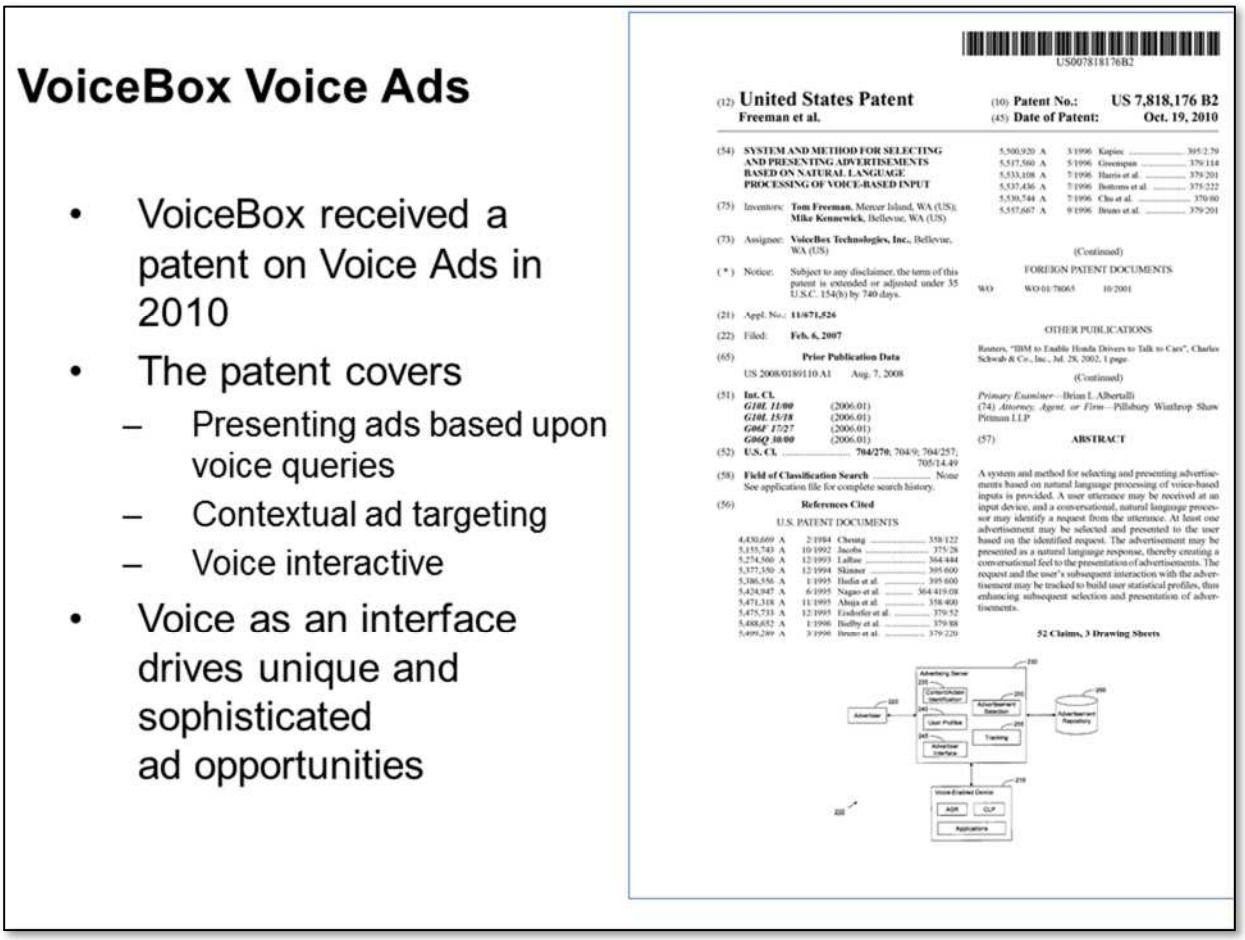

Figure 6: Slide from 2011 Presentation

31. The slide deck VoiceBox Technologies presented to Amazon at the October 26, 2011 meeting also proposed a business arrangement where VoiceBox Technologies would provide "Voice Services" to Amazon. The VoiceBox Technologies Voice Services from the presentation are shown below:

Figure 7: Slide from 2011 Presentation

32. On information and belief, some of the Amazon personnel involved in the 2011 meetings became technical leaders for Amazon's Alexa Products while others became high-level executives with close working relationships with the senior leadership of Amazon. On information and belief, one of Mr. Freed's past positions was Technical Advisor to CEO, a position that has been described as CEO Jeff Bezos's "shadow" advisor. On information and

belief, Mr. Freed then went on to become Vice President, Amazon Devices where he led a team of engineers working on Amazon's Alexa Products. On information and belief, Mr. Hart has also been Mr. Bezos's "shadow" advisor—he held the Technical Advisor to CEO position around 2011. On information and belief, around 2011, Al Lindsey was promoted to Vice President managing the Alexa Engine Software team. On information and belief, around 2011, Mr. Deramat was promoted to the position Vice President & Distinguished Engineer for Amazon Alexa. On information and belief, around 2011, Mr. Thimsen was promoted to the position Director of Engineering for Amazon Echo. As for Mr. Typrin, he states on his LinkedIn page that he is "[o]ne of the founding members of the team that shaped the vision and direction for Amazon's Echo and Alexa Voice Services."

33. A couple days after the last meeting in 2011, VoiceBox Technologies sent an email to Amazon asking for Amazon's feedback. Mr. Komorous from Amazon replied that Amazon was "still discussing internally how contextual speech / cybermind 2012 could play a part in [Amazon's] future." Amazon did not provide the results of these discussions and did not pursue a business relationship with VoiceBox Technologies. Instead, on information and belief, Amazon decided to build its Alexa Products—without telling VoiceBox Technologies or asking permission to use VoiceBox Technologies' patented technology.

34. In 2014, Amazon announced the launch of Alexa, a virtual assistant, along with the first-generation Echo product, a smart speaker. Amazon's Alexa and first-generation Echo product were strikingly similar to the patented technology that VoiceBox Technologies showed Amazon in 2011.

35. In 2016, Amazon abruptly hired Philippe Di Cristo, who was VoiceBox Technologies' Chief Scientist. While at VoiceBox Technologies, Mr. Di Cristo gained knowledge

of the company's voice technology and had full access to VoiceBox Technologies' intellectual property. As Mr. Di Cristo explains on his LinkedIn Page, he had worked on an "Amazon Echo-like system" while at VoiceBox Technologies. Exhibit A at 3. On information and belief, Mr. Di Cristo has helped design and implement VoiceBox Technologies' patented technology into Amazon's Echo and other Alexa Products.

36. On information and belief, Mr. Di Cristo played an active role in soliciting additional VoiceBox employees to join Amazon. For example, shortly after Mr. Di Cristo joined Amazon from VoiceBox Technologies, Amazon ramped-up its efforts to recruit VoiceBox Technologies employees.

37. On January 10, 2017, Amazon hosted an "Evening with the Leadership of Amazon Voice & Advanced Shopping," which Amazon expressly described as an "invite only networking event for Voice Box employees . . . to talk . . . about opportunities at Amazon." The director of Amazon's Voice & Advanced NUI Shopping group— on information and belief, the group Mr. Di Cristo joined—sent an invite for the event to a large number of VoiceBox Technologies employees and indicated that Amazon was "building a world-class speech & NLU engineering team" and "[y]our profile looks quite relevant and we'd love to talk to you and see if there's a fit." For this event, Amazon rented out Seastar, the premier seafood restaurant near VoiceBox Technologies' office.

38. On information and belief, Mr. Di Cristo was originally scheduled to be a speaker at the event targeting VoiceBox Technologies employees—but abruptly withdrew. The event emphasized Amazon's need for VoiceBox Technologies' NLU technology. On information and belief, around this time, Amazon faced numerous NLU challenges and had only completed a

small portion of work toward Amazon's goal to build conversational dialog interaction into Alexa Products.

39. On January 17, 2017, after Amazon's rampant poaching of VoiceBox Technologies employees came to light, Mike Kennewick, CEO of VoiceBox Technologies, sent a letter to Jeff Bezos, CEO of Amazon, to propose a business solution. A true and correct copy of that letter is attached as Exhibit B. The letter explains that, at the time, VoiceBox Technologies had "a deep portfolio of technology and IP, including a large number of significant patents not only in NLU but also in Voice[]Commerce, running on over 200 million devices."

40. On information and belief, Mr. Booms, Amazon's Vice President of Worldwide Corporate Development, responded to VoiceBox Technologies' January 17, 2017 letter on behalf of Mr. Bezos. In Amazon's response, Mr. Booms requested a meeting at VoiceBox Technologies' offices for purposes of "go[ing] fairly deep on the technology, data, customer relationships."

41. On February 2, 2017, the parties met at VoiceBox Technologies' office. Amazon came with a team of technologists from its Alexa program, including on information and belief, Manoj Sindhwani (Director Alexa), Karthik Ramakrishnan (Senior Manager, Alexa software), Nikko Strom (Scientist, Alexa), and Deepesh Mohnani (Alexa Voice Services Product Management) joined by Mr. Booms. VoiceBox Technologies provided a detailed technical presentation, which included information about patents and pending applications then owned by VoiceBox Technologies. Slides in the presentation listed all VoiceBox Technologies patents and published applications at the time, including the '681 patent, the '049 patent, the '176 patent, the '536 patent, and the '097 patent. The February 2, 2017 slides also reproduced a highlighted claim from the '681 patent and a highlighted claim from the '176 patent.

42. Following the meeting, Mr. Booms emailed VoiceBox Technologies to request even more technical details. Then, on February 20, 2017, Amazon specifically asked VoiceBox Technologies for a list of all patents owned by the company.

43. In March of 2017, VoiceBox Technologies hosted another meeting with Amazon personnel at VoiceBox Technologies' office. The Amazon attendees included senior executives and managers responsible for Alexa. VoiceBox Technologies informed Amazon by email after the meeting that VoiceBox Technologies had "[p]atents that could be useful as the market goes mainstream." Shortly, thereafter, Mr. Komorous from Amazon emailed VoiceBox Technologies, writing that Amazon had been "[poring] through the material" VoiceBox Technologies provided and that Amazon had created yet another, even more detailed, list of requests.

44. In April of 2017, VoiceBox Technologies shared a written summary of VoiceBox Technologies' patent portfolio with Amazon. The written summary explained that VoiceBox Technologies' patents covered "core & fundamental areas." The summary showcased the '176 patent and the '703 patent, and identified the '536 patent and '097 patent by number. The summary further explained that "[v]oice advertising & conversational e-commerce are essential to the core strategies and future revenue streams of many of the world's leading technology companies, including: . . . Amazon . . . ."

OVERVIEW OF VOICEBOX'S PATENTS-IN-SUIT

45. United States Patent Number 8,073,681 ("the '681 patent"), entitled "System and Method for a Cooperative Conversational Voice User Interface," was duly and legally issued on December 6, 2011, and names Larry Baldwin, Tom Freeman, Michael Tjalve, Blane Ebersold, and Chris Weider as the inventors. Attached as Exhibit C is a true and correct copy of the '681 patent.

46. The ’681 patent claims, among other things, a system for providing a cooperative conversational voice user interface, comprising: a voice input device configured to receive an utterance during a current conversation with a user; and a conversational speech engine, wherein the conversational speech engine includes one or more processors configured to: accumulate short-term shared knowledge about the current conversation, wherein the short-term shared knowledge includes knowledge about the utterance received during the current conversation; accumulate long-term shared knowledge about the user, wherein the long-term shared knowledge includes knowledge about one or more past conversations with the user; identify a context associated with the utterance from the short-term shared knowledge and the long-term shared knowledge; infer additional information about the utterance from the short-term shared knowledge and the long-term shared knowledge in response to determining that the utterance contains insufficient information to complete a request in the identified context; establish an intended meaning for the utterance within the identified identify a context based on the additional information inferred about the utterance; and generate a response to the utterance based on the intended meaning established within the identified context.

47. VoiceBox is the assignee of the entire right, title, and interest in the ’681 patent.

48. United States Patent Number 9,015,049 (“the ’049 patent”), entitled “System and Method for a Cooperative Conversational Voice User Interface,” was duly and legally issued on April 21, 2015, and names Larry Baldwin, Tom Freeman, Michael Tjalve, Blane Ebersold, and Chris Weider as the inventors. Attached as Exhibit E is a true and correct copy of the ’049 patent.

49. The ’049 patent claims, among other things, a system for facilitating conversation-based responses, the system comprising: one or more physical processors programmed with one or more computer program instructions such that, when executed, the one

or more computer program instructions cause the one or more physical processors to: receive a natural language utterance during a conversation between a user and the system; identify a first model that includes short-term knowledge about the conversation, wherein the short-term knowledge is based on one or more prior natural language utterances received during the conversation; identify, based on the short-term knowledge, context information for the natural language utterance; determine, based on the context information, an interpretation of the natural language utterance; and generate, based on the interpretation of the natural language utterance, a response to the natural language utterance.

50. VoiceBox is the assignee of the entire right, title, and interest in the ’049 patent.

51. United States Patent Number 9,626,703 (“the ’703 patent”), entitled “Voice Commerce,” was duly and legally issued on April 18, 2017, and names Michael R. Kennewick, Sr. as the inventor. Attached as Exhibit G is a true and correct copy of the ’703 patent.

52. The ’703 patent claims, among other things, a system for providing voice commerce, the system comprising: one or more physical processors programmed with computer program instructions which, when executed, cause the one or more physical processors to: receive a user input comprising a natural language utterance; provide, without further user input after the receipt of the user input, the natural language utterance as an input to a speech recognition engine; obtain, without further user input after the receipt of the user input, one or more words or phrases recognized from the natural language utterance as an output of the speech recognition engine; identify, without further user input after the receipt of the user input, a context based at least on the one or more words or phrases; determine, without further user input identifying a product or service after the receipt of the user input, a first product or service to be purchased on behalf of a user based at least on the determined context; obtain, without further

user input identifying payment information after the receipt of the user input, first payment information with which to pay for the product or service; obtain, without further user input identifying shipping information after the receipt of the user input, first shipping information with which to deliver the product or service, wherein the first shipping information specifies a name or address of a recipient to which the product or service is to be delivered after the product or service is purchased; and complete, without further user input identifying a product or service, payment information, or shipping information after the receipt of the user input, a purchase transaction for the first product or service based on the first payment information and the first shipping information.

53. VoiceBox is the assignee of the entire right, title, and interest in the ’703 patent.

54. United States Patent Number 7,818,176 (“the ’176 patent”), entitled “System and Method for Selecting and Presenting Advertisements Based on Natural Language Processing of Voice-based Input,” was duly and legally issued on October 19, 2010, and names Tom Freeman and Mike Kennewick as the inventors. Attached as Exhibit I is a true and correct copy of the ’176 patent.

55. The ’176 patent claims, among other things, a system for selecting and presenting advertisements in response to processing natural language utterances, comprising: an input device that receives a natural language utterance containing at least one request at an input device; a speech recognition engine coupled to the input device, wherein the speech recognition engine recognizes one or more words or phrases in the natural language utterance, wherein to recognize the words or phrases in the natural language utterance, the speech recognition engine is configured to: map a stream of phonemes contained in the natural language utterance to one or more syllables that are phonemically represented in an acoustic grammar; and generate a

preliminary interpretation for the natural language utterance from the one or more syllables, wherein the preliminary interpretation generated from the one or more syllables includes the recognized words or phrases; a conversational language processor coupled to the speech recognition engine, wherein the conversational language processor is configured to: interpret the recognized words or phrases, wherein interpreting the recognized words or phrases includes establishing a context for the natural language utterance; select an advertisement in the context established for the natural language utterance; and present the selected advertisement via an output device.

56. VoiceBox is the assignee of the entire right, title, and interest in the '176 patent.

57. United States Patent Number 8,886,536 ("the '536 patent"), entitled "System and Method for Delivering Targeted Advertisements and Tracking Advertisement Interactions in Voice Recognition Contexts," was duly and legally issued on November 11, 2014, and names Tom Freeman and Mike Kenn[e]wick as the inventors. Attached as Exhibit K is a true and correct copy of the '536 patent.

58. The '536 patent claims, among other things, a computer-implemented method of providing promotional content related to one or more natural language utterances and/or responses, the method being implemented by a computer system that includes one or more physical processors executing one or more computer program instructions which, when executed, perform the method, the method comprising: receiving, at the one or more physical processors, a first natural language utterance; providing, by the one or more physical processors, a response to the first natural language utterance; receiving, at the one or more physical processors, a second natural language utterance relating to the first natural language utterance; identifying, by the one or more physical processors, requests associated with the second natural

language utterance, wherein the requests include a first request to be processed by a first device associated with a user and a second request to be processed by a second device associated with the user; determining, by the one or more physical processors, promotional content that relates to one or more of the first request or the second request; and presenting, by the one or more physical processors, the promotional content to the user.

59. VoiceBox is the assignee of the entire right, title, and interest in the ’536 patent.

60. United States Patent Number 9,269,097 (“the ’097 patent”), entitled “System and Method for Delivering Targeted Advertisements and/or Providing Natural Language Processing Based on Advertisements,” was duly and legally issued on February 23, 2016, and names Tom Freeman and Mike Kennewick as the inventors. Attached as Exhibit M is a true and correct copy of the ’097 patent.

61. The ’097 patent claims, among other things, a method for providing natural language processing based on advertisements, the method being implemented on a computer system having one or more physical processors executing computer program instructions which, when executed, perform the method, the method comprising: providing, by the computer system, an advertisement associated with a product or service for presentation to a user; receiving, at the computer system, a natural language utterance of the user; and interpreting, by the computer system, the natural language utterance based on the advertisement and, responsive to the existence of a pronoun in the natural language utterance, determining whether the pronoun refers to one or more of the product or service or a provider of the product or service.

62. VoiceBox is the assignee of the entire right, title, and interest in the ’097 patent.

COUNT ONE (INFRINGEMENT OF '681 PATENT)

63. VoiceBox incorporates and realleges each and every allegation contained in the foregoing paragraphs of this complaint, as though fully set forth herein.

64. Amazon has and continues to infringe the '681 patent by making, using, selling, offering for sale, and/or importing into the United States, Alexa Products, which embody or use the inventions of the '681 patent in violation of 35 U.S.C. § 271(a). Exemplary evidence and an exemplary chart mapping a claim to Alexa Products can be found in Exhibit D.

65. Amazon has been and is inducing infringement of the '681 patent by actively and knowingly inducing others to make, use, sell, offer for sale, or import Alexa Products that include Alexa and embody or use the inventions claimed in the '681 patent in violation of 35 U.S.C. § 271(b). On information and belief, Amazon writes software for Alexa Products and designs Alexa Products to operate in an infringing manner. Amazon causes Alexa Products to be made available through its own website. Amazon also profits from third-parties who sell Alexa Products. Amazon instructs users to use Alexa Products in an infringing manner and provides technical support for such use, including on its website and also through the Alexa virtual assistant. Amazon has known of, or been willfully blind to, the existence of the '681 patent since no later than the date it received a copy of this complaint. No later than that date, Amazon has known its actions would induce infringement by users of Alexa Products. Additionally, VoiceBox Technologies informed the Amazon employees who attended the February 2, 2017 meeting at VoiceBox Technologies' office of the '681 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '681 patent since no later than February 2, 2017. On information and belief, no later than that date, Amazon has known its actions would induce infringement by users of Alexa Products. Additionally, the '681 patent or its published

application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent Nos. 9,424,840; 9,852,729; 9,922,639; 10,026,394; and 10,102,845. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '681 patent since no later than March 4, 2015, the date on which the '681 patent or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon. On information and belief, no later than that date, Amazon has known its actions would induce infringement by users of Alexa Products.

66. Amazon has been and is continuing to contributorily infringe the '681 patent by selling or offering to sell Alexa Products, knowing them to be especially made or especially adapted for practicing the invention of the '681 patent and not a staple article or commodity of commerce suitable for substantial non-infringing use in violation of 35 U.S.C. § 271(c). On information and belief, Amazon writes software for Alexa Products and designs Alexa Products to operate in an infringing manner. Amazon causes Alexa Products to be made available through its own website. On information and belief, Amazon also profits from third-parties who sell Alexa Products. Amazon instructs users to use Alexa Products in an infringing manner and provides technical support for such use, including on its website and also through the Alexa virtual assistant. Amazon has known of, or been willfully blind to, the existence of the '681 patent since no later than it received a copy of this complaint. No later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use. Additionally, VoiceBox Technologies informed the Amazon employees who attended the February 2, 2017 meeting at VoiceBox Technologies' office of the '681 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '681 patent since no later

than February 2, 2017. On information and belief, no later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use. Additionally, the '681 patent or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent Nos. 9,424,840; 9,852,729; 9,922,639; 10,026,394; and 10,102,845. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '681 patent since no later than March 4, 2015, the date on which the '681 patent or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon. On information and belief, no later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use.

67. On information and belief, Amazon has known of the existence of the '681 patent, and its acts of infringement have been willful and in disregard for the '681 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Amazon has known of, or been willfully blind to, the existence of the '681 patent since no later than the date it received a copy of this complaint. No later than that date, Amazon has known its Alexa Products infringe the '681 patent. Additionally, VoiceBox Technologies informed the Amazon employees who attended the February 2, 2017 meeting at VoiceBox Technologies' office of the '681 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '681 patent since no later than February 2, 2017. On information and belief, no later than that date, Amazon has known its Alexa Products infringe the '681 patent. Additionally, the '681 patent or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent Nos. 9,424,840; 9,852,729; 9,922,639;

10,026,394; and 10,102,845. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '681 patent since no later than March 4, 2015, the date on which the '681 patent or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon. On information and belief, no later than that date, Amazon has known its Alexa Products infringe the '681 patent.

68. Amazon's infringement has been, and continues to be knowing, intentional, and willful.

69. Amazon's acts of infringement of the '681 patent have caused and will continue to cause VoiceBox damages for which VoiceBox is entitled to compensation pursuant to 35 U.S.C. § 284.

70. This case is exceptional and, therefore, VoiceBox is entitled to an award of attorney's fees pursuant to 35 U.S.C. § 285.

COUNT TWO (INFRINGEMENT OF THE '049 PATENT)

71. VoiceBox incorporates and realleges each and every allegation contained in the foregoing paragraphs of this complaint, as though fully set forth herein.

72. Amazon has and continues to infringe the '049 patent by making, using, selling, offering for sale, and/or importing into the United States, Alexa Products, which embody or use the inventions of the '049 patent in violation of 35 U.S.C. § 271(a). Exemplary evidence and an exemplary chart mapping a claim to Alexa Products can be found in Exhibit F.

73. Amazon has been and is inducing infringement of the '049 patent by actively and knowingly inducing others to make, use, sell, offer for sale, or import Alexa Products that include Alexa and embody or use the inventions claimed in the '049 patent in violation of 35 U.S.C. § 271(b). On information and belief, Amazon writes software for Alexa Products and

designs Alexa Products to operate in an infringing manner. Amazon causes Alexa Products to be made available through its own website. On information and belief, Amazon also profits from third-parties who sell Alexa Products. Amazon instructs users to use Alexa Products in an infringing manner and provides technical support for such use, including on its website and also through the Alexa virtual assistant. Amazon has known of, or been willfully blind to, the existence of the '049 patent since no later than the date it received a copy of this complaint. No later than that date, Amazon has known its actions would induce infringement by users of Alexa Products. Additionally, VoiceBox Technologies informed the Amazon employees who attended the February 2, 2017 meeting at VoiceBox Technologies' office of the '049 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '049 patent since no later than February 2, 2017. On information and belief, no later than that date, Amazon has known its actions would induce infringement by users of Alexa Products. Additionally, the '681 patent or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent Nos. 9,424,840; 9,852,729; 9,922,639; 10,026,394; and 10,102,845. The '681 patent or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on March 4, 2015. By March 4, 2015, the '049 patent's application had published claiming priority to the '681 patent. On April 21, 2015, the '049 patent issued claiming priority to the '681 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '049 patent since no later than April 21, 2015. On information and belief, no later than that date, Amazon has known its actions would induce infringement by users of Alexa Products.

74. Amazon has been and is continuing to contributorily infringe the '049 patent by selling or offering to sell Alexa Products, knowing them to be especially made or especially

adapted for practicing the invention of the '049 patent and not a staple article or commodity of commerce suitable for substantial non-infringing use, in violation of 35 U.S.C. § 271(c). On information and belief, Amazon writes software for Alexa Products and designs Alexa Products to operate in an infringing manner. Amazon causes Alexa Products to be made available through its own website. On information and belief, Amazon also profits from third-parties who sell Alexa Products. Amazon instructs users to use Alexa Products in an infringing manner and provides technical support for such use, including on its website and also through the Alexa virtual assistant. Amazon has known of, or been willfully blind to, the existence of the '049 patent since no later than it received a copy of this complaint. No later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use. Additionally, VoiceBox Technologies informed the Amazon employees who attended the February 2, 2017 meeting at VoiceBox Technologies' office of the '049 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '049 patent since no later than February 2, 2017. On information and belief, no later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use. Additionally, the '681 patent or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent Nos. 9,424,840; 9,852,729; 9,922,639; 10,026,394; and 10,102,845. The '681 patent or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on March 4, 2015. By March 4, 2015, the '049 patent's application had published claiming priority to the '681 patent. On April 21, 2015, the '049 patent issued claiming priority to the '681 patent. On information and belief,

Amazon has known of, or been willfully blind to, the existence of the ’049 patent since no later than April 21, 2015. On information and belief, no later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use.

75. On information and belief, Amazon has known of the existence of the ’049 patent, and its acts of infringement have been willful and in disregard for the ’049 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Amazon has known of, or been willfully blind to, the existence of the ’049 patent since no later than the date it received a copy of this complaint. No later than that date, Amazon has known its Alexa Products infringe the ’049 patent. Additionally, VoiceBox Technologies informed the Amazon employees who attended the February 2, 2017 meeting at VoiceBox Technologies’ office of the ’049 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the ’049 patent since no later than February 2, 2017. On information and belief, no later than that date, Amazon has known its Alexa Products infringe the ’049 patent. Additionally, the ’681 patent or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent Nos. 9,424,840; 9,852,729; 9,922,639; 10,026,394; and 10,102,845. The ’681 patent or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on March 4, 2015. By March 4, 2015, the ’049 patent’s application had published claiming priority to the ’681 patent. On April 21, 2015, the ’049 patent issued claiming priority to the ’681 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the ’049 patent since no later than April 21, 2015. On information and belief, no later than that date, Amazon has known its Alexa Products infringe the ’049 patent.

76. Amazon's infringement has been, and continues to be knowing, intentional, and willful.

77. Amazon's acts of infringement of the '049 patent have caused and will continue to cause VoiceBox damages for which VoiceBox is entitled to compensation pursuant to 35 U.S.C. § 284.

78. This case is exceptional and, therefore, VoiceBox is entitled to an award of attorney's fees pursuant to 35 U.S.C. § 285.

COUNT THREE (INFRINGEMENT OF THE '703 PATENT)

79. VoiceBox incorporates and realleges each and every allegation contained in the foregoing paragraphs of this complaint, as though fully set forth herein.

80. Amazon has and continues to infringe the '703 patent by making, using, selling, offering for sale, and/or importing into the United States, Alexa Products, which embody or use the inventions of the '703 patent in violation of 35 U.S.C. § 271(a). Exemplary evidence and an exemplary chart mapping a claim to Alexa Products can be found in Exhibit H.

81. Amazon has been and is inducing infringement of the '703 patent by actively and knowingly inducing others to make, use, sell, offer for sale, or import Alexa Products that include Alexa and embody or use the inventions claimed in the '703 patent, in violation of 35 U.S.C. § 271(b). On information and belief, Amazon writes software for Alexa Products and designs Alexa Products to operate in an infringing manner. Amazon causes Alexa Products to be made available through its own website. On information and belief, Amazon also profits from third-parties who sell Alexa Products. Amazon instructs users to use Alexa Products in an infringing manner and provides technical support for such use, including on its website and also through the Alexa virtual assistant. Amazon has known of, or been willfully blind to, the

existence of the ’703 patent since no later than the date it received a copy of this complaint. No later than that date, Amazon has known its actions would induce infringement by users of Alexa Products. Additionally, in April of 2017, VoiceBox Technologies sent a written summary of VoiceBox Technologies’ patent portfolio to Amazon that informed Amazon of the ’703 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the ’703 patent since no later than April of 2017. On information and belief, no later than that date, Amazon has known its actions would induce infringement by users of Alexa Products.

82. Amazon has been and is continuing to contributorily infringe the ’703 patent by selling or offering to sell Alexa Products, knowing them to be especially made or especially adapted for practicing the invention of the ’703 patent and not a staple article or commodity of commerce suitable for substantial non-infringing use in violation of 35 U.S.C. § 271(c). On information and belief, Amazon writes software for Alexa Products and designs Alexa Products to operate in an infringing manner. Amazon causes Alexa Products to be made available through its own website. On information and belief, Amazon also profits from third-parties who sell Alexa Products. Amazon instructs users to use Alexa Products in an infringing manner and provides technical support for such use, including on its website and also through the Alexa virtual assistant. Amazon has known of, or been willfully blind to, the existence of the ’703 patent since no later than it received a copy of this complaint. No later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use. Additionally, in April of 2017, VoiceBox Technologies sent a written summary of VoiceBox Technologies’ patent portfolio to Amazon that informed Amazon of the ’703 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the ’703 patent since no later

than April of 2017. On information and belief, no later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use.

83. On information and belief, Amazon has known of the existence of the '703 patent, and its acts of infringement have been willful and in disregard for the '703 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Amazon has known of, or been willfully blind to, the existence of the '703 patent since no later than the date it received a copy of this complaint. No later than that date, Amazon has known its Alexa Products infringe the '703 patent. Additionally, in April of 2017, VoiceBox Technologies sent a written summary of VoiceBox Technologies' patent portfolio to Amazon that informed Amazon of the '703 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '703 patent since no later than April of 2017. On information and belief, no later than that date, Amazon has known its Alexa Products infringe the '703 patent.

84. Amazon's infringement has been, and continues to be knowing, intentional, and willful.

85. Amazon's acts of infringement of the '703 patent have caused and will continue to cause VoiceBox damages for which VoiceBox is entitled to compensation pursuant to 35 U.S.C. § 284.

86. This case is exceptional and, therefore, VoiceBox is entitled to an award of attorney's fees pursuant to 35 U.S.C. § 285.

COUNT FOUR (INFRINGEMENT OF THE '176 PATENT)

87. VoiceBox incorporates and realleges each and every allegation contained in the foregoing paragraphs of this complaint, as though fully set forth herein.

88. Amazon has and continues to infringe the '176 patent by making, using, selling, offering for sale, and/or importing into the United States, Alexa Products, which embody or use the inventions of the '176 patent in violation of 35 U.S.C. § 271(a). Exemplary evidence and an exemplary chart mapping a claim to Alexa Products can be found in Exhibit J.

89. Amazon has been and is inducing infringement of the '176 patent by actively and knowingly inducing others to make, use, sell, offer for sale, or import Alexa Products that include Alexa and embody or use the inventions claimed in the '176 patent, in violation of 35 U.S.C. § 271(b). On information and belief, Amazon writes software for Alexa Products and designs Alexa Products to operate in an infringing manner. Amazon causes Alexa Products to be made available through its own website. On information and belief, Amazon also profits from third-parties who sell Alexa Products. Amazon instructs users to use Alexa Products in an infringing manner and provides technical support for such use, including on its website and also through the Alexa virtual assistant. Amazon has known of, or been willfully blind to, the existence of the '176 patent since no later than the date it received a copy of this complaint. No later than that date, Amazon has known its actions would induce infringement by users of Alexa Products. Additionally, VoiceBox notified the Amazon employees that attended the October 26, 2011 meeting at VoiceBox Technologies' office of the '176 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '176 patent since October 26, 2011. On information and belief, no later than that date, Amazon has known its actions would induce infringement by users of Alexa Products. Additionally, the '176 patent or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,152,973. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '176 patent since no later

than August 10, 2018, the date on which the '176 patent or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon. On information and belief, no later than that date, Amazon has known its actions would induce infringement by users of Alexa Products. Additionally, U.S. Pat. No. 8,145,489 or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,049,656. U.S. Pat. No. 8,145,489 or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on January 12, 2015. By that date, U.S. Pat. No. 8,145,489 had issued claiming priority to the '176 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '176 patent since no later than January 12, 2015. On information and belief, no later than that date, Amazon has known its actions would induce infringement by users of Alexa Products.

90. Amazon has been and is continuing to contributorily infringe the '176 patent by selling or offering to sell Alexa Products, knowing them to be especially made or especially adapted for practicing the invention of the '176 patent and not a staple article or commodity of commerce suitable for substantial non-infringing use in violation of 35 U.S.C. § 271(c). On information and belief, Amazon writes software for Alexa Products and designs Alexa Products to operate in an infringing manner. Amazon causes Alexa Products to be made available through its own website. On information and belief, Amazon also profits from third-parties who sell Alexa Products. Amazon instructs users to use Alexa Products in an infringing manner and provides technical support for such use, including on its website and also through the Alexa virtual assistant. Amazon has known of, or been willfully blind to, the existence of the '176 patent since no later than it received a copy of this complaint. No later than that date, Amazon

has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use. Additionally, VoiceBox notified the Amazon employees that attended the October 26, 2011 meeting at VoiceBox Technologies' office of the '176 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '176 patent since October 26, 2011. On information and belief, no later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use. Additionally, the '176 patent or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,152,973. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '176 patent since no later than August 10, 2018, the date on which the '176 patent or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon. On information and belief, no later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use. Additionally, U.S. Pat. No. 8,145,489 or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,049,656. U.S. Pat. No. 8,145,489 or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on January 12, 2015. By that date, U.S. Pat. No. 8,145,489 had issued claiming priority to the '176 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '176 patent since no later than January 12, 2015. On information and belief, no later than that date, Amazon

has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use.

91. On information and belief, Amazon has known of the existence of the ’176 patent, and its acts of infringement have been willful and in disregard for the ’176 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Amazon has known of, or been willfully blind to, the existence of the ’176 patent since no later than the date it received a copy of this complaint. No later than that date, Amazon has known its Alexa Products infringe the ’176 patent. Additionally, VoiceBox notified the Amazon employees that attended the October 26, 2011 meeting at VoiceBox Technologies’ office of the ’176 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the ’176 patent since no later than October 26, 2011. No later than that date, Amazon has known its Alexa Products infringe the ’176 patent. Additionally, the ’176 patent or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,152,973. On information and belief, Amazon has known of, or been willfully blind to, the existence of the ’176 patent since no later than August 10, 2018, the date on which the ’176 patent or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon. On information and belief, no later than that date, Amazon has known its Alexa Products infringe the ’176 patent. Additionally, U.S. Pat. No. 8,145,489 or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,049,656. U.S. Pat. No. 8,145,489 or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on January 12, 2015. By that date, U.S. Pat. No. 8,145,489 had issued claiming priority to the ’176 patent. On information and belief, Amazon has known

of, or been willfully blind to, the existence of the '176 patent since no later than January 12, 2015. On information and belief, no later than that date, Amazon has known its Alexa Products infringe the '176 patent.

92. Amazon's infringement has been, and continues to be knowing, intentional, and willful.

93. Amazon's acts of infringement of the '176 patent have caused and will continue to cause VoiceBox damages for which VoiceBox is entitled to compensation pursuant to 35 U.S.C. § 284.

94. This case is exceptional and, therefore, VoiceBox is entitled to an award of attorney's fees pursuant to 35 U.S.C. § 285.

COUNT FIVE (INFRINGEMENT OF THE '536 PATENT)

95. VoiceBox incorporates and realleges each and every allegation contained in the foregoing paragraphs of this complaint, as though fully set forth herein.

96. Amazon has and continues to infringe the '536 patent by making, using, selling, offering for sale, and/or importing into the United States, Alexa Products, which embody or use the inventions of the '536 patent in violation of 35 U.S.C. § 271(a). Exemplary evidence and an exemplary chart mapping a claim to Alexa Products can be found in Exhibit L.

97. Amazon has been and is inducing infringement of the '536 patent by actively and knowingly inducing others to make, use, sell, offer for sale, or import Alexa Products that include Alexa and embody or use the inventions claimed in the '536 patent, in violation of 35 U.S.C. § 271(b). On information and belief, Amazon writes software for Alexa Products and designs Alexa Products to operate in an infringing manner. Amazon causes Alexa Products to be made available through its own website. On information and belief, Amazon also profits from

third-parties who sell Alexa Products. Amazon instructs users to use Alexa Products in an infringing manner and provides technical support for such use, including on its website and also through the Alexa virtual assistant. Amazon has known of, or been willfully blind to, the existence of the '536 patent since no later than the date it received a copy of this complaint. No later than that date, Amazon has known its actions would induce infringement by users of Alexa Products. Additionally, VoiceBox Technologies informed the Amazon employees who attended the February 2, 2017 meeting at VoiceBox Technologies' office of the '536 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '536 patent since no later than February 2, 2017. On information and belief, no later than that date, Amazon has known its actions would induce infringement by users of Alexa Products. Additionally, the '176 patent or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,152,973. The '176 patent or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on August 10, 2018. As of that date, the '536 patent had issued claiming priority to the '176 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '536 patent since no later than August 10, 2018. On information and belief, no later than that date, Amazon has known its actions would induce infringement by users of Alexa Products. Additionally, U.S. Pat. No. 8,145,489 or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,049,656. U.S. Pat. No. 8,145,489 or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on January 12, 2015. By that date, the '536 patent had issued claiming priority to U.S. Pat. No. 8,145,489. On information and belief, Amazon has known of, or been willfully blind to,

the existence of the ’536 patent since no later than January 12, 2015. On information and belief, no later than that date, Amazon has known its actions would induce infringement by users of Alexa Products.

98. Amazon has been and is continuing to contributorily infringe the ’536 patent by selling or offering to sell Alexa Products, knowing them to be especially made or especially adapted for practicing the invention of the ’536 patent and not a staple article or commodity of commerce suitable for substantial non-infringing use, in violation of 35 U.S.C. § 271(c). On information and belief, Amazon writes software for Alexa Products and designs Alexa Products to operate in an infringing manner. Amazon causes Alexa Products to be made available through its own website. On information and belief, Amazon also profits from third-parties who sell Alexa Products. Amazon instructs users to use Alexa Products in an infringing manner and provides technical support for such use, including on its website and also through the Alexa virtual assistant. Amazon has known of, or been willfully blind to, the existence of the ’536 patent since no later than it received a copy of this complaint. No later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use. Additionally, VoiceBox Technologies informed the Amazon employees who attended the February 2, 2017 meeting at VoiceBox Technologies’ office of the ’536 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the ’536 patent since no later than February 2, 2017. On information and belief, no later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use. Additionally, the ’176 patent or its published application was cited during prosecution of one or more patents assigned to a

subsidiary of Amazon, including U.S. Patent No. 10,152,973. The ’176 patent or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on August 10, 2018. As of that date, the ’536 patent had issued claiming priority to the ’176 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the ’536 patent since no later than August 10, 2018. On information and belief, no later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use. Additionally, U.S. Pat. No. 8,145,489 or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,049,656. U.S. Pat. No. 8,145,489 or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on January 12, 2015. By that date, the ’536 patent had issued claiming priority to U.S. Pat. No. 8,145,489. On information and belief, Amazon has known of, or been willfully blind to, the existence of the ’536 patent since no later than January 12, 2015. On information and belief, no later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use.

99. On information and belief, Amazon has known of the existence of the ’536 patent, and its acts of infringement have been willful and in disregard for the ’536 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Amazon has known of, or been willfully blind to, the existence of the ’536 patent since no later than the date it received a copy of this complaint. No later than that date, Amazon has known its Alexa Products infringe the ’536 patent. Additionally, VoiceBox Technologies informed the Amazon employees who attended the February 2, 2017 meeting at VoiceBox Technologies’ office of the

'536 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '536 patent since no later than February 2, 2017. On information and belief, no later than that date, Amazon has known its Alexa Products infringe the '536 patent. Additionally, the '176 patent or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,152,973. The '176 patent or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on August 10, 2018. As of that date, the '536 patent had issued claiming priority to the '176 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '536 patent since no later than August 10, 2018. On information and belief, no later than that date, Amazon has known its Alexa Products infringe the '536 patent. Additionally, U.S. Pat. No. 8,145,489 or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,049,656. U.S. Pat. No. 8,145,489 or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on January 12, 2015. By that date, the '536 patent had issued claiming priority to U.S. Pat. No. 8,145,489. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '536 patent since no later than January 12, 2015. On information and belief, no later than that date, Amazon has known its Alexa Products infringe the '536 patent.

100. Amazon's infringement has been, and continues to be knowing, intentional, and willful.

101. Amazon's acts of infringement of the '536 patent have caused and will continue to cause VoiceBox damages for which VoiceBox is entitled to compensation pursuant to 35 U.S.C. § 284.

102. This case is exceptional and, therefore, VoiceBox is entitled to an award of attorney's fees pursuant to 35 U.S.C. § 285.

COUNT SIX (INFRINGEMENT OF THE '097 PATENT)

103. VoiceBox incorporates and realleges each and every allegation contained in the foregoing paragraphs of this complaint, as though fully set forth herein.

104. Amazon has and continues to infringe the '097 patent by making, using, selling, offering for sale, and/or importing into the United States, Alexa Products, which embody or use the inventions of the '097 patent in violation of 35 U.S.C. § 271(a). Exemplary evidence and an exemplary chart mapping a claim to Alexa Products can be found in Exhibit N.

105. Amazon has been and is inducing infringement of the '097 patent by actively and knowingly inducing others to make, use, sell, offer for sale, or import Alexa Products that include Alexa and embody or use the inventions claimed in the '097 patent, in violation of 35 U.S.C. § 271(b). On information and belief, Amazon writes software for Alexa Products and designs Alexa Products to operate in an infringing manner. Amazon causes Alexa Products to be made available through its own website. On information and belief, Amazon also profits from third-parties who sell Alexa Products. Amazon instructs users to use Alexa Products in an infringing manner and provides technical support for such use, including on its website and also through the Alexa virtual assistant. Amazon has known of, or been willfully blind to, the existence of the '097 patent since no later than the date it received a copy of this complaint. No later than that date, Amazon has known its actions would induce infringement by users of Alexa Products. Additionally, VoiceBox Technologies informed the Amazon employees who attended the February 2, 2017 meeting at VoiceBox Technologies' office of the '097 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the

’097 patent since no later than February 2, 2017. On information and belief, no later than that date, Amazon has known its actions would induce infringement by users of Alexa Products. Additionally, the ’176 patent or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,152,973. The ’176 patent or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on August 10, 2018. As of that date, the ’097 patent had issued claiming priority to the ’176 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the ’097 patent since no later than August 10, 2018. On information and belief, no later than that date, Amazon has known its actions would induce infringement by users of Alexa Products. Additionally, U.S. Pat. No. 8,145,489 or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,049,656. U.S. Pat. No. 8,145,489 or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on January 12, 2015. On February 23, 2016, the ’097 patent issued claiming priority to U.S. Pat. No. 8,145,489. On information and belief, Amazon has known of, or been willfully blind to, the existence of the ’097 patent since no later than February 23, 2016. On information and belief, no later than that date, Amazon has known its actions would induce infringement by users of Alexa Products.

106. Amazon has been and is continuing to contributorily infringe the ’097 patent by selling or offering to sell Alexa Products, knowing them to be especially made or especially adapted for practicing the invention of the ’097 patent and not a staple article or commodity of commerce suitable for substantial non-infringing use, in violation of 35 U.S.C. § 271(c). On information and belief, Amazon writes software for Alexa Products and designs Alexa Products

to operate in an infringing manner. Amazon causes Alexa Products to be made available through its own website. On information and belief, Amazon also profits from third-parties who sell Alexa Products. Amazon instructs users to use Alexa Products in an infringing manner and provides technical support for such use, including on its website and also through the Alexa virtual assistant. Amazon has known of, or been willfully blind to, the existence of the '097 patent since no later than it received a copy of this complaint. No later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use. Additionally, VoiceBox Technologies informed the Amazon employees who attended the February 2, 2017 meeting at VoiceBox Technologies' office of the '097 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '097 patent since no later than February 2, 2017. On information and belief, no later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use. Additionally, the '176 patent or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,152,973. The '176 patent or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on August 10, 2018. As of that date, the '097 patent had issued claiming priority to the '176 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '097 patent since no later than August 10, 2018. On information and belief, no later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use. Additionally, U.S. Pat. No. 8,145,489 or its published application was cited during

prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,049,656. U.S. Pat. No. 8,145,489 or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on January 12, 2015. On February 23, 2016, the '097 patent issued claiming priority to U.S. Pat. No. 8,145,489. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '097 patent since no later than February 23, 2016. On information and belief, no later than that date, Amazon has known its Alexa Products are especially made or adapted for a use or product that is both patented and infringing and that there is no substantial non-infringing use.

107. On information and belief, Amazon has known of the existence of the '097 patent, and its acts of infringement have been willful and in disregard for the '097 patent, without any reasonable basis for believing that it had a right to engage in the infringing conduct. Amazon has known of, or been willfully blind to, the existence of the '097 patent since no later than the date it received a copy of this complaint. No later than that date, Amazon has known its Alexa Products infringe the '097 patent. Additionally, VoiceBox Technologies informed the Amazon employees who attended the February 2, 2017 meeting at VoiceBox Technologies' office of the '097 patent. On information and belief, Amazon has known of, or been willfully blind to, the existence of the '097 patent since no later than February 2, 2017. On information and belief, no later than that date, Amazon has known its Alexa Products infringe the '097 patent. Additionally, the '176 patent or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,152,973. The '176 patent or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on August 10, 2018. As of that date, the '097 patent had issued claiming priority to the '176 patent. On information and belief, Amazon has known of, or been willfully

blind to, the existence of the ’097 patent since no later than August 10, 2018. On information and belief, no later than that date, Amazon has known its Alexa Products infringe the ’097 patent. Additionally, U.S. Pat. No. 8,145,489 or its published application was cited during prosecution of one or more patents assigned to a subsidiary of Amazon, including U.S. Patent No. 10,049,656. U.S. Pat. No. 8,145,489 or its published application was first cited during prosecution of one or more patents assigned to a subsidiary of Amazon on January 12, 2015. On February 23, 2016, the ’097 patent issued claiming priority to U.S. Pat. No. 8,145,489. On information and belief, Amazon has known of, or been willfully blind to, the existence of the ’097 patent since no later than February 23, 2016. On information and belief, no later than that date, Amazon has known its Alexa Products infringe the ’097 patent.

108. Amazon’s infringement has been, and continues to be knowing, intentional, and willful.

109. Amazon’s acts of infringement of the ’097 patent have caused and will continue to cause VoiceBox damages for which VoiceBox is entitled to compensation pursuant to 35 U.S.C. § 284.

110. This case is exceptional and, therefore, VoiceBox is entitled to an award of attorney’s fees pursuant to 35 U.S.C. § 285.

PRAYER FOR RELIEF

WHEREFORE, VoiceBox, respectfully requests the Court to enter judgment in favor of VoiceBox and against Amazon as to all claims asserted herein as follows:

a) Adjudging that Amazon has infringed, actively induced infringement of, and contributorily infringed at least one claim of the VoiceBox Patents in violation of 35 U.S.C. §§ 271(a), (b), and/or (c);

b) Ordering Amazon to account and pay damages adequate to compensate VoiceBox for Amazon's infringement of the VoiceBox Patents, including for any infringing acts not presented at trial and pre-judgment and post-judgment interest and costs, pursuant to 35 U.S.C. § 284;

c) Ordering that the damages award be increased up to three times the actual amount assessed, pursuant to 35 U.S.C. § 284;

d) Declaring this case exceptional and awarding VoiceBox its reasonable attorneys' fees, pursuant to 35 U.S.C. § 285;

e) Awarding VoiceBox interest, including prejudgment and post-judgment interest, on the foregoing sums; and

f) Awarding such other and further relief as this Court deems just and proper.

JURY DEMAND

Pursuant to Federal Rules of Civil Procedure Rule 38, VoiceBox demands a trial by jury on all issues so triable.

Dated: July 29, 2019

WILSON SONSINI GOODRICH & ROSATI
Professional Corporation

/s/ Ian R. Liston

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Attorneys for VB Assets, LLC

EXHIBIT A

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Philippe Di Cristo

Speech and Voice Technology Leader at Amazon

Bellevue, Washington

Computer Software

6 people have recommended Philippe

Amazon

VoiceBox Technologies

Aix-Marseille University

500+ connections

View Philippe Di Cristo's full profile. It's free!

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Summary

Avid follower of "conversational computing" leveraging emerging AI technologies and the ever growing accessibility to people data and behaviors. Passionate about technological innovation moving the human-machine interaction forward.

32% Technical Leader and Manager, 25% Innovator, 23% Scientist, 17% Developer, 3% Still-trying-to-figure-it-out

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experiences leading to pioneering intellectual property.

Come join me build the ultimate Personal Assistant experience.
I am looking for passionate scientists in Natural Language Understanding and Machine Learning. Your work directly improves Alexa customers by making her smarter everyday. We work hard, have fun, and of course make history. What are you waiting for?

Experience

Image for Speech and

Speech and Voice Technology Leader

Amazon

October 2016 – Present • 2 years 10 months

Seattle, WA

I am building a team taking to take broad responsibilities in building the ultimate Personal Assistant experiences.

I am looking for ML scientists and Computational Linguists.

Image for Chief Scientis

Chief Scientist, Vice-President Speech and NLU R&D

VoiceBox Technologies

July 2003 – September 2016 • 13 years 3 months

Bellevue, WA

I joined the company in its infant stage as employee number 9. I cover broad responsibilities including strong technology lead, top-level management and architect/SE.

Some of my functions include leading an international team of over 100 engineers and scientists designing and implementing new Speech Recognition and Natural Language Understanding algorithms to enhance company's IP, researching and identifying technology trends to define mission critical strategic and tactical roadmap and patents, researching and evaluating worldwide potential technology partners, communicating company's technology IP to investors, executives partners, customers and stakeholders as well as driving competitor analysis and managing Speech partner relations.

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for Lexus Enform/Entune, Samsung S-Voice (now on all S6 and S7 phones), as well as worldwide embedded car products (Chrysler, Renault, and more).

Designed and implemented in 2006, VoiceBox “Cybermind”, the Amazon Echo-like system. Look for it on YouTube! (http://bit.ly/cybermind). In 2013, IEEE ranked VoiceBox Technologies #13 in Patent Power for the Computer Software industry.

Report to executives and work closely with finance and sales and marketing department to ensure cohesive execution of the company’s plan

Result from IEEE that says it all: "Among the world’s most Creative and Impactful Technology IP"

Image for Director Core

Director Core Technologies

Conversay

2000 – 2003 • 3 years

Redmond WA

As Principal Speech Scientist and Architect, I lead the embedded Speech Recognition and Text-to-Speech (TTS) research and development. I am responsible not only for the design and management of the entire system architecture but also for improving the performances of “CASSI” (Conversay ASR and Speech Synthesis Interface) by proposing new algorithms and long-term research projects. I manage a domestic and international scientist team.
I work directly with C level and monthly report to the Board of Directors.

Image for Sr. Softwar e

Sr. Software Engineer

Eloquent Technologies (now part of Nuance)

1999 – 2000 • 1 year

Ithaca, New York Area

As main Speech Scientist, I am responsible for the enhancement and maintenance of the core text to speech synthesis engine. I designed a new architecture and optimized the Delta language compiler and interpreter (a proprietary programming language of Eloquent Technology, designed for speech synthesis). I also performed analysis and improved French prosody rules leveraging linguistic knowledge.

Sign in Join now

Image for Research

Research Engineer, NLP Lead

Scientific National Research Center (CNRS) - Speech and Language Lab (Laboratoire Parole et Langage)

1994 – 1998 • 4 years

Marseille Area, France

As NLP Lead within the Language Research Engineering (LRE) projects Multext (MultiLingual Text Tools and Corpora) which encompassed initially 7 European countries (France, Spain, Netherlands, Germany, Italy and Switzerland), I contributed to the Development of standards and specifications for the encoding and the processing of linguistic corpora and, the production of tools and resources for natural language processing (NLP) in a multilingual environment. Multext was the largest project funded in the Commission of European Communities Linguistic Research and Engineering Program; it got extended to include eastern Europe countries and partners (Multext-East)

Education

Image for Aix-Marseille

Aix-Marseille University

Ph.D, Speech & Computer Science

1993 – 1997

Volunteering Experience

Image for Honors selectio

Honors selection committee members of the Innovation FABA 2016

French American Chamber of Commerce

May 2016

Science and Technology

As an active member in the community, I am supporting the French American Chamber of Commerce Business Innovation Award (FABA) 2016I

http://faccpnw.wix.com/thefabapnw#!innovation-award/xjs0v

Skills & Endorsements

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Languages

English
Full professional proficiency

French
Native or bilingual proficiency

Spanish
Limited working proficiency

Recommendations

A preview of what LinkedIn members have to say about Philippe:

" Philippe is "captain oh my captain"! I have been working under his supervision for close to 10 years. Thanks to him, during the whole time I have been always feeling the passion for work, looking forward to new challenges, and feel lucky to work in such a great (yet with a lot pressure) work environment. He does not only have a very strong technical background, programming skills, clear/long-term vision from both technology and application point of views, but also a great personality. He brings laughter to everywhere. It is really an honor and pleasure to work with him. I am sure he will succeed wherever he is going.

" Philippe is a great leader. Under his supervision, we were able to achieve great success on very difficult tasks. Philippe understands how engineering and research works, and he is also able to manage difficult requests from demanding customers. While he was always focused on quality and speed of delivery, he was also very respectful of personal boundaries and understands that life extends beyond work. He is a real pleasure to work with and I highly recommend him!

Join LinkedIn to see who recommended Philippe

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Image **The Language Technology Group**

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Image **Speech Analytics**

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View Philippe Di Cristo's full profile to...

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Technology Office Assistant at City of Dover

Janna Wagner
Student at Kent State University at Trumbull

Kayla Murphy
Student at Kent State University at Trumbull

Yang Mi
Student at University of Washington

Grant Peterson
Student Majoring in Supply Chain Management at University of Tennessee, Knoxville

Nathan Yonker
High School Diploma at Ohio Virtual Academy and student of Kent state Trumbull

Devin Smeallie

Krishel Arrell
Client and communication focused individual invested in the promotion of positivity within my environment.

Rajiv Rai
Coach

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Programming **Programming Foundations: Test-Driven Development (2013)**

Blockchain: **Blockchain: Learning Solidity**

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Philippe's public profile badge

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Phili ppe **Philippe Di Cristo**
Speech and Voice Technology Leader at Amazon

Speech and Voice Technology Leader at Amazon

Aix-Marseille University

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Technology Lead at Expedia, Inc.

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Accessibility Technology Lead at Expedia Group

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Avinash Gupta Kolluri

Technology Lead / Cloud Solutions Design Engineer

Dan Corlis s

Dan Corliss

Technology Lead AR/VR at Facebook

Anil Kumar

Anil Kumar

Technology Lead at Expedia

Rekha Nanda

Rekha Nanda

Technology Leader , International Technology at Amazon

Breck Morris on

Breck Morrison

Technology Leader at Amazon

Sumal atha Koppu

Sumalatha Koppula

Technology Lead at Expedia Inc | AWS Certified Solutions Architect

Tony Wu

Tony Wu

Hadoop Administrator at Expedia, Inc.

Velsa my Raja

Velsamy Raja

Technology Lead at Expedia, Inc.

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EXHIBIT B

voicebox
1110 112th Ave NE Suite 500
Bellevue, Washington 98004

Jeff Bezos
Amazon.com Inc
410 Terry Avenue North
Seattle, Washington
98109

January 17, 2017

Dear Jeff,

This is Mike Kennewick, CEO of Voicebox Technologies in Bellevue, WA. We, along with Nuance Communications, are the leader in Speech and NLU services for the automotive marketplace. We also developed an NLU for Samsung for use in their smart phones -- including their upcoming Personal Assistant, Bixby. I met you briefly when you were just starting Amazon, you visited my Document Management Company, Saros. I have followed and admired your amazing success ever since.

The reason I am writing is that your Voice and Advanced NUI Shopping team recently hosted a targeted, invite-only recruiting dinner for over 100 of our current and former employees. All of our employees have signed a non-compete and non-solicitation agreement, so we are very concerned about Amazon's recruitment of them. Compounding the matter is that a former Voicebox Chief Speech Scientist & Vice President, Embedded Speech Technologies, who is in violation of both his non-compete and non-solicitation agreement, was heavily involved in and listed as a speaker at the event. Also, I'd like to bring to your attention the fact that your team came to our office in 2011 to discuss a potential acquisition and we disclosed details about a Smart Speaker/Personal Assistant we created. The following link is a demonstration of our Smart Speaker: King 5 News https://youtu.be/DDcRyPnvWhw. As you can see, the Echo is remarkably similar in design and functionality to our 2005 product.

Our lawyers are in discussion with your lawyers about the recruiting issue and your law firm, Summit Law Group, asked us whether there is a business solution to the problem. The reason I am writing is to see if we can in fact find such a solution.

As it turns out, we are currently considering the sale of Voicebox to another party. It occurs to me that perhaps we should also be also talking to Amazon about such an acquisition:

1. We have 150 people in Bellevue, who are experts in Speech and NLU, whose talent your team is obviously interested in.
2. We have a deep portfolio of technology and IP, including a large number of significant patents not only in NLU but also in Voice-Commerce, running on over 200 million devices.
3. We have extensive experience in the automotive market and we are the market leader in providing Natural Language Understanding to car companies including Toyota, Renault, Mazda, Subaru and Chrysler.

Your team's interest in our engineers and your recent announcements about the connected car makes me think that there may be strong synergies between our companies. I am particularly struck by the public statements you've made about innovation as our company is driven by innovation; we were the first to develop a personal assistant in a smart speaker and we were the first to develop a personal assistant in a connected car. In summary, we are an innovator right in your own back yard and we have people, IP and capabilities that I believe may make more sense with Amazon than the other alternative we are considering. I am sincere in my belief that the combination of our capabilities and yours can make a big difference against competitors like Google, Apple and Alibaba. I hope you will consider my offer in the spirit it is intended.

Please let me know if you are interested in a short phone call or face to face meeting to discuss this possibility.

Sincerely Yours,

Mike Kennewick

EXHIBIT C

US008073681B2

(12) **United States Patent**
Baldwin et al.

(10) **Patent No.: US 8,073,681 B2**
(45) **Date of Patent: Dec. 6, 2011**

(54) **SYSTEM AND METHOD FOR A COOPERATIVE CONVERSATIONAL VOICE USER INTERFACE**

(75) Inventors: **Larry Baldwin**, Maple Valley, WA (US); **Tom Freeman**, Mercer Island, WA (US); **Michael Tjalve**, Bellevue, WA (US); **Blane Ebersold**, Seattle, WA (US); **Chris Weider**, Everett, WA (US)

(73) Assignee: **VoiceBox Technologies, Inc.**, Bellevue, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1217 days.

(21) Appl. No.: **11/580,926**

(22) Filed: **Oct. 16, 2006**

(65) **Prior Publication Data**

US 2008/0091406 A1 Apr. 17, 2008

(51) **Int. Cl.**
G06F 17/27 (2006.01)
G10L 21/00 (2006.01)
G10L 11/00 (2006.01)

(52) **U.S. Cl.** **704/9**; 704/270; 704/275

(58) **Field of Classification Search** 704/270–275, 704/9

See application file for complete search history.

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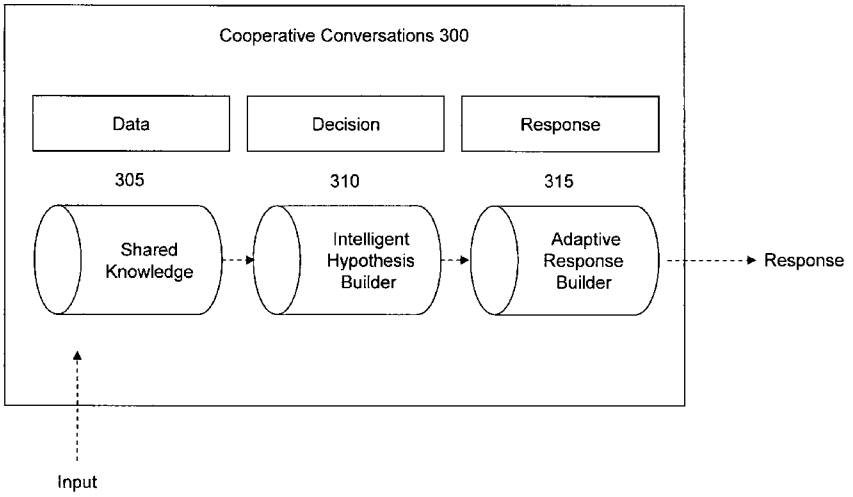
Primary Examiner — Eric Yen

(74) *Attorney, Agent, or Firm* — Pillsbury Winthrop Shaw Pittman LLP

(57) **ABSTRACT**

A cooperative conversational voice user interface is provided. The cooperative conversational voice user interface may build upon short-term and long-term shared knowledge to generate one or more explicit and/or implicit hypotheses about an intent of a user utterance. The hypotheses may be ranked based on varying degrees of certainty, and an adaptive response may be generated for the user. Responses may be worded based on the degrees of certainty and to frame an appropriate domain for a subsequent utterance. In one implementation, misrecognitions may be tolerated, and conversational course may be corrected based on subsequent utterances and/or responses.

42 Claims, 3 Drawing Sheets



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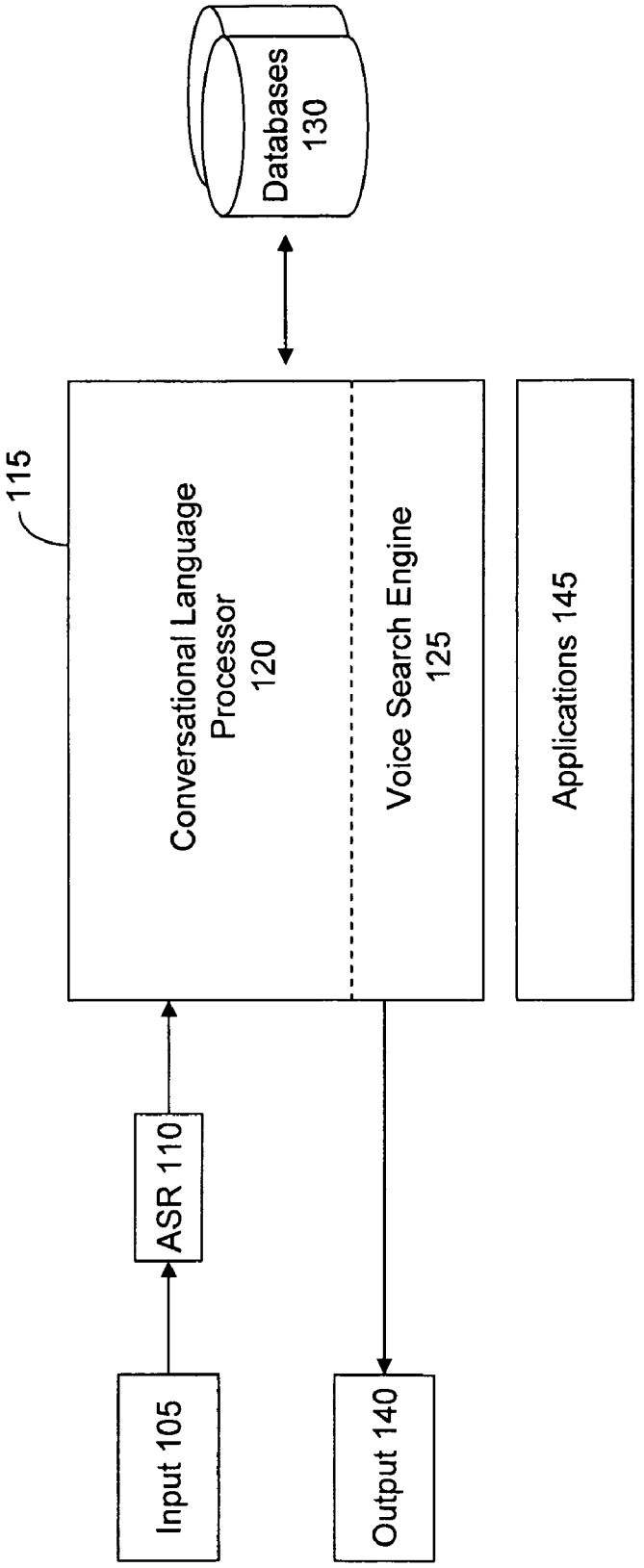
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130
115
Conversational Language
Processor
120
Voice Search Engine
125
Applications 145
ASR 110
Input 105
Output 140

FIG. 1

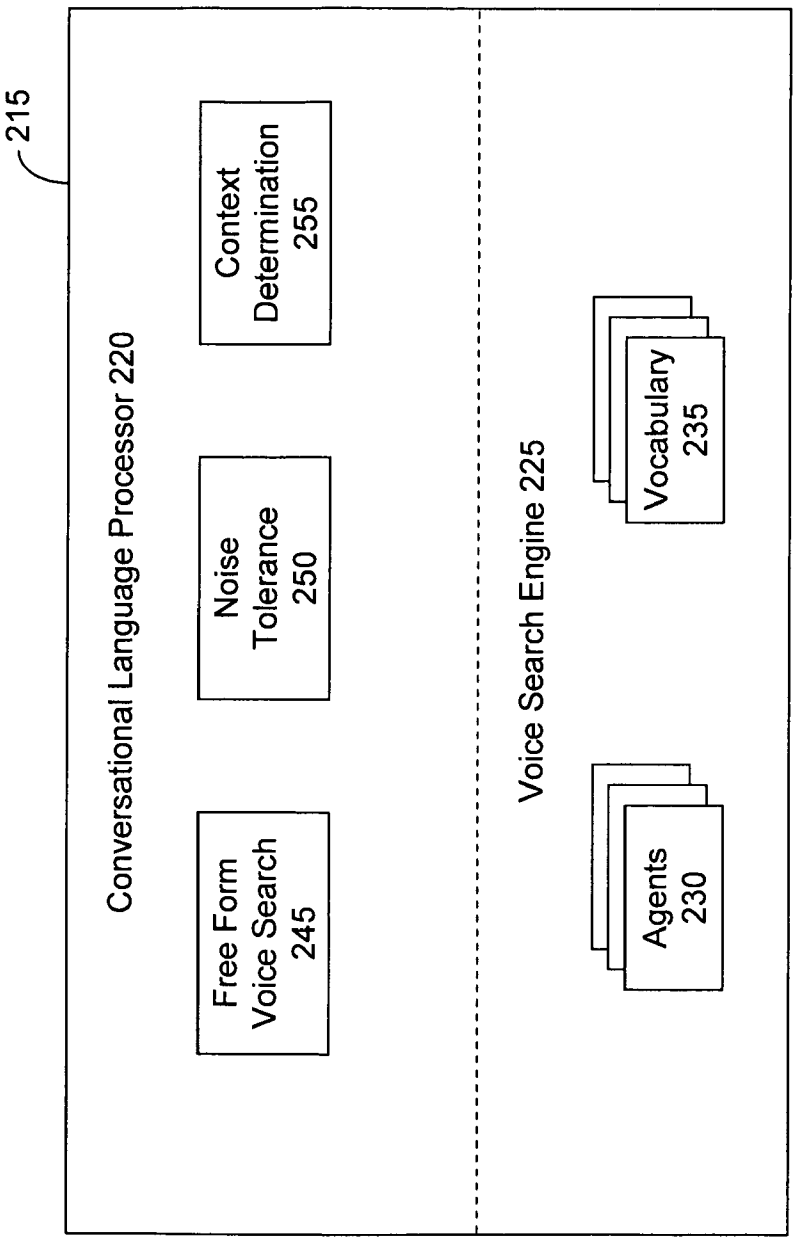

215
Conversational Language Processor 220
Context Determination 255
Noise Tolerance 250
Free Form Voice Search 245
Voice Search Engine 225
Vocabulary 235
Agents 230

FIG. 2

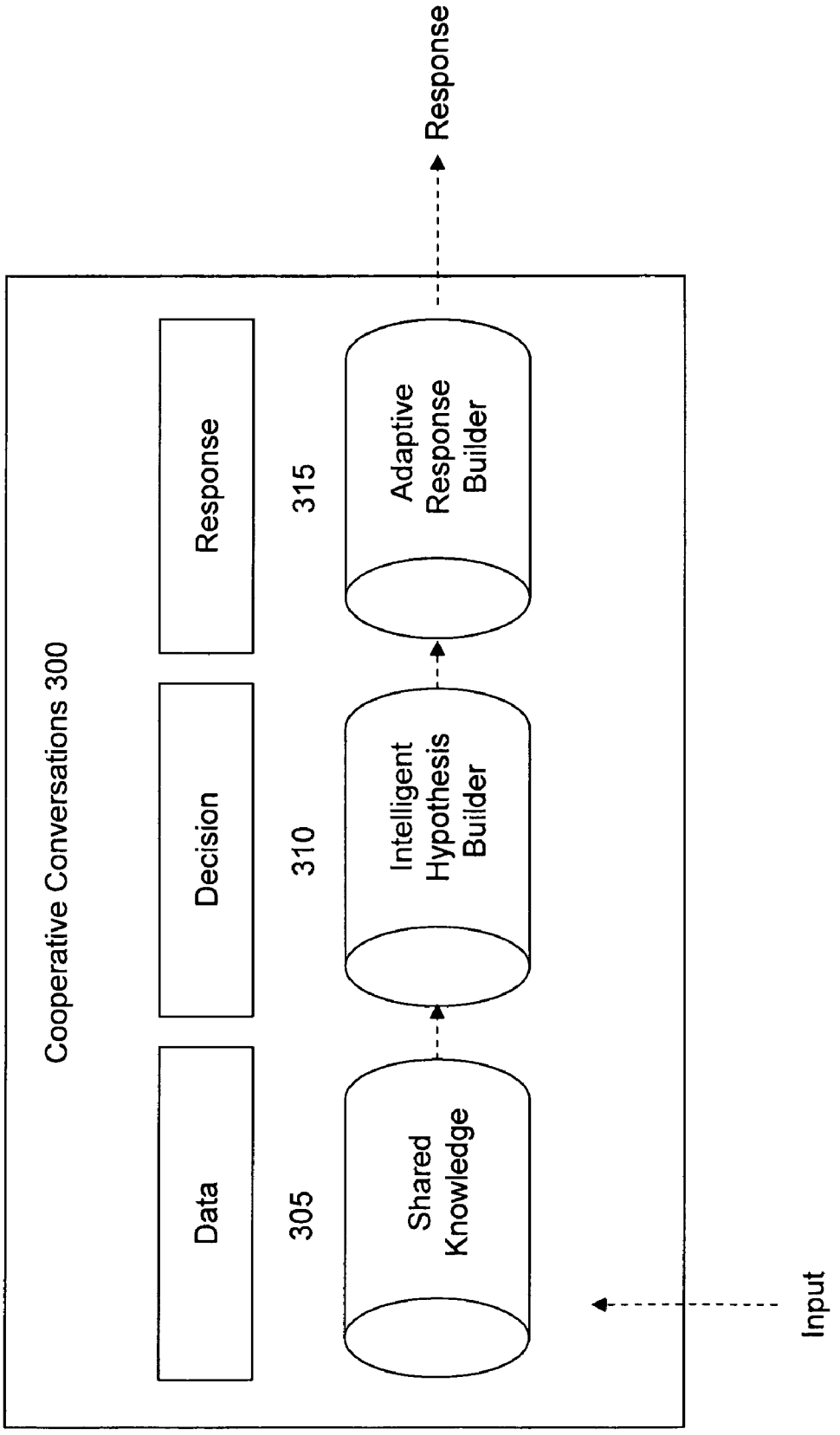

Response
Cooperative Conversations 300
Response
Decision
Data
315
310
305
Adaptive Response Builder
Intelligent Hypothesis Builder
Shared Knowledge
Input

FIG. 3

SYSTEM AND METHOD FOR A COOPERATIVE CONVERSATIONAL VOICE USER INTERFACE

FIELD OF THE INVENTION

The invention relates to a cooperative conversational model for a human to machine voice user interface.

BACKGROUND OF THE INVENTION

Advances in technology, particularly within the convergence space, have resulted in an increase in demand for voice recognition software that can exploit technology in ways that are intuitive to humans. While communication between human beings is most often "cooperative," in that information and/or context is shared to advance mutual conversational goals, existing Human-to-Machine interfaces fail to provide the same level of intuitive interaction. For example, each human participant in a conversation can contribute to an exchange for the benefit of the exchange. This is done through shared assumptions and expectations regarding various aspects of the conversation, such as the topic, participant knowledge about the topic, expectations of the other participant's knowledge about the topic, appropriate word usage for the topic and/or participants, conversational development based on previous utterances, the participants' tone or inflection, the quality and quantity of contribution expected from each participant, and many other factors. Participating in conversations that continually build and draw upon shared information is a natural and intuitive way for humans to converse.

In contrast, complex Human-to-Machine interfaces do not allow users to exploit technology in an intuitive way, which inhibits mass-market adoption for various technologies. Incorporating a speech interface helps to alleviate this burden by making interaction easier and faster, but existing speech interfaces (when they actually work) still require significant learning on the part of the user. That is, existing speech interfaces are unable to bridge the gap between archaic Human-to-Machine interfaces and conversational speech that would make interaction with systems feel normal. Users should be able to directly request what they want from a system in a normal, conversational fashion, without having to memorize exact words or phrases. Alternatively, when users are uncertain of particular needs, they should be able to engage the system in a productive, cooperative dialogue to resolve their requests. Instead, existing speech interfaces force users to dumb down their requests to match simple sets of instructions in simple languages in order to communicate requests in ways that systems can understand. Using existing speech interfaces, there is virtually no option for dialogue between the user and the system to satisfy mutual goals.

Therefore, existing systems lack a conversational speech model that can provide users with the ability to interact with systems in ways that are inherently intuitive to human beings. Existing systems suffer from these and other problems.

SUMMARY OF THE INVENTION

According to various embodiments and aspects of the invention, a cooperative conversational voice user interface may understand free form human utterances, freeing users from being restricted to a fixed set of commands and/or requests. Rather, users can engage in cooperative conversations with a machine to complete a request or series of requests using a natural, intuitive, free form manner of expression.

According to an aspect of the invention, an exemplary system architecture for implementing a cooperative conversational voice user interface is provided. The system may receive an input, which may include a human utterance received by an input device, where the utterance may include one or more requests. As used herein, an "utterance" may be words, syllables, phonemes, or any other audible sound made by a human being. As used herein, a "request" may be a command, directive, or other instruction for a device, computer, or other machine to retrieve information, perform a task, or take some other action. In one implementation, the input may be a multi-modal input, where at least part of the multi-modal input is an utterance. The utterance component of the input may be processed by a speech recognition engine (which may alternatively be referred to as an Automatic Speech Recognizer or ASR) to generate one or more preliminary interpretations of the utterance. The one or more preliminary interpretations may then be provided to a conversational speech engine for further processing, where the conversational speech engine may communicate with one or more databases to generate an adaptive conversational response, which may be returned to the user as an output. In one implementation, the output may be a multi-modal output. For example, the utterance may include a request to perform an action, and the output may include a conversational response reporting success or failure, as well as an execution of the action.

According to another aspect of the invention, an exemplary conversational speech engine may generate an adaptive conversational response to a request or series of requests. The conversational speech engine may include a free form voice search module that may understand an utterance made using typical, day-to-day language (i.e., in free form), and may account for variations in how humans normally speak, the vocabulary they use, and the conditions in which they speak. To account for intangible variables of human speech, the free form search module may include models of casual human speech. For example, in one implementation, the free form search module may understand specialized jargon and/or slang, tolerate variations in word order, and tolerate verbalized pauses or stuttered speech. For example, formalized English requests, where a verb precedes a noun, may be treated in an equivalent manner to requests where the noun precedes the verb. In another implementation, compound requests and/or compound tasks with multiple variables may be identified in a single utterance. By identifying all relevant information for completing one or more tasks from a single utterance, advantages may be provided over existing voice user interfaces, such as Command and Control systems that use verbal menus to restrict information that a person can provide at a given point. In another implementation, inferring intended requests from incomplete or ambiguous requests may provide a conversational feel. By modeling what contextual signifiers, qualifiers, or other information may be required to perform a task in an identified context, an adaptive response may be generated, such as prompting a user for missing contextual signifiers, qualifiers, or other information. In one implementation, the response may ask for missing information in a way that most restricts possible interpretations, and the response may be framed to establish a domain for a subsequent user utterance. In another implementation, common alternatives for nouns and verbs may be recognized to reflect variations in usage patterns according to various criteria. Thus, variations in expression may be supported

because word order is unimportant or unanticipated, and nouns and/or verbs may be represented in different ways to give simplistic, yet representative, examples. In another implementation, requests may be inferred from contradictory or otherwise inaccurate information, such as when an utterance includes starts and stops, restarts, stutters, run-on sentences, or other imperfect speech. For example, a user may sometimes change their mind, and thus alter the request in mid-utterance, and the imperfect speech feature may nonetheless be able to infer a request based on models of human speech. For example, various models may indicate that a last criterion is most likely to be correct, or intonation, emphasis, stress, use of the word "not," or other models may indicate which criterion is most likely to be correct.

According to another aspect of the invention, the conversational speech engine may include a noise tolerance module that may discard words or noise which has no meaning in a given context to reduce a likelihood of confusion. Moreover, the noise tolerance module may filter out environmental and non-human noise to further reduce a likelihood of confusion. In one implementation, the noise tolerance module may cooperate with other modules and features to filter out words that do not fit into an identified context. For example, the noise tolerance module may filter other human conversations and/or utterances within a range of one or more microphones. For example, a single device may include multiple microphones, or multiple devices may each include one or more microphones, and the noise tolerance module may collate inputs and cooperatively filter out sound by comparing a speech signal from the various microphones. The noise tolerance module may also filter out non-human environmental noise within range of the microphones, out-of-vocabulary words caused by speaker ambiguity or malapropisms, or other noise that may be unrelated to a target request. Performance benchmarks for the noise tolerance module may be defined by noise models based on human criteria. For example, if a driver of a car is 92% likely to be understood by a passenger when traveling at 65 miles-per-hour with windows cracked, then performance benchmarks for the noise tolerance module may have a similar performance under such conditions.

According to another aspect of the invention, the conversational speech engine may include a context determination process that determines one or more contexts for a request to establish meaning within a conversation. The one or more contexts may be determined by having one or more context domain agents compete to determine a most appropriate domain for a given utterance. Once a given domain "wins" the competition, the winning domain may be responsible for establishing or inferring further contexts and updating short-term and long-term shared knowledge. If there is a deadlock between context domain agents, an adaptive conversational response may prompt the user to assist in disambiguating between the deadlocked agents. Moreover, the context determination process may infer intended operations and/or context based on previous utterances and/or requests, whereas existing systems consider each utterance independently, potentially making the same errors over and over again. For example, if a given interpretation turns out to be incorrect, the incorrect interpretation may be removed as a potential interpretation from one or more grammars associated with the speech recognition engine and/or from possible interpretations determined by the conversational speech engine, thereby assuring that a mistake will not be repeated for an identical utterance.

The context determination process may provide advantages over existing voice user interfaces by continually updating one or more models of an existing context and establishing context as a by-product of a conversation, which cannot be established a priori. Rather, the context determination process may track conversation topics and attempt to fit a current utterance into recent contexts, including switching between contexts as tasks are completed, partially completed, requested, etc. The context determination process may identify one or more context domains for an utterance by defining a collection of related functions that may be useful for users in various context domains. Moreover, each context domain may have relevant vocabularies and thought collections to model word groupings, which when evaluated together, may disambiguate one context domain from another. Thus, eliminating out-of-context words and noise words when searching for relevant combinations may enhance accuracy of inferences. This provides advantages over existing systems that attempt to assign meaning to every component of an utterance (i.e., including out-of-context words and noise words), which results in nearly infinite possible combinations and greater likelihood of confusion. The context determination process may also be self-aware, assigning degrees of certainty to one or more generated hypotheses, where a hypothesis may be developed to account for variations in environmental conditions, speaker ambiguity, accents, or other factors. By identifying a context, capabilities within the context, vocabularies within the context, what tasks are done most often historically in the context, what task was just completed, etc., the context determination process may establish intent from rather meager phonetic clues. Moreover, just as in human-to-human conversation, users may switch contexts at any time without confusion, enabling various context domains to be rapidly selected, without menu-driven dead ends, when an utterance is unambiguous.

According to another aspect of the invention, an exemplary cooperative conversational model may build upon free form voice search, noise tolerance, and context determination to implement a conversational Human-to-Machine interface that reflects human interaction and normal conversational behavior. That is, the cooperative conversational model enables humans and machines to participant in a conversation with an accepted purpose or direction, with each participant contributing to the conversation for the benefit of the conversation. By taking advantage of human presumptions about utterances that humans rely upon, both as speakers and listeners, a Human-to-Machine interface may be analogous to everyday human-to-human conversation. In one implementation, the exemplary cooperative conversation model may take incoming data (shared knowledge) to inform a decision (intelligent hypothesis building), and then may refine the decision and generate a response (adaptive response building).

According to another aspect of the invention, shared knowledge may include both short-term and long-term knowledge. Short-term knowledge may accumulate during a single conversation, where input received during a single conversation may be retained. The shared knowledge may include cross-modality awareness, where in addition to accumulating input relating to user utterances, requests, locations, etc., the shared knowledge may accumulate a current user interface state relating to other modal inputs to further build shared knowledge models. The shared knowledge may be used to build one or more intelligent hypotheses using current and relevant information, build long-term shared knowledge by identifying information with long-term significance, and generate adaptive responses with relevant state and word usage information. Moreover, because cooperative conversations model human conversations, short-term session data may be expired after a psychologically appropriate amount of

time, thereby humanizing system behavior, reducing a likelihood of contextual confusion based on stale data, while also adding relevant information from an expired session context to long-term knowledge models. Long-term shared knowledge may generally be user-centric, rather than session-based, where inputs may be accumulated over time to build user, environmental, cognitive, historical, or other long-term knowledge models. Long-term and short-term shared knowledge may be used simultaneously anytime a user engages in a cooperative conversation. Long-term shared knowledge may include explicit and/or implicit user preferences, a history of recent contexts, requests, tasks, etc., user-specific jargon related to vocabularies and/or capabilities of a context, most often used word choices, or other information. The long-term shared knowledge may be used to build one or more intelligent hypotheses using current and relevant information, generate adaptive responses with appropriate word choices when unavailable via short-term shared knowledge, refine long-term shared knowledge models, identify a frequency of specific tasks, identify tasks a user frequently has difficulty with, or provide other information and/or analysis to generate more accurate conversational responses. Shared knowledge may also be used to adapt a level of unprompted support (e.g., for novices versus experienced users, users who are frequently misrecognized, etc.) Thus, shared knowledge may enable a user and a voice user interface to share assumptions and expectations such as topic knowledge, conversation history, word usage, jargon, tone, or other assumptions and/or expectations that facilitate a cooperative conversation between human users and a system.

According to another aspect of the inventions a conversation type may be identified for any given utterance. Categorizing and developing conceptual models for various types of exchanges may consistently align user expectations and domain capabilities. One or more intelligent hypotheses may be generated as to a conversation type by considering conversational goals, participant roles, and/or an allocation of information among the participants. Based on the conversational goals, participant roles, and allocation of information, the intelligent hypotheses may consider various factors to classify a conversation (or utterance) into general types of conversations that can interact with one another to form many more variations and permutations of conversation types (e.g., a conversation type may change dynamically as information is reallocated from one participant to another, or as conversational goals change based on the reallocation of information).

According to another aspect of the invention, the intelligent hypotheses may include one or more hypotheses of a user's intent in an utterance. In addition, the intelligent hypotheses may use short-term and/or long-term shared knowledge to proactively build and evaluate interaction with a user as a conversation progresses or over time. The hypotheses may model human-to-human interaction to include a varying degree of certainty for each hypothesis. That is, just as humans rely on knowledge shared by participants to examine how much and what kind of information was available, the intelligent hypotheses may leverage the identified conversation type and shared knowledge to generate a degree of certainty for each hypothesis.

According to another aspect of the invention, syntactically, grammatically, and contextually sensitive "intelligent responses" may be generated from the intelligent hypotheses that can be used to generate a conversational experience for a user, while also guiding the user to reply in a manner favorable for recognition. The intelligent responses may create a conversational feel by adapting to a user's manner of speaking, framing responses appropriately, and having natural variation and/or personality (e.g., by varying tone, pace, timing, inflection, word use, jargon, and other variables in a verbal or audible response).

According to another aspect of the invention, the intelligent responses may adapt to a user's manner of speaking by using contextual signifiers and grammatical rules to generate one or more sentences that may cooperate with the user. By taking advantage of shared knowledge about how a user utters a request, the responses may be modeled using similar techniques used to recognize requests. The intelligent responses may rate possible responses statistically and/or randomize responses, which creates an opportunity to build an exchange with natural variation and conversational feel. This provides advantages over existing voice user interfaces where input and output is incongruous, as the input is "conversational" and the output is "computerese."

According to another aspect of the invention, the intelligent responses may frame responses to influence a user reply utterance for easy recognition. For example, the responses may be modeled to illicit utterances from the user that may be more likely to result in a completed request. Thus, the responses may conform to a cooperative nature of human dialog and a natural human tendency to "parrot" what was just heard as part of a next utterance. Moreover, knowledge of current context may enhance responses to generate more meaningful conversational responses. Framing the responses may also deal with misrecognitions according to human models. For example, humans frequently remember a number of recent utterances, especially when one or more previous utterances were misrecognized or unrecognized. Another participant in the conversation may limit correction to a part of the utterance that was misrecognized or unrecognized, or over subsequent utterances and/or other interactions, clues may be provided to indicate the initial interpretation was incorrect. Thus, by storing and analyzing multiple utterances, utterances from earlier in a conversation may be corrected as the conversation progresses.

According to another aspect of the invention, the intelligent responses may include multi-modal, or cross-modal, responses to a user. In one implementation, responses may be aware of and control one or more devices and/or interfaces, and users may respond by using whichever input method, or combination of input methods, is most convenient.

According to another aspect of the invention, the intelligent responses may correct a course of a conversation without interrupting conversational flow. That is, even though the intelligent responses may be reasonably "sure," the intelligent responses may nonetheless sometimes be incorrect. While existing voice user interfaces tend to fail on average conversational missteps, normal human interactions may expect missteps and deal with them appropriately. Thus, responses after misrecognitions may be modeled after clarifications, rather than errors, and words may chosen in subsequent responses to move conversation forward and establish an appropriate domain to be explored with the user.

Other objects and advantages of the invention will be apparent to those skilled in the art based on the following drawings and detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an exemplary block diagram of a system architecture according to one aspect of the invention.

FIG. **2** is an exemplary block diagram of a conversational speech engine according to one aspect of the invention.

FIG. **3** is an exemplary block diagram of a cooperative conversational model according to one aspect of the invention.

DETAILED DESCRIPTION

Referring to FIG. **1**, an exemplary system architecture for implementing a cooperative conversational voice user interface is illustrated according to one aspect of the invention. The system may receive an input **105** from a user, where in one implementation, input **105** may be an utterance received by an input device (e.g., a microphone), where the utterance may include one or more requests. Input **105** may also be a multi-modal input, where at least part of the multi-modal input is an utterance. For example, the input device may include a combination of a microphone and a touch-screen device, and input **105** may include an utterance that includes a request relating to a portion of a display on the touch-screen device that the user is touching. For instance, the touch-screen device may be a navigation device, and input **105** may include an utterance of "Give me directions to here," where the user may be requesting directions to a desired destination on the display of the navigation device.

The utterance component of input **105** may be processed by a speech recognition engine **110** (which may alternatively be referred to herein as Automatic Speech Recognizer **110**, or as shown in FIG. **1**, ASR **110**) to generate one or more preliminary interpretations of the utterance. The speech recognition engine **110** may process the utterance using any suitable technique known in the art. For example, in one implementation, the speech recognition engine **110** may interpret the utterance using techniques of phonetic dictation to recognize a phoneme stream, as described in U.S. patent application Ser. No. 11/513,269, entitled "Dynamic Speech Sharpening," filed Aug. 31, 2006, which issued as U.S. Pat. No. 7,634,409 on Dec. 15, 2009, and which is hereby incorporated by reference in its entirety. The one or more preliminary interpretations generated by the speech recognition engine **110** may then be provided to a conversational speech engine **115** for further processing. Conversational speech engine **115** may include a conversational language processor **120** and/or a voice search engine **125**, described in greater detail in FIG. **2** below. Conversational speech engine **115** may communicate with one or more databases **130** to generate an adaptive conversational response, which may be returned to the user as an output **140**. In one implementation, output **140** may be a multi-modal output and/or an interaction with one or more applications **145** to complete the request. For example, output **140** may include a combination of an audible response and a display of a route on a navigation device. For example, the utterance may include a request to perform an action, and output **140** may include a conversational response reporting success or failure, as well as an execution of the action. In addition, in various implementations, the speech recognition engine **110**, conversational speech engine **115**, and/or databases **130** may reside locally (e.g., on a user device), remotely (e.g., on a server), or a hybrid model of local and remote processing may be used (e.g., lightweight applications may be processed locally while computationally intensive applications may be processed remotely).

Referring to FIG. **2**, an exemplary block diagram is provided illustrating a conversational speech engine **215** according to one aspect of the invention. Conversational speech engine **215** may include a conversational language processor **220** that generates an adaptive conversational response to a request or series of requests using a free form voice search module **245**, a noise tolerance module **250**, and/or a context determination process **255**. According to one aspect of the invention, modules **245**-**255** may communicate with a voice search engine **225** that includes one or more context domain agents **230** and/or one or more vocabularies **235** to aid in interpreting utterances and generating responses, as described in "Enhancing the VUE™ (Voce-User-Experience) Through Conversational Speech," by Tom Freeman and Larry Baldwin, which is herein incorporated by reference in its entirety. Conversational speech engine **215** may generate an adaptive conversational response to one or more requests, where the requests may depend on unspoken assumptions, incomplete information, context established by previous utterances, user profiles, historical profiles, environmental profiles, or other information. Moreover, conversational speech engine **215** may track which requests have been completed, which requests are being processed, and/or which requests cannot be processed due to incomplete or inaccurate information, and the response may be generated accordingly.

According to one aspect of the invention, free form voice search module **245** may understand an utterance made using typical, day-to-day language (i.e., in free form), and may account for variations in how humans normally speak, the vocabulary they use, and the conditions in which they speak. Because variables such as stress, distraction, and serendipity are always different and infinitely varied, free form search module **245** may be designed with a goal of understanding that no human will come to the same Human-to-Machine interface situation in the same way twice. Thus, free form search module **245** may implement one or more features that model casual human speech. In various implementations, free form search module **245** may include, among other things, a free form utterance feature, a one-step access feature, an inferencing intended operations feature, an alternative expression feature, and/or an imperfect speech feature.

The free form utterance feature may understand specialized jargon and/or slang, tolerate variations in word order (e.g., whether a subject of a request comes before or after a verb may be irrelevant), and tolerate verbalized pauses (e.g., "um," "ah," "eh," and other utterances without meaning). For example, the free form utterance feature may treat formalized English verb-before-noun requests in an equivalent manner to free form requests where a noun may precede a verb. For example, user utterances of "Change it to the Squizz" and "You know, um, that Squizz channel, ah, switch it there" may be treated equivalently (where Squizz is a channel on XM Satellite Radio). In either case, the free form utterance feature is able to identify "Squizz" as a subject of the utterance and "Change it" or "switch it" as a verb or request for the utterance (e.g., by cooperating with context determination process **255**, or other features, and identifying a relevant context domain agent **230** and/or vocabulary **235** to interpret the utterance).

The one-step access feature may understand utterances that include compound requests with multiple variables. For example, a user utterance may be "What is the forecast for Boston this weekend?" The one-step access feature may identify "weather" as a context (e.g., by cooperating with context determination process **255**, or other features, and identifying "forecast" as a synonym of "weather"), and search for a city equal to "Boston" and a time equal to "weekend." By identifying all relevant information for completing a task from a single utterance, the one-step access feature may overcome drawbacks of existing voice user interfaces, such as Command and Control systems that use verbal menus to restrict information that a person can provide at a given point (e.g., a Command and Control system for a phone directory service may say: "State please," . . . "City please," . . . "What listing," etc.). Moreover, some utterances may include compound

requests, and the one-step access feature may decompose the compound requests into sub-tasks. For example, a user utterance of "I need to be at a meeting tomorrow in San Francisco at 8:00 am" may be decomposed into a set of sub-tasks such as (1) checking availability and reserving a flight on an evening before the meeting, (2) checking availability and reserving a hotel, (3) checking availability and reserving a car, etc., where users may further designate preferences for various tasks (e.g., first check availability on an airline for which the user is a frequent flyer). Depending on a level of shared knowledge about a user's preferences and/or historical patterns, the one-step access feature may infer additional tasks from a request. For example, in the above example, the one-step access feature may also check a weather forecast, and if the weather is "nice" (as defined by the user preferences and/or as inferred from historical patterns), the one-step access feature may schedule a tee-time at a preferred golf course in San Francisco.

The inferencing intended operations feature may identify an intended request from incomplete or ambiguous requests. For example, when a user utters "Route <indecipherable> Chicago <indecipherable> here," where the user intended to say "Route calculation to Chicago from here," the inferencing intended operations feature may model what is required to calculate a route (an origination point and a destination point). Because the utterance includes the origination point and the destination point, a request to calculate a route from the user's present location to Chicago may be inferred. Similarly, when the inferencing intended operations feature does not have sufficient information to infer a complete request, an adaptive conversational response may be generated to prompt the user for missing information. For example, when an utterance includes a request for a stock quote but not a company name (e.g., "Get me the stock price for <indecipherable>"), the response may be "What company's stock quote do you want?" The user may then provide an utterance including the company name, and the request may be completed. In one implementation, the response may ask for missing information in a way that most restricts possible interpretations (e.g., in a request for a task that requires both a city and a state, the state may be asked for first because there are fewer states than cities). Moreover, the inferencing intended operations feature may model compound tasks and/or requests by maintaining context and identifying relevant and/or missing information at both a composite and sub-task level.

The alternative expression feature may recognize common alternatives for nouns and verbs to reflect variations in usage patterns according to various criteria. For example, users may vary expression based on age, socio-economics, ethnicity, user whims, or other factors. Thus, the alternative expression feature may support variations in expression where word order is unimportant or unanticipated. Alternatives in expression based on various criteria or demographics may be loaded into context domain agents **230** and/or vocabularies **235**, and the alternative expression feature may update context domain agents **230** and/or vocabularies **235** based on inferred or newly discovered variations. In one implementation, conversational speech engine **215** may include a subscription interface to update changes to context domain agents **230** and/or vocabularies **235** (e.g., a repository may aggregate various user utterances and deploy updates system wide). In operation, the alternative expression feature may allow nouns and/or verbs to be represented in different ways to give simplistic, yet representative, examples. For example, a user interested in a weather forecast for Washington, D.C. may provide any of the following utterances, each of which are interpreted equivalently: "What's the weather like in DC," "Is it raining inside the Beltway," Gimme the forecast for the capital," etc. Similarly, utterances of "Go to my home," "Go home," "Show route to home," and "I would like to know my way home" may all be interpreted equivalently, where a user profile may include the user's home address and a navigation route to the home address may be calculated.

The imperfect speech feature may be able to infer requests from contradictory or otherwise inaccurate information, such as when an utterance includes starts and stops, restarts, stutters, run-on sentences, or other imperfect speech. For example, a user may sometimes change their mind, and thus alter the request in mid-utterance, and the imperfect speech feature may nonetheless be able to infer a request based on models of human speech. For example, for an utterance of "Well, I wanna . . . . Mexi . . . no, steak restaurant please, I'm hungry," existing voice user interfaces make no assumptions regarding models of human speech and would be unable to infer whether the user wanted a Mexican or steak restaurant. The imperfect speech feature overcomes these drawbacks by using various models of human understanding that may indicate that a last criterion is most likely to be correct, or intonation, emphasis, stress, use of the word "not," or other models may indicate which criterion is most likely to be correct. Thus, in the above example, the imperfect speech feature may infer that the user wants a steak restaurant.

According to one aspect of the invention, noise tolerance module **250** may be closely related to the imperfect speech feature, and may operate to discard words or noise that has no meaning in a given context so as not to create confusion. Moreover, noise tolerance module **250** may filter out environmental and non-human noise to further reduce a likelihood of confusion. In one implementation, noise tolerance module **250** may cooperate with other modules and features to filter out words that do not fit into a context. For example, one or more contexts may be identified, and words that have no meaning with respect to system capabilities, random human utterances without meaning and other noise may be filtered out. Thus, noise tolerance module **250** may model real-world conditions to identify meaningful requests. For example, noise tolerance module **250** may filter other human conversations and/or utterances within a range of one or more microphones, For example a single device may include multiple microphones, or multiple devices may each include one or more microphones, and the noise tolerance module may collate inputs and cooperatively filter out sound by comparing a speech signal from the various microphones. Noise tolerance module **250** may also filter out non-human environmental noise within the range of the microphones, out-of-vocabulary words, which could be a result of speaker ambiguity or malapropisms, or other noise that may be unrelated to a target request. Noise models in noise tolerance module **250** may define performance benchmarks based on human criteria. For example, if a driver of a car, traveling at 65 miles-per-hour, with windows cracked is 92% likely to be understood by a passenger, then noise tolerance module **250** may have a similar performance under those conditions.

According to one aspect of the invention, conversational speech engine **215** may include a context determination process **255** that determines one or more contexts for a request to establish meaning within a conversation. The one or more contexts may be determined by having one or more context domain agents compete to determine a most appropriate domain for a given utterance, as described in U.S. patent application Ser. No. 11/197,504, entitled "Systems and Methods for Responding to Natural Language Speech Utterance," filed Aug. 5, 2005, which issued as U.S. Pat. No. 7,640,160 on Dec. 29, 2009 and U.S. patent application Ser. No. 11/212,

693, entitled "Mobile Systems and Methods of Supporting Natural Language Human-Machine Interactions," filed Aug. 29, 2005, both of which are hereby incorporated by reference in their entirety. Once a given context domain agent "wins" the competition, the winning agent may be responsible for establishing or inferring further contexts and updating short-term and long-term shared knowledge. If there is a deadlock between context domain agents, an adaptive conversational response may prompt the user to assist in disambiguating between the deadlocked agents. For example, a user utterance of "What about traffic?" may have a distinct meaning in various contexts. That is, "traffic" may have a first meaning when the user is querying a system's media player (i.e., "traffic" would be a Rock and Roll band led by singer/songwriter Steve Winwood), a second meaning when the user is querying a search interface regarding Michael Douglas films (i.e., "traffic" would be a film directed by Steven Soderbergh), a third meaning when the user is querying a navigation device for directions to an airport (i.e., "traffic" would be related to conditions on roads along a route to the airport).

Moreover, context determination process **255** may infer intended operations and/or context based on previous utterances and/or requests, whereas existing systems consider each utterance independently, potentially making the same errors over and over again. For example, if a given interpretation turns out to be incorrect, the incorrect interpretation may be removed as a potential interpretation from one or more grammars associated with the speech recognition engine and/or from possible subsequent interpretations determined by context determination process **255**, thereby assuring that a mistake will not be repeated for an identical utterance.

Context determination process **255** may overcome drawbacks of existing systems by continually updating one or more models of an existing context, where establishing context may be a by-product of a conversation, which cannot be established a priori. Context determination process **255** may establish a first context domain, change to a second context domain, change back to the first context domain, and so on, as tasks are completed, partially completed, requested, etc, and a context stack may track conversation topics and attempt to fit a current utterance into a most-recent context, next-most-recent topic, etc., traversing the context stack until a most likely intent can be established. For example, a user may utter "What's the traffic report," and context determination process **255** may establish Traffic as a context, and return an output including a traffic report, which does not happen to mention traffic on Interstate-5. The user may then utter "What about I-5?" and context determination process **255** may know that the current context is Traffic, a traffic report including information about Interstate-5 may be searched for, and the traffic report indicating that Interstate-5 is crowded may be returned as an output. The user may then utter "Is there a faster way?" and context determination module **255** may know that the current context is still Traffic, and may search for routes to a specified destination with light traffic and avoiding Interstate-5. Moreover, context determination process **255** may build context based on user profiles, environmental profiles, historical profiles, or other information to further refine the context. For example, the profiles may indicate that Interstate-5 is a typical route taken Monday through Friday.

The profiles may be particularly meaningful when attempting to disambiguate between contexts where a word has different meanings in different contexts. For example, a user may utter "What's the weather in Seattle?" and context determination process **255** may establish Weather as a context, as well as establishing Seattle as an environmental context. The user may then utter "and Portland?" and context determination process **255** may return a weather report for Portland, Oreg. based on the Weather and an environmental proximity between Portland, Oreg. and Seattle, Wash. The user may then ask "What time does the game start?" " and a search for sports events with teams from Seattle and/or Portland may occur, with results presented conversationally according to methods described in greater detail below in FIG. **3**. Correlatively, had user originally uttered "What's the weather in Portsmouth, N.H.," in the second utterance, context determination process **255** may instead retrieve a weather report for Portland, Me. based on an environmental proximity to New Hampshire. Moreover, when environmental profiles, contextual shared knowledge, and/or other short-term and/or long-term shared knowledge does not provide enough information to disambiguate between possibilities, responses may prompt the user with a request for further information (e.g., "Did you mean Portland, Me., or Portland, Oreg.?").

Context determination process **255** may cooperate with context domain agents **230**, where each context domain agent **230** may define a collection of related functions that may be useful for users. Moreover, each context domain agent **230** may include a relevant vocabulary **235** and thought collections that model word groupings, which when evaluated together, may disambiguate one context domain from another (e.g., a Music context domain agent **230** may include a vocabulary **235** for songs, artists, albums, etc., whereas a Stock context domain agent **230** may include a vocabulary **235** for company names, ticker symbols, financial metrics, etc.). Thus, accuracy in identifying meaning may be enhanced by eliminating out-of-context words and noise words when searching for relevant combinations. In contrast, existing systems attempt to assign meaning to every component of an utterance (e.g., including out-of-context words and noise words), which results in nearly infinite possible combinations and greater likelihood of confusion. Moreover, context domain agents **230** may include metadata for each criteria to further assist in interpreting utterances, inferring intent, completing incomplete requests, etc. (e.g., a Space Needle vocabulary word may include metadata for Seattle, landmark, tourism, Sky City restaurant, etc.). Given a disambiguated criterion, context determination process **255** may thus be able to automatically determine other information needed to complete a request, discard importance of word order, and perform other enhancements for conversational speech.

Context domain agents **230** may also be self-aware, assigning degrees of certainty to one or more generated hypotheses, where a hypothesis may be developed to account for variations in environmental conditions, speaker ambiguity, accents, or other factors. Conceptually, context domain agents **230** may be designed to model utterances as a hard-of-hearing person would at a noisy party. By identifying a context, capabilities within the context, vocabularies within the context, what tasks are done most often historically in the context, what task was just completed, etc., a context domain agent **230** may establish intent from rather meager phonetic clues. Moreover, the context stack may be one of a plurality of components for establishing context, and thus not a constraint upon the user. All context domains may be accessible, allowing the user to switch contexts at any time without confusion. Thus, just as in human-to-human conversation, context domains may be rapidly selected, without menu-driven dead ends, when an utterance is unambiguous. For example, a user may utter, "Please call Rich Kennewick on his cell phone," and a system response of "Do you wish me to call Rich Kennewick on his cell?" may be generated. The user may decide at that point to call Rich Kennewick later, and instead,

listen to some music. Thus, the user may then utter, "No, play the Louis Armstrong version of Body and Soul from my iPod," and a system response of "Playing Body and Soul by Louis Armstrong" may be generated as Body and Soul is played through a media player. In this example, the later utterance has no contextual connection to the first utterance, yet because request criteria in the utterances are unambiguous, contexts can be switched easily without relying on the context stack.

Referring to FIG. **3**, an exemplary cooperative conversational model **300** is illustrated according to an aspect of the invention. Cooperative conversational model **300** may build upon free form voice search **245**, noise tolerance **250**, and context determination **255** to implement a conversational Human-to-Machine interface that reflects how humans interact with each other and their normal behavior in conversation. Simply put, cooperative conversational model **300** enables humans and machines to participate in a conversation with an accepted purpose or direction, with each participant contributing to the conversation for the benefit of the conversation. That is, cooperative conversational model **300** incorporates technology and process-flow that takes advantage of human presumptions about utterances that humans rely upon, both as speakers and listeners, thereby creating a Human-to-Machine interface that is analogous to everyday human-to-human conversation. In one implementation, a cooperative conversation may take incoming data (shared knowledge) **305** to inform a decision (intelligent hypothesis building) **310**, and then may refine the decision and generate a response (adaptive response building) **315**.

According to one aspect of the invention, shared knowledge **305** includes both short-term and long-term knowledge about incoming data. Short-term knowledge may accumulate during a single conversation, while long-term knowledge may accumulate over time to build user profiles, environmental profiles, historical profiles, cognitive profiles, etc.

Input received during a single conversation may be retained in a Session Input Accumulator. The Session Input Accumulator may include cross-modality awareness, where in addition to accumulating input relating to user utterances, requests, locations, etc., the Session Input Accumulator may accumulate a current user interface state relating to other modal inputs to further build shared knowledge models and more accurate adaptive responses (e.g., when a user utters a request relating to a portion of a touch-screen device, as described above). For example, the Session Input Accumulator may accumulate inputs including recognition text for each utterance, a recorded speech file for each utterance, a list-item selection history, a graphical user interface manipulation history, or other input data. Thus, the Session Input Accumulator may populate Intelligent Hypothesis Builder **310** with current and relevant information, build long-term shared knowledge by identifying information with long-term significance, provide Adaptive Response Builder **315** with relevant state and word usage information, retain recent contexts for use with Intelligent Hypothesis Builder **310**, and/or retain utterances for reprocessing during multi-pass evaluations. Moreover, because cooperative conversations **300** model human conversations, short-term session data may be expired after a psychologically appropriate amount of time, thereby humanizing system behavior. For example, a human is unlikely to recall a context of a conversation from two years ago, but because the context would be identifiable by a machine, session context is expired after a predetermined amount of time to reduce a likelihood of contextual confusion based on stale data. However, relevant information from an expired session context may nonetheless be added to user, historical, environmental, cognitive, or other long-term knowledge models.

Long-term shared knowledge may generally be user-centric, rather than session-based. That is, inputs may be accumulated over time to build user, environmental, cognitive, historical, or other long-term knowledge models. Long-term and short-term shared knowledge (collectively, shared knowledge **305**) may be used simultaneously anytime a user engages in a cooperative conversation **300**. Long-term shared knowledge may include explicit and/or implicit user preferences, a history of most recently used agents, contexts, requests, tasks, etc., user-specific jargon related to vocabularies and/or capabilities of an agent and/or context, most often used word choices, or other information. The long-term shared knowledge may be used to populate Intelligent Hypothesis Builder **310** with current and relevant information, provide Adaptive Response Builder **315** with appropriate word choices when the appropriate word choices are unavailable via the Session Input Accumulator, refine long-term shared knowledge models, identify a frequency of specific tasks, identify tasks a user frequently has difficulty with, or provide other information and/or analysis to generate more accurate conversational responses.

As described above, shared knowledge **305** may be used to populate Intelligent Hypothesis Builder **310**, such that a user and a voice user interface may share assumptions and expectations such as topic knowledge, conversation history, word usage, jargon, tone (e.g., formal, humorous, terse, etc.), or other assumptions and/or expectations that facilitate interaction at a Human-to-Machine interface.

According to an aspect of the invention, one component of a successful cooperative conversation may be identifying a type of conversation from an utterance. By categorizing and developing conceptual models for various types of exchanges, user expectations and domain capabilities may be consistently aligned. Intelligent Hypothesis Builder **310** may generate a hypothesis as to a conversation type by considering conversational goals, participant roles, and/or an allocation of information among the participants. Conversational goals may broadly include: (1) getting a discrete piece of information or performing a discrete task, (2) gathering related pieces of information to make a decision, and/or (3) disseminating or gathering large amounts of information to build expertise. Participant roles may broadly include: (1) a leader that controls a conversation, (2) a supporter that follows the leader and provides input as requested, and/or (3) a consumer that uses information. Information may be held by one or more of the participants at the outset of a conversation, where a participant may hold most (or all) of the information, little (or none) of the information, or the information may be allocated roughly equally amongst the participants. Based on the conversational goals, participant roles, and allocation of information, Intelligent Hypothesis Builder **310** may consider various factors to classify a conversation (or utterance) into general types of conversations that can interact with one another to form many more variations and permutations of conversation types (e.g., a conversation type may change dynamically as information is reallocated from one participant to another, or as conversational goals change based on the reallocation of information).

For example, in one implementation, a query conversation may include a conversational goal of getting a discrete piece of information or performing a particular task, where a leader of the query conversation may have a specific goal in mind and may lead the conversation toward achieving the goal. The other participant may hold the information and may support the leader by providing the information. In a didactic conver-

sation, a leader of the conversation may control information desired by a supporter of the conversation. The supporter's role may be limited to regulating an overall progression of the conversation and interjecting queries for clarification. In an exploratory conversation, both participants share leader and supporter roles, and the conversation may have no specific goal, or the goal may be improvised as the conversation progresses. Based on this model, Intelligent Hypothesis Builder **310** may broadly categorize a conversation (or utterance) according to the following diagram:

	Participant A User	Participant B Voice User Interface
	QUERY	
GOAL	Get information/action	Provide information/action
ROLE	Leader/Consumer	Supporter/Dispenser
INFORMATION	Less	More
ALLOCATION		
	DIDACTIC	
GOAL	Get information	Provide information
ROLE	Follower/Consumer	Leader/Dispenser
INFORMATION	Less	More
ALLOCATION		
	EXPLORATORY	
GOAL	Gather/share information	Gather/share information
ROLE	Follower/Consumer and Leader/Dispenser	Follower/Consumer and Leader/Dispenser
INFORMATION	Equal or alternating	Equal or alternating
ALLOCATION		

Intelligent Hypothesis Builder **310** may use an identified conversation type to assist in generating a set of hypotheses as to a user's intent in an utterance. In addition, Intelligent Hypothesis Builder **310** may use short-term shared knowledge from the Session Input Accumulator to proactively build and evaluate interaction with a user as a conversation progresses, as well as long-term shared knowledge to proactively build and evaluate interaction with the user over time. Intelligent Hypothesis Builder **310** may thus adaptively arrive at a set of n-best hypotheses about user intent, and the n-best hypotheses may be provided to an Adaptive Response Builder **315**. In addition, Intelligent Hypothesis Builder **310** may model human-to-human interaction by calculating a degree of certainty for each of the hypotheses. That is, just as humans rely on knowledge shared by participants to examine how much and what kind of information was available, Intelligent Hypothesis Builder **310** may leverage the identified conversation type and short-term and long-term shared knowledge to generate a degree of certainty for each hypothesis.

According to another aspect of the invention, Intelligent Hypothesis Builder **310** may generate one or more explicit hypotheses of a user's intent when an utterance contains all information (including qualifiers) needed to complete a request or task. Each hypothesis may have a corresponding degree of certainty, which may be used to determine a level of unprompted support to provide in a response. For example, a response may include a confirmation to ensure the utterance was not misunderstood or the response may adaptively prompt a user to provide missing information.

According to another aspect of the invention, Intelligent Hypothesis Builder **310** may use short-term knowledge to generate one or more implicit hypotheses of a user's intent when an utterance may be missing required qualifiers or other information needed to complete a request or task. Each hypothesis may have a corresponding degree of certainty. For instance, when a conversation begins, short-term knowledge stored in the Session Input Accumulator may be empty, and as the conversation progresses, the Session Input Accumulator may build a history of the conversation. Intelligent Hypothesis Builder **310** may use data in the Session Input Accumulator to supplement or infer additional information about a current utterance. For example, Intelligent Hypothesis Builder **310** may evaluate a degree of certainty based on a number of previous requests relevant to the current utterance. In another example, when the current utterance contains insufficient information to complete a request or task, data in the Session Input Accumulator may be used to infer missing information so that a hypothesis can be generated. In still another example, Intelligent Hypothesis Builder **310** may identify syntax and/or grammar to be used by Adaptive Response Builder **315** to formulate personalized and conversational response. In yet another example, when the current utterance contains a threshold amount of information needed to complete a request or task, data in the Session Input Accumulator may be relied upon to tune a degree of certainty.

According to another aspect of the invention, Intelligent Hypothesis Builder **310** may use long-term shared knowledge to generate one or more implicit hypotheses of a user's intent when an utterance is missing qualifiers or other information needed to complete a request or task. Each hypothesis may have a corresponding degree of certainty. Using long-term knowledge may be substantially similar to using short-term shared knowledge, except that information may be unconstrained by a current session, and an input mechanism may include information from additional sources other than conversational sessions. For example, Intelligent Hypothesis Builder **310** may use information from long-term shared knowledge at any time, even when a new conversation is initiated, whereas short-term shared knowledge may be limited to an existing conversation (where no short-term shared knowledge would be available when a new conversation is initiated). Long-term shared knowledge may come from several sources, including user preferences or a plug-in data source (e.g., a subscription interface to a remote database), expertise of a user (e.g., based on a frequency of errors, types of tasks requested, etc., the user may be identified as a novice, intermediate, experienced, or other type of user), agent-specific information and/or language that may also apply to other agents (e.g., by decoupling information from an agent to incorporate the information into other agents), frequently used topics passed in from the Session Input Accumulator, frequently used verbs, nouns, or other parts of speech, and/or other syntax information passed in from the Session Input Accumulator, or other sources of long-term shared knowledge may be used.

According to another aspect of the invention, knowledge-enabled utterances, as generated by Intelligent Hypothesis Builder **310**, may include one or more explicit (supplied by a user), and one or more implicit (supplied by Intelligent Hypothesis Builder **310**) contextual signifiers, qualifiers, criteria, and other information that can be used to identify and evaluate relevant tasks. At that point, Intelligent Hypothesis Builder **310** may provide an input to Adaptive Response Builder **315**. The input received by Adaptive Response Builder **315** may include at least a ranked list of hypotheses, including explicit and/or implicit hypotheses, each of which may have a corresponding degree of certainty. A hypothesis may be assigned one of four degrees of certainty: (1) "sure," where contextual signifiers and qualifiers relate to one task,

context and qualifiers relate to one task, and a confidence level associated with a preliminary interpretation generated at the speech recognition engine exceeds a predetermined threshold; (2) "pretty sure," where contextual signifiers and qualifiers relate to more than one task (select top-ranked task) and criteria relates to one request, and/or the confidence level associated with the preliminary interpretation generated at the speech recognition engine is below the predetermined threshold; (3) "not sure," where additional contextual signifiers or qualifiers are needed to indicate or rank a task; and (4) "no hypothesis," where little or no information can be deciphered. Each degree of certainty may further be classified as explicit or implicit, which may be used to adjust a response. The input received by Adaptive Response Builder **310** may also include a context, user syntax and/or grammar, context domain agent specific information and/or preferences (e.g., a travel context domain agent may know a user frequently requests information about France, which may be shared with a movie context domain agent so that responses may occasionally include French movies).

According to another aspect of the invention, Adaptive Response Builder **315** may build syntactically, grammatically, and contextually sensitive "intelligent responses" that can be used with one or more agents to generate a conversational experience for a user, while also guiding the user to reply in a manner favorable for recognition. In one implementation, the intelligent responses may include a verbal or audible reply played through an output device (e.g., a speaker), and/or an action performed by a device, computer, or machine (e.g., downloading a web page, showing a list executing an application, etc.). In one implementation, an appropriate response may not require conversational adaptation, and default replies and/or randomly selected response sets for a given task may be used.

According to another aspect of the invention, Adaptive Response Builder **310** may draw on information maintained by Intelligence Hypothesis Builder **310** to generate responses that may be sensitive to context, task recognition of a current utterance, what a user already knows about a topic, what an application already knows about the topic, shared knowledge regarding user preferences and/or related topics, appropriate contextual word usage (e.g., jargon), words uttered by the user in recent utterances, conversational development and/or course correction, conversational tone, type of conversation, natural variation in wording of responses, or other information. As a result, Adaptive Response Builder **315** may generate intelligent responses that create conversational feel, adapt to information that accumulates over a duration of a conversation, maintain cross-modal awareness, and keep the conversation on course.

According to another aspect of the invention, Adaptive Response Builder **315** may create a conversational feel by adapting to a user's manner of speaking, framing responses appropriately, and having natural variation and/or personality (e.g., by varying tone, pace, timing, inflection, word use, jargon, and other variables in a verbal or audible response). Adapting to a user's manner of speaking may include using contextual signifiers and grammatical rules to generate one or more sentences for use as response sets that may cooperate with the user. By taking advantage of short-term (from the Session Input Accumulator) and long-term (from one or more profiles) shared knowledge about how a user utters a request, the responses may be modeled using techniques used to recognize requests. Adaptive Response Builder **315** may rate possible responses statistically and/or randomize responses, which creates an opportunity to build an exchange with natural variation and conversational feel. This may be a significant advantage over existing voice user interfaces with incongruous input and output, where the input is "conversational" and the output is "computerese." The following examples may demonstrate how a response may adapt to a user's input word choices and manner of speaking:

User	Do you know (mumbled words) Seattle (more mumbled words)?
Voice User Interface	Did you want Seattle sports scores, weather, traffic, or news?
User	Find me (mumbled words) Seattle (more mumbled words)?
Voice User Interface	I found Seattle, did you want sports scores, weather, traffic, or news?
User	Get me (mumbled words) Seattle (more mumbled words)?
Voice User Interface	I've got Seattle, did you want me to get sports scores, weather, traffic, or news?

According to another aspect of the invention, Adaptive Response Builder **315** may frame responses to influence a user to reply with an utterance that may be easily recognized. For example, a user may utter, "Get me the news" and a voice user interface response may be "Which of these categories? Top news stories, international news, political news, or sports news?" The response may be likely to illicit utterances from the user, such as "Top news stories" or "International news," which are more likely to result in a completed request. Thus, the responses may conform to d cooperative nature of human dialog, and a natural human tendency to "parrot" what was just heard as part of a next utterance. Moreover, knowledge of current context may enhance responses to generate more meaningful conversational responses, such as in the following exchange:

User	What's the weather like in Dallas?
Voice User Interface	In Dallas, it's sunny and 90 degrees.
User	What theaters are showing the movie "The Fantastic Four" there?
Voice User Interface	10 theaters in Dallas are showing "The Fantastic Four." Do you want show times for a particular theater?

Framing the responses may also deal with misrecognitions according to human models. For example, humans frequently remember a number of recent utterances, especially when one or more previous utterances were misrecognized or unrecognized. Another participant in the conversation may limit correction to a part of the utterance that was misrecognized or unrecognized, or over subsequent utterances and/or other interactions, clues may be provided to indicate the initial interpretation was incorrect. Thus, by storing and analyzing multiple utterances, utterances from earlier in a conversation may be corrected as the conversation progresses.

According to another aspect of the invention, Adaptive Response Builder **315** may generate multi-modal, or cross-modal, responses to a user. In one implementation, responses may be aware of and control one or more devices and/or interfaces, and users may respond by using whichever input method, or combination of input methods, is most convenient. For example, a response asking the user to direct an utterance with a "Yes" or "No" in a multi-modal environment may also display alternatives visually.

According to another aspect of the invention, Adaptive Response Builder **315** may correct a course of a conversation without interrupting conversational flow. Adaptive Response Builder **315** may generate intelligent responses based on the ranked list of hypotheses and corresponding degrees of cer-

tainty, which may be used to correct a course of a conversation without interrupting conversational flow. That is, even though the intelligent responses may be reasonably "sure," the intelligent responses may nonetheless sometimes be incorrect. While existing voice user interfaces tend to fail on average conversational missteps, normal human interactions may expect missteps and deal with them appropriately. Thus, responses after a misrecognition may be modeled after clarifications, rather than errors, and words may chosen in subsequent responses that move conversation forward and establish an appropriate domain to be explored with the user. For example, course correction may result in the following exchange:

User	Can you get (mumbled words here) Mariners (more mumbled words)?
Voice User Interface	I've got the score for the Mariners game? 4-2 Mariners.
User	No, the start time for tomorrow's game.
Voice User Interface	Oh, 7:05.

The above disclosure has been described in terms of specific exemplary aspects, implementations, and embodiments of the invention. However, those skilled in the art will recognize various changes and modifications that may be made without departing from the scope and spirit of the invention. Therefore, the specification and drawings are to be regarded as exemplary only, and the scope of the invention is to be determined solely by the appended claims.

What is claimed is:

1. A method for providing a cooperative conversational voice user interface, comprising:

receiving an utterance at a voice input device during a current conversation with a user, wherein the utterance includes one or more words that have different meanings in different contexts;

accumulating short-term shared knowledge about the current conversation, wherein the short-term shared knowledge includes knowledge about the utterance received during the current conversation;

accumulating long-term shared knowledge about the user, wherein the long-term shared knowledge includes knowledge about one or more past conversations with the user;

determining an intended meaning for the utterance, wherein determining the intended meaning for the utterance includes:

identifying, at a conversational speech engine, a context associated with the utterance from the short-term shared knowledge and the long-term shared knowledge; and

establishing the intended meaning within the identified context, wherein the conversational speech engine establishes the intended meaning within the identified context to disambiguate an intent that the user had in speaking the one or more words that have the different meanings in the different contexts; and

generating a response to the utterance, wherein the conversational speech engine grammatically or syntactically adapts the response based on the intended meaning established within the identified context.

2. The method of claim **1**, wherein accumulating the short-term shared knowledge about the current conversation includes populating a short-term context stack with information about the utterance received during the current conversation.

3. The method of claim **2**, wherein accumulating the short-term shared knowledge about the current conversation further includes expiring the information about the utterance from the short-term context stack after a psychologically appropriate amount of time.

4. The method of claim **3** wherein accumulating the long-term shared knowledge about the user includes updating one or more long-term profiles associated with the user to include information about the utterance received during the current conversation and relevant data associated with the information expired from the short, term context stack.

5. The method of claim **1**, wherein determining the intended meaning for the utterance further includes:

identifying a conversational goal associated with the utterance, roles associated with the user and one or more other participants in the current conversation, and an information allocation among the user and the one or more other participants in the current conversation; and

classifying one or more of the utterance or the current conversation into a conversation type based on one or more of the identified conversational goal, the identified roles, or the identified information allocation, wherein the conversational speech engine further establishes the intended meaning based on the conversation type.

6. The method of claim **5** wherein the established intended meaning comprises a hypothesis having a degree of certainty about the intent that the user had in speaking the one or more words in the utterance.

7. The method of claim **6**, further comprising generating a preliminary interpretation of the utterance at a speech recognition engine coupled to the voice input device and the conversational speech engine, wherein the conversational speech engine assigns the degree of certainty to the hypothesis based on one or more of the conversation type, information associated with the identified context, or a confidence level associated with the preliminary interpretation generated at the speech recognition engine.

8. The method of claim **5**, wherein the conversational speech engine further grammatically or syntactically adapts the response based on the conversation type.

9. The method of claim **1**, wherein the conversational speech engine grammatically or syntactically adapts the response to influence a subsequent reply utterance that the conversational speech engine expects from the user during the current conversation.

10. The method of claim **1**, further comprising:

generating multiple preliminary interpretations of the utterance at a speech recognition engine coupled to the voice input device and the conversational speech engine, wherein an initial interpretation of the utterance comprises one of the multiple preliminary interpretations having a highest confidence level; and

updating the short-term shared knowledge about the current conversation to remove the initial interpretation from the multiple preliminary interpretations in response to determining that the initial interpretation was incorrect, wherein the conversational speech engine determines the intended meaning based on one of the multiple preliminary interpretations having a next highest confidence level.

11. The method of claim **1**, wherein the user speaks the utterance in a multi-modal input that further includes one or more non-voice inputs relating to the utterance.

12. The method of claim 1, wherein the conversational speech engine generates the response in a multi-modal output that includes one or more non-voice outputs that relate to the utterance or one or more tasks executed to process a request identified from the intended meaning.

13. A non-transitory computer readable medium containing computer-executable instructions for providing a cooperative conversational voice user interface, the computer-executable instructions operable when executed to:

receive an utterance at a voice input device, during a current conversation with a user, wherein the utterance includes one or more words that have different meanings in different contexts;

accumulate short-term shared knowledge about the current conversation, wherein the short-term shared knowledge includes knowledge about the utterance received at the voice during the current conversation;

accumulate long-term shared knowledge about the user, wherein the long-term shared knowledge includes knowledge about one or more past conversations with the user;

identify a context associated with the utterance, wherein a conversational speech engine identifies the context associated with the utterance from the short-term shared knowledge and the long-term shared knowledge;

establish an intended meaning for the utterance within the identified context, wherein the conversational speech engine establishes the intended meaning within the identified context to disambiguate an intent that the user had in speaking the one or more words that have the different meanings in the different contexts; and

generate a response to the utterance, wherein the conversational speech engine grammatically or syntactically adapts the response based on the intended meaning established within the identified context.

14. The non-transitory computer readable medium of claim 13, wherein to accumulate the short-term shared knowledge about the current conversation, the computer-executable instructions are further operable when executed to populate a short-term context stack with information about the utterance received during the current conversation.

15. The non-transitory computer readable medium of claim 14, wherein to accumulate the short-term shared knowledge about the current conversation, the computer-executable instructions are further operable when executed to expire the information about the utterance from the short-term context stack after a psychologically appropriate amount of time.

16. The non-transitory computer readable medium of claim 15, wherein to accumulate the long-term shared knowledge about the user, the computer-executable instructions are further operable when executed to update one or more long-term profiles associated with the user to include information about the utterance received during the current conversation and relevant data associated with the information expired from the short term context stack.

17. The non-transitory computer readable medium of claim 13, wherein the computer-executable instructions are further operable when executed to:

identify a conversational goal associated with the utterance, roles associated with the user and one or more other participants in the current conversation, and an information allocation among the user and the one or more other participants in the current conversation; and

classify one or more of the utterance or the current conversation into a conversation type based on one or more of the identified conversational goal, the identified roles, or the identified information allocation, wherein the conversational speech engine further establishes the intended meaning based on the conversation type.

18. The non-transitory computer readable medium of claim 17, wherein the established intended meaning comprises a hypothesis having a degree of certainty about the intent that the user had in speaking the one or more words in the utterance.

19. The computer-readable medium of claim 18, wherein the computer-executable instructions are further operable when executed to generate a preliminary interpretation of the utterance at a speech recognition engine, wherein the conversational speech engine assigns the degree of certainty to the hypothesis based on one or more of the conversation type, information associated with the identified context, or a confidence level associated with the preliminary interpretation generated at the speech recognition engine.

20. The non-transitory computer readable medium of claim 17, wherein the conversational speech engine further grammatically or syntactically adapts the response based on conversation type.

21. The non-transitory computer readable medium of claim 13, wherein the conversational speech engine grammatically or syntactically adapts more the response to influence a subsequent reply utterance that the conversational speech engine expects from the user during the current conversation.

22. The non-transitory computer readable medium of claim 13, wherein the computer-executable instructions are further operable when executed to:

generate multiple preliminary interpretations of the utterance at a speech recognition engine, wherein an initial interpretation of the utterance comprises one of the multiple preliminary interpretations having a highest confidence level; and

update the short-term shared knowledge about the current conversation to remove the initial interpretation from the multiple preliminary interpretations in response to determining that the initial interpretation was incorrect, wherein the conversational speech engine identifies the context associated with the utterance and establishes the intended meaning for the utterance based on one of the multiple preliminary interpretations having a next highest confidence level.

23. The non-transitory computer readable medium of claim 13, wherein the user speaks the utterance in a multi-modal input that further includes one or more non-voice inputs relating to the utterance.

24. The non-transitory computer readable medium of claim 13, wherein the conversational speech engine generates the response in a multi-modal output that includes one or more non-voice outputs that relate to the utterance or one or more tasks executed to process a request identified from the intended meaning.

25. A system for providing a cooperative conversational voice user interface, comprising:

a voice input device configured to receive an utterance during a current conversation with a user, wherein the utterance includes one or more words that have different meanings in different contexts; and

a conversational speech engine, wherein the conversational speech engine includes one or more processors configured to:

accumulate short-term shared knowledge about the current conversation, wherein the short-term shared knowledge includes knowledge about the utterance received during the current conversation;

accumulate long-term shared knowledge about the user, wherein the long-term shared knowledge includes knowledge about one or more past conversations with the user;

identify a context associated with the utterance from the short-term shared knowledge and the long-term shared knowledge;

establish an intended meaning for the utterance within the identified context to disambiguate an intent that the user had in speaking the one or more words that have the different meanings in the different contexts; and

generate a grammatically or syntactically adapted response to the utterance based on the intended meaning established within the identified context.

26. The system of claim **25**, wherein to accumulate the short-term shared knowledge about the current conversation, the one or more processors are further configured to populate a short-term context stack with information about the utterance received during the current conversation.

27. The system of claim **26**, wherein to accumulate the short-term shared knowledge about the current conversation, the one or more processors are further configured to expire the information about the utterance from the short-term context stack after a psychologically appropriate amount of time.

28. The system of claim **27**, wherein to accumulate the long-term shared knowledge about the user, the one or more processors are further configured to update one or more long-term profiles associated with the user to include information about the utterance received during the current conversation and relevant data associated with the information expired from the short term context stack.

29. The system of claim **25**, wherein the one or more processors are further configured to:

identify a conversational goal associated with the utterance, roles associated with the user and one or more other participants in the current conversation, and an information allocation among the user and the one or more other participants in the current conversation; and

classify one or more of the utterance or the current conversation into a conversation type based on one or more of the identified conversational goal, the identified roles, or the identified information allocation, wherein the one or more processors are further configured to establish the intended meaning based on the conversation type.

30. The system of claim **29** wherein the established intended meaning comprises a hypothesis having a degree of certainty about the intent that the user had in speaking the one or more words in the utterance.

31. The system of claim **30**, further comprising a speech recognition engine configured to generate a preliminary interpretation of the utterance, wherein the one or more processors are further configured to assign the degree of certainty to the hypothesis based on one or more of the conversation type, information associated with the identified context, a confidence level associated with the preliminary interpretation generated at the speech recognition engine.

32. The system of claim **29** wherein the one or more processors are further configured to generate the grammatically syntactically adapted response based on the conversation type.

33. The system of claim **25**, wherein the one or more processors are further configured to generate the grammatically or syntactically adapted response to influence a subsequent reply utterance expected from the user during the current conversation.

34. The system of claim **25**, further comprising a speech recognition engine configured to:

generate multiple preliminary interpretations of the utterance, wherein an initial interpretation of the utterance comprises one of the multiple preliminary interpretations having a highest confidence level; and

update the short-term shared knowledge about the current conversation to remove the initial interpretation from the multiple preliminary interpretations in response to determining that the initial interpretation was incorrect, wherein the one or more processors are configured to identify the context associated with the utterance and establish the intended meaning for the utterance based on one of the multiple preliminary interpretations having a next highest confidence level.

35. The system of claim **25**, wherein the user speaks the utterance in a multi-modal input that further includes one or more non-voice inputs relating to the utterance.

36. The system of claim **25**, wherein the grammatically or syntactically adapted response comprises a multi-modal output that includes one or more non-voice outputs that relate to the utterance or one or more tasks executed to process a request identified from the intended meaning.

37. A method for providing a cooperative conversational voice user interface, comprising:

receiving an utterance at a voice input device during a current conversation with a user;

accumulating short-term shared knowledge about the current conversation, wherein the short-term shared knowledge includes knowledge about the utterance received during the current conversation;

accumulating long-term shared knowledge about the user, wherein the long-term shared knowledge includes knowledge about one or more past conversations with the user;

determining an intended meaning for the utterance, wherein determining the intended meaning for the utterance includes:

identifying, at a conversational speech engine, a context associated with the utterance from the short-term shared knowledge and the long-term shared knowledge;

inferring additional information about the utterance from the short-term shared knowledge and the long-term shared knowledge in response to determining that the utterance contains insufficient information to complete a request in the identified context; and

establishing the intended meaning within the identified context based on the additional information inferred about the utterance; and

generating a response to the utterance based on the intended meaning established within the identified context.

38. The method of claim **37**, wherein the established intended meaning comprises an implicit hypothesis having a corresponding degree of certainty about an intent that the user had in speaking the utterance.

39. A non-transitory computer readable medium containing computer-executable instructions for providing a cooperative conversational voice user interface, the computer-executable instructions operable when executed to:

receive an utterance at a voice input device during a current conversation with a user;

accumulate short-term shared knowledge about the current conversation, wherein the short-term shared knowledge includes knowledge about the utterance received during the current conversation;

accumulate long-term shared knowledge about the user, wherein the long-term shared knowledge includes knowledge about one or more past conversations with the user;

identify a context associated with the utterance, wherein a conversational speech engine identifies the context associated with the utterance from the short-term shared knowledge and the long-term shared knowledge;

infer additional information about the utterance from the short-term shared knowledge and the long-term shared knowledge in response to determining that the utterance contains insufficient information to complete a request in the identified context;

establish an intended meaning for the utterance within the identified context based on the additional information inferred about the utterance; and

generate a response to the utterance based on the intended meaning established within the identified context.

40. The non-transitory computer readable medium of claim **39**, wherein the established intended meaning comprises an implicit hypothesis having a corresponding degree of certainty about an intent that the user had in speaking the utterance.

41. A system for providing a cooperative conversational voice user interface, comprising:

a voice input device configured to receive an utterance during a current conversation with a user; and

a conversational speech engine, wherein the conversational speech engine includes one or more processors configured to:

accumulate short-term shared knowledge about the current conversation, wherein the short-term shared knowledge includes knowledge about the utterance received during the current conversation;

accumulate long-term shared knowledge about the user, wherein the long-term shared knowledge includes knowledge about one or more past conversations with the user;

identify a context associated with the utterance from the short-term shared knowledge and the long-term shared knowledge;

infer additional information about the utterance from the short-term shared knowledge and the long-term shared knowledge in response to determining that the utterance contains insufficient information to complete a request in the identified context;

establish an intended meaning for the utterance within the identified identify a context based on the additional information inferred about the utterance; and

generate a response to the utterance based on the intended meaning established within the identified context.

42. The system of claim **41**, wherein the established intended meaning comprises an implicit hypothesis having a corresponding degree of certainty about an intent that the user had in speaking the utterance.

* * * * *

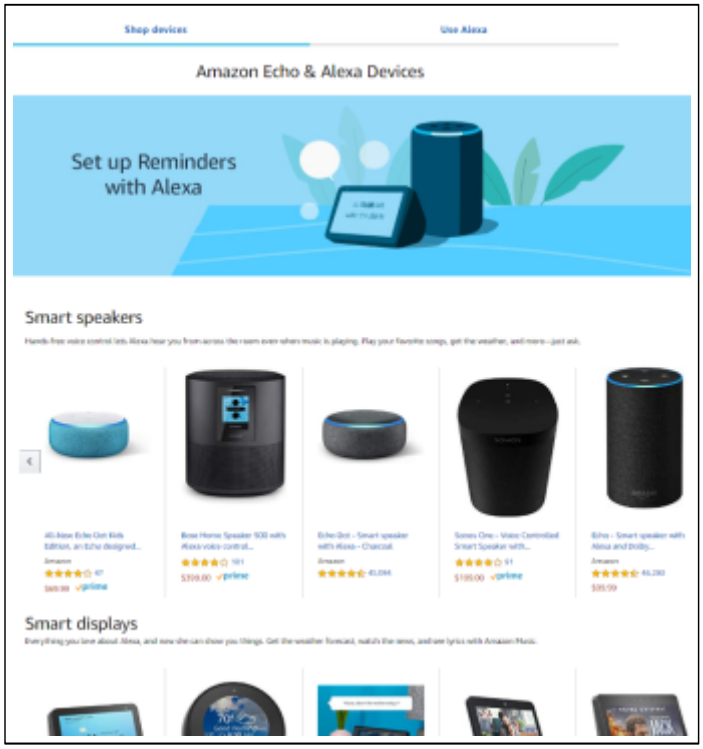
EXHIBIT D

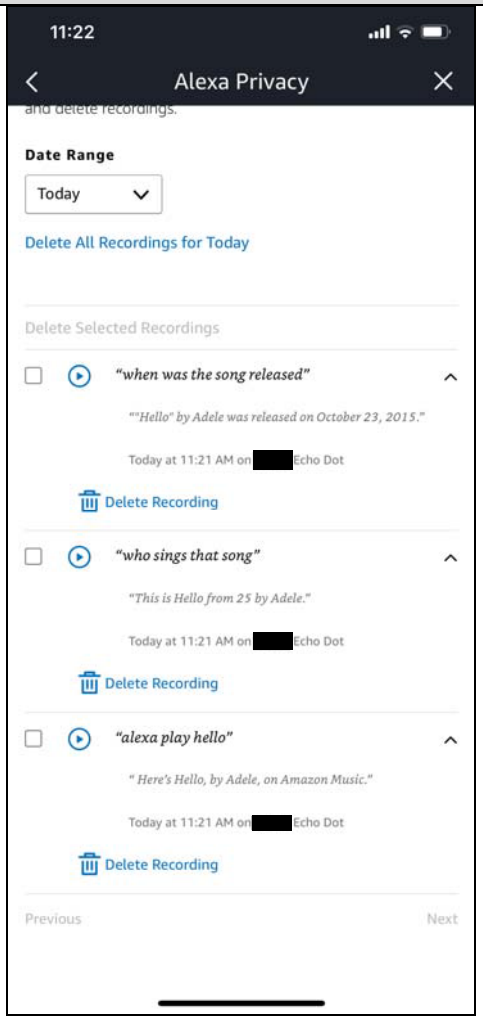
U.S. Pat. No. 8,073,681 ("the '681 patent")
Infringement Chart for Claim 41

The following chart provides exemplary infringement allegations with respect to an exemplary claim of the '681 patent based on Plaintiff's investigation to date. Plaintiff reserves the right to provide modified and/or more detailed allegations (including with additional claims, products, and evidence) in accordance with its discovery obligations in view of any applicable scheduling order. This chart uses "Alexa Products" to refer to the full scope of instrumentalities identified in the complaint. Any discussion of specific Alexa Products in the following chart is exemplary.

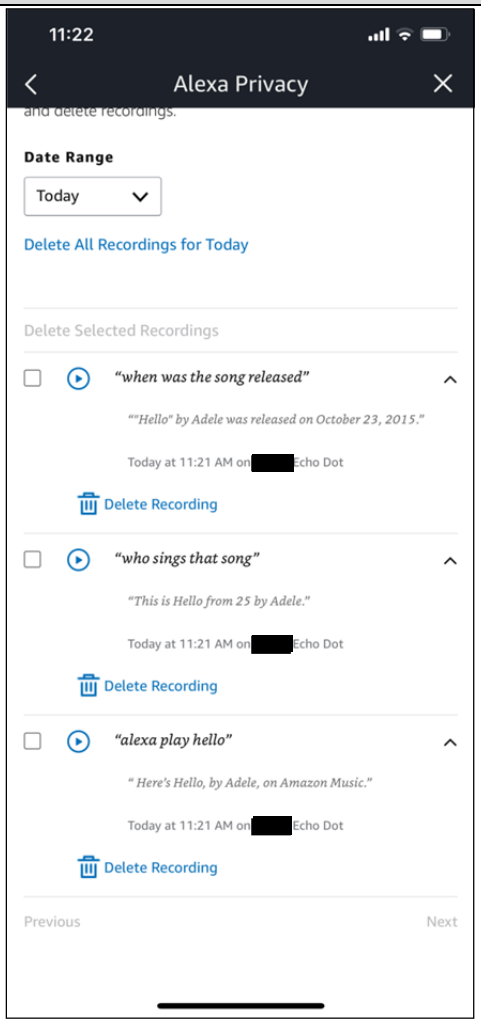
Exemplary information relevant to infringement:

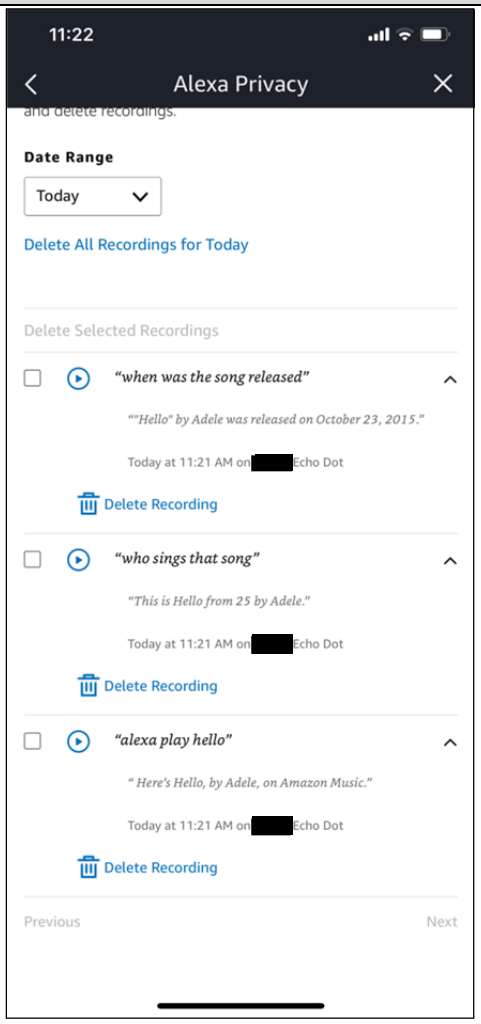
1. Larry Hardesty, *Alexa at Interspeech 2018: How Interaction Histories Can Improve Speech Understanding*, Aug. 29, 2018 post on Alexa Blogs, https://developer.amazon.com/blogs/alexa/post/37473f78-6726-4b8a-b08d-6b0d41c62753/title-tk ("*Interaction Histories*")
2. Chetan Naik et al., *Contextual Slot Carryover for Disparate Schemas*, Proc. Interspeech 2018, 596-600, *available at* https://www.isca-speech.org/archive/Interspeech_2018/pdfs/1035.pdf
3. *Amazon Echo & Alexa Devices* - Amazon Official Site, https://www.amazon.com/Amazon-Echo-And-Alexa-Devices/b/?ie=UTF8&node=9818047011&ref_=sv_devicesubnav_1 (last visited Jul. 22, 2019)
4. *Alexa and Alexa Device FAQs*, Amazon Help & Customer Service - Amazon Official Site, https://www.amazon.com/gp/help/customer/display.html?nodeId=201602230 (last visited Jul. 22, 2019)
5. Sarah Perez, *Alexa will soon gain a memory, converse more naturally, and automatically launch skills,* TechCrunch, Apr. 26, 2018, https://techcrunch.com/2018/04/26/alexa-will-soon-gain-a-memory-converse-more-naturally-and-automatically-launch-skills/ ("*Alexa will soon gain a memory*")
6. Ruhi Sarikaya, *Making Alexa More Friction-Free*, Apr. 25, 2018 post on Alexa Blogs, https://developer.amazon.com/blogs/alexa/post/60e1f011-3236-4162-b0f6-509205d354ca/making-alexa-more-friction-free
7. Arpit Gupta, *How Alexa Is Learning to Converse More Naturally*, Aug. 27, 2018 post on Alexa Blogs, https://developer.amazon.com/blogs/alexa/post/15bf7d2a-5e5c-4d43-90ae-c2596c9cc3a6/how-alexa-is-learning-to-converse-more-naturally ("*How Alexa is Learning*")
8. Kyle Wiggers, *Amazon researchers share how AI helps Alexa answer follow-up questions*, VentureBeat, August 27, 2018, https://venturebeat.com/2018/08/27/amazon-researchers-share-how-ai-helps-alexa-answer-follow-up-questions/ ("*AI helps Alexa*")
9. *What is Conversational AI?*, Amazon Alexa - Amazon Developer Services and Technologies - Amazon Official Site, https://developer.amazon.com/alexa-skills-kit/conversational-ai (last visited Jul. 22, 2019)
10. *Designing for Conversation – Build for dialog*, Amazon Alexa - Amazon Developer Services and Technologies - Amazon Official Site, https://developer.amazon.com/ask-resources/guided/conversational-design-workshop#/lessons/gDcQVF9nOFOtNljrELzARIGN4HuD7LNh?_k=q4qp1a (last visited Jul. 22, 2019)
11. *Audio Hardware Configurations*, Amazon Alexa - Amazon Developer Services and Technologies - Amazon Official Site, https://developer.amazon.com/docs/alexa-voice-service/audio-hardware-configurations.html (last visited Jul. 22, 2019)

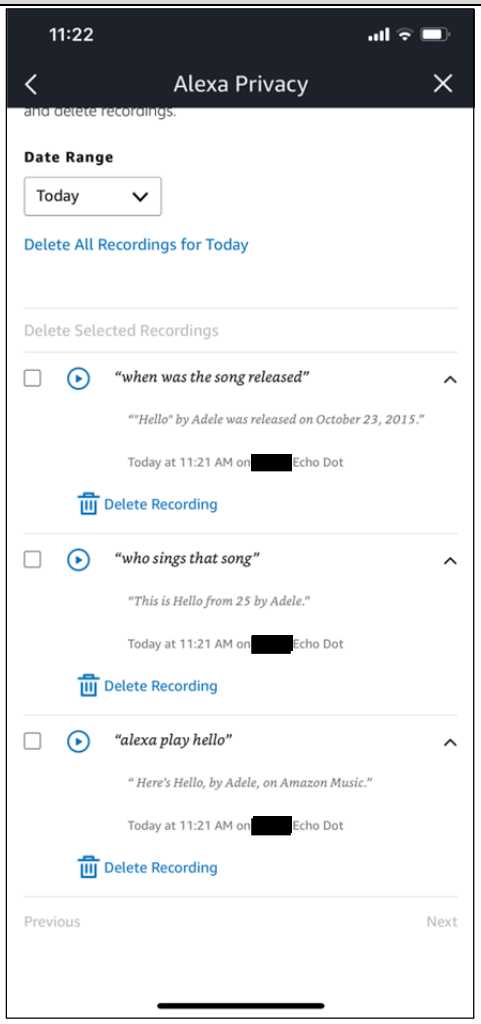
'681 Patent Claim Language	Exemplary Alexa Products
41.[pr] A system for providing a cooperative conversational voice user interface, comprising:	Alexa Products include a system for providing a cooperative conversational voice user interface. For example, Alexa Products (e.g. Echo, Echo Dot, Alexa apps, and Alexa cloud) include Alexa.  E.g. *Amazon Echo & Alexa Devices*. "With conversational AI, voice-enabled devices like Amazon Echo . . . ." E.g. *What is Conversational AI?* Alexa Products include Amazon's Alexa cloud. "Alexa allows you to ask questions and make requests using just your voice. For instance, you can ask Alexa a question, such as "What is the weather today in New York?", or tell Alexa to do something, like "Add batteries to my shopping list," or "Play jazz." When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud so we can process and respond to your request." E.g. *Alexa and Alexa Device FAQs* at answer to question 1.
[41.a] a voice input device configured to receive an utterance during a current conversation with a user; and	Alexa Products include a voice input device configured to receive an utterance during a current conversation with a user. An example is receiving an utterance shown below in a screenshot of Alexa app's "Review Voice History" page below.

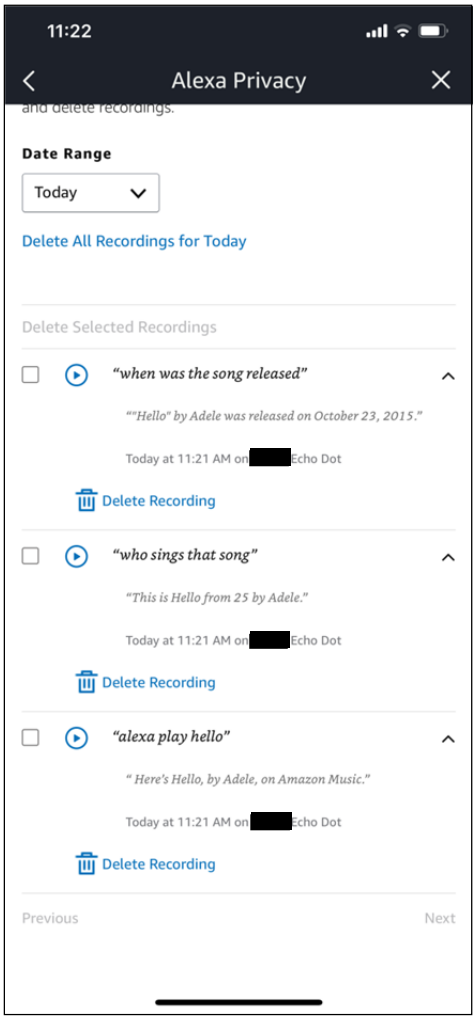
'681 Patent Claim Language	Exemplary Alexa Products
	 Below are additional examples. "Each line of the script spoken by the user is known as an utterance. The utterances are then mapped to an intent. When the user speaks one of them the associated intent will be invoked." *Designing for Conversation – Build for dialog* at Step 2. "With conversational AI, voice-enabled devices like Amazon Echo . . . ." E.g. *What is Conversational AI?* Alexa Products include Amazon's Alexa cloud. "Alexa allows you to ask questions and make requests using just your voice. For instance, you can ask Alexa a question, such as "What is the weather today in New York?", or tell Alexa to do something, like "Add batteries to my shopping list," or "Play jazz." When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud so we can process and respond to your request." E.g. *Alexa and Alexa Device FAQs* at answer to question 1.
[41.b] a conversational speech engine, wherein the conversational speech engine includes one or more processors configured to:	Alexa Products include a conversational speech engine, wherein the conversational speech engine includes one or more processors configured to perform the operations recited in the claim. For example, Alexa Products include Amazon's Alexa cloud that has one or more physical processors: "When you speak to Alexa, a

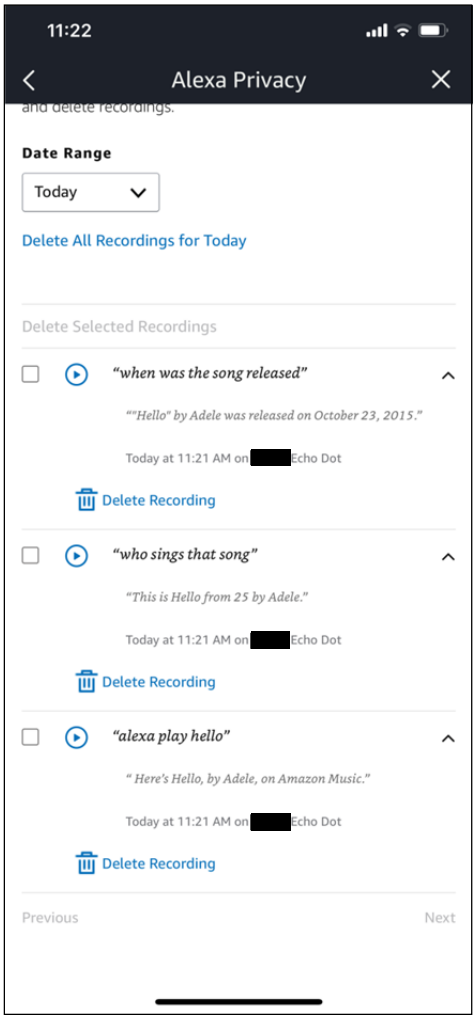
'681 Patent Claim Language	Exemplary Alexa Products
	recording of what you asked Alexa is sent to Amazon's cloud where we process your request and other information to respond to you. For example, when you ask "Alexa, play top hits on Amazon Music" we use the recording of your request and information from Amazon Music to play top hits." *Alexa and Alexa Device FAQs* at answer to question 2. Below are more examples. "Alexa uses a combination of automatic speech recognition (ASR) and natural language understanding (NLU) to understand user speech and respond with precision. ASR converts user speech into text, NLU converts that text into intents for Alexa to act on. At the end of this process Alexa sends directives to your product instructing it to perform an action..." *Audio Hardware Configurations* at Automatic Speech Recognition Profiles. "The correct hardware configuration and audio processing algorithms can improve your product's listening sensitivity for the wake word Alexa." *Audio Hardware Configurations* at Hardware and Audio Algorithms.
[41.c] accumulate short-term shared knowledge about the current conversation, wherein the short-term shared knowledge includes knowledge about the utterance received during the current conversation;	Alexa Products accumulate short-term shared knowledge about the current conversation, wherein the short-term shared knowledge includes knowledge about the utterance received during the current conversation. An example is accumulating short-term shared knowledge about the current conversation shown below in a screenshot of Alexa app's "Review Voice History" page below.

'681 Patent Claim Language	Exemplary Alexa Products
	 Below are more examples. "Alexa will soon be able to have more natural conversations with users, thanks to something called 'context carryover.' This means that Alexa will be able to understand follow-up questions and respond appropriately..." *Alexa will soon gain a memory*. "Each domain has its own schema to represent slots. The user starts off by asking weather in a city, follows it up with a question about restaurant that serves mexican cuisine, finally she asks about directions to the restaurant...[this] showcase[s] the challenges of multi-domain system...we present a neural network architecture that addresses the challenge..."*Contextual Slot Carryover for Disparate Schemas.*
[41.d] accumulate long-term shared knowledge about the user, wherein the long-term shared knowledge includes knowledge about one or more past conversations with the user;	Alexa Products accumulate long-term shared knowledge about the user, wherein the long-term shared knowledge includes knowledge about one or more past conversations with the user. An example is accumulating knowledge about one or more past conversations with the user as shown below in a screenshot of Alexa app's "Review Voice History" page below.

'681 Patent Claim Language	Exemplary Alexa Products
	 As another example, Alexa machine learning scientists "use collaborative filtering...to help resolve ambiguous requests. For instance, if a customer says, "Alexa, play 'Hello,'" his or her music-listening history should indicate whether the song intended is the one by Adele or the one by Lionel Richie." *Interaction Histories.* More examples are below. Alexa uses "interaction history to improve customers' Alexa experiences." *Interaction Histories.* "Conversations are not isolated occurrences. They build on previous questions and answers, whether from five minutes or five days ago. When appropriate, voice-first experiences should account for prior context to make the conversation more engaging or relevant to the user." *What is Conversational AI?*
[41.e] identify a context associated with the utterance from the short-term shared knowledge and the long-term shared knowledge;	Alexa Products identify a context associated with the utterance from the short-term shared knowledge and the long-term shared knowledge. An example is identifying a context associated with the utterance from the short-term shared knowledge and the long-term shared knowledge shown below in a screenshot of Alexa app's "Review Voice History" page below.

'681 Patent Claim Language	Exemplary Alexa Products
	 Below are more examples. "[C]ontext modeling facilitates a more efficient dialogue by enabling users to reference previous entities and/or intents." *Interaction Histories* (internal quotations omitted). "Capturing and modeling context accurately is critical...even seemingly simple requests...can have multiple valid responses depending on surrounding context." *Interaction Histories* (internal quotations omitted). "The system consists of two parts, Gupta explained: (1) an encoder that produces summary vectors from conversation data, and (2) a decoder that calculates a confidence score for each slot. The two together "learn" slot names and all of their possible values to create embeddings — i.e., points in geometric space that represent strings of words — and then leverage a long short-term memory (LSTM) encoder (a neural network that accounts for the sequencing of data) to identify words helpful in determining candidate slot mapping." *AI helps Alexa*.
[41.f] infer additional information about the utterance from the short-term shared knowledge and the long-term shared knowledge in	Alexa Products infer additional information about the utterance from the short-term shared knowledge and the long-term shared knowledge in response to determining that the utterance contains insufficient information to complete a request in the identified context.

'681 Patent Claim Language	Exemplary Alexa Products
response to determining that the utterance contains insufficient information to complete a request in the identified context;	An example is inferring additional information about the utterance shown below in a screenshot of Alexa app's "Review Voice History" page below.  Below are more examples. "The system consists of two parts, Gupta explained: (1) an encoder that produces summary vectors from conversation data, and (2) a decoder that calculates a confidence score for each slot. The two together "learn" slot names and all of their possible values to create embeddings — i.e., points in geometric space that represent strings of words — and then leverage a long short-term memory (LSTM) encoder (a neural network that accounts for the sequencing of data) to identify words helpful in determining candidate slot mapping." *AI helps Alexa*. "[C]ontext modeling facilitates a more efficient dialogue by enabling users to reference previous entities and/or intents." (internal quotations omitted) *Interaction Histories.* Alexa "uses interaction history to improve customers' Alexa experiences." *Interaction Histories.*
[41.g] establish an intended meaning for the utterance within the identified identify a context based	Alexa Products establish an intended meaning for the utterance within the identified identify a context based on the additional information

'681 Patent Claim Language	Exemplary Alexa Products
on the additional information inferred about the utterance; and	inferred about the utterance. An example is establishing an intended meaning for the utterance within the identified context shown below in a screenshot of Alexa app's "Review Voice History" page below.  Below are more examples. "Capturing and modeling context accurately is critical...even seemingly simple requests...can have multiple valid responses depending on surrounding context." (internal quotations omitted) *Interaction Histories.* "Today, Alexa analyzes the semantic content of utterances according to the categories domain, intent, and slot." *How Alexa is Learning*.
[41.h] generate a response to the utterance based on the intended meaning established within the identified context.	Alexa Products generate a response to the utterance based on the intended meaning established within the identified context. An example is generating a response shown below in a screenshot of Alexa app's "Review Voice History" page below.

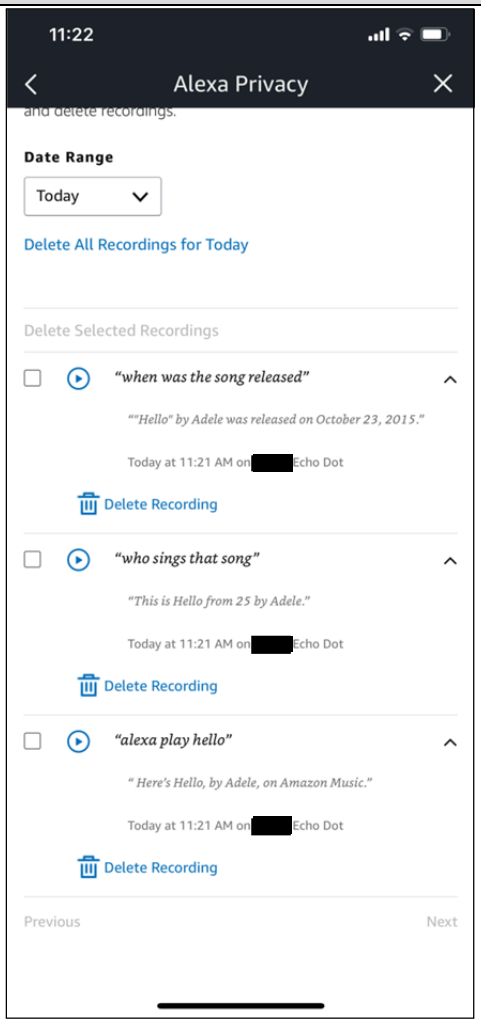
'681 Patent Claim Language	Exemplary Alexa Products
	 Below are more examples. "We are providing this more natural way of engaging with Alexa by adding deep learning models to our spoken language understanding (SLU) pipeline that allows us to carry customers' intent and entities within and across domains (i.e., between weather and traffic)." *Making Alexa More Friction-Free*. "Alexa will soon be able to have more natural conversations with users, thanks to something called 'context carryover.' This means that Alexa will be able to understand follow-up questions and respond appropriately..." *Alexa will soon gain a memory*.

EXHIBIT E

US009015049B2

(12) **United States Patent**
Baldwin et al.

(10) **Patent No.: US 9,015,049 B2**
(45) **Date of Patent: Apr. 21, 2015**

(54) **SYSTEM AND METHOD FOR A COOPERATIVE CONVERSATIONAL VOICE USER INTERFACE**

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(72) Inventors: **Larry Baldwin**, Maple Valley, WA (US); **Tom Freeman**, Mercer Island, WA (US); **Michael Tjalve**, Bellevue, WA (US); **Blane Ebersold**, Seattle, WA (US); **Chris Weider**, Everett, WA (US)

(73) Assignee: **VoiceBox Technologies Corporation**, Bellevue, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/987,645**

(22) Filed: **Aug. 19, 2013**

(65) **Prior Publication Data**

US 2013/0339022 A1 Dec. 19, 2013

Related U.S. Application Data

(60) Division of application No. 13/251,712, filed on Oct. 3, 2011, now Pat. No. 8,515,765, and a continuation of application No. 11/580,926, filed on Oct. 16, 2006, now Pat. No. 8,073,681.

(51) **Int. Cl.**
G10L 15/00 (2013.01)
G10L 25/00 (2013.01)
(Continued)

(52) **U.S. Cl.**
CPC ***G06F 3/167*** (2013.01); ***G10L 15/22*** (2013.01); *G10L 15/183* (2013.01); *G10L 2015/0631* (2013.01)

(58) **Field of Classification Search**
CPC G10L 15/22; G10L 15/18; G10L 15/1815; G10L 15/1822; G10L 15/183; G10L 15/187; G10L 15/19; G10L 15/193; G10L 15/197; G06F 3/167
USPC 704/9, 270–275
See application file for complete search history.

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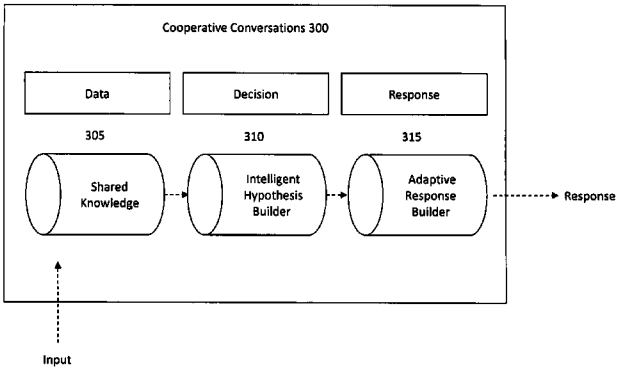
(Continued)

Primary Examiner — Eric Yen
(74) *Attorney, Agent, or Firm* — Pillsbury Winthrop Shaw Pittman LLP

(57) **ABSTRACT**

A cooperative conversational voice user interface is provided. The cooperative conversational voice user interface may build upon short-term and long-term shared knowledge to generate one or more explicit and/or implicit hypotheses about an intent of a user utterance. The hypotheses may be ranked based on varying degrees of certainty, and an adaptive response may be generated for the user. Responses may be worded based on the degrees of certainty and to frame an appropriate domain for a subsequent utterance. In one implementation, misrecognitions may be tolerated, and conversational course may be corrected based on subsequent utterances and/or responses.

20 Claims, 3 Drawing Sheets



(51) **Int. Cl.**

G06F 17/27	(2006.01)
G06F 3/16	(2006.01)
G10L 15/22	(2006.01)
G10L 15/183	(2013.01)
G10L 15/06	(2013.01)

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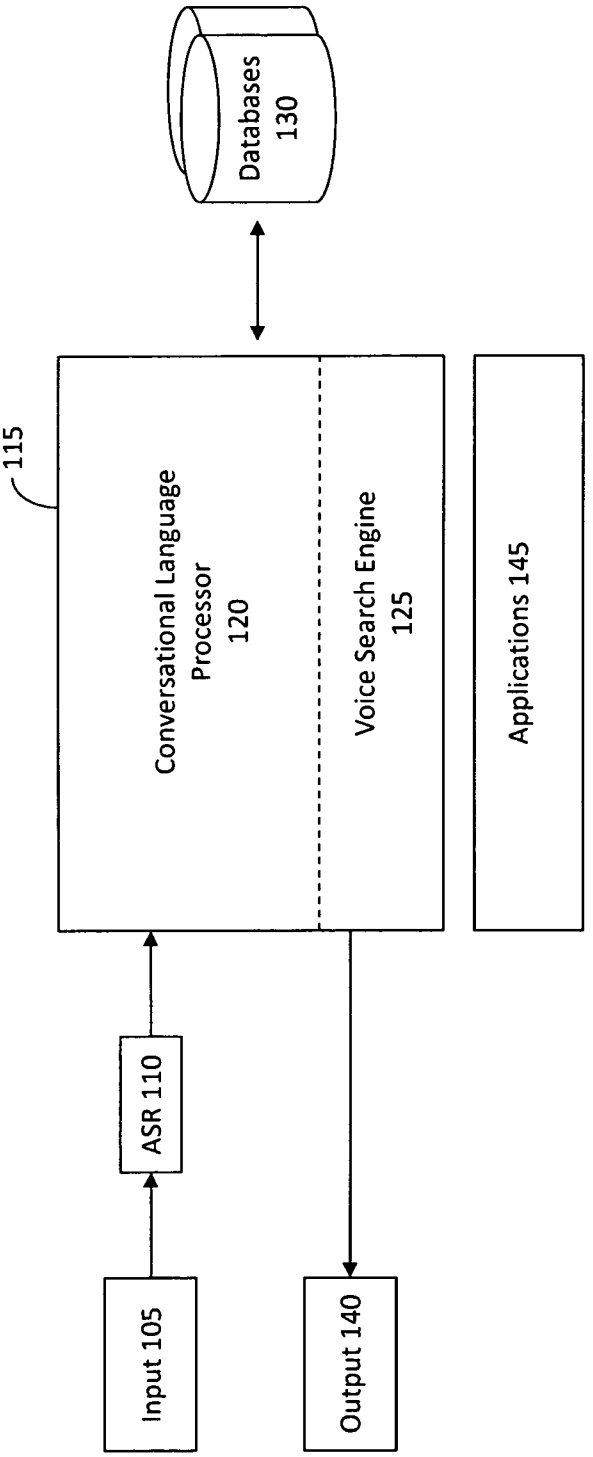

Databases
130
115
Conversational Language
Processor
120
Voice Search Engine
125
Applications 145
ASR 110
Input 105
Output 140

Figure 1

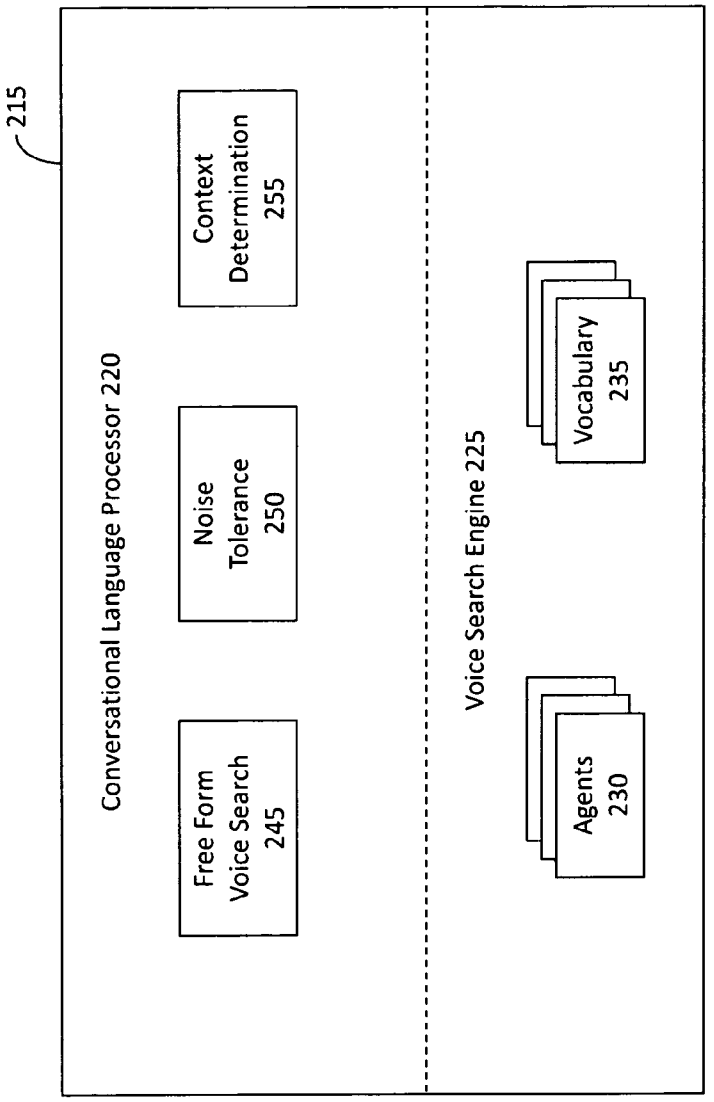

215
Conversational Language Processor 220
Free Form Voice Search 245
Noise Tolerance 250
Context Determination 255
Voice Search Engine 225
Agents 230
Vocabulary 235

Figure 2

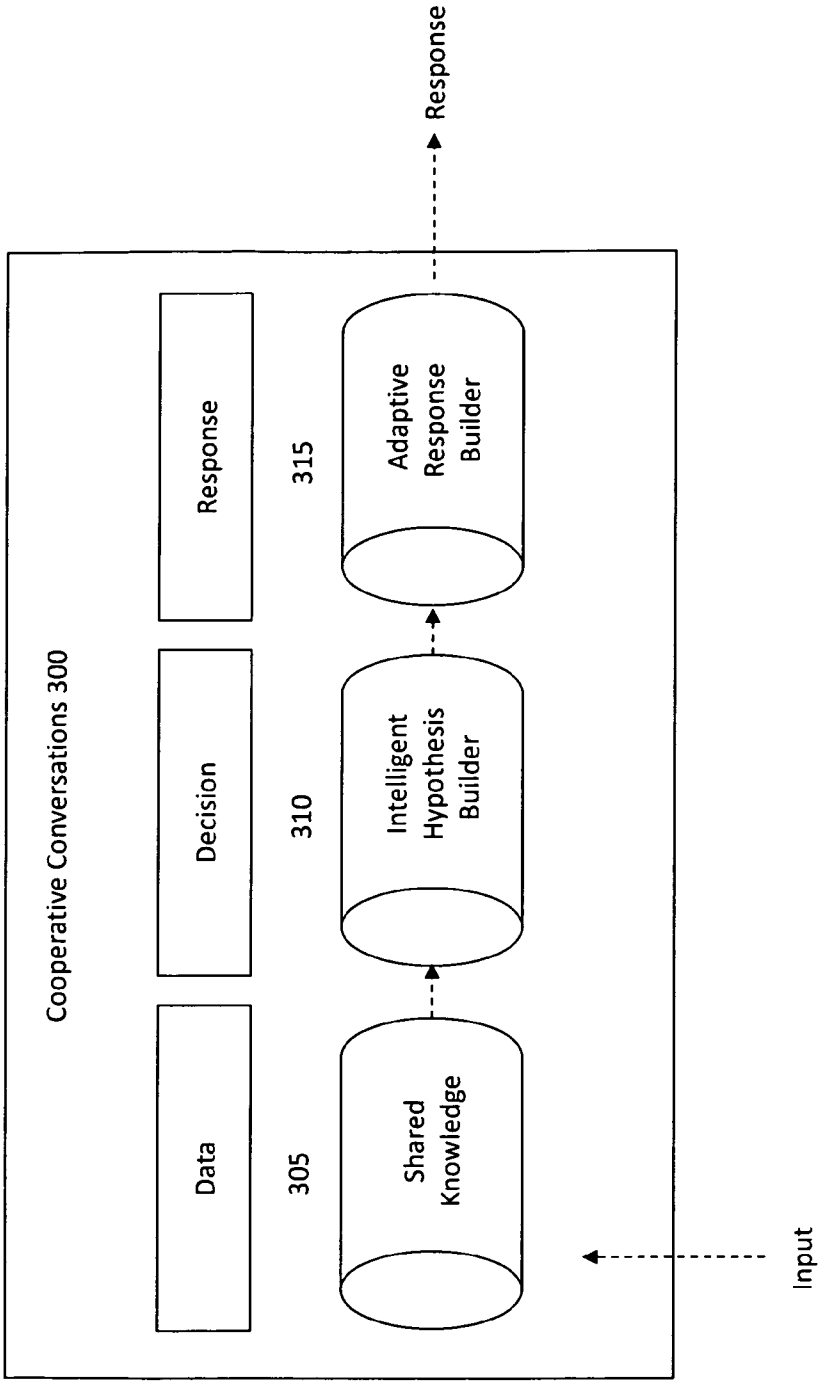

Response
Cooperative Conversations 300
Response
Decision
Data
315
310
305
Adaptive Response Builder
Intelligent Hypothesis Builder
Shared Knowledge
Input

Figure 3

SYSTEM AND METHOD FOR A COOPERATIVE CONVERSATIONAL VOICE USER INTERFACE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a divisional of U.S. patent application Ser. No. 13/251,712, entitled "System and Method for a Cooperative Conversational Voice User Interface," filed Oct. 3, 2011 (which issued as U.S. Pat. No. 8,515,765 on Aug. 20, 2013), which is a continuation of U.S. patent application Ser. No. 11/580,926, entitled "System and Method for a Cooperative Conversational Voice User Interface," filed Oct. 16, 2006 (which issued as U.S. Pat. No. 8,073,681 on Dec. 6, 2011), each of which are hereby incorporated by reference in its entirety.

FIELD OF THE INVENTION

The invention relates to a cooperative conversational model for a human to machine voice user interface.

BACKGROUND OF THE INVENTION

Advances in technology, particularly within the convergence space, have resulted in an increase in demand for voice recognition software that can exploit technology in ways that are intuitive to humans. While communication between human beings is most often "cooperative," in that information and/or context is shared to advance mutual conversational goals, existing Human-to-Machine interfaces fail to provide the same level of intuitive interaction. For example, each human participant in a conversation can contribute to an exchange for the benefit of the exchange. This is done through shared assumptions and expectations regarding various aspects of the conversation, such as the topic, participant knowledge about the topic, expectations of the other participant's knowledge about the topic, appropriate word usage for the topic and/or participants, conversational development based on previous utterances, the participants' tone or inflection, the quality and quantity of contribution expected from each participant, and many other factors. Participating in conversations that continually build and draw upon shared information is a natural and intuitive way for humans to converse.

In contrast, complex Human-to-Machine interfaces do not allow users to exploit technology in an intuitive way, which inhibits mass-market adoption for various technologies. Incorporating a speech interface helps to alleviate this burden by making interaction easier and faster, but existing speech interfaces (when they actually work) still require significant learning on the part of the user. That is, existing speech interfaces are unable to bridge the gap between archaic Human-to-Machine interfaces and conversational speech that would make interaction with systems feel normal. Users should be able to directly request what they want from a system in a normal, conversational fashion, without having to memorize exact words or phrases. Alternatively, when users are uncertain of particular needs, they should be able to engage the system in a productive, cooperative dialogue to resolve their requests. Instead, existing speech interfaces force users to dumb down their requests to match simple sets of instructions in simple languages in order to communicate requests in ways that systems can understand. Using existing speech interfaces, there is virtually no option for dialogue between the user and the system to satisfy mutual goals.

Therefore, existing systems lack a conversational speech model that can provide users with the ability to interact with systems in ways that are inherently intuitive to human beings. Existing systems suffer from these and other problems.

SUMMARY OF THE INVENTION

According to various embodiments and aspects of the invention, a cooperative conversational voice user interface may understand free form human utterances, freeing users from being restricted to a fixed set of commands and/or requests. Rather, users can engage in cooperative conversations with a machine to complete a request or series of requests using a natural, intuitive, free form manner of expression.

According to an aspect of the invention, an exemplary system architecture for implementing a cooperative conversational voice user interface is provided. The system may receive an input, which may include a human utterance received by an input device, where the utterance may include one or more requests. As used herein, an "utterance" may be words, syllables, phonemes, or any other audible sound made by a human being. As used herein, a "request" may be a command, directive, or other instruction for a device, computer, or other machine to retrieve information, perform a task, or take some other action. In one implementation, the input may be a multi-modal input, where at least part of the multi-modal input is an utterance. The utterance component of the input may be processed by a speech recognition engine (which may alternatively be referred to as an Automatic Speech Recognizer or ASR) to generate one or more preliminary interpretations of the utterance. The one or more preliminary interpretations may then be provided to a conversational speech engine for further processing, where the conversational speech engine may communicate with one or more databases to generate an adaptive conversational response, which may be returned to the user as an output. In one implementation, the output may be a multi-modal output. For example, the utterance may include a request to perform an action, and the output may include a conversational response reporting success or failure, as well as an execution of the action.

According to another aspect of the invention, an exemplary conversational speech engine may generate an adaptive conversational response to a request or series of requests. The conversational speech engine may include a free form voice search module that may understand an utterance made using typical, day-to-day language (i.e., in free form), and may account for variations in how humans normally speak, the vocabulary they use, and the conditions in which they speak. To account for intangible variables of human speech, the free form search module may include models of casual human speech. For example, in one implementation, the free form search module may understand specialized jargon and/or slang, tolerate variations in word order, and tolerate verbalized pauses or stuttered speech. For example, formalized English requests, where a verb precedes a noun, may be treated in an equivalent manner to requests where the noun precedes the verb. In another implementation, compound requests and/or compound tasks with multiple variables may be identified in a single utterance. By identifying all relevant information for completing one or more tasks from a single utterance, advantages may be provided over existing voice user interfaces, such as Command and Control systems that use verbal menus to restrict information that a person can provide at a given point. In another implementation, inferring intended requests from incomplete or ambiguous requests

may provide a conversational feel. By modeling what contextual signifiers, qualifiers, or other information may be required to perform a task in an identified context, an adaptive response may be generated, such as prompting a user for missing contextual signifiers, qualifiers, or other information. In one implementation, the response may ask for missing information in a way that most restricts possible interpretations, and the response may be framed to establish a domain for a subsequent user utterance. In another implementation, common alternatives for nouns and verbs may be recognized to reflect variations in usage patterns according to various criteria. Thus, variations in expression may be supported because word order is unimportant or unanticipated, and nouns and/or verbs may be represented in different ways to give simplistic, yet representative, examples. In another implementation, requests may be inferred from contradictory or otherwise inaccurate information, such as when an utterance includes starts and stops, restarts, stutters, run-on sentences, or other imperfect speech. For example, a user may sometimes change their mind, and thus alter the request in mid-utterance, and the imperfect speech feature may nonetheless be able to infer a request based on models of human speech. For example, various models may indicate that a last criterion is most likely to be correct, or intonation, emphasis, stress, use of the word "not," or other models may indicate which criterion is most likely to be correct.

According to another aspect of the invention, the conversational speech engine may include a noise tolerance module that may discard words or noise which has no meaning in a given context to reduce a likelihood of confusion. Moreover, the noise tolerance module may filter out environmental and non-human noise to further reduce a likelihood of confusion. In one implementation, the noise tolerance module may cooperate with other modules and features to filter out words that do not fit into an identified context. For example, the noise tolerance module may filter other human conversations and/or utterances within a range of one or more microphones. For example, a single device may include multiple microphones, or multiple devices may each include one or more microphones, and the noise tolerance module may collate inputs and cooperatively filter out sound by comparing a speech signal from the various microphones. The noise tolerance module may also filter out non-human environmental noise within range of the microphones, out-of-vocabulary words caused by speaker ambiguity or malapropisms, or other noise that may be unrelated to a target request. Performance benchmarks for the noise tolerance module may be defined by noise models based on human criteria. For example, if a driver of a car is 92% likely to be understood by a passenger when traveling at 65 miles-per-hour with windows cracked, then performance benchmarks for the noise tolerance module may have a similar performance under such conditions.

According to another aspect of the invention, the conversational speech engine may include a context determination process that determines one or more contexts for a request to establish meaning within a conversation. The one or more contexts may be determined by having one or more context domain agents compete to determine a most appropriate domain for a given utterance. Once a given domain agent "wins" the competition, the winning domain agent may be responsible for establishing or inferring further contexts and updating short-term and long-term shared knowledge. If there is a deadlock between context domain agents, an adaptive conversational response may prompt the user to assist in disambiguating between the deadlocked agents. Moreover, the context determination process may infer intended operations and/or context based on previous utterances and/or requests, whereas existing systems consider each utterance independently, potentially making the same errors over and over again. For example, if a given interpretation turns out to be incorrect, the incorrect interpretation may be removed as a potential interpretation from one or more grammars associated with the speech recognition engine and/or from possible interpretations determined by the conversational speech engine, thereby assuring that a mistake will not be repeated for an identical utterance.

The context determination process may provide advantages over existing voice user interfaces by continually updating one or more models of an existing context and establishing context as a by-product of a conversation, which cannot be established a priori. Rather, the context determination process may track conversation topics and attempt to fit a current utterance into recent contexts, including switching between contexts as tasks are completed, partially completed, requested, etc. The context determination process may identify one or more context domains for an utterance by defining a collection of related functions that may be useful for users in various context domains. Moreover, each context domain may have relevant vocabularies and thought collections to model word groupings, which when evaluated together, may disambiguate one context domain from another. Thus, eliminating out-of-context words and noise words when searching for relevant combinations may enhance accuracy of inferences. This provides advantages over existing systems that attempt to assign meaning to every component of an utterance (i.e., including out-of-context words and noise words), which results in nearly infinite possible combinations and greater likelihood of confusion. The context determination process may also be self-aware, assigning degrees of certainty to one or more generated hypotheses, where a hypothesis may be developed to account for variations in environmental conditions, speaker ambiguity, accents, or other factors. By identifying a context, capabilities within the context, vocabularies within the context, what tasks are done most often historically in the context, what task was just completed, etc., the context determination process may establish intent from rather meager phonetic clues. Moreover, just as in human-to-human conversation, users may switch contexts at any time without confusion, enabling various context domains to be rapidly selected, without menu-driven dead ends, when an utterance is unambiguous.

According to another aspect of the invention, an exemplary cooperative conversational model may build upon free form voice search, noise tolerance, and context determination to implement a conversational Human-to-Machine interface that reflects human interaction and normal conversational behavior. That is, the cooperative conversational model enables humans and machines to participant in a conversation with an accepted purpose or direction, with each participant contributing to the conversation for the benefit of the conversation. By taking advantage of human presumptions about utterances that humans rely upon, both as speakers and listeners, a Human-to-Machine interface may be analogous to everyday human-to-human conversation. In one implementation, the exemplary cooperative conversation model may take incoming data (shared knowledge) to inform a decision (intelligent hypothesis building), and then may refine the decision and generate a response (adaptive response building).

According to another aspect of the invention, shared knowledge may include both short-term and long-term knowledge. Short-term knowledge may accumulate during a single conversation, where input received during a single conversation may be retained. The shared knowledge may

include cross-modality awareness, where in addition to accumulating input relating to user utterances, requests, locations, etc., the shared knowledge may accumulate a current user interface state relating to other modal inputs to further build shared knowledge models. The shared knowledge may be used to build one or more intelligent hypotheses using current and relevant information, build long-term shared knowledge by identifying information with long-term significance, and generate adaptive responses with relevant state and word usage information. Moreover, because cooperative conversations model human conversations, short-term session data may be expired after a psychologically appropriate amount of time, thereby humanizing system behavior, reducing a likelihood of contextual confusion based on stale data, while also adding relevant information from an expired session context to long-term knowledge models. Long-term shared knowledge may generally be user-centric, rather than session-based, where inputs may be accumulated over time to build user, environmental, cognitive, historical, or other long-term knowledge models. Long-term and short-term shared knowledge may be used simultaneously anytime a user engages in a cooperative conversation. Long-term shared knowledge may include explicit and/or implicit user preferences, a history of recent contexts, requests, tasks, etc., user-specific jargon related to vocabularies and/or capabilities of a context, most often used word choices, or other information. The long-term shared knowledge may be used to build one or more intelligent hypotheses using current and relevant information, generate adaptive responses with appropriate word choices when unavailable via short-term shared knowledge, refine long-term shared knowledge models, identify a frequency of specific tasks, identify tasks a user frequently has difficulty with, or provide other information and/or analysis to generate more accurate conversational responses. Shared knowledge may also be used to adapt a level of unprompted support (e.g., for novices versus experienced users, users who are frequently misrecognized, etc.) Thus, shared knowledge may enable a user and a voice user interface to share assumptions and expectations such as topic knowledge, conversation history, word usage, jargon, tone, or other assumptions and/or expectations that facilitate a cooperative conversation between human users and a system.

According to another aspect of the invention, a conversation type may be identified for any given utterance. Categorizing and developing conceptual models for various types of exchanges may consistently align user expectations and domain capabilities. One or more intelligent hypotheses may be generated as to a conversation type by considering conversational goals, participant roles, and/or an allocation of information among the participants. Based on the conversational goals, participant roles, and allocation of information, the intelligent hypotheses may consider various factors to classify a conversation (or utterance) into general types of conversations that can interact with one another to form many more variations and permutations of conversation types (e.g., a conversation type may change dynamically as information is reallocated from one participant to another, or as conversational goals change based on the reallocation of information).

According to another aspect of the invention, the intelligent hypotheses may include one or more hypotheses of a user's intent in an utterance. In addition, the intelligent hypotheses may use short-term and/or long-term shared knowledge to proactively build and evaluate interaction with a user as a conversation progresses or over time. The hypotheses may model human-to-human interaction to include a varying degree of certainty for each hypothesis. That is, just as humans rely on knowledge shared by participants to examine how much and what kind of information was available, the intelligent hypotheses may leverage the identified conversation type and shared knowledge to generate a degree of certainty for each hypothesis.

According to another aspect of the invention, syntactically, grammatically, and contextually sensitive "intelligent responses" may be generated from the intelligent hypotheses that can be used to generate a conversational experience for a user, while also guiding the user to reply in a manner favorable for recognition. The intelligent responses may create a conversational feel by adapting to a user's manner of speaking, framing responses appropriately, and having natural variation and/or personality (e.g., by varying tone, pace, timing, inflection, word use, jargon, and other variables in a verbal or audible response).

According to another aspect of the invention, the intelligent responses may adapt to a user's manner of speaking by using contextual signifiers and grammatical rules to generate one or more sentences that may cooperate with the user. By taking advantage of shared knowledge about how a user utters a request, the responses may be modeled using similar techniques used to recognize requests. The intelligent responses may rate possible responses statistically and/or randomize responses, which creates an opportunity to build an exchange with natural variation and conversational feel. This provides advantages over existing voice user interfaces where input and output is incongruous, as the input is "conversational" and the output is "computerese."

According to another aspect of the invention, the intelligent responses may frame responses to influence a user reply utterance for easy recognition. For example, the responses may be modeled to illicit utterances from the user that may be more likely to result in a completed request. Thus, the responses may conform to a cooperative nature of human dialog and a natural human tendency to "parrot" what was just heard as part of a next utterance. Moreover, knowledge of current context may enhance responses to generate more meaningful conversational responses. Framing the responses may also deal with misrecognitions according to human models. For example, humans frequently remember a number of recent utterances, especially when one or more previous utterances were misrecognized or unrecognized. Another participant in the conversation may limit correction to a part of the utterance that was misrecognized or unrecognized, or over subsequent utterances and/or other interactions, clues may be provided to indicate the initial interpretation was incorrect. Thus, by storing and analyzing multiple utterances, utterances from earlier in a conversation may be corrected as the conversation progresses.

According to another aspect of the invention, the intelligent responses may include multi-modal, or cross-modal, responses to a user. In one implementation, responses may be aware of and control one or more devices and/or interfaces, and users may respond by using whichever input method, or combination of input methods, is most convenient.

According to another aspect of the invention, the intelligent responses may correct a course of a conversation without interrupting conversational flow. That is, even though the intelligent responses may be reasonably "sure," the intelligent responses may nonetheless sometimes be incorrect. While existing voice user interfaces tend to fail on average conversational missteps, normal human interactions may expect missteps and deal with them appropriately. Thus, responses after misrecognitions may be modeled after clarifications, rather than errors, and words may chosen in subsequent

responses to move conversation forward and establish an appropriate domain to be explored with the user.

Other objects and advantages of the invention will be apparent to those skilled in the art based on the following drawings and detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an exemplary block diagram of a system architecture according to one aspect of the invention.

FIG. **2** is an exemplary block diagram of a conversational speech engine according to one aspect of the invention.

FIG. **3** is an exemplary block diagram of a cooperative conversational model according to one aspect of the invention.

DETAILED DESCRIPTION

Referring to FIG. **1**, an exemplary system architecture for implementing a cooperative conversational voice user interface is illustrated according to one aspect of the invention. The system may receive an input **105** from a user, where in one implementation, input **105** may be an utterance received by an input device (e.g., a microphone), where the utterance may include one or more requests. Input **105** may also be a multi-modal input, where at least part of the multi-modal input is an utterance. For example, the input device may include a combination of a microphone and a touch-screen device, and input **105** may include an utterance that includes a request relating to a portion of a display on the touch-screen device that the user is touching. For instance, the touch-screen device may be a navigation device, and input **105** may include an utterance of "Give me directions to here," where the user may be requesting directions to a desired destination on the display of the navigation device.

The utterance component of input **105** may be processed by a speech recognition engine **110** (which may alternatively be referred to herein as Automatic Speech Recognizer **110**, or as shown in FIG. **1**, ASR **110**) to generate one or more preliminary interpretations of the utterance. The speech recognition engine **110** may process the utterance using any suitable technique known in the art. For example, in one implementation, the speech recognition engine **110** may interpret the utterance using techniques of phonetic dictation to recognize a phoneme stream, as described in U.S. patent application Ser. No. 11/513,269, entitled "Dynamic Speech Sharpening," filed Aug. 31, 2006, which issued as U.S. Pat. No. 7,634,409 on Dec. 15, 2009, and which is hereby incorporated by reference in its entirety. The one or more preliminary interpretations generated by the speech recognition engine **110** may then be provided to a conversational speech engine **115** for further processing. Conversational speech engine **115** may include a conversational language processor **120** and/or a voice search engine **125**, described in greater detail in FIG. **2** below. Conversational speech engine **115** may communicate with one or more databases **130** to generate an adaptive conversational response, which may be returned to the user as an output **140**. In one implementation, output **140** may be a multi-modal output and/or an interaction with one or more applications **145** to complete the request. For example, output **140** may include a combination of an audible response and a display of a route on a navigation device. For example, the utterance may include a request to perform an action, and output **140** may include a conversational response reporting success or failure, as well as an execution of the action. In addition, in various implementations, the speech recognition engine **110**, conversational speech engine **115**, and/or databases **130** may reside locally (e.g., on a user device), remotely (e.g., on a server), or a hybrid model of local and remote processing may be used (e.g., lightweight applications may be processed locally while computationally intensive applications may be processed remotely).

Referring to FIG. **2**, an exemplary block diagram is provided illustrating a conversational speech engine **215** according to one aspect of the invention. Conversational speech engine **215** may include a conversational language processor **220** that generates an adaptive conversational response to a request or series of requests using a free form voice search module **245**, a noise tolerance module **250**, and/or a context determination process **255**. According to one aspect of the invention, modules **245**-**255** may communicate with a voice search engine **225** that includes one or more context domain agents **230** and/or one or more vocabularies **235** to aid in interpreting utterances and generating responses, as described in "Enhancing the VUE™ (Voce-User-Experience) Through Conversational Speech," by Tom Freeman and Larry Baldwin, which is herein incorporated by reference in its entirety. Conversational speech engine **215** may generate an adaptive conversational response to one or more requests, where the requests may depend on unspoken assumptions, incomplete information, context established by previous utterances, user profiles, historical profiles, environmental profiles, or other information. Moreover, conversational speech engine **215** may track which requests have been completed, which requests are being processed, and/or which requests cannot be processed due to incomplete or inaccurate information, and the response may be generated accordingly.

According to one aspect of the invention, free form voice search module **245** may understand an utterance made using typical, day-to-day language (i.e., in free form), and may account for variations in how humans normally speak, the vocabulary they use, and the conditions in which they speak. Because variables such as stress, distraction, and serendipity are always different and infinitely varied, free form search module **245** may be designed with a goal of understanding that no human will come to the same Human-to-Machine interface situation in the same way twice. Thus, free form search module **245** may implement one or more features that model casual human speech. In various implementations, free form search module **245** may include, among other things, a free form utterance feature, a one-step access feature, an inferencing intended operations feature, an alternative expression feature, and/or an imperfect speech feature.

The free form utterance feature may understand specialized jargon and/or slang, tolerate variations in word order (e.g., whether a subject of a request comes before or after a verb may be irrelevant), and tolerate verbalized pauses (e.g., "um," "ah," "eh," and other utterances without meaning). For example, the free form utterance feature may treat formalized English verb-before-noun requests in an equivalent manner to free form requests where a noun may precede a verb. For example, user utterances of "Change it to the Squizz" and "You know, urn, that Squizz channel, ah, switch it there" may be treated equivalently (where Squizz is a channel on XM Satellite Radio). In either case, the free form utterance feature is able to identify "Squizz" as a subject of the utterance and "Change it" or "switch it" as a verb or request for the utterance (e.g., by cooperating with context determination process **255**, or other features, and identifying a relevant context domain agent **230** and/or vocabulary **235** to interpret the utterance).

The one-step access feature may understand utterances that include compound requests with multiple variables. For example, a user utterance may be "What is the forecast for Boston this weekend?" The one-step access feature may iden-

tify "weather" as a context (e.g., by cooperating with context determination process **255**, or other features, and identifying "forecast" as a synonym of "weather"), and search for a city equal to "Boston" and a time equal to "weekend." By identifying all relevant information for completing a task from a single utterance, the one-step access feature may overcome drawbacks of existing voice user interfaces, such as Command and Control systems that use verbal menus to restrict information that a person can provide at a given point (e.g., a Command and Control system for a phone directory service may say: "State please," . . . "City please," . . . "What listing," etc.). Moreover, some utterances may include compound requests, and the one-step access feature may decompose the compound requests into sub-tasks. For example, a user utterance of "I need to be at a meeting tomorrow in San Francisco at 8:00 am" may be decomposed into a set of sub-tasks such as (1) checking availability and reserving a flight on an evening before the meeting, (2) checking availability and reserving a hotel, (3) checking availability and reserving a car, etc., where users may further designate preferences for various tasks (e.g., first check availability on an airline for which the user is a frequent flyer). Depending on a level of shared knowledge about a user's preferences and/or historical patterns, the one-step access feature may infer additional tasks from a request. For example, in the above example, the one-step access feature may also check a weather forecast, and if the weather is "nice" (as defined by the user preferences and/or as inferred from historical patterns), the one-step access feature may schedule a tee-time at a preferred golf course in San Francisco.

The inferencing intended operations feature may identify an intended request from incomplete or ambiguous requests. For example, when a user utters "Route <indecipherable> Chicago <indecipherable> here," where the user intended to say "Route calculation to Chicago from here," the inferencing intended operations feature may model what is required to calculate a route (an origination point and a destination point). Because the utterance includes the origination point and the destination point, a request to calculate a route from the user's present location to Chicago may be inferred. Similarly, when the inferencing intended operations feature does not have sufficient information to infer a complete request, an adaptive conversational response may be generated to prompt the user for missing information. For example, when an utterance includes a request for a stock quote but not a company name (e.g., "Get me the stock price for <indecipherable>"), the response may be "What company's stock quote do you want?" The user may then provide an utterance including the company name, and the request may be completed. In one implementation, the response may ask for missing information in a way that most restricts possible interpretations (e.g., in a request for a task that requires both a city and a state, the state may be asked for first because there are fewer states than cities). Moreover, the inferencing intended operations feature may model compound tasks and/or requests by maintaining context and identifying relevant and/or missing information at both a composite and sub-task level.

The alternative expression feature may recognize common alternatives for nouns and verbs to reflect variations in usage patterns according to various criteria. For example, users may vary expression based on age, socio-economics, ethnicity, user whims, or other factors. Thus, the alternative expression feature may support variations in expression where word order is unimportant or unanticipated. Alternatives in expression based on various criteria or demographics may be loaded into context domain agents **230** and/or vocabularies **235**, and the alternative expression feature may update context domain agents **230** and/or vocabularies **235** based on inferred or newly discovered variations. In one implementation, conversational speech engine **215** may include a subscription interface to update changes to context domain agents **230** and/or vocabularies **235** (e.g., a repository may aggregate various user utterances and deploy updates system wide). In operation, the alternative expression feature may allow nouns and/or verbs to be represented in different ways to give simplistic, yet representative, examples. For example, a user interested in a weather forecast for Washington, D.C. may provide any of the following utterances, each of which are interpreted equivalently: "What's the weather like in DC," "Is it raining inside the Beltway," Gimme the forecast for the capital," etc. Similarly, utterances of "Go to my home," "Go home," "Show route to home," and "I would like to know my way home" may all be interpreted equivalently, where a user profile may include the user's home address and a navigation route to the home address may be calculated.

The imperfect speech feature may be able to infer requests from contradictory or otherwise inaccurate information, such as when an utterance includes starts and stops, restarts, stutters, run-on sentences, or other imperfect speech. For example, a user may sometimes change their mind, and thus alter the request in mid-utterance, and the imperfect speech feature may nonetheless be able to infer a request based on models of human speech. For example, for an utterance of "Well, I wanna . . . Mexi . . . no, steak restaurant please, I'm hungry," existing voice user interfaces make no assumptions regarding models of human speech and would be unable to infer whether the user wanted a Mexican or steak restaurant. The imperfect speech feature overcomes these drawbacks by using various models of human understanding that may indicate that a last criterion is most likely to be correct, or intonation, emphasis, stress, use of the word "not," or other models may indicate which criterion is most likely to be correct. Thus, in the above example, the imperfect speech feature may infer that the user wants a steak restaurant.

According to one aspect of the invention, noise tolerance module **250** may be closely related to the imperfect speech feature, and may operate to discard words or noise that has no meaning in a given context so as not to create confusion. Moreover, noise tolerance module **250** may filter out environmental and non-human noise to further reduce a likelihood of confusion. In one implementation, noise tolerance module **250** may cooperate with other modules and features to filter out words that do not fit into a context. For example, one or more contexts may be identified, and words that have no meaning with respect to system capabilities, random human utterances without meaning and other noise may be filtered out. Thus, noise tolerance module **250** may model real-world conditions to identify meaningful requests. For example, noise tolerance module **250** may filter other human conversations and/or utterances within a range of one or more microphones, For example, a single device may include multiple microphones, or multiple devices may each include one or more microphones, and the noise tolerance module may collate inputs and cooperatively filter out sound by comparing a speech signal from the various microphones. Noise tolerance module **250** may also filter out non-human environmental noise within the range of the microphones, out-of-vocabulary words, which could be a result of speaker ambiguity or malapropisms, or other noise that may be unrelated to a target request. Noise models in noise tolerance module **250** may define performance benchmarks based on human criteria. For example, if a driver of a car, traveling at 65 miles-per-hour, with windows cracked is 92% likely to be understood by a

passenger, then noise tolerance module **250** may have a similar performance under those conditions.

According to one aspect of the invention, conversational speech engine **215** may include a context determination process **255** that determines one or more contexts for a request to establish meaning within a conversation. The one or more contexts may be determined by having one or more context domain agents compete to determine a most appropriate domain for a given utterance, as described in U.S. patent application Ser. No. 11/197,504, entitled "Systems and Methods for Responding to Natural Language Speech Utterance," filed Aug. 5, 2005, which issued as U.S. Pat. No. 7,640,160 on Dec. 29, 2009 and U.S. patent application Ser. No. 11/212,693, entitled "Mobile Systems and Methods of Supporting Natural Language Human-Machine Interactions," filed Aug. 29, 2005, which issued as U.S. Pat. No. 7,949,529 on May 24, 2011, both of which are hereby incorporated by reference in their entirety. Once a given context domain agent "wins" the competition, the winning agent may be responsible for establishing or inferring further contexts and updating short-term and long-term shared knowledge. If there is a deadlock between context domain agents, an adaptive conversational response may prompt the user to assist in disambiguating between the deadlocked agents. For example, a user utterance of "What about traffic?" may have a distinct meaning in various contexts. That is, "traffic" may have a first meaning when the user is querying a system's media player (i.e., "traffic" would be a Rock and Roll band led by singer/songwriter Steve Winwood), a second meaning when the user is querying a search interface regarding Michael Douglas films (i.e., "traffic" would be a film directed by Steven Soderbergh), a third meaning when the user is querying a navigation device for directions to an airport (i.e., "traffic" would be related to conditions on roads along a route to the airport).

Moreover, context determination process **255** may infer intended operations and/or context based on previous utterances and/or requests, whereas existing systems consider each utterance independently, potentially making the same errors over and over again. For example, if a given interpretation turns out to be incorrect, the incorrect interpretation may be removed as a potential interpretation from one or more grammars associated with the speech recognition engine and/or from possible subsequent interpretations determined by context determination process **255**, thereby assuring that a mistake will not be repeated for an identical utterance.

Context determination process **255** may overcome drawbacks of existing systems by continually updating one or more models of an existing context, where establishing context may be a by-product of a conversation, which cannot be established a priori. Context determination process **255** may establish a first context domain, change to a second context domain, change back to the first context domain, and so on, as tasks are completed, partially completed, requested, etc, and a context stack may track conversation topics and attempt to fit a current utterance into a most-recent context, next-most-recent topic, etc., traversing the context stack until a most likely intent can be established. For example, a user may utter "What's the traffic report," and context determination process **255** may establish Traffic as a context, and return an output including a traffic report, which does not happen to mention traffic on Interstate-5. The user may then utter "What about I-5?" and context determination process **255** may know that the current context is Traffic, a traffic report including information about Interstate-5 may be searched for, and the traffic report indicating that Interstate-5 is crowded may be returned as an output. The user may then utter "Is there a faster way?" and context determination module **255** may know that the current context is still Traffic, and may search for routes to a specified destination with light traffic and avoiding Interstate-5. Moreover, context determination process **255** may build context based on user profiles, environmental profiles, historical profiles, or other information to further refine the context. For example, the profiles may indicate that Interstate-5 is a typical route taken Monday through Friday.

The profiles may be particularly meaningful when attempting to disambiguate between contexts where a word has different meanings in different contexts. For example, a user may utter "What's the weather in Seattle?" and context determination process **255** may establish Weather as a context, as well as establishing Seattle as an environmental context. The user may then utter "and Portland?" and context determination process **255** may return a weather report for Portland, Oreg. based on the Weather and an environmental proximity between Portland, Oreg. and Seattle, Wash. The user may then ask "What time does the game start?" and a search for sports events with teams from Seattle and/or Portland may occur, with results presented conversationally according to methods described in greater detail below in FIG. **3**. Correlatively, had user originally uttered "What's the weather in Portsmouth, N.H.," in the second utterance, context determination process **255** may instead retrieve a weather report for Portland, Me. based on an environmental proximity to New Hampshire. Moreover, when environmental profiles, contextual shared knowledge, and/or other short-term and/or long-term shared knowledge does not provide enough information to disambiguate between possibilities, responses may prompt the user with a request for further information (e.g., "Did you mean Portland, Me., or Portland, Oreg.?").

Context determination process **255** may cooperate with context domain agents **230**, where each context domain agent **230** may define a collection of related functions that may be useful for users. Moreover, each context domain agent **230** may include a relevant vocabulary **235** and thought collections that model word groupings, which when evaluated together, may disambiguate one context domain from another (e.g., a Music context domain agent **230** may include a vocabulary **235** for songs, artists, albums, etc., whereas a Stock context domain agent **230** may include a vocabulary **235** for company names, ticker symbols, financial metrics, etc.). Thus, accuracy in identifying meaning may be enhanced by eliminating out-of-context words and noise words when searching for relevant combinations. In contrast, existing systems attempt to assign meaning to every component of an utterance (e.g., including out-of-context words and noise words), which results in nearly infinite possible combinations and greater likelihood of confusion. Moreover, context domain agents **230** may include metadata for each criteria to further assist in interpreting utterances, inferring intent, completing incomplete requests, etc. (e.g., a Space Needle vocabulary word may include metadata for Seattle, landmark, tourism, Sky City restaurant, etc.). Given a disambiguated criterion, context determination process **255** may thus be able to automatically determine other information needed to complete a request, discard importance of word order, and perform other enhancements for conversational speech.

Context domain agents **230** may also be self-aware, assigning degrees of certainty to one or more generated hypotheses, where a hypothesis may be developed to account for variations in environmental conditions, speaker ambiguity, accents, or other factors. Conceptually, context domain agents **230** may be designed to model utterances as a hard-of-hearing person would at a noisy party. By identifying a context, capabilities within the context, vocabularies within

the context, what tasks are done most often historically in the context, what task was just completed, etc., a context domain agent **230** may establish intent from rather meager phonetic clues. Moreover, the context stack may be one of a plurality of components for establishing context, and thus not a constraint upon the user. All context domains may be accessible, allowing the user to switch contexts at any time without confusion. Thus, just as in human-to-human conversation, context domains may be rapidly selected, without menu-driven dead ends, when an utterance is unambiguous. For example, a user may utter, "Please call Rich Kennewick on his cell phone," and a system response of "Do you wish me to call Rich Kennewick on his cell?" may be generated. The user may decide at that point to call Rich Kennewick later, and instead, listen to some music. Thus, the user may then utter, "No, play the Louis Armstrong version of Body and Soul from my iPod," and a system response of "Playing Body and Soul by Louis Armstrong" may be generated as Body and Soul is played through a media player. In this example, the later utterance has no contextual connection to the first utterance, yet because request criteria in the utterances are unambiguous, contexts can be switched easily without relying on the context stack.

Referring to FIG. **3**, an exemplary cooperative conversational model **300** is illustrated according to an aspect of the invention. Cooperative conversational model **300** may build upon free form voice search **245**, noise tolerance **250**, and context determination **255** to implement a conversational Human-to-Machine interface that reflects how humans interact with each other and their normal behavior in conversation. Simply put, cooperative conversational model **300** enables humans and machines to participate in a conversation with an accepted purpose or direction, with each participant contributing to the conversation for the benefit of the conversation. That is, cooperative conversational model **300** incorporates technology and process-flow that takes advantage of human presumptions about utterances that humans rely upon, both as speakers and listeners, thereby creating a Human-to-Machine interface that is analogous to everyday human-to-human conversation. In one implementation, a cooperative conversation may take incoming data (shared knowledge) **305** to inform a decision (intelligent hypothesis building) **310**, and then may refine the decision and generate a response (adaptive response building) **315**.

According to one aspect of the invention, shared knowledge **305** includes both short-term and long-term knowledge about incoming data. Short-term knowledge may accumulate during a single conversation, while long-term knowledge may accumulate over time to build user profiles, environmental profiles, historical profiles, cognitive profiles, etc.

Input received during a single conversation may be retained in a Session Input Accumulator. The Session Input Accumulator may include cross-modality awareness, where in addition to accumulating input relating to user utterances, requests, locations, etc., the Session Input Accumulator may accumulate a current user interface state relating to other modal inputs to further build shared knowledge models and more accurate adaptive responses (e.g., when a user utters a request relating to a portion of a touch-screen device, as described above). For example, the Session Input Accumulator may accumulate inputs including recognition text for each utterance, a recorded speech file for each utterance, a list-item selection history, a graphical user interface manipulation history, or other input data. Thus, the Session Input Accumulator may populate Intelligent Hypothesis Builder **310** with current and relevant information, build long-term shared knowledge by identifying information with long-term significance, provide Adaptive Response Builder **315** with relevant state and word usage information, retain recent contexts for use with Intelligent Hypothesis Builder **310**, and/or retain utterances for reprocessing during multi-pass evaluations. Moreover, because cooperative conversations **300** model human conversations, short-term session data may be expired after a psychologically appropriate amount of time, thereby humanizing system behavior. For example, a human is unlikely to recall a context of a conversation from two years ago, but because the context would be identifiable by a machine, session context is expired after a predetermined amount of time to reduce a likelihood of contextual confusion based on stale data. However, relevant information from an expired session context may nonetheless be added to user, historical, environmental, cognitive, or other long-term knowledge models.

Long-term shared knowledge may generally be user-centric, rather than session-based. That is, inputs may be accumulated over time to build user, environmental, cognitive, historical, or other long-term knowledge models. Long-term and short-term shared knowledge (collectively, shared knowledge **305**) may be used simultaneously anytime a user engages in a cooperative conversation **300**. Long-term shared knowledge may include explicit and/or implicit user preferences, a history of most recently used agents, contexts, requests, tasks, etc., user-specific jargon related to vocabularies and/or capabilities of an agent and/or context, most often used word choices, or other information. The long-term shared knowledge may be used to populate Intelligent Hypothesis Builder **310** with current and relevant information, provide Adaptive Response Builder **315** with appropriate word choices when the appropriate word choices are unavailable via the Session Input Accumulator, refine long-term shared knowledge models, identify a frequency of specific tasks, identify tasks a user frequently has difficulty with, or provide other information and/or analysis to generate more accurate conversational responses.

As described above, shared knowledge **305** may be used to populate Intelligent Hypothesis Builder **310**, such that a user and a voice user interface may share assumptions and expectations such as topic knowledge, conversation history, word usage, jargon, tone (e.g., formal, humorous, terse, etc.), or other assumptions and/or expectations that facilitate interaction at a Human-to-Machine interface.

According to an aspect of the invention, one component of a successful cooperative conversation may be identifying a type of conversation from an utterance. By categorizing and developing conceptual models for various types of exchanges, user expectations and domain capabilities may be consistently aligned. Intelligent Hypothesis Builder **310** may generate a hypothesis as to a conversation type by considering conversational goals, participant roles, and/or an allocation of information among the participants. Conversational goals may broadly include: (1) getting a discrete piece of information or performing a discrete task, (2) gathering related pieces of information to make a decision, and/or (3) disseminating or gathering large amounts of information to build expertise. Participant roles may broadly include: (1) a leader that controls a conversation, (2) a supporter that follows the leader and provides input as requested, and/or (3) a consumer that uses information. Information may be held by one or more of the participants at the outset of a conversation, where a participant may hold most (or all) of the information, little (or none) of the information, or the information may be allocated roughly equally amongst the participants. Based on the conversational goals, participant roles, and allocation of information, Intelligent Hypothesis Builder **310** may consider various factors to classify a conversation (or utterance) into

general types of conversations that can interact with one another to form many more variations and permutations of conversation types (e.g., a conversation type may change dynamically as information is reallocated from one participant to another, or as conversational goals change based on the reallocation of information).

For example, in one implementation, a query conversation may include a conversational goal of getting a discrete piece of information or performing a particular task, where a leader of the query conversation may have a specific goal in mind and may lead the conversation toward achieving the goal. The other participant may hold the information and may support the leader by providing the information. In a didactic conversation, a leader of the conversation may control information desired by a supporter of the conversation. The supporter's role may be limited to regulating an overall progression of the conversation and interjecting queries for clarification. In an exploratory conversation, both participants share leader and supporter roles, and the conversation may have no specific goal, or the goal may be improvised as the conversation progresses. Based on this model, Intelligent Hypothesis Builder **310** may broadly categorize a conversation (or utterance) according to the following diagram:

QUERY

	Participant A User	Participant B Voice User Interface
GOAL	Get information/action	Provide information/action
ROLE	Leader/Consumer	Supporter/Dispenser
INFORMATION	Less	More
ALLOCATION		

DIDACTIC

	Participant A User	Participant B Voice User Interface
GOAL	Get information	Provide information
ROLE	Follower/Consumer	Leader/Dispenser
INFORMATION	Less	More
ALLOCATION		

EXPLORATORY

	Participant A User	Participant B Voice User Interface
GOAL	Gather/share information	Gather/share information
ROLE	Follower/Consumer and Leader/Dispenser	Follower/Consumer and Leader/Dispenser
INFORMATION	Equal or alternating	Equal or alternating
ALLOCATION		

Intelligent Hypothesis Builder **310** may use an identified conversation type to assist in generating a set of hypotheses as to a user's intent in an utterance. In addition, Intelligent Hypothesis Builder **310** may use short-term shared knowledge from the Session Input Accumulator to proactively build and evaluate interaction with a user as a conversation progresses, as well as long-term shared knowledge to proactively build and evaluate interaction with the user over time. Intelligent Hypothesis Builder **310** may thus adaptively arrive at a set of N-best hypotheses about user intent, and the N-best hypotheses may be provided to an Adaptive Response Builder **315**. In addition, Intelligent Hypothesis Builder **310** may model human-to-human interaction by calculating a degree of certainty for each of the hypotheses. That is, just as humans rely on knowledge shared by participants to examine how much and what kind of information was available, Intelligent Hypothesis Builder **310** may leverage the identified conversation type and short-term and long-term shared knowledge to generate a degree of certainty for each hypothesis.

According to another aspect of the invention, Intelligent Hypothesis Builder **310** may generate one or more explicit hypotheses of a user's intent when an utterance contains all information (including qualifiers) needed to complete a request or task. Each hypothesis may have a corresponding degree of certainty, which may be used to determine a level of unprompted support to provide in a response. For example, a response may include a confirmation to ensure the utterance was not misunderstood or the response may adaptively prompt a user to provide missing information.

According to another aspect of the invention, Intelligent Hypothesis Builder **310** may use short-term knowledge to generate one or more implicit hypotheses of a user's intent when an utterance may be missing required qualifiers or other information needed to complete a request or task. Each hypothesis may have a corresponding degree of certainty. For instance, when a conversation begins, short-term knowledge stored in the Session Input Accumulator may be empty, and as the conversation progresses, the Session Input Accumulator may build a history of the conversation. Intelligent Hypothesis Builder **310** may use data in the Session Input Accumulator to supplement or infer additional information about a current utterance. For example, Intelligent Hypothesis Builder **310** may evaluate a degree of certainty based on a number of previous requests relevant to the current utterance. In another example, when the current utterance contains insufficient information to complete a request or task, data in the Session Input Accumulator may be used to infer missing information so that a hypothesis can be generated. In still another example, Intelligent Hypothesis Builder **310** may identify syntax and/or grammar to be used by Adaptive Response Builder **315** to formulate personalized and conversational response. In yet another example, when the current utterance contains a threshold amount of information needed to complete a request or task, data in the Session Input Accumulator may be relied upon to tune a degree of certainty.

According to another aspect of the invention, Intelligent Hypothesis Builder **310** may use long-term shared knowledge to generate one or more implicit hypotheses of a user's intent when an utterance is missing qualifiers or other information needed to complete a request or task. Each hypothesis may have a corresponding degree of certainty. Using long-term knowledge may be substantially similar to using short-term shared knowledge, except that information may be unconstrained by a current session, and an input mechanism may include information from additional sources other than conversational sessions. For example, Intelligent Hypothesis Builder **310** may use information from long-term shared knowledge at any time, even when a new conversation is initiated, whereas short-term shared knowledge may be limited to an existing conversation (where no short-term shared knowledge would be available when a new conversation is initiated). Long-term shared knowledge may come from several sources, including user preferences or a plug-in data source (e.g., a subscription interface to a remote database), expertise of a user (e.g., based on a frequency of errors, types of tasks requested, etc., the user may be identified as a novice, intermediate, experienced, or other type of user), agent-specific information and/or language that may also apply to other

agents (e.g., by decoupling information from an agent to incorporate the information into other agents), frequently used topics passed in from the Session Input Accumulator, frequently used verbs, nouns, or other parts of speech, and/or other syntax information passed in from the Session Input Accumulator, or other sources of long-term shared knowledge may be used.

According to another aspect of the invention, knowledge-enabled utterances, as generated by Intelligent Hypothesis Builder **310**, may include one or more explicit (supplied by a user), and one or more implicit (supplied by Intelligent Hypothesis Builder **310**) contextual signifiers, qualifiers, criteria, and other information that can be used to identify and evaluate relevant tasks. At that point, Intelligent Hypothesis Builder **310** may provide an input to Adaptive Response Builder **315**. The input received by Adaptive Response Builder **315** may include at least a ranked list of hypotheses, including explicit and/or implicit hypotheses, each of which may have a corresponding degree of certainty. A hypothesis may be assigned one of four degrees of certainty: (1) "sure," where contextual signifiers and qualifiers relate to one task, context and qualifiers relate to one task, and a confidence level associated with a preliminary interpretation generated at the speech recognition engine exceeds a predetermined threshold; (2) "pretty sure," where contextual signifiers and qualifiers relate to more than one task (select top-ranked task) and criteria relates to one request, and/or the confidence level associated with the preliminary interpretation generated at the speech recognition engine is below the predetermined threshold; (3) "not sure," where additional contextual signifiers or qualifiers are needed to indicate or rank a task; and (4) "no hypothesis," where little or no information can be deciphered. Each degree of certainty may further be classified as explicit or implicit, which may be used to adjust a response. The input received by Adaptive Response Builder **310** may also include a context, user syntax and/or grammar, context domain agent specific information and/or preferences (e.g., a travel context domain agent may know a user frequently requests information about France, which may be shared with a movie context domain agent so that responses may occasionally include French movies).

According to another aspect of the invention, Adaptive Response Builder **315** may build syntactically, grammatically, and contextually sensitive "intelligent responses" that can be used with one or more agents to generate a conversational experience for a user, while also guiding the user to reply in a manner favorable for recognition. In one implementation, the intelligent responses may include a verbal or audible reply played through an output device (e.g., a speaker), and/or an action performed by a device, computer, or machine (e.g., downloading a web page, showing a list, executing an application, etc.). In one implementation, an appropriate response may not require conversational adaptation, and default replies and/or randomly selected response sets for a given task may be used.

According to another aspect of the invention, Adaptive Response Builder **310** may draw on information maintained by Intelligence Hypothesis Builder **310** to generate responses that may be sensitive to context, task recognition of a current utterance, what a user already knows about a topic, what an application already knows about the topic, shared knowledge regarding user preferences and/or related topics, appropriate contextual word usage (e.g., jargon), words uttered by the user in recent utterances, conversational development and/or course correction, conversational tone, type of conversation, natural variation in wording of responses, or other information. As a result, Adaptive Response Builder **315** may generate intelligent responses that create conversational feel, adapt to information that accumulates over a duration of a conversation, maintain cross-modal awareness, and keep the conversation on course.

According to another aspect of the invention, Adaptive Response Builder **315** may create a conversational feel by adapting to a user's manner of speaking, framing responses appropriately, and having natural variation and/or personality (e.g., by varying tone, pace, timing, inflection, word use, jargon, and other variables in a verbal or audible response). Adapting to a user's manner of speaking may include using contextual signifiers and grammatical rules to generate one or more sentences for use as response sets that may cooperate with the user. By taking advantage of short-term (from the Session Input Accumulator) and long-term (from one or more profiles) shared knowledge about how a user utters a request, the responses may be modeled using techniques used to recognize requests. Adaptive Response Builder **315** may rate possible responses statistically and/or randomize responses, which creates an opportunity to build an exchange with natural variation and conversational feel. This may be a significant advantage over existing voice user interfaces with incongruous input and output, where the input is "conversational" and the output is "computerese." The following examples may demonstrate how a response may adapt to a user's input word choices and manner of speaking:

User	Do you know [mumbled words] Seattle [more mumbled words]?
Voice User Interface	Did you want Seattle sports scores, weather, traffic, or news?

User	Find me [mumbled words] Seattle [more mumbled words]?
Voice User Interface	I found Seattle, did you want sports scores, weather, traffic, or news?

User	Get me [mumbled words] Seattle [more mumbled words]?
Voice User Interface	I've got Seattle, did you want me to get sports scores, weather, traffic, or news?

According to another aspect of the invention, Adaptive Response Builder **315** may frame responses to influence a user to reply with an utterance that may be easily recognized. For example, a user may utter, "Get me the news" and a voice user interface response may be "Which of these categories? Top news stories, international news, political news, or sports news?" The response may be likely to illicit utterances from the user, such as "Top news stories" or "International news," which are more likely to result in a completed request. Thus, the responses may conform to a cooperative nature of human dialog, and a natural human tendency to "parrot" what was just heard as part of a next utterance. Moreover, knowledge of current context may enhance responses to generate more meaningful conversational responses, such as in the following exchange:

User	What's the weather like in Dallas?
Voice User	In Dallas, it's sunny and 90 degrees.

-continued

Interface	
User	What theaters are showing the movie "The Fantastic Four" there?
Voice User Interface	10 theaters in Dallas are showing "The Fantastic Four." Do you want show times for a particular theater?

Framing the responses may also deal with misrecognitions according to human models. For example, humans frequently remember a number of recent utterances, especially when one or more previous utterances were misrecognized or unrecognized. Another participant in the conversation may limit correction to a part of the utterance that was misrecognized or unrecognized, or over subsequent utterances and/or other interactions, clues may be provided to indicate the initial interpretation was incorrect. Thus, by storing and analyzing multiple utterances, utterances from earlier in a conversation may be corrected as the conversation progresses.

According to another aspect of the invention, Adaptive Response Builder **315** may generate multi-modal, or cross-modal, responses to a user. In one implementation, responses may be aware of and control one or more devices and/or interfaces, and users may respond by using whichever input method, or combination of input methods, is most convenient. For example, a response asking the user to direct an utterance with a "Yes" or "No" in a multi-modal environment may also display alternatives visually.

According to another aspect of the invention, Adaptive Response Builder **315** may correct a course of a conversation without interrupting conversational flow. Adaptive Response Builder **315** may generate intelligent responses based on the ranked list of hypotheses and corresponding degrees of certainty, which may be used to correct a course of a conversation without interrupting conversational flow. That is, even though the intelligent responses may be reasonably "sure," the intelligent responses may nonetheless sometimes be incorrect. While existing voice user interfaces tend to fail on average conversational missteps, normal human interactions may expect missteps and deal with them appropriately. Thus, responses after a misrecognition may be modeled after clarifications, rather than errors, and words may chosen in subsequent responses that move conversation forward and establish an appropriate domain to be explored with the user. For example, course correction may result in the following exchange:

User	Can you get [mumbled words here] Mariners [more mumbled words]?
Voice User Interface	I've got the score for the Mariners game? 4-2 Mariners.
User	No, the start time for tomorrow's game.
Voice User Interface	Oh, 7:05.

The above disclosure has been described in terms of specific exemplary aspects, implementations, and embodiments of the invention. However, those skilled in the art will recognize various changes and modifications that may be made without departing from the scope and spirit of the invention. Therefore, the specification and drawings are to be regarded as exemplary only, and the scope of the invention is to be determined solely by the appended claims.

What is claimed is:

1. A computer-implemented method of facilitating conversation-based responses, the method being implemented by a computer system that includes one or more physical processors executing one or more computer program instructions which, when executed, perform the method, the method comprising:

receiving, at the computer system, a natural language utterance during a conversation between a user and the computer system;

identifying, by the computer system, a first model that includes short-term knowledge about the conversation, wherein the short-term knowledge is based on one or more prior natural language utterances received during the conversation;

identifying, by the computer system, based on the short-term knowledge, context information for the natural language utterance;

determining, by the computer system, based on the context information, an interpretation of the natural language utterance; and

generating, by the computer system, based on the interpretation of the natural language utterance, a response to the natural language utterance.

2. The method of claim **1**, wherein determining the interpretation of the natural language utterance comprises determining, based on the context information, an interpretation of one or more recognized words of the natural language utterance.

3. The method of claim **1**, further comprising:

updating, by the computer system, based on information about the natural language utterance, during the conversation, the short-term knowledge in the first model,

wherein the updated short-term knowledge is used to determine subsequent context information for one or more subsequent natural language utterances received during the conversation.

4. The method of claim **1**, further comprising:

identifying, by the computer system, a second model that includes long-term knowledge about one or more prior conversations between the user and the computer system,

wherein determining the context information comprises determining, based on the short-term knowledge and the long-term knowledge, the context information.

5. The method of claim **4**, further comprising:

updating, by the computer system, based on information about the natural language utterance, the long-term knowledge in the second model,

wherein the updated long-term knowledge is used to determine subsequent context information for one or more subsequent natural language utterances received during the conversation.

6. The method of claim **5**, wherein the updated long-term knowledge is used to determine subsequent context information for one or more subsequent conversations.

7. The method of claim **1**, further comprising:

identifying, by the computer system, based on the short-term knowledge, a manner in which the natural language utterance is spoken,

wherein generating the response comprises generating, based on the identified manner and the interpretation of the natural language utterance, the response.

8. The method of claim **7**, further comprising:

identifying, by the computer system, a second model that includes long-term knowledge about one or more prior conversations between the user and the computer system,

wherein identifying the manner comprises identifying, based on the short-term knowledge and the long-term knowledge, the manner.

9. The method of claim 7, wherein generating the response comprises generating, based on a response format associated with the identified manner, the response.

10. The method of claim 1, wherein the natural language utterance and the one or more prior natural language utterances are associated with the user.

11. A system for facilitating conversation-based responses, the system comprising:

one or more physical processors programmed with one or more computer program instructions such that, when executed, the one or more computer program instructions cause the one or more physical processors to:

receive a natural language utterance during a conversation between a user and the system;

identify a first model that includes short-term knowledge about the conversation, wherein the short-term knowledge is based on one or more prior natural language utterances received during the conversation;

identify, based on the short-term knowledge, context information for the natural language utterance;

determine, based on the context information, an interpretation of the natural language utterance; and

generate, based on the interpretation of the natural language utterance, a response to the natural language utterance.

12. The system of claim 11, wherein determining the interpretation of the natural language utterance comprises determining, based on the context information, an interpretation of one or more recognized words of the natural language utterance.

13. The system of claim 11, wherein the one or more physical processors are caused to:

update, based on information about the natural language utterance, during the conversation, the short-term knowledge in the first model,

wherein the updated short-term knowledge is used to determine subsequent context information for one or more subsequent natural language utterances received during the conversation.

14. The system of claim 11, wherein the one or more physical processors are caused to:

identify a second model that includes long-term knowledge about one or more prior conversations between the user and the system,

wherein determining the context information comprises determining, based on the short-term knowledge and the long-term knowledge, the context information.

15. The system of claim 14, wherein the one or more physical processors are caused to:

update, based on information about the natural language utterance, the long-term knowledge in the second model,

wherein the updated long-term knowledge is used to determine subsequent context information for one or more subsequent natural language utterances received during the conversation.

16. The system of claim 15, wherein the updated long-term knowledge is used to determine subsequent context information for one or more subsequent conversations.

17. The system of claim 11, wherein the one or more physical processors are caused to:

identify, based on the short-term knowledge, a manner in which the natural language utterance is spoken,

wherein generating the response comprises generating, based on the identified manner and the interpretation of the natural language utterance, the response.

18. The system of claim 17, wherein the one or more physical processors are caused to:

identify a second model that includes long-term knowledge about one or more prior conversations between the user and the computer system,

wherein identifying the manner comprises identifying, based on the short-term knowledge and the long-term knowledge, the manner.

19. The system of claim 17, wherein generating the response comprises generating, based on a response format associated with the identified manner, the response.

20. The system of claim 11, wherein the natural language utterance and the one or more prior natural language utterances are associated with the user.

* * * * *

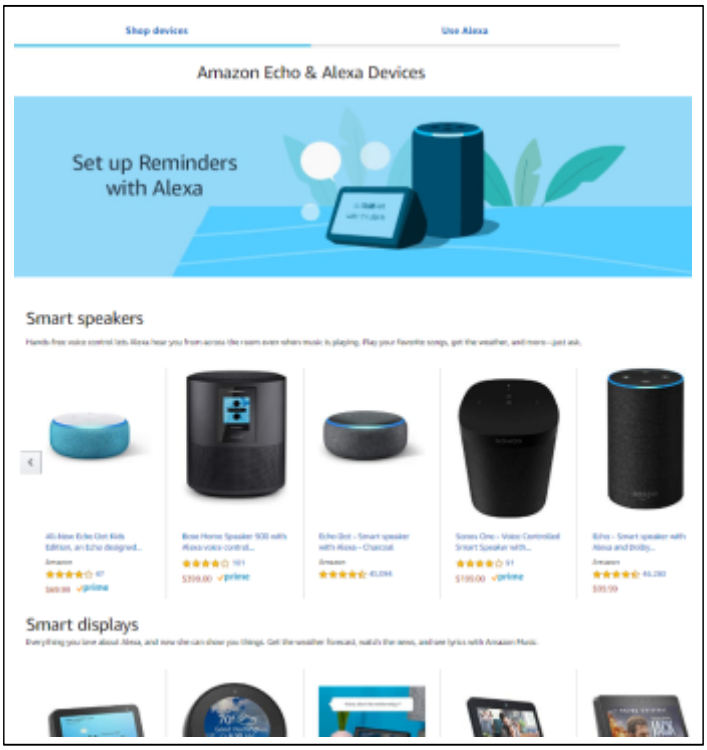
EXHIBIT F

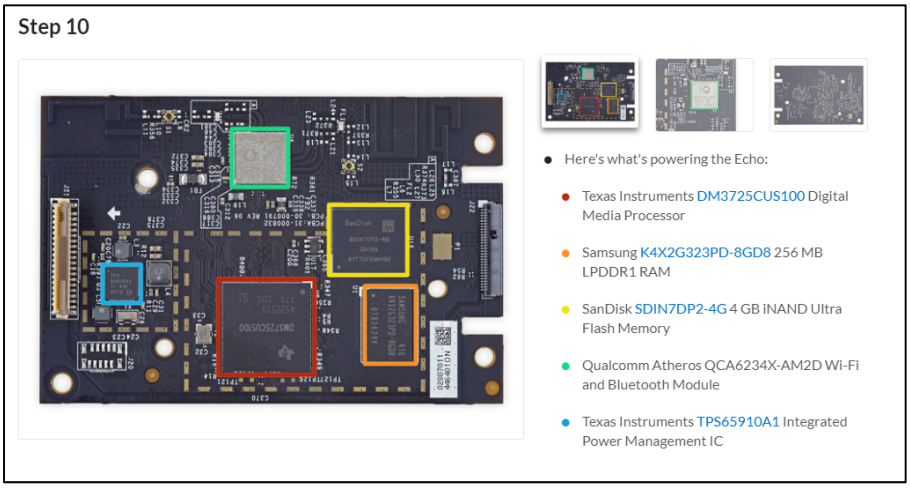
U.S. Pat. No. 9,015,049 ("the '049 patent")
Infringement Chart for Claim 11

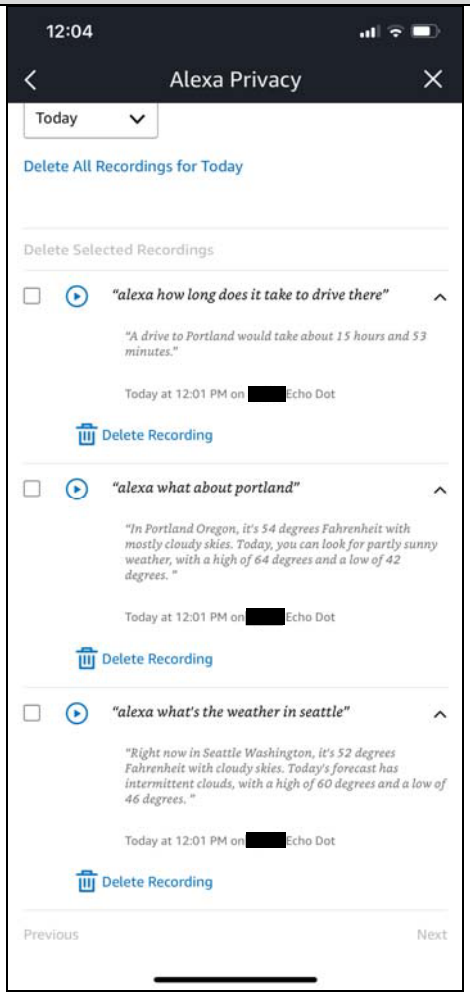
The following chart provides exemplary infringement allegations with respect to an exemplary claim of the '049 patent based on Plaintiff's investigation to date. Plaintiff reserves the right to provide modified and/or more detailed allegations (including with additional claims, products, and evidence) in accordance with its discovery obligations in view of any applicable scheduling order. This chart uses "Alexa Products" to refer to the full scope of instrumentalities identified in the complaint. Any discussion of specific Alexa Products in the following chart is exemplary.

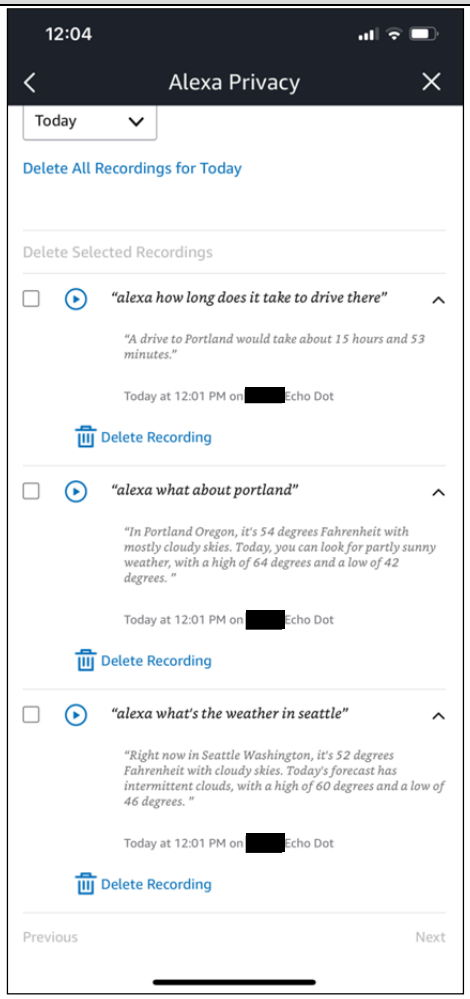
Exemplary information relevant to infringement:

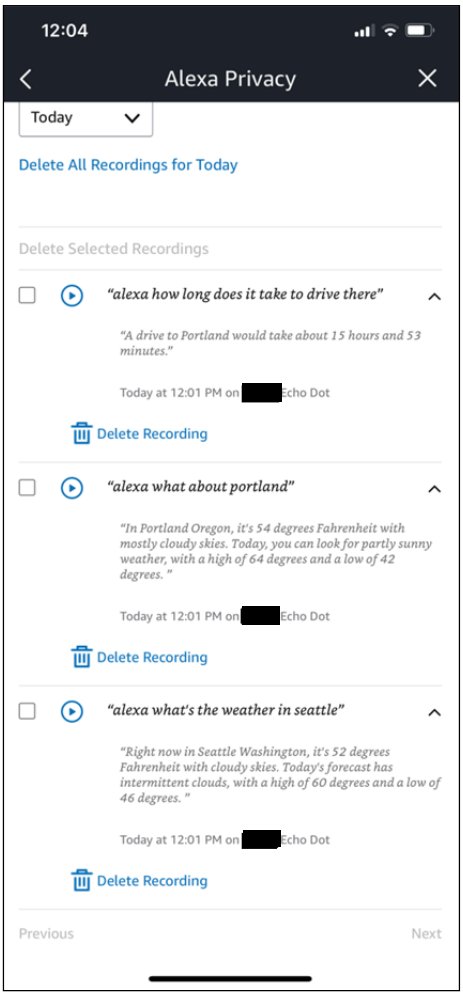
1. *Amazon Echo & Alexa Devices* - Amazon Official Site, https://www.amazon.com/Amazon-Echo-And-Alexa-Devices/b/?ie=UTF8&node=9818047011&ref_=sv_devicesubnav_1 (last visited Jul. 22, 2019)
2. *Alexa and Alexa Device FAQs*, Amazon Help & Customer Service - Amazon Official Site, https://www.amazon.com/gp/help/customer/display.html?nodeId=201602230 (last visited Jul. 22, 2019)
3. *Use Alexa > Alexa Features > Entertainment*, Amazon.com, https://www.amazon.com/b/ref=aeg_flp_ent_text/ref=s9_acss_bw_cg_aegflp_md1_w?node=17934676011&pf_rd_m=ATVPDKIKX0DER&pf_rd_s=merchandised-search-6&pf_rd_r=52PC5VKKVN8N50VH8CXF&pf_rd_t=101&pf_rd_p=6414bf70-6ba0-4f3e-9138-998f49588b76&pf_rd_i=17934672011 (last visited Jul. 22, 2019)
4. Sarah Perez, *Alexa will soon gain a memory, converse more naturally, and automatically launch skills*, TechCrunch, Apr. 26, 2018, https://techcrunch.com/2018/04/26/alexa-will-soon-gain-a-memory-converse-more-naturally-and-automatically-launch-skills/ ("*Alexa will soon gain a memory*")
5. Ruhi Sarikaya, *Making Alexa More Friction-Free*, Apr. 25, 2018 post on Alexa Blogs, https://developer.amazon.com/blogs/alexa/post/60e1f011-3236-4162-b0f6-509205d354ca/making-alexa-more-friction-free
6. Arpit Gupta, *How Alexa Is Learning to Converse More Naturally*, Aug. 27, 2018 post on Alexa Blogs, https://developer.amazon.com/blogs/alexa/post/15bf7d2a-5e5c-4d43-90ae-c2596c9cc3a6/how-alexa-is-learning-to-converse-more-naturally ("*How Alexa is Learning*")
7. Kyle Wiggers, *Amazon researchers share how AI helps Alexa answer follow-up questions*, VentureBeat, August 27, 2018, https://venturebeat.com/2018/08/27/amazon-researchers-share-how-ai-helps-alexa-answer-follow-up-questions/ ("*AI helps Alexa*")
8. *What is Conversational AI?*, Amazon Alexa - Amazon Developer Services and Technologies - Amazon Official Site, https://developer.amazon.com/alexa-skills-kit/conversational-ai (last visited Jul. 22, 2019)
9. *Audio Hardware Configurations*, Amazon Alexa - Amazon Developer Services and Technologies - Amazon Official Site, https://developer.amazon.com/docs/alexa-voice-service/audio-hardware-configurations.html (last visited Jul. 22, 2019)
10. *Designing for Conversation – Build for dialog*, Amazon Alexa - Amazon Developer Services and Technologies - Amazon Official Site, https://developer.amazon.com/ask-resources/guided/conversational-design-workshop#/lessons/gDcQVF9nOFOtNljrELzARIGN4HuD7LNh?_k=q4qp1a (last visited Jul. 22, 2019)
11. *Amazon Echo Teardown*, IFIXIT, Dec. 16, 2014, https://www.ifixit.com/Teardown/Amazon+Echo+Teardown/33953

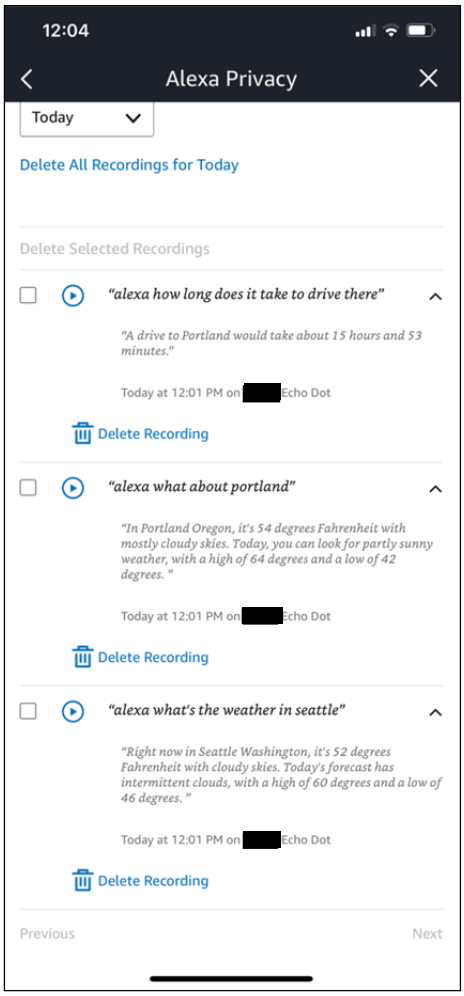
'049 Patent Claim Language	**Exemplary Alexa Products**
11.[pr] A system for facilitating conversation-based responses, the system comprising:	Alexa Products include a system for facilitating conversation-based responses. For example, Alexa Products (e.g. Echo, Echo Dot, Alexa apps, and Alexa cloud) include Alexa.  E.g. *Amazon Echo & Alexa Devices*. "With conversational AI, voice-enabled devices like Amazon Echo . . . ." E.g. *What is Conversational AI?* Alexa is connected to Amazon's Alexa cloud. "Alexa allows you to ask questions and make requests using just your voice. For instance, you can ask Alexa a question, such as "What is the weather today in New York?", or tell Alexa to do something, like "Add batteries to my shopping list," or "Play jazz." When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud so we can process and respond to your request." E.g. *Alexa and Alexa Device FAQs* at answer to question 1. "When it comes to connecting you to everything you're into, Alexa is at home anywhere. Whether you want to listen to music, books, radio stations, or podcasts, all you have to do is ask. In the mood for games, movies, or a good laugh? Let Alexa connect the dots between all the things you love." *Use Alexa > Alexa Features > Entertainment.*
[11.a] one or more physical processors programmed with one or more computer program instructions such that, when executed, the one or more computer program instructions	Alexa Products include one or more physical processors programmed with one or more computer program instructions such that, when executed, the one or more computer program instructions cause the one or more physical processors to perform the operations recited in the claim.

'049 Patent Claim Language	Exemplary Alexa Products
cause the one or more physical processors to:	For example, the Echo has the physical processors shown below:  E.g. *Amazon Echo Teardown* at Step 10. As another example, Alexa Products include Amazon's Alexa cloud that has one or more physical processors: "When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud where we process your request and other information to respond to you. For example, when you ask "Alexa, play top hits on Amazon Music" we use the recording of your request and information from Amazon Music to play top hits." *Alexa and Alexa Device FAQs* at answer to question 2. Below are more examples. "Alexa uses a combination of automatic speech recognition (ASR) and natural language understanding (NLU) to understand user speech and respond with precision. ASR converts user speech into text, NLU converts that text into intents for Alexa to act on. At the end of this process Alexa sends directives to your product instructing it to perform an action..." *Audio Hardware Configurations* at Automatic Speech Recognition Profiles. "The correct hardware configuration and audio processing algorithms can improve your product's listening sensitivity for the wake word Alexa." *Audio Hardware Configurations* at Hardware and Audio Algorithms.
[11.b] receive a natural language utterance during a conversation between a user and the system;	Alexa Products receive a natural language utterance during a conversation between a user and the system. Examples are receiving the utterances shown in a screenshot of Alexa app's "Review Voice History" page below.

'049 Patent Claim Language	Exemplary Alexa Products
	 Below are more examples. "Alexa allows you to ask questions and make requests using just your voice. For instance, you can ask Alexa a question, such as "What is the weather today in New York?", or tell Alexa to do something, like "Add batteries to my shopping list," or "Play jazz." When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud so we can process and respond to your request." E.g. *Alexa and Alexa Device FAQs* at answer to question 1. "Each line of the script spoken by the user is known as an utterance. The utterances are then mapped to an intent. When the user speaks one of them the associated intent will be invoked." *Designing for Conversation – Build for dialog* at Step 2.
[11.c] identify a first model that includes short-term knowledge about the conversation, wherein the short-term knowledge is based on one or more prior natural language utterances received during the conversation;	Alexa Products identify a first model that includes short-term knowledge about the conversation, wherein the short-term knowledge is based on one or more prior natural language utterances received during the conversation. An example is identifying a model that includes short term knowledge based on a prior natural language utterance ("alexa what's the weather in seattle" or "alexa what about portland") received during the conversation, as shown in a screenshot of Alexa app's "Review Voice History" page below.

'049 Patent Claim Language	Exemplary Alexa Products
	 Below are more examples. "Conversations are not isolated occurrences. They build on previous questions and answers, whether from five minutes or five days ago. When appropriate, voice-first experiences should account for prior context to make the conversation more engaging or relevant to the user." *What is Conversational AI?* "Alexa will soon be able to have more natural conversations with users, thanks to something called 'context carryover.' This means that Alexa will be able to understand follow-up questions and respond appropriately..." *Alexa will soon gain a memory*. "For instance, you could ask "Alexa, how is the weather in Seattle?" and then ask, "What about this weekend?" after Alexa responds." *Alexa will soon gain a memory*. "You can even change the subject, saying "Alexa, how's the weather in Portland?" then "How long does it take to get there?" *Alexa will soon gain a memory*.
[11.d] identify, based on the short-term knowledge, context information for the natural language utterance;	Alexa Products identify, based on the short-term knowledge, context information for the natural language utterance. An example is identifying weather or location based on short-term knowledge as shown in a screenshot of Alexa app's "Review Voice

'049 Patent Claim Language	Exemplary Alexa Products
	History" page below.  Below are more examples. "Everyday conversations take many things into account besides just the words we speak, including why, when, and where we converse. When designing for voice, think about how you can provide context to provide a delightful conversation." *What is Conversational AI?* "Today, Alexa analyzes the semantic content of utterances according to the categories domain, intent, and slot." *How Alexa is Learning.* "The system consists of two parts, Gupta explained: (1) an encoder that produces summary vectors from conversation data, and (2) a decoder that calculates a confidence score for each slot. The two together "learn" slot names and all of their possible values to create embeddings — i.e., points in geometric space that represent strings of words — and then leverage a long short-term memory (LSTM) encoder (a neural network that accounts for the sequencing of data) to identify words helpful in determining candidate slot mapping." *AI helps Alexa*.
[11.e] determine, based on the context information, an interpretation of the natural language utterance; and	Alexa Products determine, based on the context information, an interpretation of the natural language utterance. An example is determining an interpretation of the utterance, as shown below in a screenshot of Alexa app's "Review Voice History" page

'049 Patent Claim Language	Exemplary Alexa Products
	below.  Below are more examples. "Today, Alexa analyzes the semantic content of utterances according to the categories domain, intent, and slot." *How Alexa is Learning*. "If, for instance, a customer says, "How far is it to Redmond?" and after the answer follows up by saying, "Find good Indian restaurants there", Alexa should be able to infer that "there" refers to Redmond." *How Alexa is Learning*. "The system consists of two parts, Gupta explained: (1) an encoder that produces summary vectors from conversation data, and (2) a decoder that calculates a confidence score for each slot. The two together "learn" slot names and all of their possible values to create embeddings — i.e., points in geometric space that represent strings of words — and then leverage a long short-term memory (LSTM) encoder (a neural network that accounts for the sequencing of data) to identify words helpful in determining candidate slot mapping." *AI helps Alexa*.

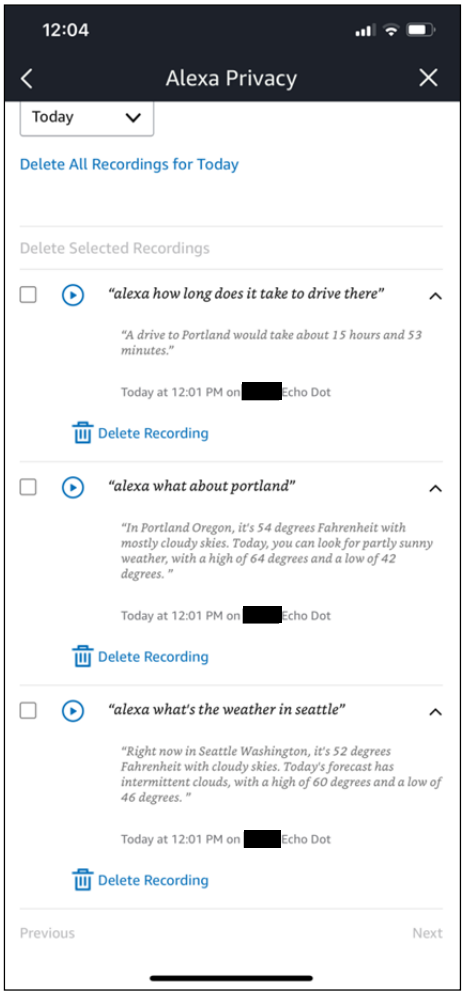
'049 Patent Claim Language	Exemplary Alexa Products
[11.f] generate, based on the interpretation of the natural language utterance, a response to the natural language utterance.	Alexa Products generate, based on the interpretation of the natural language utterance, a response to the natural language utterance. An example is one or more of the responses shown below in a screenshot of Alexa app's "Review Voice History" page below.  Below are more examples. "We are providing this more natural way of engaging with Alexa by adding deep learning models to our spoken language understanding (SLU) pipeline that allows us to carry customers' intent and entities within and across domains (i.e., between weather and traffic)." *Making Alexa More Friction-Free.* "Alexa will soon be able to have more natural conversations with users, thanks to something called 'context carryover.' This means that Alexa will be able to understand follow-up questions and respond appropriately..." *Alexa will soon gain a memory*.

EXHIBIT G

US009626703B2

(12) **United States Patent**
Kennewick, Sr.

(10) **Patent No.: US 9,626,703 B2**
(45) **Date of Patent: Apr. 18, 2017**

(54) **VOICE COMMERCE**

(71) Applicant: **VOICEBOX TECHNOLOGIES CORPORATION**, Bellevue, WA (US)

(72) Inventor: **Michael R. Kennewick, Sr.**, Bellevue, WA (US)

(73) Assignee: **VoiceBox Technologies Corporation**, Bellevue, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/855,334**

(22) Filed: **Sep. 15, 2015**

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Related U.S. Application Data

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(51) **Int. Cl.**

G06Q 30/06	(2012.01)
G10L 15/18	(2013.01)
G10L 15/22	(2006.01)

(52) **U.S. Cl.**

CPC ***G06Q 30/0601*** (2013.01); *G10L 15/18* (2013.01); *G10L 2015/223* (2013.01)

(58) **Field of Classification Search**

CPC G06Q 30/06; G06Q 30/0617; G06F 17/2785; G06F 17/3064

(Continued)

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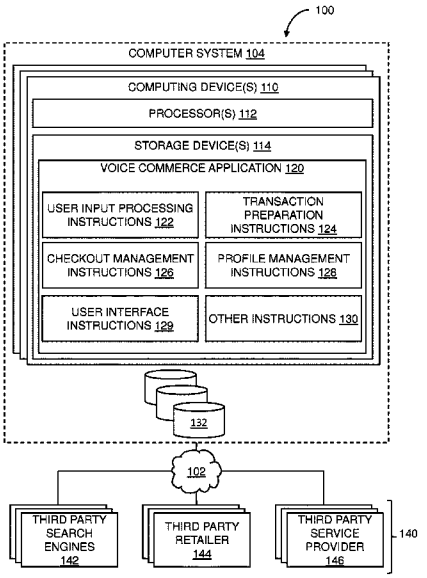
Primary Examiner — Mila Airapetian
(74) *Attorney, Agent, or Firm* — Sheppard Mullin Richter & Hampton LLP

(57) **ABSTRACT**

In certain implementations, a system for facilitating voice commerce is provided. A user input comprising a natural language utterance related to a product or service to be purchased may be received. A first product or service that is to be purchased may be determined based on the utterance. First payment information that is to be used to purchase the first product or service may be obtained. First shipping information that is to be used to deliver the first product or service may be obtained. A purchase transaction for the first product or service may completed based on the first payment information and the first shipping information without further user input, after the receipt of utterance, that identifies a product or service type or a product or service, seller information, payment information, shipping information, or other information related to purchasing the first product or service.

33 Claims, 6 Drawing Sheets



(58) **Field of Classification Search**
USPC 707/713; 704/10; 379/88.01, 88.1; 705/26.1
See application file for complete search history.

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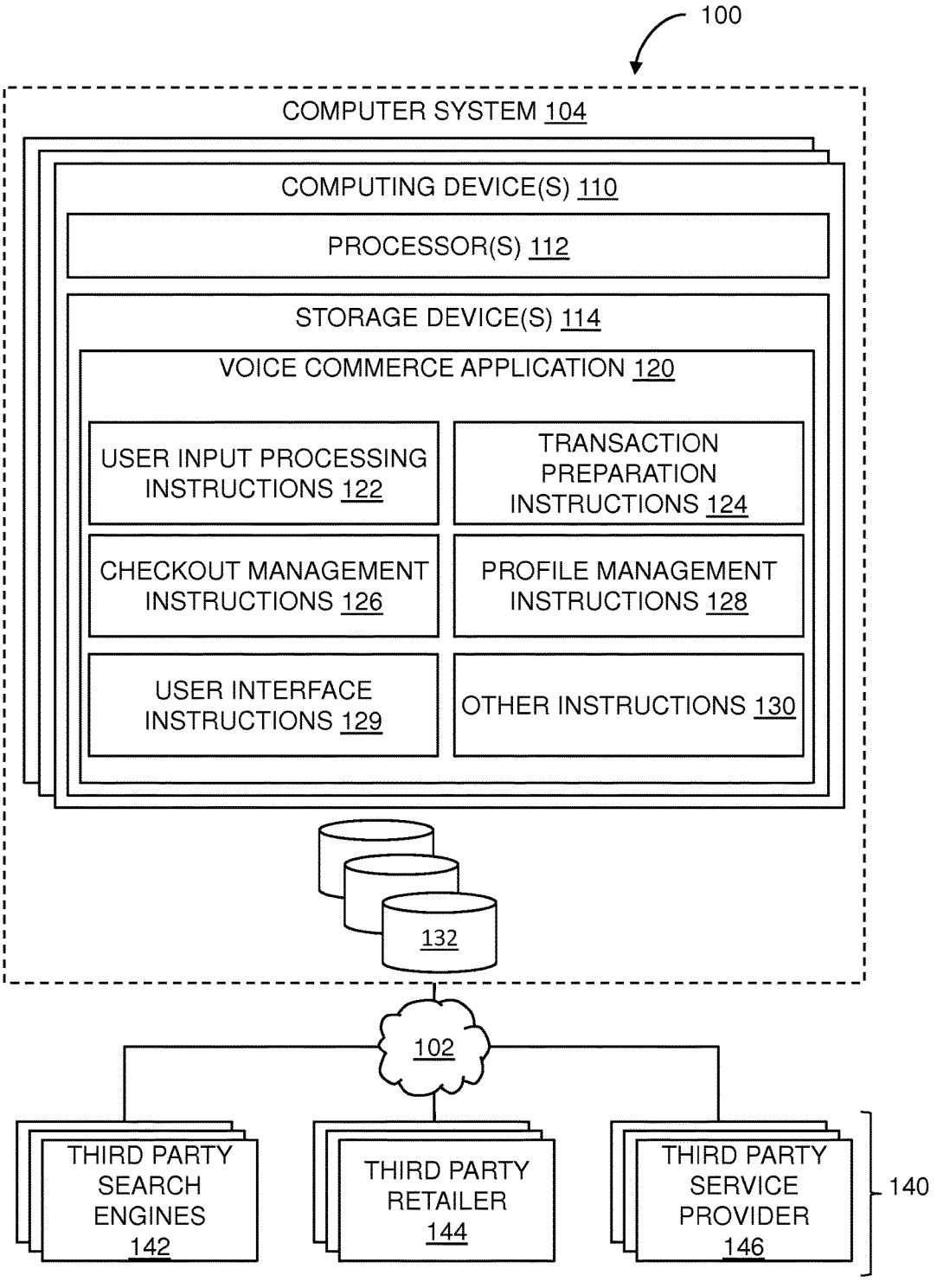
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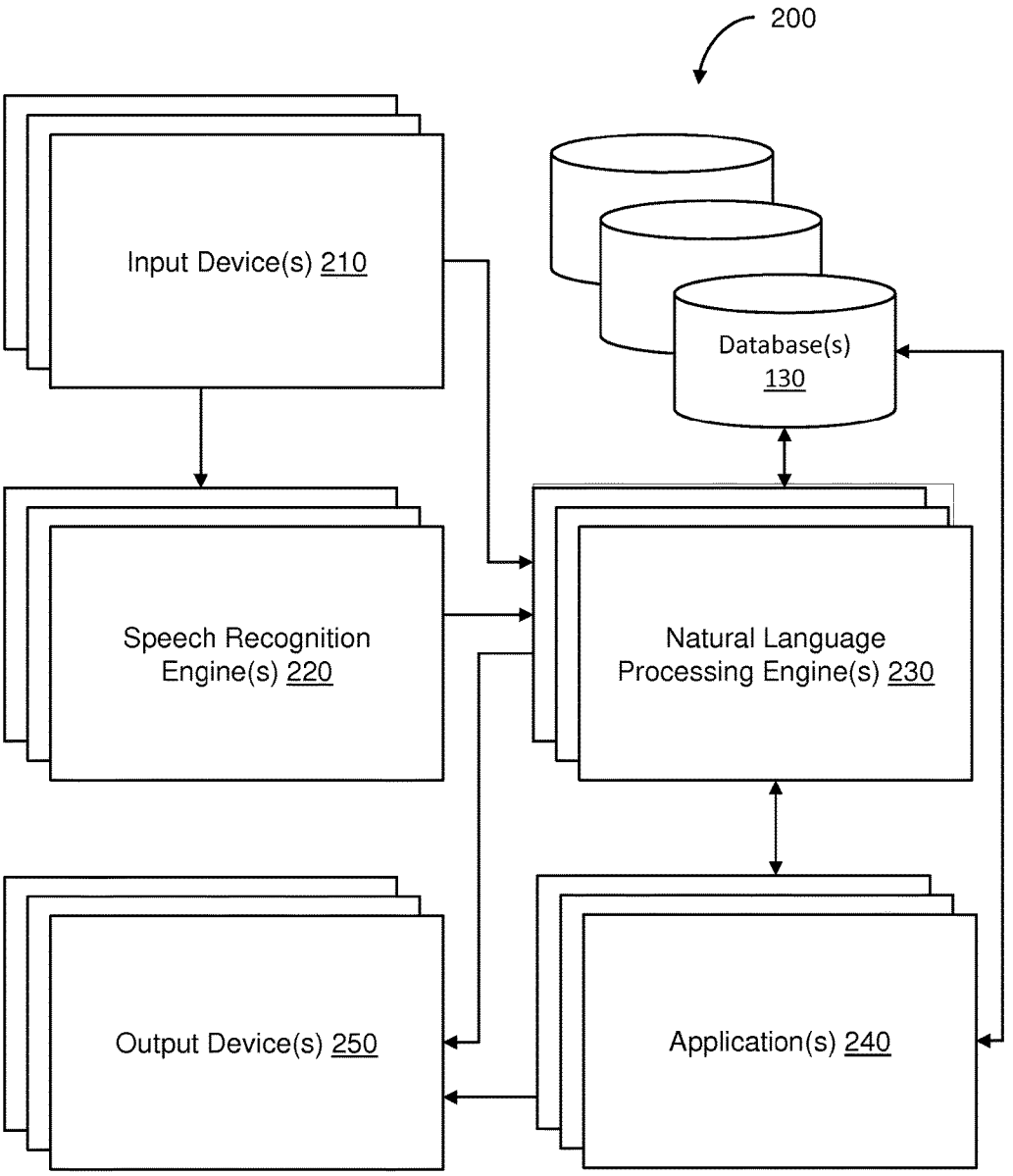
COMPUTING DEVICE(S) 110
PROCESSOR(S) 112
STORAGE DEVICE(S) 114
VOICE COMMERCE APPLICATION 120
USER INPUT PROCESSING INSTRUCTIONS 122
TRANSACTION PREPARATION INSTRUCTIONS 124
CHECKOUT MANAGEMENT INSTRUCTIONS 126
PROFILE MANAGEMENT INSTRUCTIONS 128
USER INTERFACE INSTRUCTIONS 129
OTHER INSTRUCTIONS 130
132
102
THIRD PARTY SEARCH ENGINES 142
THIRD PARTY RETAILER 144
THIRD PARTY SERVICE PROVIDER 146
140

FIG. 1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Database(s) 130
Speech Recognition Engine(s) 220
Natural Language Processing Engine(s) 230
Output Device(s) 250
Application(s) 240

FIG. 2

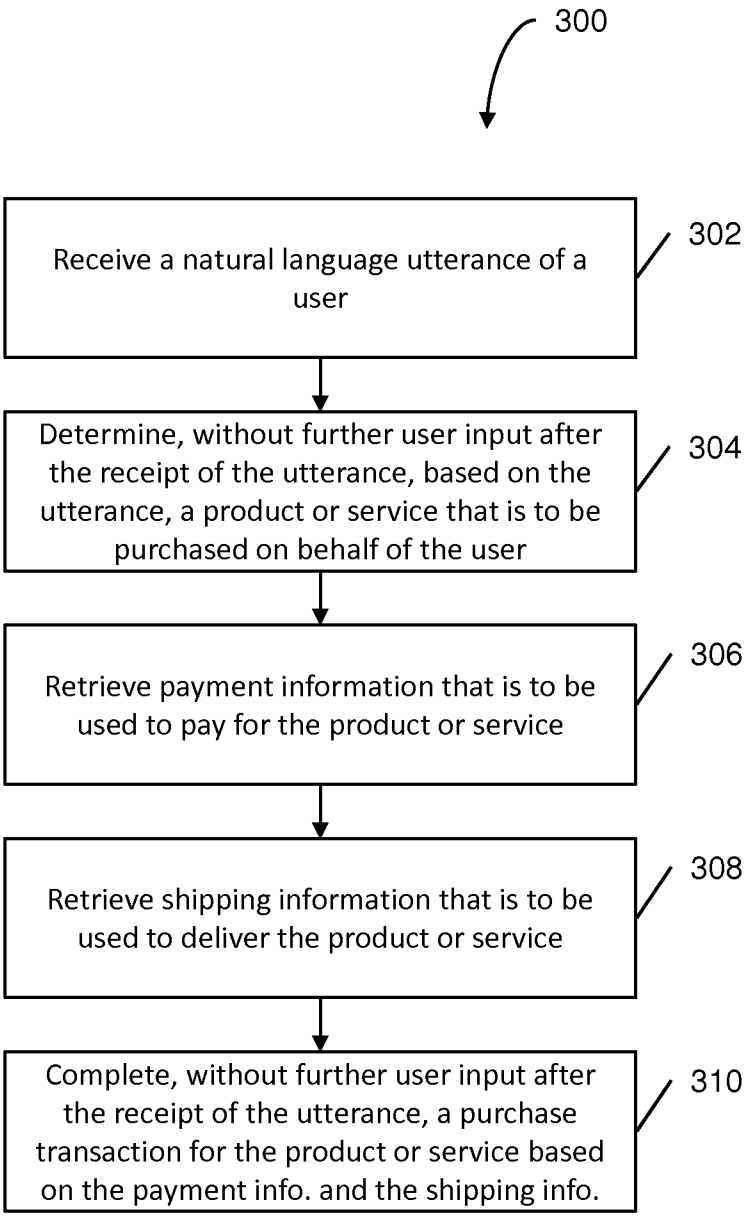

300
Receive a natural language utterance of a user
302
Determine, without further user input after the receipt of the utterance, based on the utterance, a product or service that is to be purchased on behalf of the user
304
Retrieve payment information that is to be used to pay for the product or service
306
Retrieve shipping information that is to be used to deliver the product or service
308
Complete, without further user input after the receipt of the utterance, a purchase transaction for the product or service based on the payment info. and the shipping info.
310

FIG. 3

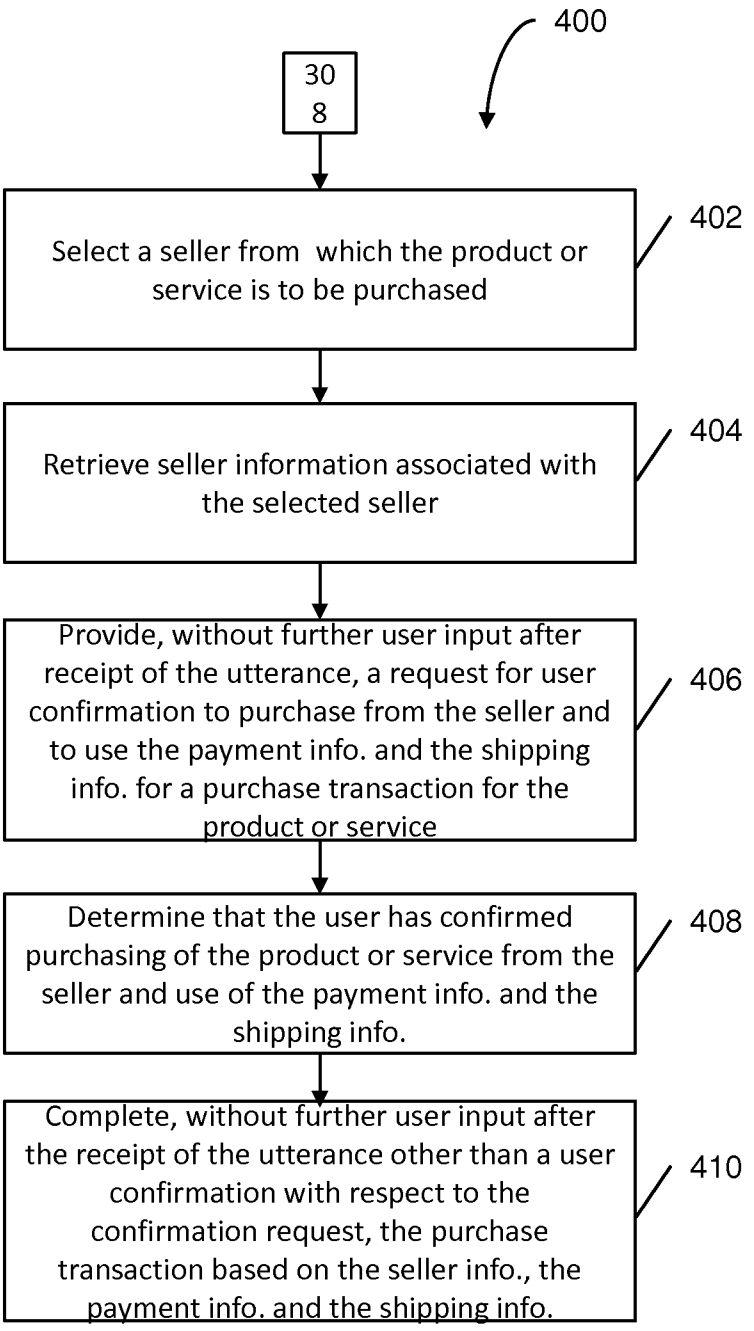

400
308
Select a seller from which the product or service is to be purchased
402
Retrieve seller information associated with the selected seller
404
Provide, without further user input after receipt of the utterance, a request for user confirmation to purchase from the seller and to use the payment info. and the shipping info. for a purchase transaction for the product or service
406
Determine that the user has confirmed purchasing of the product or service from the seller and use of the payment info. and the shipping info.
408
Complete, without further user input after the receipt of the utterance other than a user confirmation with respect to the confirmation request, the purchase transaction based on the seller info., the payment info. and the shipping info.
410

FIG. 4

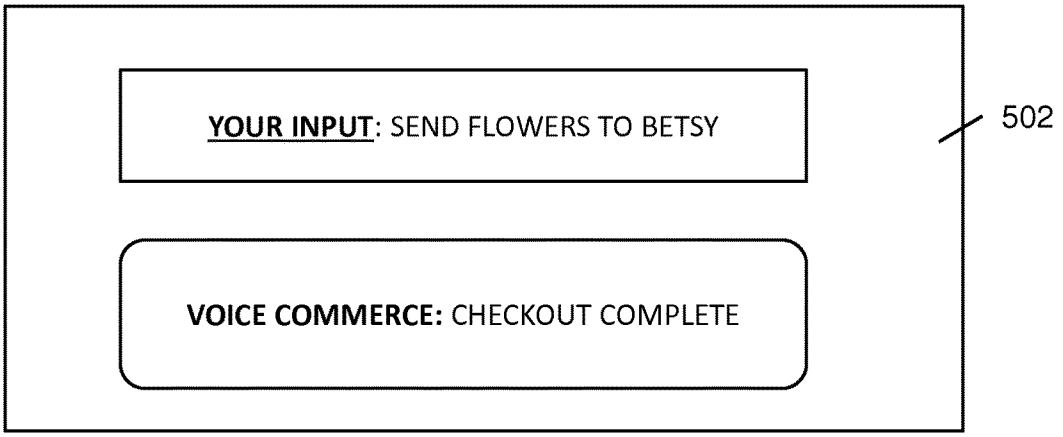


FIG. 5

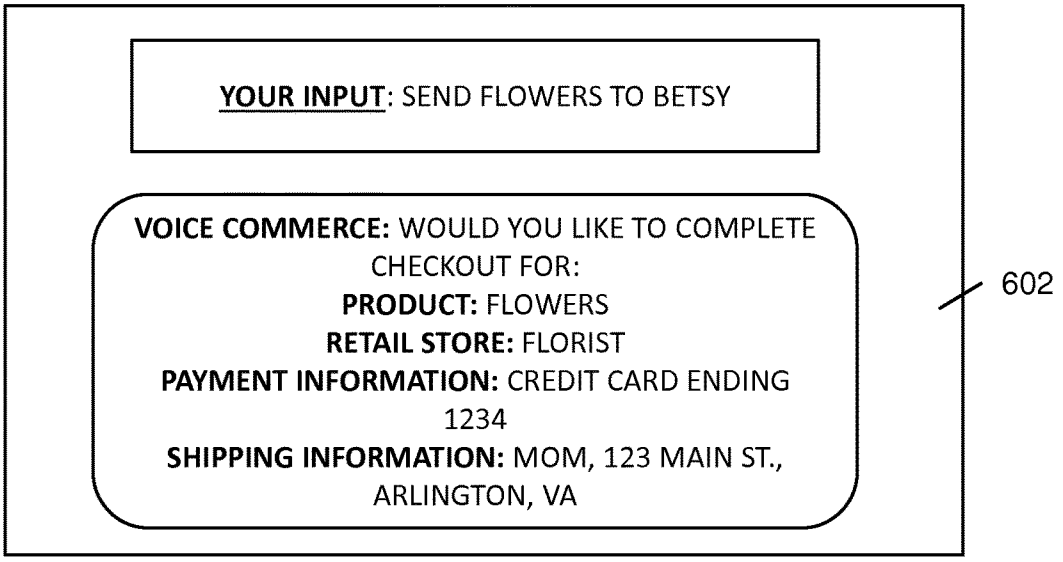


FIG. 6A

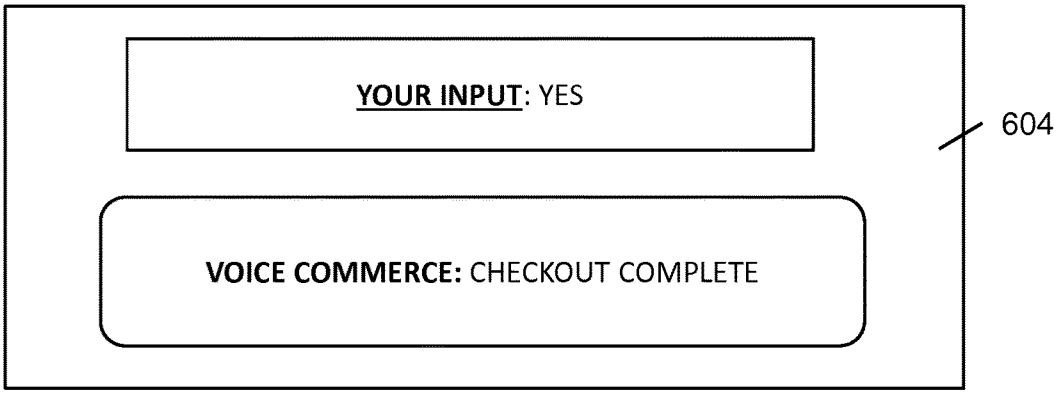


FIG. 6B

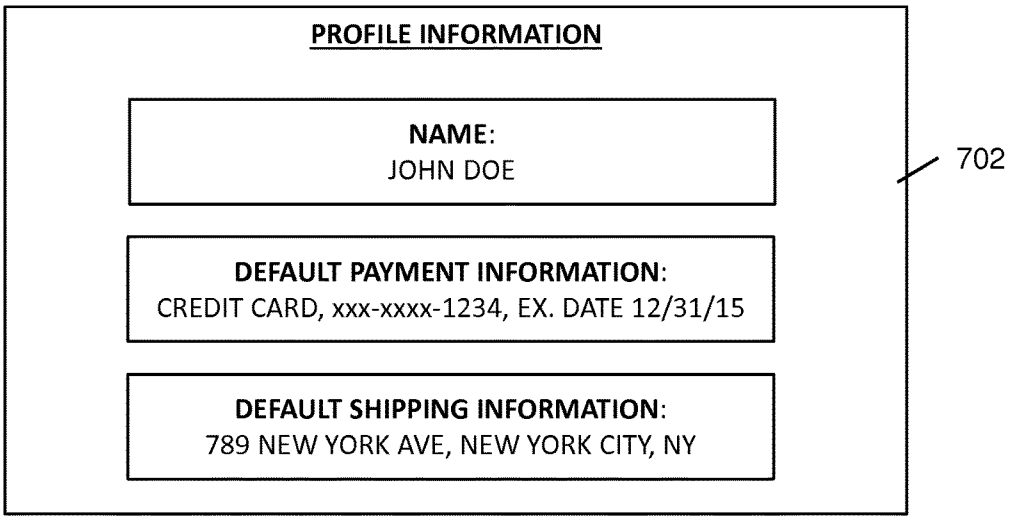
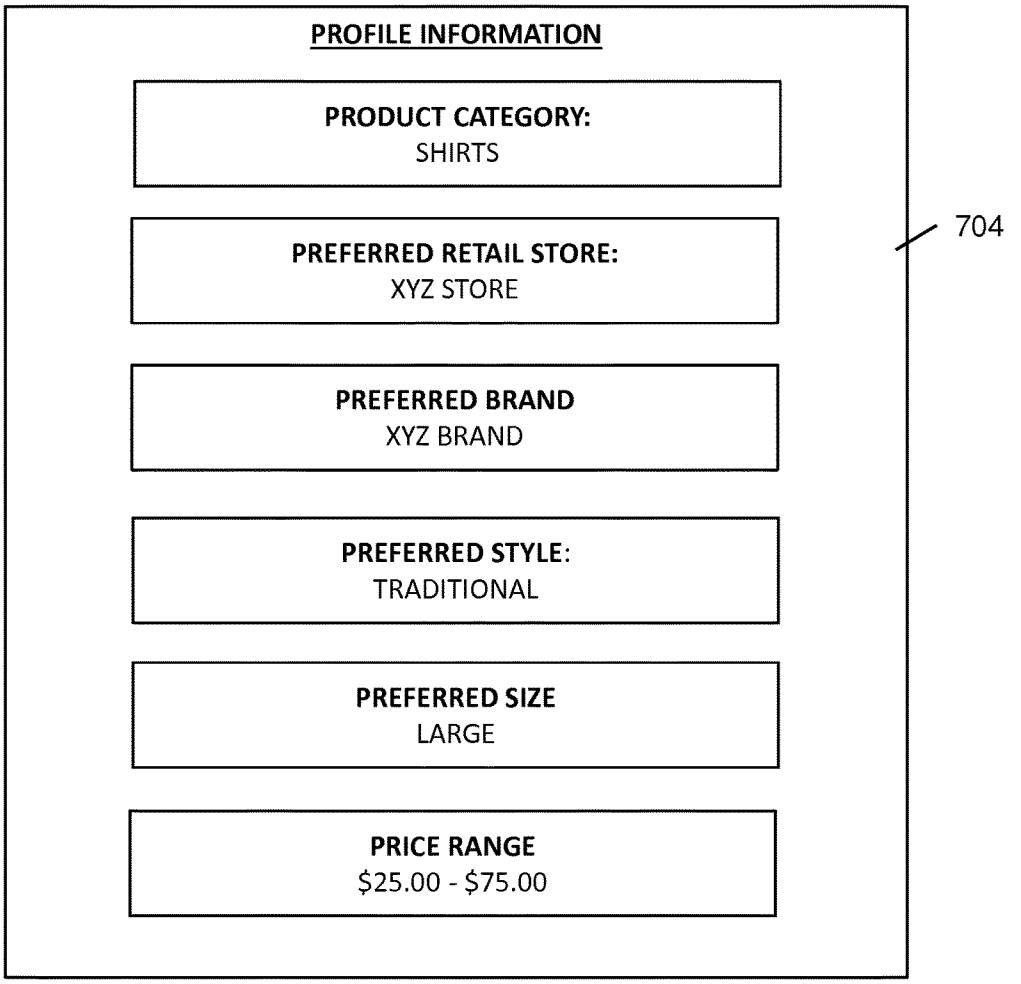

PROFILE INFORMATION
NAME:
JOHN DOE
DEFAULT PAYMENT INFORMATION:
CREDIT CARD, xxx-xxxx-1234, EX. DATE 12/31/15
DEFAULT SHIPPING INFORMATION:
789 NEW YORK AVE, NEW YORK CITY, NY
702

FIG. 7A


PROFILE INFORMATION
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SHIRTS
PREFERRED RETAIL STORE:
XYZ STORE
PREFERRED BRAND
XYZ BRAND
PREFERRED STYLE:
TRADITIONAL
PREFERRED SIZE
LARGE
PRICE RANGE
$25.00 - $75.00
704

FIG. 7B

VOICE COMMERCE

CROSS REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. Provisional Patent Application Ser. No. 62/051,273 filed Sep. 16, 2014 entitled "VOICE COMMERCE", the entirety of which is incorporated herein by reference.

FIELD OF THE INVENTION

The invention relates to systems and methods for providing voice commerce. More particularly, the invention relates to systems and methods for preparing and/or completing checkout of product or service purchases via a single utterance.

BACKGROUND OF THE INVENTION

Mobile electronic devices have emerged to become nearly ubiquitous in the everyday lives of many people. One of the reasons for this increased use is the convenience of performing tasks with a mobile electronic device. One task that has seen significant growth is online shopping. During an online shopping session, a user browses a website to locate a product or service for purchase. After the product or service has been located, the user makes payment through the mobile electronic device and has the purchased product or service delivered.

One difficulty in online shopping via a mobile electronic device is that the user must search a website in order to locate a product or service to be purchased and fill out numerous payment and shipping forms to complete checkout (or a purchase transaction). Mobile electronic devices typically contain small screens and keyboards, making it hard for the user to search for the product or service to purchase and input payment and shipping information. While some online shopping applications assist the user in filling out payment and shipping forms, the foregoing applications are often limited to the amount of information that can be provided. Further, some online shopping applications include a "one-click" purchase option. However, this still requires the user to browse the website to locate product or services which they wish to purchase. These and other drawbacks exist.

SUMMARY OF THE INVENTION

The invention relates to systems and methods for preparing and/or completing checkout of product or service purchases via a single utterance. More particularly, the systems and methods may process a single utterance of a user to determine a product or service that is to be purchased, payment information that is to be used to pay for the product or service, shipping information that is to be used to deliver the product or service, and/or other information that is thereafter utilized to prepare and/or complete a purchase transaction for the product or service. In some implementations, the preparation and/or completion of the purchase transaction may be performed without further user input after receipt of the utterance (with which the determination of the product or service, the payment information, or shipping information is based).

In an implementation, the system may receive and process a user input comprising a natural language utterance to determine a product or service to be purchased on behalf of a user. As an example, one or more words associated with the natural language utterance may be indicative of a product or service type, product name, seller name, etc., which can be used to determine the product or service that is to be purchased. Without further user input after the receipt of the user input (or the natural language utterance), the system may obtain payment information that is to be used to pay for the product or service, shipping information that is to be used to deliver the product or service, or other information that is to be used to complete a purchase transaction for the product or service.

In an implementation, upon receipt of a natural language utterance of a user, and without further user input after the receipt of the utterance, the system may process the utterance to determine a product or service, and complete a purchase transaction for the product or service based on payment information associated with the user, shipping information indicating who, where, when, and/or how the product or service is to be delivered, or other information. In a further implementation, after the purchase transaction is completed, the user may be provided with an option to modify one or more aspects related to the product or service purchase (e.g., modify payment information, shipping information, seller from which the product or service is purchased, etc.). As an example, the initial product or service purchase may be cancelled (and result in refund of the payment provided for the completed purchase transaction) in response to the user's modification, and a new purchase transaction may be initiated in accordance with the user's modification. Of course, in some implementations, such after-transaction-completion modifications may be limited to avoid fraud or other issues (e.g., limited to a predefined time period after the transaction completion, limited to certain types of modifications, etc.). In this way, users can experience the convenience of a purchase transaction being completed with reduced actions (e.g., single utterance) without fear of inaccuracies that might be associated with the purchase transaction.

In an implementation, upon receipt of a natural language utterance of a user, and without further user input after the receipt of the utterance, the system may process the utterance to determine a product or service to be purchased, and present a request for user confirmation (or user approval) of the product or service to be purchased, payment information that is to be used to pay for the product or service, shipping information that is to be used to deliver the product or service, or other information that is to be used to complete a purchase transaction for the product or service. Upon receipt of the requested confirmation from the user, a purchase transaction for the product or service may be completed without further user input after the receipt of the requested confirmation. As an example, after the user has provided the utterance, the user may be presented with a prompt that: (i) identifies the product or service, the cost(s) associated with the purchase/delivery of the product or service, the payment information, and the shipping information; and (ii) solicits the user's approval to complete checkout of the product or service using a particular payment method (specified by the payment information to pay for the associated cost(s)), a particular shipping method (specified by the shipping information), along with a name and address (specified by the shipping information) to which the product or service is to be delivered. The user may respond by providing a subsequent natural language utterance. If it is determined (upon receiving and processing the subsequent utterance) that the user provided his/her approval, checkout of the product or service purchase may

be completed (e.g., without further user input after receipt of the utterance other than the subsequent utterance). In this way, the confirmation may be used to ensure that that the information utilized to complete checkout of the product or service checkout is accurate and acceptable to the user.

Various other aspects of the invention will be apparent through the detailed description of the invention and the drawings attached hereto. It is also to be understood that both the foregoing general description and the following detailed description are exemplary and not restrictive of the scope of the invention. As used in the specification and in the claims, the singular form of "a", "an", and "the" include plural referents unless the context clearly dictates otherwise. In addition, as used in the specification and the claims, the term "or" means "and/or" unless the context clearly dictates otherwise.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a system for providing voice commerce, according to an implementation of the invention.

FIG. **2** illustrates a system for facilitating natural language processing, according to an implementation of the invention.

FIG. **3** illustrates a flow diagram of a process for providing voice commerce, according to an implementation of the invention.

FIG. **4** illustrates a flow diagram of another process for providing voice commerce, according to an implementation of the invention.

FIG. **5** illustrates a screenshot of a user interface which facilitates voice commerce, according to an implementation of the invention.

FIGS. **6**A and **6**B illustrate screenshots of a user interface which facilitates voice commerce, according to an implementation of the invention.

FIGS. **7**A and **7**B illustrate screenshots of a user interface which facilitates management of profile information, according to an implementation of the invention.

DETAILED DESCRIPTION OF THE INVENTION

In the following description, for the purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the implementations of the invention. It will be appreciated, however, by those having skill in the art that the implementations of the invention may be practiced without these specific details or with an equivalent arrangement. In other instances, well-known structures and devices are shown in block diagram form in order to avoid unnecessarily obscuring the implementations of the invention.

FIG. **1** illustrates a system **100** for providing voice commerce to a user, according to an implementation of the invention. In an implementation, the system **100** may prepare and/or complete checkout of product or service purchases related to one or more user inputs. The user inputs may comprise an auditory input (e.g., received via a microphone), a visual input (e.g., received via a camera), a tactile input (e.g., received via a touch sensor device), a keyboard input, a mouse input, or other user input that is recognizable by the system **100**. As an example, a natural language utterance may be received from a user and processed to prepare and/or complete checkout of product or service purchases.

In an implementation, system **100** may receive and process a single utterance of a user to determine a product or service that is to be purchased, payment information that is to be used to pay for the product or service, shipping information that is to be used to deliver the product or service, and/or other information that is thereafter utilized to prepare and/or complete the purchase of the product or service.

In one use case, if the user input is a natural language utterance spoken by a user, the natural language utterance may be processed by a speech recognition engine to recognize one or more words of the natural language utterance. The recognized words may then be processed, along with context information associated with the user, by a natural language processing engine to determine one or more products or services and/or other information (e.g., payment information, shipping information, seller information, associated cost information, etc.) that can be used to prepare and/or complete one or more purchase transactions for the products or services. Upon determination of such information, for example, the natural language processing engine may provide the information to one or more applications that then utilize the information to prepare and/or complete the purchase transactions.

As an example, when a user speaks the utterance "Send flowers to my mother," the user's mother may be identified as the recipient of a product that the user intends to purchase (e.g., based on the words "send," "my", and "mother"), and flowers may be identified as the type of product that the user intends to have purchased and delivered to the user's mother (e.g., based on the words "send" and "flowers"). Without necessarily receiving any further input from the user, the system **100** may automatically determine the name and address of the user's mother, a payment method associated with the user, a seller from which flowers are to be purchased, a particular item (e.g., a particular flower purchase order) to be purchased from the seller, and the costs associated with the purchase/delivery of the purchase item. Such information may then be utilized to initiate and/or complete a purchase transaction for the purchase item. The name and address of the user's mother may, for example, be determined by querying the user's profile information, the user's address book(s) or contact list(s), the user's social network(s), one or more people search databases, etc. The payment method associated with the user may be determined by querying the user's profile information. The seller from which flowers are to be purchased or the purchase item from the seller may be determined based on a set of preferred merchants indicated by a service provider (e.g., a company associated with the system **100**), preference information associated with the user that identifies merchants approved by the user (e.g., the user's profile information may identify a predefined set of merchants from which the user has approved the system **100** to purchase products or services on behalf of the user), or similar criteria. For example, system **100** may determine which flowers are to be purchased from the merchant's range of offerings based on the user's profile information including the types of items a user likes, qualities of items the user likes, the categories of items a user likes, minimum item rating requirements, item pricing requirements, user location and context information, shipping requirements, etc. The associated costs may be determined based on information regarding the seller, the purchase item, the mother's address, the delivery method (e.g., different fees associated with one-day shipping, two-day shipping, etc.), the payment method (e.g., different fees associated with different payment methods), or other information.

It should be noted that while, in some implementations, a purchase transaction for a product or service may be completed without further user input after receiving a natural language utterance (from which the product or service is determined), user input may be solicited (or received unsolicited) from a user in other implementations to determine payment information, shipping information, seller information, or other information that is to be used to complete the purchase transaction.

In an implementation, upon receipt of a natural language utterance of a user, and without further user input after the receipt of the utterance, the system **100** may process the utterance to determine a product or service to be purchased, and present (e.g., via a graphical user interface, via an auditory user interface, etc.) a request for user confirmation (or user approval) of the product or service, shipping information that is to be used to deliver the product or service, payment information that is to be used to pay for the product or service, and/or other information to ensure that such information is correct and accepted by the user for use with purchasing the product or service. Upon receipt of the requested confirmation from the user, a purchase transaction for the product or service may be completed without further user input after the receipt of the requested confirmation.

As an example, with respect to the above "Send flowers to my mother" utterance scenario, the following information may be presented to the user as part of the user confirmation request: (i) the name and address of the user's mother; (ii) a payment method associated with the user; (iii) a seller from which flowers are to be purchased; (iv) a particular item (e.g., a particular flower purchase order) to be purchased from the seller; and (v) the costs associated with the purchase/delivery of the purchase item. As a further example, the user may provide any of the following utterances—"That's fine," "The information is correct," "Go ahead and purchase the flowers," "Order the flowers," or other utterance—to indicate the user's confirmation to complete the purchase transaction. As such, based on the confirmation, the purchase transaction for the purchase item (e.g., a particular flower purchase order) may be completed (e.g., without further user input after the receipt of the utterance "Send flowers to my mother" other than the confirmation utterance).

In an implementation, user profile information (e.g., name, payment information, shipping information, preferences, etc.) may be pre-stored so that the user profile information may be utilized by system **100** for preparing and/or completing checkout of product or service purchases. In an implementation, defaults associated with the user profile information, such as default payment information, default shipping information, etc., may be automatically or manually pre-set for preparing and/or completing checkout of product or service purchases.

In an implementation, preferred sellers, brands, style, size, or other parameters related to products or services may be automatically or manually pre-set as profile information. As an example, preferred sellers from which products or services are to be purchased and preferred brands of such products or services may be automatically pre-set by the system (e.g., pre-set to system preferred sellers and brands) until the preferences are manually modified by the user. The preferred store, brand, style, size, or other parameters may be obtained (e.g., in response to a natural language utterance indicating a product or service without further user input after the receipt of the utterance) to prepare and/or complete checkout of a product or service purchase unless the utterance (or other information) specifies otherwise. In another implementation, the profile information may include information relating to the general likes or dislikes of the user utilized to select the product or service to be purchased including the types of items a user likes, qualities of items the user likes, the categories of items a user likes, minimum item rating requirements, item pricing requirements, user location and context information, shipping requirements, etc.

In an implementation, preparation and/or completion of checkout of product or service purchases may be limited to certain categories of products or services (e.g., no automobiles), a particular price range (e.g., no more than $100), etc., to reduce the number or severity of purchases related to fraud. The categories of product or services and/or the price ranges may, for instance, be automatically or manually pre-set (e.g., automatically preset by the system, manually pre-set by the user).

Other uses of system **100** are described herein and still others will be apparent to those having skill in the art. Having described a high level overview of some of the system functions, attention will now be turned to various system components that facilitate these and other functions.

System Components

System **100** may include a computer system **104**, one or more databases **132**, one or more remote information sources **142**, **144**, **164**, and/or other components.

To facilitate these and other functions, computer system **104** may include one or more computing devices **110**. Each computing device **110** may include one or more processors **112**, one or more storage devices **114**, and/or other components.

Processor(s) **112** may be programmed by one or more computer program instructions, which may be stored in storage device(s) **114**. The one or more computer program instructions may include, without limitation, voice commerce application **120**. Voice commerce application **120** may itself include different sets of instructions that each program the processor(s) **112** (and therefore computer system **104**) to perform one or more operations described herein. For example, voice commerce application **120** may include user input processing instructions **122**, transaction preparation instructions **124**, checkout management instructions **126**, profile management instructions **128**, user interface instructions **129**, and/or other instructions **130** that program computer system **104**. Other applications may, of course, include one or more of the instructions **120-130** to perform one or more operations as described herein. As used herein, for convenience, the various instructions will be described as performing an operation, when, in fact, the various instructions program computer system **104** to perform the operation.

In some implementations, a given user device **160** may comprise a given computer device **110**. As such, the given user device **160** may comprise processor(s) **112** that are programmed with one or more computer program instructions, such as voice commerce instructions **120**, user input processing instructions **122**, transaction preparation instructions **124**, checkout management instructions **126**, profile management instructions **128**, user interface instructions **129**, and/or other instructions **130**.

As used hereinafter, for convenience, the foregoing instructions will be described as performing an operation, when, in fact, the various instructions may program processor(s) **112** (and thereafter computer system **104**) to perform the operation.

Registering User Information and Providing Voice Commerce

In an implementation, voice commerce application **120** may register a user to use the system. For example, during registration of a user, voice commerce application **120** may obtain profile information of the user that includes user settings. Information obtained during registration (or registration information) may include, for example, user identification information, payment information, shipping information, user preferences, and/or other information. The registration information may also include preferred sellers, brands, style, size, or other parameters related to products or services as well as limits on the purchase of particular product and service categories and particular price ranges for products or services. In another implementation, the registration information may also include limitations of certain categories of products or services to be purchased and/or particular price ranges of the products or services to be purchased. The registration information may be stored as profile information associated with the user in one or more databases, such as a database **132**.

In an implementation, the voice commerce application **120** may process one or more user inputs to prepare and/or complete checkout of product or service purchases related to the one or more user inputs. The user inputs may comprise an auditory input (e.g., received via a microphone), a visual input (e.g., received via a camera), a tactile input (e.g., received via a touch sensor device), an olfactory input, a gustatory input, a keyboard input, a mouse input, or other user input. As an example, a natural language utterance, a natural language gesture, or other natural language user input may be received from a user, and processed to determine the meaning of the user input (and corresponding actions, if any, to be taken) with respect to preparation and completion of a purchase transaction. It should be noted that while, in some implementations, the receipt of a natural language utterance may trigger preparation and/or completion of a purchase transaction with further user input after the receipt of the utterance, the receipt of a natural language input of another type (e.g., gestures or other non-verbal communication) may, in other implementations, trigger preparation and/or completion of a purchase transaction with further user input after the receipt of the input of the other type. As such, to the extent possible, one or more operations described herein as based on a natural language utterance may, in other implementations, instead be based on a natural language input of another type.

The voice commerce application **120** may utilize instructions associated with one or more speech recognition engines, one or more natural language processing engines, or other components for processing user inputs to determine user requests related to the user inputs. For example, voice commerce application **120** may process a single utterance of a user to determine a product or service that is to be purchased, payment information that is to be used to pay for the product or service, shipping information that is to be used to deliver the product or service, and/or other information that is thereafter utilized to prepare and/or complete the purchase of the product or service.

In an implementation, voice commerce application **120** may process a user input (e.g., a natural language utterance) to determine one or more words associated with the user input, and initiate one or more user requests (e.g., queries, commands, etc.) based on the determined words, context information associated with the user (e.g., a current location of the user, the time at which the user spoke the utterance, a product or service recently discussed by the user, or other context), user profile information, or other information. As an example, a user may speak the utterance "Order a pizza for delivery," and the voice commerce application **120** may interpret the utterance and determine that the user's intent is to purchase a pizza for delivery to the user. In one use case, without further user input after receiving the utterance, the voice commerce application **120** may initiate and complete a purchase transaction for the pizza to be delivered. If, for instance, the voice commerce application **120** determines that the user is currently at home, it may complete a purchase transaction with a pizza restaurant from which the user has previously ordered pizza to have the previously ordered pizza delivered to the user's house.

In an implementation, voice commerce application **120** may utilize a user input (e.g., a natural language utterance) to determine a product or service that is to be purchased by searching one or more databases associated with one or more sellers (e.g., partners, third party retailers, service providers, etc.). Results obtained from the search may include one or more products and/or services related to the user input. Each set of results may be individually grouped according to its source or product/service category. The voice commerce application **120** may automatically select the product/service to be purchased from the set of results. As an example, a single utterance may automatically result in the selection of a seller (e.g., a third party retailer) and the selection of a product related to the utterance that is available for purchase via the seller.

In an implementation, the voice commerce application **120** may prepare and/or complete checkout of a product or service purchase related to one or more user inputs. The voice commerce application **120** may determine payment information that is to be used to pay for the product or service, shipping information that is to be used to deliver the product or service, and/or other information that is thereafter utilized to prepare and/or complete the purchase of the product or service. In one implementation, the voice commerce application **120** may automatically complete the checkout of the product or service purchase related to the one or more user inputs. As an example, a single utterance from the user may result in the preparation and/or completion of the checkout of the product or service without further input from the user. In another implementation, the voice commerce application **120** may provide a request for confirmation of the determined product or service, shipping information, payment information, and/or other information to the user to solicit a confirmation from the user to complete the checkout of the product or service purchase.

In an implementation, the voice commerce application **120** may utilize user profile information to prepare and/or complete checkout of product or service purchases via a user input. In an implementation, the voice commerce application **120** may utilize defaults associated with the user profile information, such as default payment information, default shipping information, etc., for preparing and/or completing checkout of product or service purchases. In another implementation, the voice commerce application **120** may utilize product and/or service preferences including preferred sellers, brands, style, size, or other parameters related to products or services for preparing and/or completing checkout of product or service purchases. In another embodiment, the voice commerce application **120** may limit checkout of product or service purchases to certain categories of products or services, a particular price range, etc., to reduce the number or severity of purchases related to fraud. In another implementation, the profile information may determine a product or service to be purchased based from profile

information relating to the general likes or dislikes of the user including the types of items a user likes, qualities of items the user likes, the categories of items a user likes, minimum item rating requirements, item pricing requirements, user location and context information, shipping requirements, etc.

Having described high level functions and operations of voice commerce application **120**, attention will now be turned to particular functions and operations of voice commerce application **120** as illustrated through its various instructions. The various instructions (e.g., user input processing instructions **122**, transaction preparation instructions **124**, checkout management instructions **126**, profile management instructions **128**, user interface instructions **129**, and/or other instructions **130**) of voice commerce application **120** are described individually as discreet sets of instructions by way of illustration and not limitation, as two or more of the instructions may be combined.

User Input Processing

In an implementation, the user input processing instructions **122** may process one or more user inputs of a user to prepare and/or complete checkout of product or service purchases related to the one or more user inputs. The user inputs may comprise an auditory input (e.g., received via a microphone), a visual input (e.g., received via a camera), a tactile input (e.g., received via a touch sensor device), a keyboard input, a mouse input, or other user input. As described herein elsewhere, user input processing instructions **122** may comprise instructions associated with one or more speech recognition engines (e.g., speech recognition engine(s) **220** of FIG. **2**), one or more natural language processing engines (e.g., natural language processing engine(s) **230** of FIG. **2**), or other components for processing user inputs to determine user requests related to the user inputs. For example, user input processing instructions **122** may process a natural language utterance of a user to determine a product or service that is to be purchased, payment information that is to be used to pay for the product or service, shipping information that is to be used to deliver the product or service, and/or other information that is thereafter utilized to prepare and/or complete the purchase of the product or service.

In one use case, if the user input is a natural language utterance spoken by a user, the natural language utterance may be processed by a speech recognition engine to recognize one or more words of the natural language utterance. The recognized words may then be processed, along with context information associated with the user, by a natural language processing engine to determine one or more products or services and/or other information (e.g., payment information, shipping information, seller information, associated cost information, etc.) that can be used to prepare and/or complete checkout of product or service purchases when the user provided the natural language utterance.

In an implementation, the user input processing instructions **122** may utilize one or more previous user inputs (e.g., related to a product or service) in processing a particular user input to determine one or more products or services and/or other information (e.g., payment information, shipping information, seller information, associated cost information, etc.) that can be used to prepare and/or complete one or more checkout of product or service purchases.

As an example, a first user input (that occurs prior to a second user input) may be indicative of a user's intent to make a purchase (e.g., without necessarily identifying a product or service type or a product or service), and the second user input may be indicative of a particular product or service type and/or a particular product or service (e.g., without necessarily being indicative of the user's intent to make a purchase). In one use case, for example, a user may provide the utterance "I'm looking to buy something" as the first user input, after which an automated personal assistant (of a related application) may ask the user what the user would like to buy. The user may respond with the second user input by saying "Flowers for my mom." The word "buy" may be recognized when speech recognition is performed on the first user input, and the word "flowers" may be recognized when speech recognition is performed on the second user input. Further processing on the word "buy" may indicate the user's intent to purchase, and further processing on the word "flowers" may indicate the particular product type of a product that the user would like to purchase.

As another example, a first user input (that occurs prior to a second user input) may be indicative of a particular product or service type and/or a particular product or service (e.g., without necessarily being indicative of the user's intent to make a purchase), and the second user input may be indicative of a user's intent to make a purchase (e.g., without necessarily identifying a product or service type or a product or service). In one scenario, for example, the user may provide the utterance "Those are beautiful flowers" while viewing photographs on a friend's social networking page. Subsequently, the user may provide the utterance "I'd like to buy some." The words "those" and "flowers" may be recognized when speech recognition is performed on the first user input, and the words "buy" and some" may be recognized when speech recognition is performed on the second user input. Further processing on the words "those" and "flowers" may indicate the flowers in the photographs that the user viewed on the friend's social networking page, and further processing on the words "buy" and "some" may indicate the user's intent to make a purchase.

FIG. **2** illustrates a system **200** for facilitating natural language processing, according to an implementation of the invention. As shown in FIG. **2**, system **200** may comprise input device(s) **210**, speech recognition engine(s) **220**, natural language processing engine(s) **230**, application(s) **240**, output device(s) **250**, database(s) **132**, or other components.

In an implementation, one or more components of system **200** may comprise one or more computer program instructions of FIG. **1** and/or processor(s) **112** programmed with the computer program instructions of FIG. **1**. As an example, speech recognition engine(s) **220** and/or natural language processing engine(s) **230** may comprise user input processing instructions **122**, transaction preparation instructions **124**, checkout management instructions **126**, profile management instructions **128**, or other instructions.

Input device(s) **210** may comprise an auditory input device (e.g., microphone), a keyboard, a mouse, or other input devices. Input received at input device(s) **210** may be provided to speech recognition engine(s) **220** and/or natural language processing engine(s) **230**.

Speech recognition engine(s) **220** may process one or more inputs received from input device(s) **210** to recognize one or more words represented by the received inputs. As an example, with respect to auditory input, speech recognition engine(s) **220** may process an audio stream captured by an auditory input device to isolate segments of sound of the audio stream. The sound segments (or a representation of the sound segments) are then processed with one or more speech models (e.g., acoustic model, lexicon list, language model, etc.) to recognize one or more words of the received inputs. Upon recognition of the words of received inputs, the

recognized words may then be provided to natural language processing engine(s) **230** for further processing. In other examples, natural language processing engine(s) **230** may process one or more other types of inputs (e.g., visual input representing sign language communication, gestures, or other forms of communication) to recognize one or more words represented by the other types of inputs.

Natural language processing engine(s) **230** may receive one or more inputs from input device(s) **210**, speech recognition engine(s) **220**, application(s) **240**, database(s) **132**, or other components. As an example, natural language processing engine(s) **230** may process inputs received from input device(s) **210**, such as user inputs (e.g., voice, non-voice, etc.), location-based inputs (e.g., GPS data, cell ID, etc.), other sensor data input, or other inputs to determine context information associated with one or more user inputs. As another example, natural language processing engine(s) **230** may obtain profile information, context information, or other information from database(s) **132**. The obtained information (or context information determined based on inputs from input device(s) **210**) may be processed to determine one or more user inputs of a user. In yet another example, natural language processing engine(s) **230** may process one or more recognized words from speech recognition engine(s) **220** and other information (e.g., information from input device(s) **210**, application(s) **240**, and/or database(s) **132**) to determine one or more user inputs.

In an implementation, natural language processing engine(s) **230**, application(s) **240**, or other components may store information in database(s) **132** for later use by natural language processing engine(s) **230**, application(s) **240**, or other components. As an example, as described in further detail elsewhere herein, natural language processing engine(s) **230** may store information regarding user inputs in database(s) **132** and/or update profile information, or other information in database(s) **132** based on the information regarding the user inputs.

Transaction Preparation and Search for Products or Services

In an implementation, transaction preparation instructions **124** may utilize information from a processing of the user inputs (e.g., one or more recognized words, product or service type, product name, seller name, etc.) to determine a product or service that is to be purchased. Transaction preparation instructions **124** may utilize such information to search one or more databases associated with one or more sellers (e.g., partners, third party retailers, service providers, etc.). Results obtained from the search may include one or more products and/or services related to the user input. The results are then utilized by the transaction preparation instructions **124** to select the product or service to be purchased by the user. As an example, a single utterance may automatically result in the selection of a seller (e.g., a third party retailer) and the selection of a product or service related to the utterance that is available for purchase via the seller.

In an implementation, transaction preparation instructions **124** may obtain product or service results related to the user input that are available from a remote information source **140**. Remote information sources **140** may include information sources that are accessible to computer system **104** via a remote or external network connection (e.g., outside of a firewall), such as the Internet. For example, as illustrated in FIG. **1**, remote information source(s) **140** may include, without limitation, a third party search engine **142** (e.g., GOOGLE, BING, YAHOO, etc.), third party retailers **144**, including online retailers and offline retailers having an online presence (e.g., AMAZON, GROUPON, EBAY, EXPEDIA, BESTBUY, etc.), third party service providers **146** (e.g., weather services, calendar/scheduling services, etc.), and/or other information source that is remotely accessible to computer system **104**. In another implementation, the transaction preparation instructions **124** may select the product or service (that is to be purchased) from one or more predetermined sets of products or services stored in database **132**. For example, system **200** may store one or more sets of predetermined products or services that may be selected by the transaction preparation instructions **124** or included in the product or service results.

In an implementation, transaction preparation instructions **124** may provide a set of product and service results for the search. The transaction preparation instructions **124** may utilize the set of results to select the product or service that is to be purchased. In an implementation, the transaction preparation instructions **124** may select the product or service (that is to be purchased) according to a set of predefined rules. For example, the product or service (that is to be purchased) may be selected based on the user input, location of the user, cost comparison of sellers (e.g., partners, third party retailers, third party service providers, etc.), shipping date comparison of the sellers, or other criteria. In another implementation, the results of the search are presented for selection by the user. In another implementation, the profile information may include information relating to the general likes or dislikes of the user t to determine the product or service to be purchased including the types of items a user likes, qualities of items the user likes, the categories of items a user likes, minimum item rating requirements, item pricing requirements, user location and context information, shipping requirements, etc.

In an implementation, transaction preparation instructions **124** may utilize context information associated with the user to determine the product or service to be purchased. Based on the context information, the transaction preparation instructions **124** may refine the search for products or services to be purchased. In one embodiment, the context information may include personal data associated with the user, data from a database associated with the user, data describing an event, data describing an acoustic environment in which the spoken input is received, location, local time, etc. For example, the transaction preparation instructions **124** may utilize the time of the user input to further define the availability of product or service to be purchased.

Continuing the foregoing examples, a user input related to "lawnmower" may cause transaction preparation instructions **124** to cause a search on a third party search engine **142** to be initiated using the search term "lawnmower." In an implementation, depending on the context (e.g., indicating that the user intends to buy a lawnmower), transaction preparation instructions **124** may add additional search terms such as "purchase" or "sale." Transaction preparation instructions **124** may search (in addition to or instead of) other remote information sources **140** as well (e.g., retail related to "lawnmower" from one or more third party retailers **144**, landscaping services related to "lawnmower" from one or more third party service providers **146**, and/or other information related to "lawnmower" from one or more other remote information sources **140**).

In another embodiment, the transaction preparation instructions **124** may utilize user inputs such as location-based inputs (e.g., GPS data, cell ID, etc.) to further refine the search for products or services to be purchased. The transaction preparation instructions **124** may utilize the location-based input to further refine the geographic area in

which the products or services are offered. For example, if the user utters "Please buy a pizza," the transaction preparation instructions **124** utilize the location-based inputs to determine the closest pizzeria in relation to the user. In an implementation, the transaction preparation instructions **124** may utilize website browsing information to refine the search for products or services to be purchased. For example, if the user utters "buy this" while browsing a retailing website, the transaction preparation instructions **124** may utilize website browsing information to determine the product or service the user is viewing. It should be contemplated that the transaction preparation instructions **124** prepares and/or completes checkout of the determined product or service directly from the website (or the seller associated with the website) or from another seller that may not be associated with the website.

In an implementation, the transaction preparation instructions **124** may utilize the profile information to select the product or service and/or the sellers from which the product or service is to be purchased. As described below, the profile information may include preferred sellers, brands, style, size, or other parameters related to products or services that may be automatically or manually pre-set. The profile information may also include the types of items a user likes, qualities of terms the user likes, the categories of items a user likes, minimum item rating requirements, item pricing requirements, user location and context information, shipping requirements, etc. The transaction preparation instructions **124** may select the product or service and the sellers (from which the product or service is to be purchased) based on the profile information. As an example, preferred retailers from which products or services is to be purchased and preferred brands of such products or services may be automatically pre-set by the system (e.g., pre-set to system preferred sellers and brands) until the defaults are manually modified by users. The default store, brand, style, size, or other parameters may be obtained (in response to an utterance indicative of a user's intent to purchase a product or service) to prepare and/or complete checkout of a product or service purchase unless the single utterance (or other information) specifies otherwise.

In an implementation, selection of the product or service purchases by the transaction preparation instructions **124** may be limited to certain categories of products or services (e.g., no automobiles), a particular price range (e.g., no more than $100), etc., to reduce the number or severity of purchases related to fraud. The categories of product or services and/or the price ranges may, for instance, be automatically or manually pre-set (e.g., automatically preset by the system, manually pre-set by the user) and stored in the profile information.

In one implementation, the transaction preparation instructions **124** may provide prospective transactions or offers to the user based on the user's profile information. For example, the transaction preparation instructions **124** may prepare a transaction for the user without any input from the user. In one implementation, the transaction preparation instructions **124** may analyze the user's profile information to determine any potential transaction opportunities, and provide a prospective transaction or offer related to the potential transaction opportunity. For example, in the case that voice commerce application **120** determines an upcoming anniversary of the user, the transaction preparation instructions **124** may prepare a prospective purchase for the user related to the anniversary. In another implementation, the transaction preparation instructions **124** may provide offers to the user related to purchases for the potential transaction opportunity.

In an implementation, an administrator of the system **100** (or a subsystem thereof) may manage a set of predetermined sellers from whose inventories are searched for available products or services in response to a user input indicative of a user's intent to purchase. As an example, the administrator may specify a set of sellers that have priority over other sellers in having their products or services offered to users. Thus, a seller from which a product or service is to be purchased may be selected from the predetermined set of sellers specified by the administrator. Other criteria may, of course, be considered when selecting a seller with which a user is to complete a purchase transaction for a product or service.

Checkout Management

In an implementation, the checkout management instructions **126** may prepare and/or complete checkout of selected product or service purchases related to one or more user inputs. The checkout management instructions **126** may determine payment information that is to be used to pay for a selected product or service, shipping information that is to be used to deliver the selected product or service, and/or other information that is thereafter utilized to prepare and/or complete the purchase of the selected product or service. For example, the checkout management instructions **126** may utilize default payment information stored in the profile information for preparing or completing checkout of the selected product or service. Likewise, the checkout management instructions **126** may utilize default shipping information stored in the profile information for preparing or completing checkout of the selected product or service. In another implementation, the checkout management instructions **126** utilize an address book or contact list of the user stored in the profile information to provide shipping information for checkout of products or services for individuals other than the user. For example, a user input may reference an individual, other than the user, that is recognized by the user input processing instructions **122** (e.g., "Send flowers to my mom" wherein the user's mom is recognized as the intended recipient of the flowers). The checkout management instructions **126** may utilize the address book or contact list of the user to determine if the referenced individual's address is available for input as the shipping information.

In one implementation, the checkout management instructions **126** automatically complete the checkout of the product or service purchase. As an example, a single utterance from the user may result in the completion of checkout of the product or service without further input or approval from the user. In another implementation, the checkout management instructions **126** may present a request for confirmation of the determined product or service, shipping information, payment information, and/or other information to the user to solicit a confirmation from the user to complete the checkout of the product or service purchase. For example, the checkout management instructions **126** may prepare all of the aspects (e.g., payment information, shipping information, etc.) of checkout of the product or service purchase but wait until confirmation from the user to complete checkout.

In an implementation, the checkout management instructions **126** may utilize user profile information for preparing and/or completing checkout of product or service purchases via a user input. In an implementation, the checkout management instructions **126** may utilize defaults associated with the user profile information, such as default payment

information, default shipping information, etc., for preparing and/or completing checkout of product or service purchases. In another implementation, the checkout management instructions **126** utilize an address book or contact list of the user stored in the profile information to provide shipping information for checkout of products or services for individuals other than the user.

Profile Management

In an implementation, stored user profile information (e.g., name, payment information, shipping information, preferences, etc.) may be utilized by voice commerce application **120** for preparing and/or completing checkout of product or service purchases. In an implementation, profile management instructions **128** may automatically set defaults associated with the user profile information, such as default payment information, default shipping information, etc. In another implementation, profile management instructions **128** may automatically or manually pre-set profile information for preparing and/or completing checkout of product or service purchases. In an implementation, profile management instructions **128** enable the user to set profile information including default payment and shipping information utilized by the voice commerce application **120**.

In an implementation, profile management instructions **128** may automatically or pre-set preferred sellers, brands, style, size, or other parameters related to products or services. As an example, preferred retailers or service providers from which products or services are to be purchased and preferred brands of such products or services may be automatically pre-set by the profile management instructions **128** (e.g., pre-set to system preferred sellers and brands) until the preferences are manually modified by users. The preferred store, brand, style, size, or other parameters may be obtained (in response to a single utterance) to prepare and/or complete checkout of a product or service purchase unless the single utterance (or other information) specifies otherwise. In an implementation, profile management instructions **128** enable the user to set preferred sellers, brands, style, size, or other parameters related to products or services utilized by the voice commerce application **120**. The profile management instructions **128** may automatically or pre-set information relating to the general likes or dislikes of the user to determine a product or service to be purchased including the types of items a user likes, qualities of items the user likes, the categories of items a user likes, minimum item rating requirements, item pricing requirements, user location and context information, shipping requirements, etc.

In an implementation, profile management instructions **128** may automatically or pre-set limits of checkout of product or service purchases to certain categories of products or services (e.g., no automobiles), a particular price range (e.g., no more than $100), etc., to reduce the number or severity of purchases related to fraud. The categories of product or services and/or the price ranges may, for instance, be automatically or manually pre-set (e.g., automatically preset by the system, manually pre-set by the user). In an implementation, profile management instructions **128** enable the user to set limits of checkout of product or service purchases to certain categories of products or services (e.g., no automobiles), a particular price range (e.g., no more than $100), or other criteria.

In another implementation, profile management instructions **128** may store profile information relating to the user's personal information. For example, the profile information may include the user's address book or contact list, calendar, and other information which assist the voice commerce application **120** in determining products or services to be purchased. In one implementation, the user's personal information may be pre-stored based on the registration information or otherwise set by the user.

User Interface

In an implementation, user interface instructions **129** may generate a voice commerce interface. The voice commerce interface may provide status information relating to the preparation and/or completion of checkout of product or service purchases. For example, the voice commerce interface may indicate to a user when checkout of product or service purchases is completed. In one implementation, the user interface instructions **129** may also provide the user with a request for confirmation to complete checkout of a product or service purchase. Examples of the voice commerce interface are illustrated with respect to FIGS. **5**, **6**A, and **5**B.

In an implementation, user interface instructions **129** may generate a profile information management interface. The profile management interface may allow the user to set profile information related to the purchase of products or services. For example, the profile management interface enables the user to set default payment and shipping information. The profile management interface may also enable the user to set preferred sellers, brands, style, size, or other parameters related to products or services as well as limits of certain categories of products or services and particular price ranges.

Examples of System Architectures and Configurations

Different system architectures may be used. For example, all or a portion of voice commerce application **120** may be executed on a user device. In other words, computing device **110** as illustrated may include a user device operated by the user. In implementations where all or a portion of voice commerce application **120** is executed on the user device, the user device may search remote information sources, prepare or complete checkout of product or service purchases, generate the interface, and/or perform other functions/operations of voice commerce application **120**.

All or a portion of voice commerce application **120** may be executed on a server device. In other words, computing device **110** as illustrated may include a server device that obtains a user request from a user device operated by the user. In implementations where all or a portion of voice commerce application **120** is executed on the server device, the server device may search remote information sources **140**, obtain sets of results, prepare or complete checkout of product or service purchases, provide the interface to a user device, and/or perform other functions/operations of voice commerce application **120**.

Although illustrated in FIG. **1** as a single component, computer system **104** may include a plurality of individual components (e.g., computer devices) each programmed with at least some of the functions described herein. In this manner, some components of computer system **104** may perform some functions while other components may perform other functions, as would be appreciated. The one or more processors **112** may each include one or more physical processors that are programmed by computer program instructions. The various instructions described herein are exemplary only. Other configurations and numbers of instructions may be used, so long as the processor(s) **112** are programmed to perform the functions described herein.

It should be appreciated that although the various instructions are illustrated in FIG. **1** as being co-located within a single computing device **110**, one or more instructions may be executed remotely from the other instructions. For example, some computing devices **110** of computer system

104 may be programmed by some instructions while other computing devices 110 may be programmed by other instructions, as would be appreciated. Furthermore, the various instructions described herein are exemplary only. Other configurations and numbers of instructions may be used, so long as processor(s) 112 are programmed to perform the functions described herein.

The description of the functionality provided by the different instructions described herein is for illustrative purposes, and is not intended to be limiting, as any of instructions may provide more or less functionality than is described. For example, one or more of the instructions may be eliminated, and some or all of its functionality may be provided by other ones of the instructions. As another example, processor(s) 112 may be programmed by one or more additional instructions that may perform some or all of the functionality attributed herein to one of the instructions.

The various instructions described herein may be stored in a storage device 114, which may comprise random access memory (RAM), read only memory (ROM), and/or other memory. The storage device may store the computer program instructions (e.g., the aforementioned instructions) to be executed by processor(s) 112 as well as data that may be manipulated by processor(s) 112. The storage device may comprise floppy disks, hard disks, optical disks, tapes, or other storage media for storing computer-executable instructions and/or data.

The various components illustrated in FIG. 1 may be coupled to at least one other component via a network 102, which may include any one or more of, for instance, the Internet, an intranet, a PAN (Personal Area Network), a LAN (Local Area Network), a WAN (Wide Area Network), a SAN (Storage Area Network), a MAN (Metropolitan Area Network), a wireless network, a cellular communications network, a Public Switched Telephone Network, and/or other network. In FIG. 1 and other drawing Figures, different numbers of entities than depicted may be used. Furthermore, according to various implementations, the components described herein may be implemented in hardware and/or software that configure hardware.

User device(s) may include a device that can interact with computer system 104 through network 102. Such user device(s) may include, without limitation, a tablet computing device, a smartphone, a laptop computing device, a desktop computing device, a network-enabled appliance such as a "Smart" television, a vehicle computing device, and/or other device that may interact with computer system 104.

The various databases 132 described herein may be, include, or interface to, for example, an Oracle™ relational database sold commercially by Oracle Corporation. Other databases, such as Informix™, DB2 (Database 2) or other data storage, including file-based (e.g., comma or tab separated files), or query formats, platforms, or resources such as OLAP (On Line Analytical Processing), SQL (Structured Query Language), a SAN (storage area network), Microsoft Access™, MySQL, PostgreSQL, HSpace, Apache Cassandra, MongoDB, Apache CouchDB™, or others may also be used, incorporated, or accessed. The database may comprise one or more such databases that reside in one or more physical devices and in one or more physical locations. The database may store a plurality of types of data and/or files and associated data or file descriptions, administrative information, or any other data. The database(s) 132 may be stored in storage device 114 and/or other storage that is accessible to computer system 104.

Example Flow Diagrams

The following flow diagrams describe operations that may be accomplished using some or all of the system components described in detail above and, in some implementations, various operations may be performed in different sequences and various operations may be omitted. Additional operations may be performed along with some or all of the operations shown in the depicted flow diagrams. One or more operations may be performed simultaneously. Accordingly, the operations as illustrated (and described in greater detail below) are exemplary by nature and, as such, should not be viewed as limiting.

FIG. 3 depicts a data flow diagram for a process 300 for providing voice commerce, according to an implementation of the invention. The various processing operations and/or data flows depicted in FIG. 3 (and in the other drawing figures) are described in greater detail herein. The described operations may be accomplished using some or all of the system components described in detail above and, in some implementations, various operations may be performed in different sequences and various operations may be omitted. Additional operations may be performed along with some or all of the operations shown in the depicted flow diagrams. One or more operations may be performed simultaneously. Accordingly, the operations as illustrated (and described in greater detail below) are exemplary by nature and, as such, should not be viewed as limiting.

In an operation 302, a natural language utterance of a user may be received. As an example, upon receipt, the natural language utterance may be processed by a speech recognition engine to recognize one or more words of the natural language utterance. The recognized words may then be processed, along with context information associated with the user, by a natural language processing engine to determine one or more products or services and/or other information (e.g., payment information, shipping information, seller information, associated cost information, etc.) that can be used to prepare and/or complete checkout of product or service purchases.

In an operation 304, a product or service to be purchased on behalf of the user may be determined based on the natural language utterance. As an example, upon recognition of one or more words associated with the natural language utterance that are related to at least one product or service, the product/service-related words may be utilized to search one or more databases associated with one or more third party retailers and/or service providers, and obtain results indicating one or more products or services. The results may then be processed, along with context information associated with the user, to select the most relevant product or service as the product or service that is to be purchased on behalf of the user.

As illustrated by FIG. 3, in one implementation, the product or service that is to be purchased may be determined without any further user input after the receipt of the natural language utterance (from which the determination of the product or service to be purchased is based). In another implementation, the product or service that is to be purchased may be determined without further user input identifying the product or service after the receipt of the natural language utterance.

In an operation 306, payment information that is to be used to pay for the product or service may be retrieved. As an example, default payment information associated with the user (e.g., for paying for product or services on behalf of the user) may be stored as profile information associated with the user. Such default payment may, for example, be

retrieved from one or more databases storing the user's profile information, and utilized to pay for the product or service.

In an operation **308**, shipping information that is to be used to deliver the product or service may be retrieved. As an example, default shipping information associated with the user (e.g., for delivering products or services on behalf of the user) may be stored as profile information associated with the user. Such default shipping information may, for instance, retrieved from one or more databases storing the user's profile information, and be utilized to deliver the product or service.

In an operation **310**, a purchase transaction for the product or service may be completed based on the payment information and the shipping information.

As illustrated by FIG. **3**, in one implementation, the purchase transaction may be completed without any further user input after the receipt of the natural language utterance (from which the determination of the product or service to be purchased is based). In another implementation, the product or service that is to be purchased may be determined without further user input identifying the product or service, identifying the payment information, or identifying the shipping information after the receipt of the natural language utterance.

FIG. **4** depicts a data flow diagram for another process **400** for providing voice commerce, according to an implementation of the invention. The various processing operations and/or data flows depicted in FIG. **4** (and in the other drawing figures) are described in greater detail herein. The described operations may be accomplished using some or all of the system components described in detail above and, in some implementations, various operations may be performed in different sequences and various operations may be omitted. Additional operations may be performed along with some or all of the operations shown in the depicted flow diagrams. One or more operations may be performed simultaneously. Accordingly, the operations as illustrated (and described in greater detail below) are exemplary by nature and, as such, should not be viewed as limiting.

As illustrated by FIG. **3**, a natural language utterance of a user may be received, and a product or service that is to be purchased on behalf of the user may be determined based on the natural language utterance without further user input after the receipt of the natural language utterance. Payment information that is to be used to pay for the product or service, and shipping information that is to be used to deliver the product or service, may also be retrieved.

Referring back to FIG. **4**, in an operation **402**, a seller from which the product or service is to be purchased may be selected. As an example, the user may have specified a set of sellers from which the user prefers to purchase products or services. As such, the seller may be selected from the predetermined set of sellers specified by the user. As another example, an administrator of the system **100** (or of a subsystem of the system **100**) may have specified a set of sellers that have priority over other sellers in having their products or services offered to users. Thus, the seller may be selected from the predetermined set of sellers specified by the administrator. As yet another example, a database of sellers may be queried to determine which seller has the product or service available for purchase. The sellers that have the product or service available for purchase may then be compared against one another to determine, for example, which seller has the lower price (or overall lower total purchase costs) for the product or service, which sellers has the highest customer rating, or other criteria in selecting the seller from which the product or service is to be purchased.

In an operation **404**, seller information associated with the selected seller may be retrieved. As an example, seller information may comprise a name of the seller, contact information associated with the seller, a price at which the seller will sell the product or service to the user, individual or overall costs involved with purchase of the product or service from the seller, a refund policy of the seller for the product or service, or other information.

In an operation **406**, a request for user confirmation (to purchase the product or service from the seller and to use the payment information and the shipping information for a purchase transaction for the product or service) may be provided without further user input after the receipt of the utterance.

In an operation **408**, it may be determined that the user has confirmed purchasing of the product or service from the seller and use of the payment information and the shipping information for the purchase transaction. As such, in an operation **410**, the purchase transaction may be completed based on the seller information, the payment information, and the shipping information without further user input after the receipt of the utterance other than a user confirmation with respect to the confirmation request.

Example Screenshots

FIG. **5** illustrates a screenshot **502** of a user interface which facilitates voice commerce, according to an implementation of the invention. The described screenshots may be accomplished using some or all of the system components described in detail above. As shown in screenshot **502** of FIG. **5**, a voice commerce application may enable the user to complete checkout of product or service purchases via a single utterance. As depicted in screenshot **502**, the user may say "Send flowers to Betsy." In response to receiving the utterance from the user, the voice commerce application may determine that flowers are to be purchased, and select a third party retailer from which to purchase the flowers. As an example, the user may have purchased a particular kind of flower (e.g., red roses) for Betsy numerous times in the past. As such, the particular kind of flower may be determined as the particular product that is to be purchased on behalf of the user for Betsy. The selection of the product may, for example, be performed without further user input identifying the product type (e.g., flowers) after the receipt of the utterance, without any further user input after the receipt of the utterance, etc.

The voice commerce application may also determine the payment information to be used to pay for the flowers. Because the utterance indicates that the flowers are to be sent to Betsy, the voice commerce application may determine Betsy's address from the user's address book or contact list and provide Betsy's shipping information to the retailer. The voice commerce application may then, for example, complete a purchase transaction using seller information associated with the third party retailer, the payment information, the shipping information, or other information without further user input from the user. Upon completing the purchase transaction for the flowers, the voice commerce application may indicate that checkout for the flowers has been completed. In an implementation, the product to be purchased, a seller from which the product is to be purchased, payment information, shipping information, or other information may be displayed to the user.

FIGS. **6**A and **6**B illustrate screenshots **602** and **604** of another user interface which facilitates voice commerce, according to an implementation of the invention. The

described screenshots may be accomplished using some or all of the system components described in detail above. As shown in screenshot **602** of FIG. **6**A, a voice commerce application may solicit a user confirmation from a user with respect to a product purchase before completing checkout of the product purchase. As depicted in screenshot **602**, the user may say "Send flowers to Betsy." In response to receiving the single utterance from the user, the voice commerce application may determine that flowers are to be purchased, and select a third party retailer from which to purchase the flowers. The voice commerce application may also determine the payment information to be used to pay for the flowers. Because the utterance indicates that the flowers are be sent to Betsy, the voice commerce application may determine Betsy's address from the user's address book or contact list and provide Betsy's shipping information to the retailer. The voice commerce application may then present a request for user confirmation of the purchase to the user (e.g., without further user input after the receipt of the utterance). As shown in screenshot **604**, the user may confirm purchase of the flowers by saying "Yes." Upon confirmation of the purchase, the voice commerce application may indicate that checkout for the flowers has been completed.

FIG. **7**A illustrates a screenshot **702** of a user interface which facilitates management of user profile information, according to an implementation of the invention. The described screenshots may be accomplished using some or all of the system components described in detail above. As shown in screenshot **702**, the user profile information interface includes the user name, default payment information, and default shipping information. The user may edit any data fields associated with the user name, default payment information, and default shipping information.

FIG. **7**B illustrates a screenshot **704** of another user interface which facilitates management of user profile information, according to an implementation of the invention. The described screenshots may be accomplished using some or all of the system components described in detail above. As shown in screenshot **704**, the user profile information interface may enable the user to pre-set preferences of different products and/or services to be purchased. The profile information interface includes a product/service category that may be selected by the user. For each product/service category, the user may select preferred sellers, preferred brands, preferred styles, preferred sizes, and other parameters related to the products/services to be selected. The user may also limit certain categories of products or services to a particular price range. The user may edit any data field associated with product/service category to include preferred retail stores/service providers, preferred brands, preferred styles, preferred sizes, and price ranges.

Other implementations, uses and advantages of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. The specification should be considered exemplary only, and the scope of the invention is accordingly intended to be limited only by the following claims.

What is claimed is:

1. A method for providing voice commerce, the method being implemented on a computer system having one or more physical processors programmed with computer program instructions which, when executed, perform the method, the method comprising:

receiving, by the computer system, a user input comprising a natural language utterance;

providing, by the computer system, the natural language utterance as an input to a speech recognition engine;

obtaining, by the computer system, one or more words or phrases recognized from the natural language utterance as an output of the speech recognition engine;

determining, by the computer system, a context based at least on the one or more words or phrases;

identifying, by the computer system, without further user input after the receipt of the user input, a product or service to be purchased on behalf of a user based at least on the determined context;

obtaining, by the computer system, payment information with which to pay for the product or service;

obtaining, by the computer system, without further user input after the receipt of the user input, shipping information with which to deliver the product or service, wherein the shipping information specifies a name or address of a recipient to which the product or service is to be delivered after the product or service is purchased; and

completing, by the computer system, without further user input after the receipt of the user input, a purchase transaction for the product or service based on the payment information and shipping information.

2. The method of claim **1**, further comprising:

selecting, by the computer system, a seller from which the product or service is to be purchased; and

obtaining, by the computer system, seller information associated with the seller, wherein completing the purchase transaction comprises completing, without further user input after the receipt of the user input, the purchase transaction based on the seller information, the payment information, and the shipping information.

3. The method of claim **2**, wherein the seller information comprises a price at which the seller will sell the product or service, and wherein completing the purchase transaction comprises completing, without further user input after the receipt of the user input, the purchase transaction based on the price, the payment information, and the shipping information.

4. The method of claim **2**, wherein selecting the seller comprises selecting the seller based on the price at which the seller will sell the product or service.

5. The method of claim **2**, further comprising:

obtaining, by the computer system, user profile information associated with the user, wherein the user profile information indicates a predetermined set of sellers specified by the user,

wherein selecting the seller comprises selecting the seller from the predetermined set of user-specified sellers indicated by the user profile information.

6. The method of claim **2**, further comprising:

obtaining, by the computer system, a predetermined set of sellers specified by an administrator of the system that is different than the user,

wherein selecting the seller comprises selecting the seller from the predetermined set of administrator-specified sellers.

7. The method of claim **1**, further comprising:

obtaining, by the computer system, user profile information associated with the user, wherein the user profile information comprises at least one of default payment information that is to be used to pay for products or services on behalf of the user or default shipping information that is to be used to delivery products or services on behalf of the user,

wherein at least one of: (i) obtaining the payment information comprises selecting the default payment information to pay for the product or service; or (ii) obtaining the shipping information comprises selecting the default shipping information to deliver the product or service, and

wherein completing the purchase transaction comprises completing, without further user input after the receipt of the user input, the purchase transaction based on at least one of the default payment information or the default shipping information.

8. The method of claim **1**, further comprising:

receiving, at the computer system, a previous user input prior to the receipt of the user input, wherein the previous user input is related to the product or service; and

storing, by the computer system, context information associated with the user based on information related to the previous user input,

wherein determining the product or service as at least one product or service to be purchased on behalf of the user comprises determining, without further user input after the receipt of the user input, the product or service based on the natural language utterance and the context information related to the previous user input.

9. The method of claim **8**, further comprising:

performing, by the computer system, speech recognition on the previous user input to recognize one or more words associated with the previous user input; and

identifying, by the computer system, the product or service as at least one product or service related to the previous user input based on the one or more recognized words,

wherein storing the context information comprises storing product information identifying the product or service based on the identification of the product or service as related to the previous user input such that the context information comprises the product information, and

wherein determining the product or service as at least one product or service to be purchased on behalf of the user comprises determining, without further user input after the receipt of the user input, the product or service based on the natural language utterance and the product information.

10. The method of claim **1**, wherein the one or more words or phrases identify at least one of the product or service or a product or service type.

11. The method of claim **1**, wherein the one or more words or phrases by themselves do not indicate the product or service or a product or service type.

12. The method of claim **11**, further comprising:

receiving, at the computer system, a previous user input prior to the receipt of the user input, wherein the previous user input is related to the product or service,

wherein determining the product or service as at least one product or service to be purchased on behalf of the user comprises determining, based on the previous user input, without further user input after the receipt of the user input, the product or service as at least one product or service to be purchased on behalf of the user.

13. The method of claim **1**, further comprising:

obtaining, by the computer system, user profile information associated with the user, wherein the user profile information indicates one or more pre-approved categories of products or services;

determining whether the product or service is associated with at least one of the one or more pre-approved categories;

wherein completing the purchase transaction comprises completing, without further user input after the receipt of the user input, the purchase transaction based on the payment information, the shipping information, and a determination that the product or service is associated with at least one of the one or more pre-approved categories.

14. The method of claim **1**, further comprising:

obtaining, by the computer system, user profile information associated with the user, wherein the user profile information indicates a pre-approved cost threshold;

determining whether a cost related to purchasing the product or service satisfies the pre-approved cost threshold;

wherein completing the purchase transaction comprises completing, without further user input after the receipt of the user input, the purchase transaction based on the payment information, the shipping information, and a determination that the cost related to purchasing product or service satisfies the pre-approved cost threshold.

15. A system for providing voice commerce, the system comprising:

one or more physical processors programmed with computer program instructions which, when executed, cause the one or more physical processors to:

receive a user input comprising a natural language utterance;

provide the natural language utterance as an input to a speech recognition engine;

obtain one or more words or phrases recognized from the natural language utterance as an output of the speech recognition engine;

determine a context based at least on the one or more words or phrases;

identify, without further user input after the receipt of the user input, a product or service to be purchased on behalf of a user based at least on the determined context;

obtain payment information with which to pay for the product or service;

obtain, without further user input after the receipt of the user input, shipping information with which to deliver the product or service, wherein the shipping information specifies a name or address of a recipient to which the product or service is to be delivered after the product or service is purchased; and

complete, without further user input after the receipt of the user input, a purchase transaction for the product or service based on the payment information and shipping information.

16. The system of claim **15**, wherein the one or more physical processors are further caused to:

select a seller from which the product or service is to be purchased; and

obtain seller information associated with the seller,

wherein to complete the purchase transaction, the one or more physical processors are further caused to: complete, without further user input after the receipt of the user input, the purchase transaction based on the seller information, the payment information, and the shipping information.

17. The system of claim **16**, wherein the seller information comprises a price at which the seller will sell the product or service, and wherein to complete the purchase transaction,

the one or more physical processors are further caused to: complete, without further user input after the receipt of the user input, the purchase transaction based on the price, the payment information, and the shipping information.

18. The system of claim **16**, wherein selecting the seller comprises selecting the seller based on the price at which the seller will sell the product or service.

19. The system of claim **16**, wherein the one or more physical processors are further caused to:

obtain user profile information associated with the user, wherein the user profile information indicates a predetermined set of sellers specified by the user,

wherein to select the seller, the one or more physical processors are further caused to: select the seller from the predetermined set of user-specified sellers indicated by the user profile information.

20. The system of claim **16**, wherein the one or more physical processors are further caused to:

obtain a predetermined set of sellers specified by an administrator of the system that is different than the user,

wherein to select the seller, the one or more physical processors are further caused to: select the seller from the predetermined set of administrator-specified sellers.

21. The system of claim **15**, wherein the one or more physical processors are further caused to:

receive a previous user input prior to the receipt of the user input, wherein the previous user input is related to the product or service; and

store context information associated with the user based on information related to the previous user input,

wherein to identify the product or service as at least one product or service to be purchased on behalf of the user, the one or more physical processors are further caused to: determine, without further user input after the receipt of the user input, the product or service based on the natural language utterance and the context information related to the previous user input.

22. The system of claim **21**, wherein the one or more physical processors are further caused to:

perform speech recognition on the previous user input to recognize one or more words associated with the previous user input; and

identify the product or service as at least one product or service related to the previous user input based on the one or more recognized words,

wherein to store the context information, the one or more physical processors are further caused to: store product information identifying the product or service based on the identification of the product or service as related to the previous user input such that the context information comprises the product information, and wherein to determine the product or service as at least one product or service to be purchased on behalf of the user, the one or more physical processors are further caused to: determine, without further user input after the receipt of the user input, the product or service based on the natural language utterance and the product information.

23. The system of claim **15**, wherein the one or more words or phrases by themselves do not indicate the product or service or a product or service type.

24. The system of claim **23**, wherein the one or more physical processors are further caused to:

receive a previous user input prior to the receipt of the user input, wherein the previous user input is related to the product or service,

wherein to identify the product or service as at least one product or service to be purchased on behalf of the user, the one or more physical processors are further caused to: determine, based on the previous user input, without further user input after the receipt of the user input, the product or service as at least one product or service to be purchased on behalf of the user.

25. A system for providing voice commerce, the system comprising:

one or more physical processors programmed with computer program instructions which, when executed, cause the one or more physical processors to:

receive a user input comprising a natural language utterance;

provide, without further user input after the receipt of the user input, the natural language utterance as an input to a speech recognition engine;

obtain, without further user input after the receipt of the user input, one or more words or phrases recognized from the natural language utterance as an output of the speech recognition engine;

determine, without further user input after the receipt of the user input, a context based at least on the one or more words or phrases;

identify, without further user input after the receipt of the user input, the product or service to be purchased on behalf of the user based at least on the determined context;

obtain payment information with which to pay for the product or service;

obtain, without further user input after the receipt of the user input, shipping information with which to deliver the product or service, wherein the shipping information specifies a name or address of a recipient to which the product or service is to be delivered after the product or service is purchased; and

provide, without further user input after the receipt of the user input, a request for user confirmation to use the payment information and the shipping information for a purchase transaction for the product or service.

26. The system of claim **25**, wherein the one or more physical processors are further caused to:

determine whether the user has confirmed use of the payment information and the shipping information for the purchase transaction; and

complete, without further user input after the receipt of the user input other than a user confirmation with respect to the confirmation request, the purchase transaction based on the payment information, the shipping information, and a determination that the user has confirmed use of the payment information and the shipping information.

27. The system of claim **25**, wherein the one or more physical processors are further caused to:

select a seller from which the product or service is to be purchased; and

obtain seller information associated with the seller,

wherein to provide the confirmation request, the one or more physical processors are further caused to: provide, without further user input after the receipt of the user input, a request for user confirmation to purchase the product or service from the seller and to use the payment information and the shipping information for the purchase transaction.

28. The system of claim 25, wherein the one or more physical processors are further caused to:

receive a previous user input prior to the receipt of the user input, wherein the previous user input is related to the product or service; and

store context information associated with the user based on information related to the previous user input,

wherein to identify the product or service as at least one product or service to be purchased on behalf of the user, the one or more physical processors are further caused to: identify, without further user input after the receipt of the user input, the product or service based on the natural language utterance and the context information related to the previous user input.

29. The system of claim 28, wherein the one or more physical processors are further caused to:

perform speech recognition on the previous user input to recognize one or more words associated with the previous user input; and

identify the product or service as at least one product or service related to the previous user input based on the one or more recognized words,

wherein to store the context information, the one or more physical processors are further caused to: store product information identifying the product or service based on the identification of the product or service as related to the previous user input such that the context information comprises the product information, and

wherein to identify the product or service as at least one product or service to be purchased on behalf of the user, the one or more physical processors are further caused to: determine, without further user input after the receipt of the user input, the product or service based on the natural language utterance and the product information.

30. A system for providing voice commerce, the system comprising:

one or more physical processors programmed with computer program instructions which, when executed, cause the one or more physical processors to:

receive a user input comprising a natural language utterance;

provide, without further user input after the receipt of the user input, the natural language utterance as an input to a speech recognition engine;

obtain, without further user input after the receipt of the user input, one or more words or phrases recognized from the natural language utterance as an output of the speech recognition engine;

identify, without further user input after the receipt of the user input, a context based at least on the one or more words or phrases;

determine, without further user input identifying a product or service after the receipt of the user input, a first product or service to be purchased on behalf of a user based at least on the determined context;

obtain, without further user input identifying payment information after the receipt of the user input, first payment information with which to pay for the product or service;

obtain, without further user input identifying shipping information after the receipt of the user input, first shipping information with which to deliver the product or service, wherein the first shipping information specifies a name or address of a recipient to which the product or service is to be delivered after the product or service is purchased; and

complete, without further user input identifying a product or service, payment information, or shipping information after the receipt of the user input, a purchase transaction for the first product or service based on the first payment information and the first shipping information.

31. The method of claim 1, the method further comprising:

identifying, by the computer system, a recipient of the product or service based on the one or more words or phrases, and wherein obtaining the shipping information comprises:

obtaining, by the computer system, an address of the recipient.

32. The method of claim 31, wherein identifying the recipient comprises:

associating, by the computer system, at least one word, other than a name of the recipient, from among the one or more words or phrases, that identifies the recipient.

33. The method of claim 31, wherein obtaining the address of the recipient comprises:

accessing, by the computer system, an address book of the user, wherein the address book comprises an identification of the recipient and the address.

* * * * *

EXHIBIT H

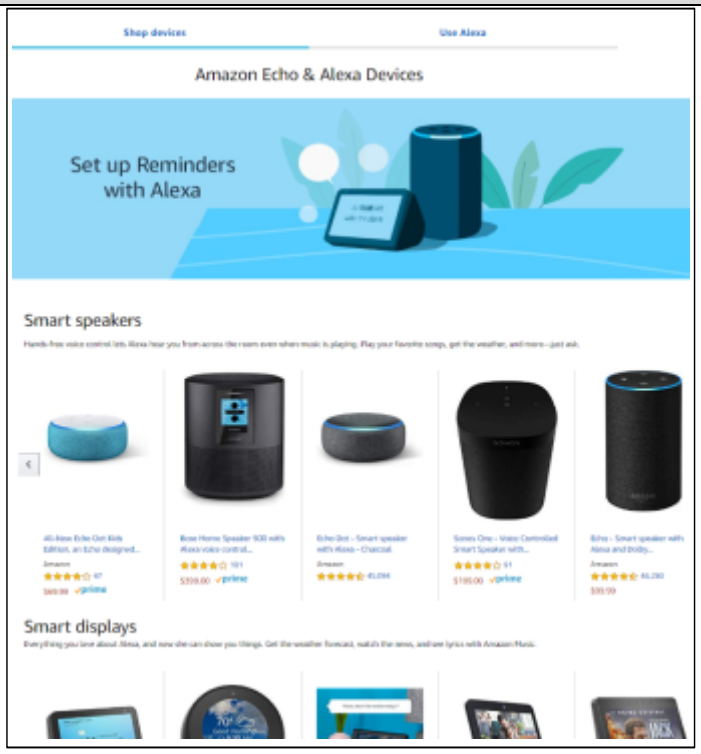
U.S. Pat. No. 9,626,703 ("the '703 patent")
Infringement Chart for Claim 30

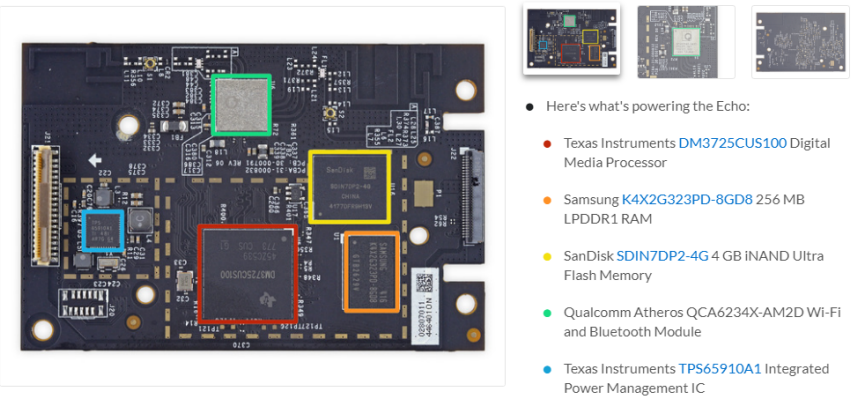
The following chart provides exemplary infringement allegations with respect to an exemplary claim of the '703 patent based on Plaintiff's investigation to date. Plaintiff reserves the right to provide modified and/or more detailed allegations (including with additional claims, products, and evidence) in accordance with its discovery obligations in view of any applicable scheduling order. This chart uses "Alexa Products" to refer to the full scope of instrumentalities identified in the complaint. Any discussion of specific Alexa Products in the following chart is exemplary.

Exemplary information relevant to infringement:

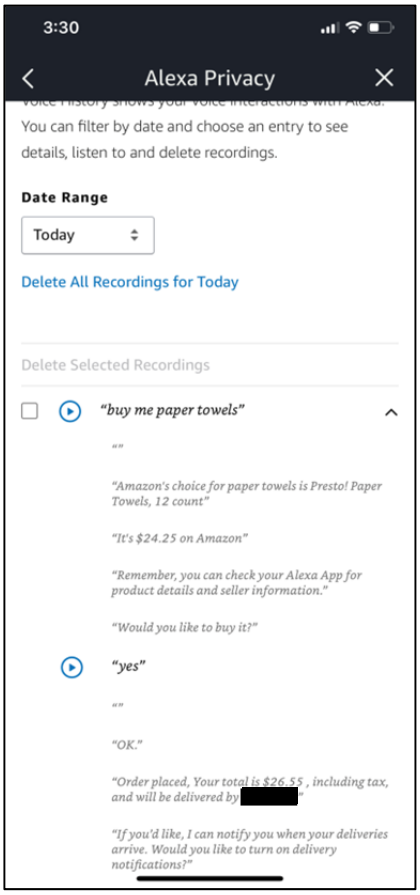
1. *Place Orders with Alexa*, Amazon Help & Customer Service - Amazon Official Site, https://www.amazon.com/gp/help/customer/display.html?nodeId=201807210 (last visited Jul. 22, 2019)
2. Taylor Martin, *How to shop with Alexa on Prime Day*, CNET, Jul. 15, 2018, https://www.cnet.com/how-to/how-to-shop-with-alexa-prime-day/ ("*Prime Day*")
3. Richard Baguley & Colin McDonald, *Appliance Science: Alexa, how does Alexa work? The science of the Amazon Echo*, CNET, Aug. 4, 2016, https://www.cnet.com/news/appliance-science-alexa-how-does-alexa-work-the-science-of-amazons-echo/ ("*Appliance Science*")
4. *Audio Hardware Configurations*, Alexa Voice Service, developer.amazon.com, https://developer.amazon.com/docs/alexa-voice-service/audio-hardware-configurations.html (last visited Jul. 22, 2019)
5. *Designing for Conversation – Build for dialog*, Amazon Alexa - Amazon Developer Services and Technologies - Amazon Official Site, https://developer.amazon.com/ask-resources/guided/conversational-design-workshop#/lessons/gDcQVF9nOFOtNljrELzARIGN4HuD7LNh?_k=q4qp1a (last visited Jul. 22, 2019)
6. *Amazon Echo & Alexa Devices* - Amazon Official Site, https://www.amazon.com/Amazon-Echo-And-Alexa-Devices/b/?ie=UTF8&node=9818047011&ref_=sv_devicesubnav_1 (last visited Jul. 22, 2019)
7. *Amazon Echo Teardown*, IFIXIT, Dec. 16, 2014, https://www.ifixit.com/Teardown/Amazon+Echo+Teardown/33953
8. *Alexa and Alexa Device FAQs*, Amazon Help & Customer Service - Amazon Official Site, https://www.amazon.com/gp/help/customer/display.html?nodeId=201602230 (last visited Jul. 22, 2019)
9. *What is Conversational AI?*, Amazon Alexa - Amazon Developer Services and Technologies - Amazon Official Site, https://developer.amazon.com/alexa-skills-kit/conversational-ai (last visited Jul. 22, 2019)
10. Chaim Gartenberg, *How to shop on Amazon using Alexa voice controls*, The Verge, Jul. 10, 2017, https://www.theverge.com/2017/7/10/15947672/amazon-alexa-voice-controls-shopping-prime-echo-how-to ("*How to Shop*")

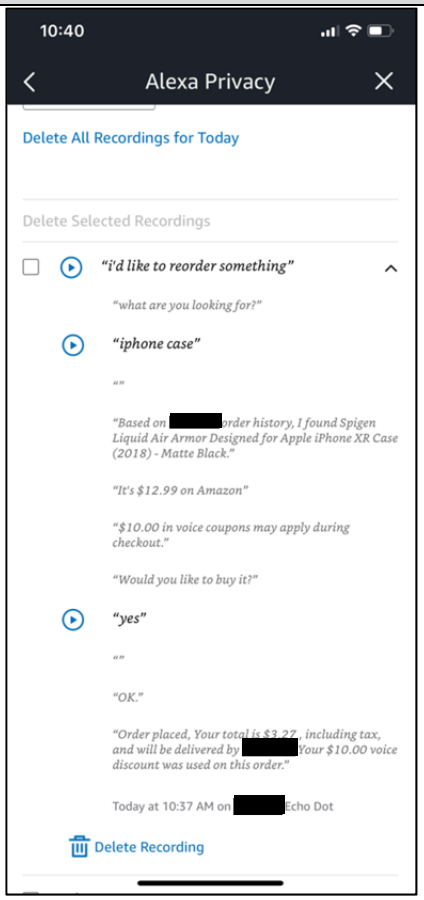
'703 Patent Claim Language	**Exemplary Alexa Products**
30. [pr] A system for providing voice commerce, the system comprising:	Alexa Products include a system for providing voice commerce. For example, Alexa Products (e.g. Echo, Echo Dot, Alexa apps, and Alexa cloud) include Alexa.

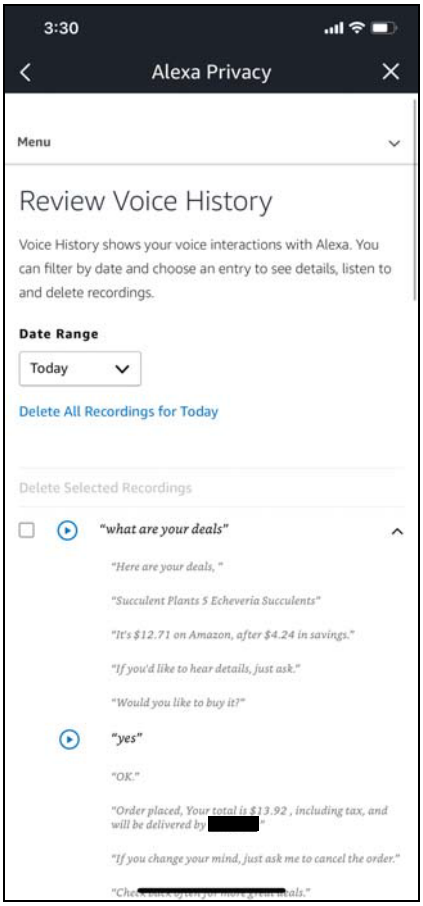
'703 Patent Claim Language	Exemplary Alexa Products
	 E.g. *Amazon Echo & Alexa Devices*. "With conversational AI, voice-enabled devices like Amazon Echo . . . ." E.g. *What is Conversational AI?* Alexa Products include Amazon's Alexa cloud. "Alexa allows you to ask questions and make requests using just your voice. For instance, you can ask Alexa a question, such as "What is the weather today in New York?", or tell Alexa to do something, like "Add batteries to my shopping list," or "Play jazz." When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud so we can process and respond to your request." E.g. *Alexa and Alexa Device FAQs* at answer to question 1. "You can ask Alexa to place orders for Prime-eligible physical products. On supported devices, you can also ask Alexa to place orders for music." *Place Orders with Alexa*. When ordering something not in your existing order history, Alexa "will suggest an 'Amazon Choice' product that meets the description." *How to Shop*.
[30.a] one or more physical processors programmed with computer program instructions which, when executed, cause the one or more physical processors to:	Alexa Products include one or more physical processors programmed with computer program instructions which, when executed, cause the one or more physical processors to perform the remaining operations recited in the claim. For example, the Echo has the physical processors shown below:

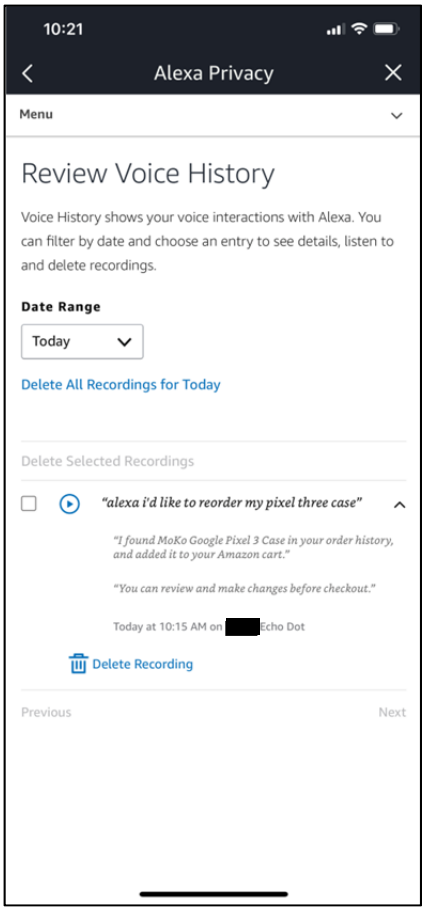
'703 Patent Claim Language	Exemplary Alexa Products
	Step 10  Here's what's powering the Echo: Texas Instruments DM3725CUS100 Digital Media Processor Samsung K4X2G323PD-8GD8 256 MB LPDDR1 RAM SanDisk SDIN7DP2-4G 4 GB iNAND Ultra Flash Memory Qualcomm Atheros QCA6234X-AM2D Wi-Fi and Bluetooth Module Texas Instruments TPS65910A1 Integrated Power Management IC E.g. *Amazon Echo Teardown* at Step 10. As another example, Alexa Products include Amazon's Alexa cloud that has one or more physical processors: "When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud where we process your request and other information to respond to you. For example, when you ask "Alexa, play top hits on Amazon Music" we use the recording of your request and information from Amazon Music to play top hits." *Alexa and Alexa Device FAQs* at answer to question 2.
[30.b] receive a user input comprising a natural language utterance;	Alexa Products receive a user input comprising a natural language utterance. Examples of receiving an utterance are shown in screenshots of Alexa app's "Review Voice History" page below.

'703 Patent Claim Language	Exemplary Alexa Products



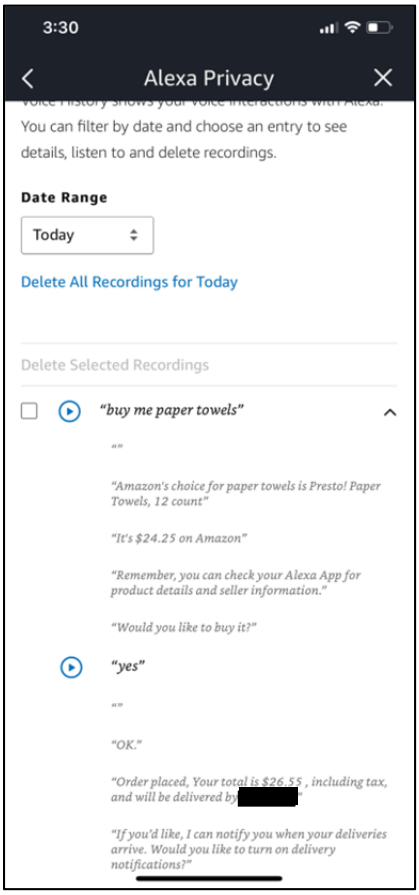


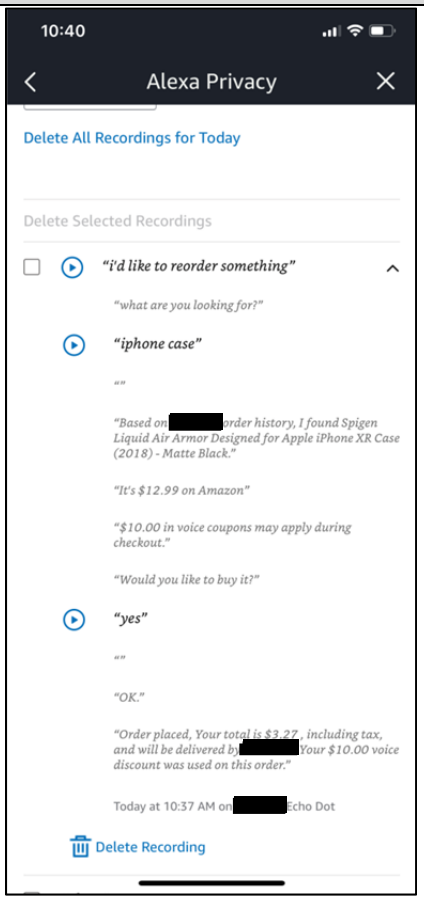


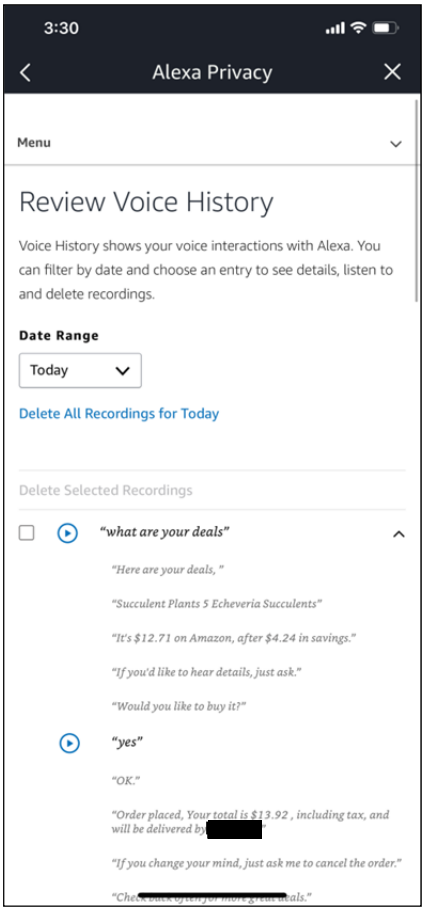


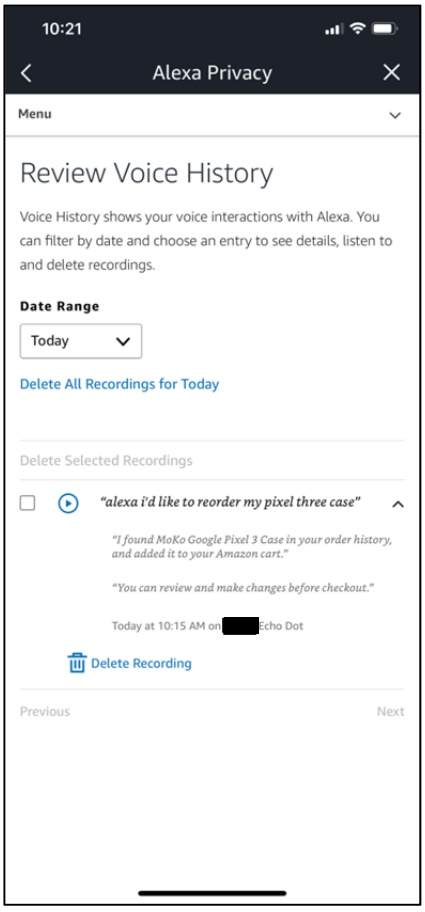
'703 Patent Claim Language	**Exemplary Alexa Products**
	Below are more examples. "Each line of the script spoken by the user is known as an utterance. The utterances are then mapped to an intent. When the user speaks one of them the associated intent will be invoked." *Designing for Conversation – Build for dialog* at Step 2. "You can ask Alexa to place orders for Prime-eligible physical products. On supported devices, you can also ask Alexa to place orders for music." *Place Orders with Alexa.*
[30.c] provide, without further user input after the receipt of the user input, the natural language utterance as an input to a speech recognition engine;	Alexa Products provide, without further user input after the receipt of the user input, the natural language utterance as an input to a speech recognition engine. "When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud where we process your request and other information to respond to you. For example, when you ask 'Alexa, play top hits on Amazon Music' we use the recording of your request and information from Amazon Music to play top hits." *Alexa and Alexa Device FAQs* at answer to question 2. "Alexa uses a combination of automatic speech recognition (ASR) and natural language understanding (NLU) to understand user speech and respond with precision. ASR converts user speech into text, NLU converts that text into intents for Alexa to act on. At the end of this process Alexa sends directives to your product instructing it to perform an action..." *Audio Hardware Configurations* at Automatic Speech Recognition Profiles. "To order something you've not ordered through Amazon before, say something like 'Alexa, order deodorant' . . . Alexa will then perform a search for that item." *Prime Day*.
[30.d] obtain, without further user input after the receipt of the user input, one or more words or phrases recognized from the natural language utterance as an output of the speech recognition engine;	Alexa Products obtain, without further user input after receipt of the user input, one or more words or phrases recognized from the natural language utterance as an output of the speech recognition engine. For example, Alexa Products obtain words or phrases as shown in screenshots of Alexa app's "Review Voice History" page below.

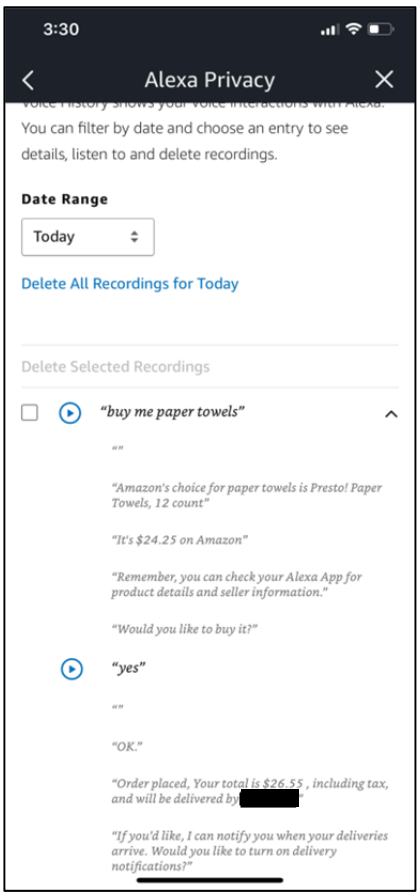
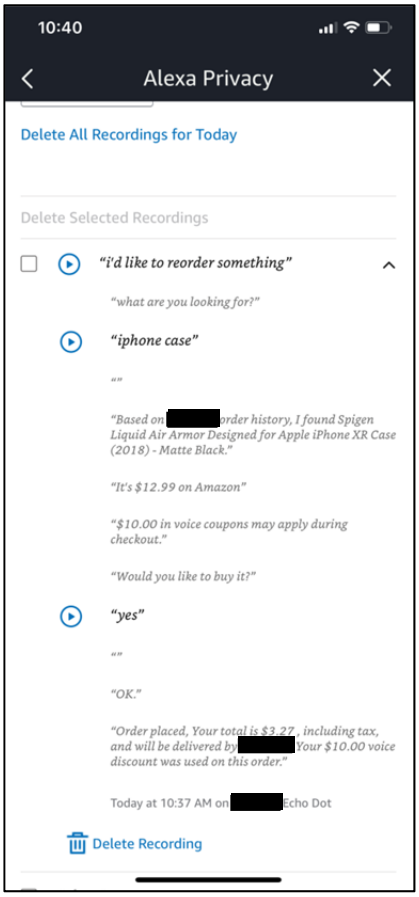
'703 Patent Claim Language	Exemplary Alexa Products

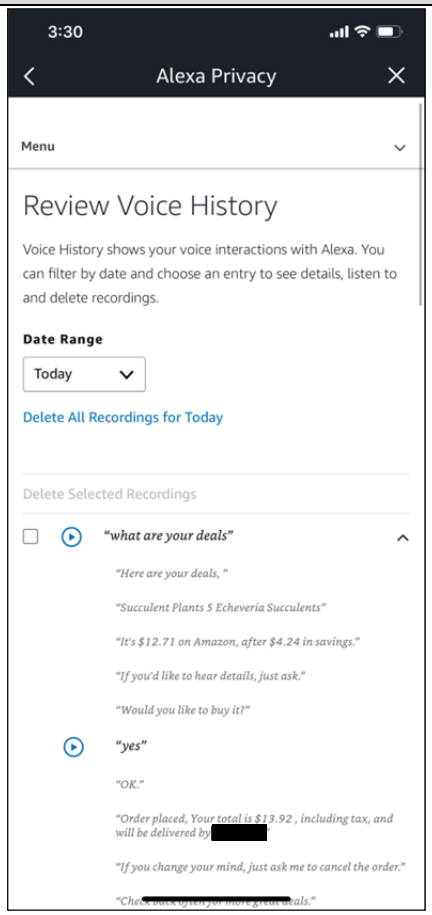
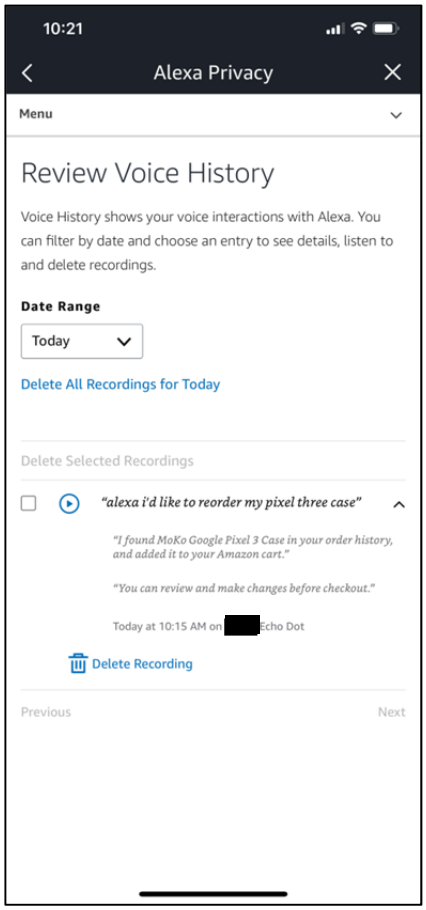




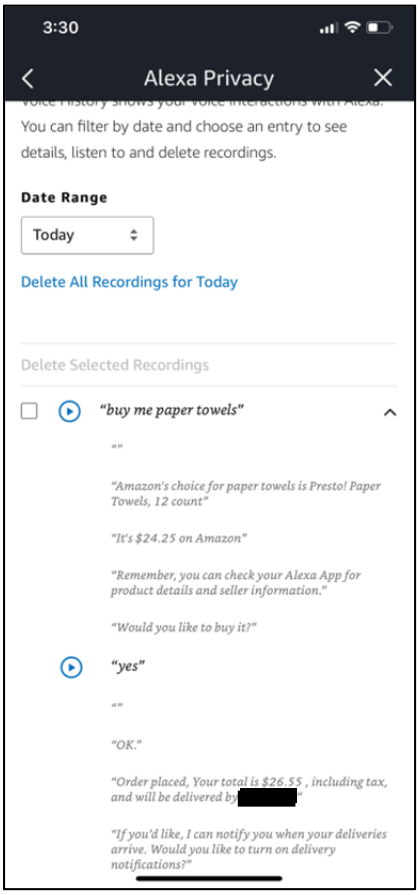


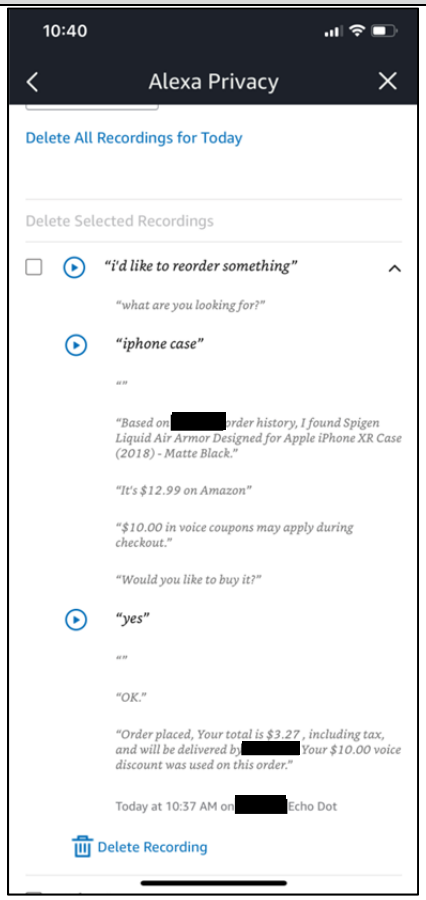


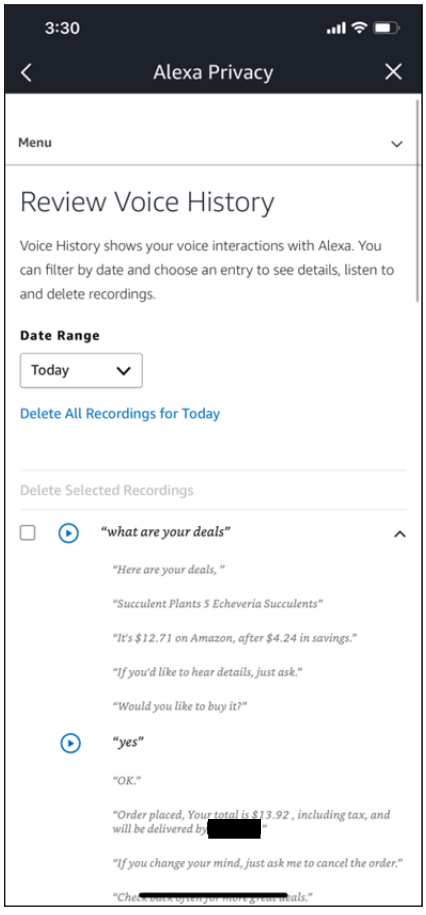
'703 Patent Claim Language	Exemplary Alexa Products
	Below are more examples. "Alexa will then perform a search for that item and offer a few recommendations..." *Prime Day*. "The service that processes this recording is called Alexa Voice Services (AVS). Run by Amazon, this converts the recording into commands that it interprets. It's more than a simple voice-to-text service: it is a fully programmable service that can work with other online services to do a surprising range of things." *Appliance Science*.
[30.e] identify, without further user input after the receipt of the user input, a context based at least on the one or more words or phrases;	Alexa Products identify, without further user input after the receipt of the user input, a context based at least on the one or more words or phrases. Examples are identifying context based on words or phrases shown below in screenshots of Alexa app's "Review Voice History" page.  

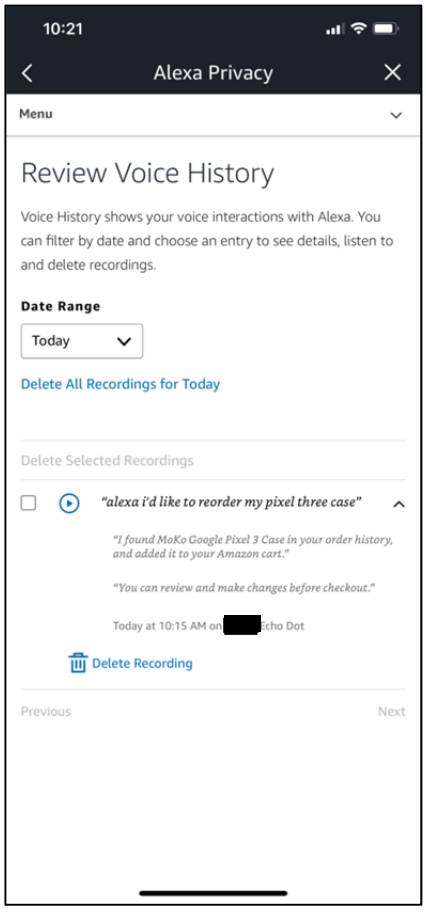
'703 Patent Claim Language	Exemplary Alexa Products
	  Below is another example. "To order something you've not ordered through Amazon before, say something like 'Alexa, order deodorant' . . . Alexa will then perform a search for that item." *Prime Day*.
[30.f] determine, without further user input identifying a product or service after the receipt of the user input, a first product or service to be purchased on behalf of a user based at least on the determined context;	Alexa Products determine, without further user input identifying a product or service after the receipt of the user input, a first product or service to be purchased on behalf of a user based at least on the determined context. Examples are determining a product based on the context as shown in screenshots of Alexa's app's "Review Voice History" page below.

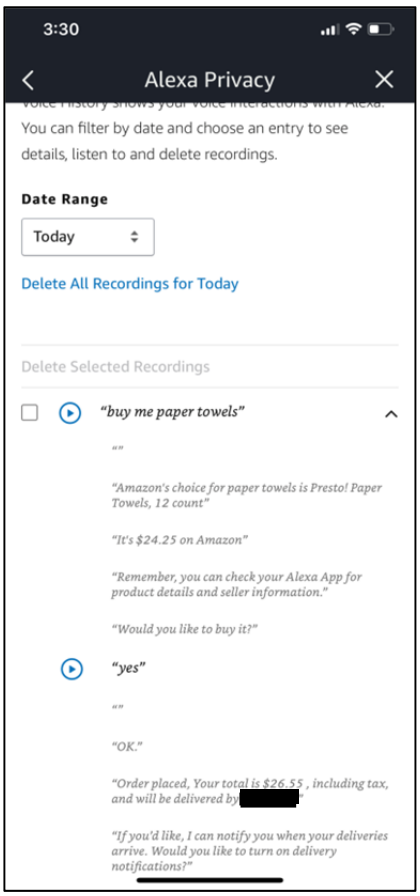
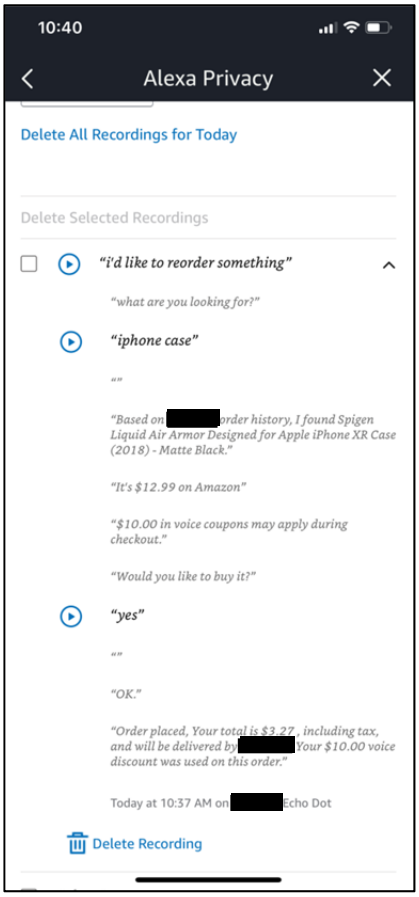
'703 Patent Claim Language	Exemplary Alexa Products



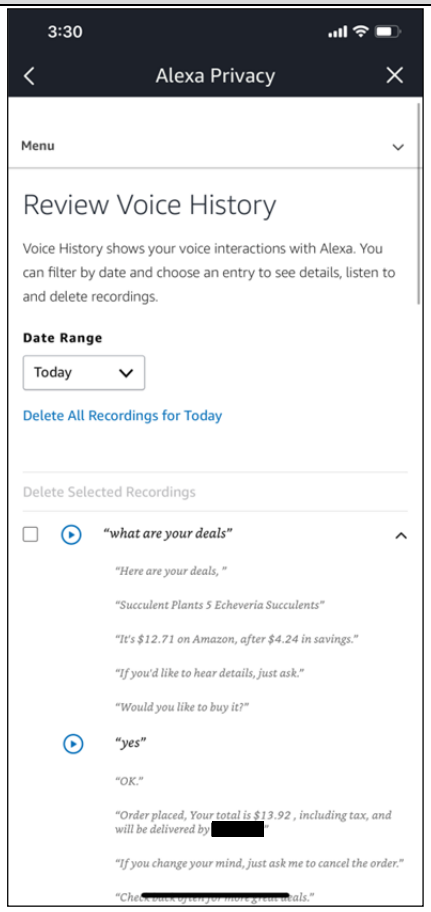




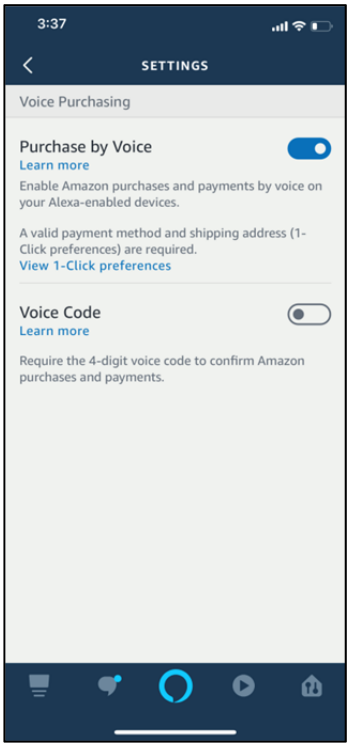


'703 Patent Claim Language	Exemplary Alexa Products
	Below are more examples. "To order something you've not ordered through Amazon before, say something like 'Alexa, order deodorant' . . . Alexa will then perform a search for that item." *Prime Day*. "It will talk you through the handful of recommendations. Like with reordering, just tell Alexa the number of the suggestion you want to add in your cart." *Prime Day*.
[30.g] obtain, without further user input identifying payment information after the receipt of the user input, first payment information with which to pay for the product or service;	Alexa Products obtain, without further user input identifying payment information after the receipt of the user input, first payment information with which to pay for the product or service. Examples are obtaining payment information, which occurred in the interactions shown in the below screenshots of Alexa app's "Review Voice History" page.  

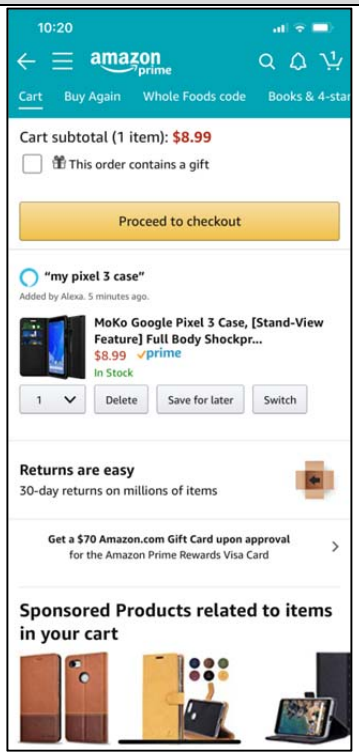
'703 Patent Claim Language	Exemplary Alexa Products



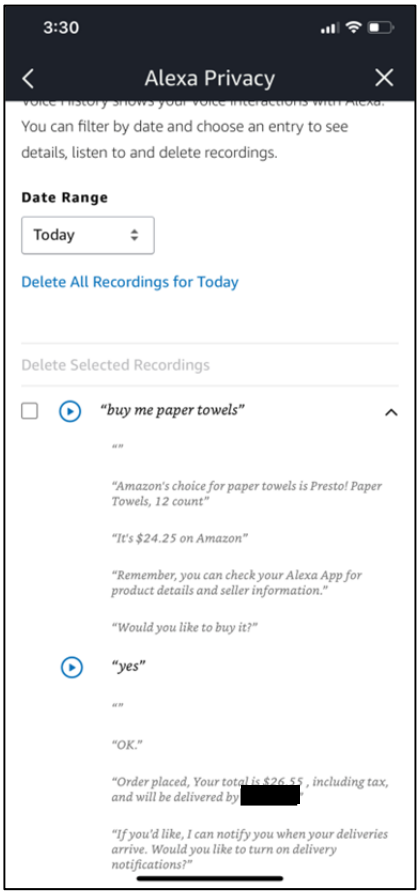
The screenshot below of Alexa's app's "Voice Purchasing" page notes that "a valid payment method...[is] required."

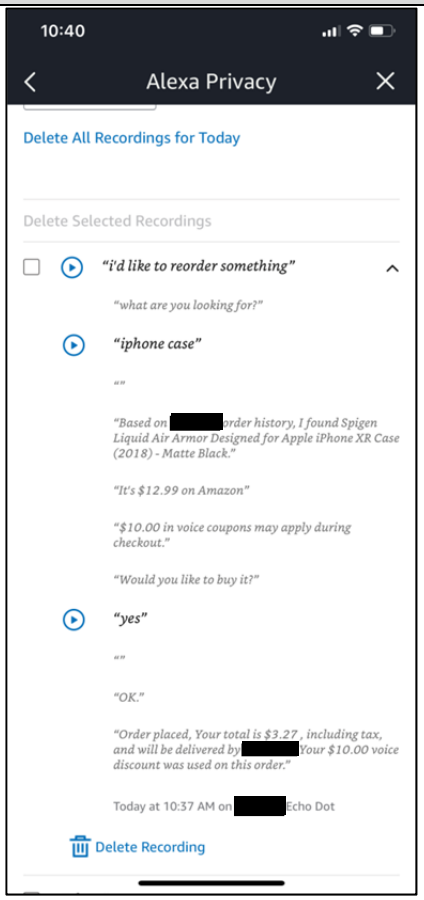


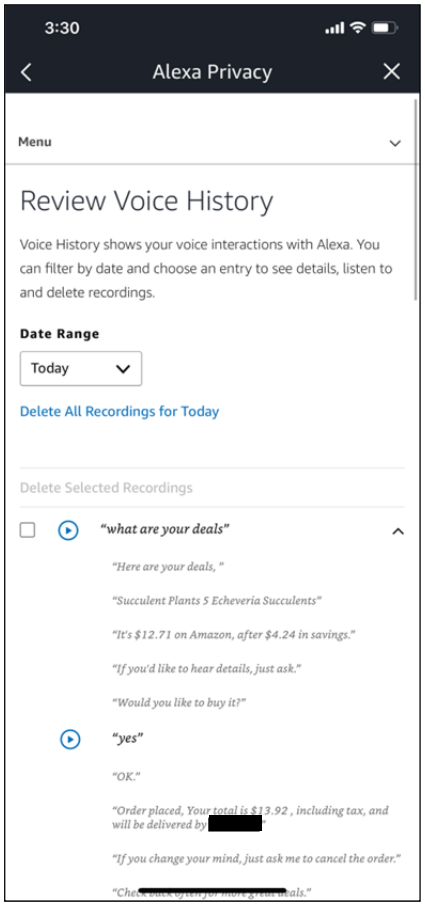
As another example, the Amazon's Shopping app can obtain payment for an item placed into the shopping cart by Alexa.

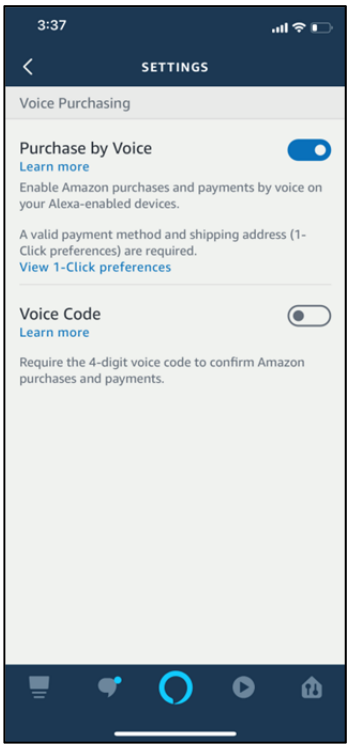
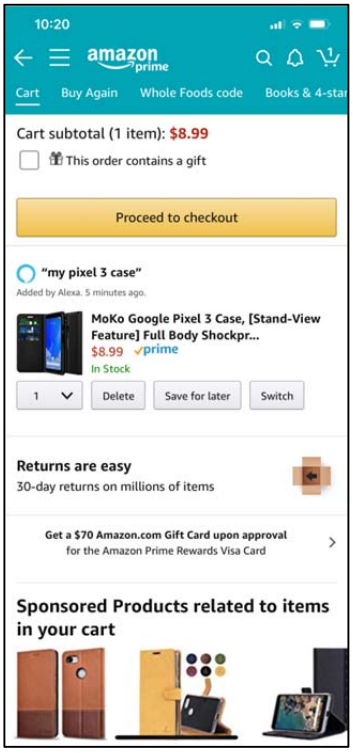
'703 Patent Claim Language	Exemplary Alexa Products
	 Below are more examples. "To place orders, you need . . . a valid payment method." *Place Orders with Alexa*. "Alexa uses the default . . . payment settings in Your Account." *Place Orders with Alexa.* "You must be an Amazon Prime member with a valid payment method set up prior to ordering something with your voice." *Prime Day*.
[30.h] obtain, without further user input identifying shipping information after the receipt of the user input, first shipping information with which to deliver the product or service, wherein the first shipping information specifies a name or address of a recipient to which the product or service is to be delivered after the product or service is purchased; and	Alexa Products obtain, without further user input identifying shipping information after the receipt of the user input, first shipping information with which to deliver the product or service, wherein the first shipping information specifies a name or address of a recipient to which the product or service is to be delivered after the product or service is purchased. Examples are obtaining shipping information, which occurred in the interactions shown in the below screenshots of Alexa app's "Review Voice History" page below.

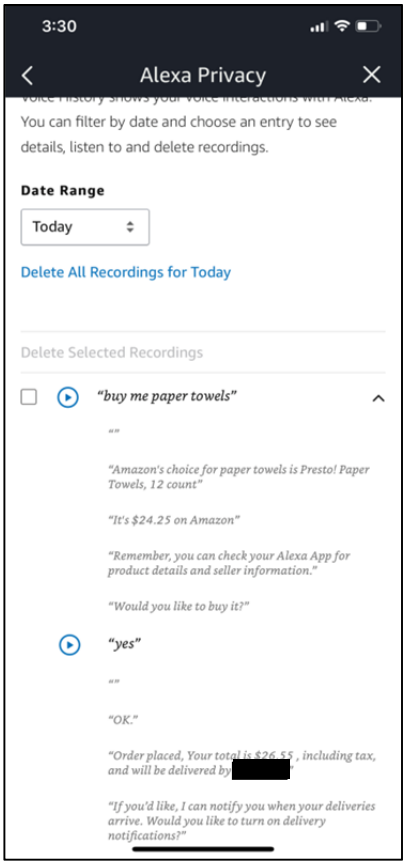
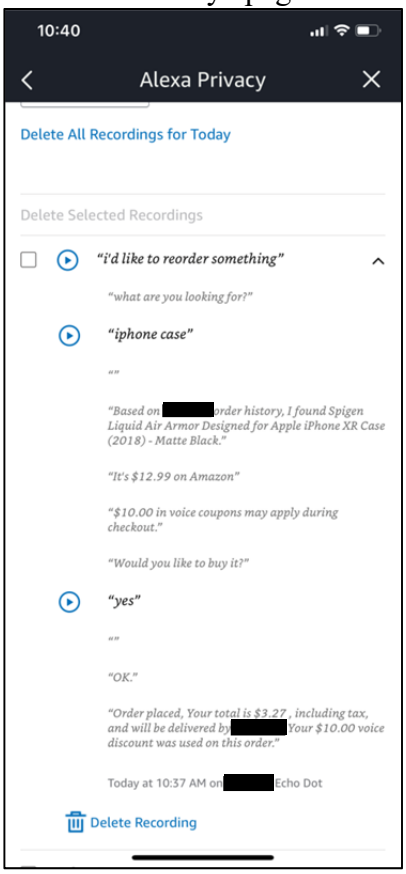
'703 Patent Claim Language	Exemplary Alexa Products

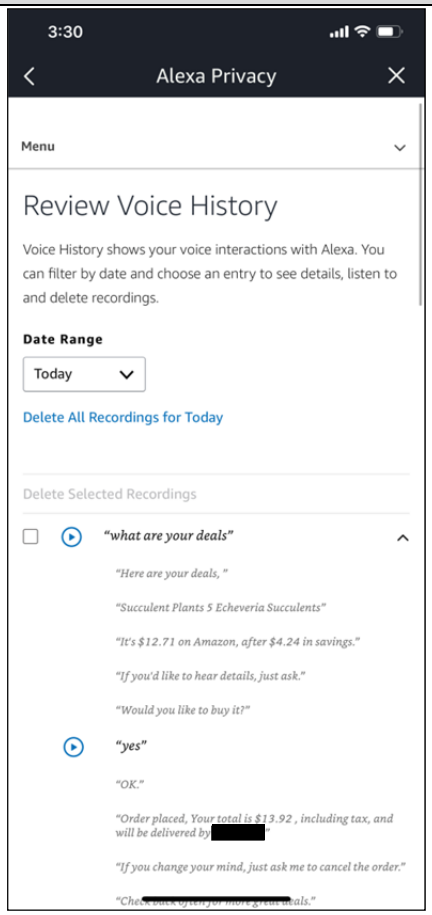






'703 Patent Claim Language	Exemplary Alexa Products
	The screenshot below of Alexa's app's "Voice Purchasing" page notes that "a valid...shipping address...[is] required."  As another example, the Amazon's Shopping app can obtain shipping information for an item placed into the shopping cart by Alexa.  Below is another example. "Alexa uses the default shipping address. . . in Your Account." *Place Orders with Alexa.*

'703 Patent Claim Language	Exemplary Alexa Products
[30.i] complete, without further user input identifying a product or service, payment information, or shipping information after the receipt of the user input, a purchase transaction for the first product or service based on the first payment information and the first shipping information.	Alexa Products complete, without further user input identifying a product or service, payment information, or shipping information after the receipt of the user input, a purchase transaction for the first product or service based on the first payment information and the first shipping information. Examples are completing a purchase transaction, as shown in screenshots of Alexa's app's "Review Voice History" page below. 

'703 Patent Claim Language	Exemplary Alexa Products
	 Another example is completing a purchase transaction from the Amazon's Shopping App for an item placed into the shopping cart by Alexa as shown in the below screenshot of Amazon's Shopping app's "Thank You" page.

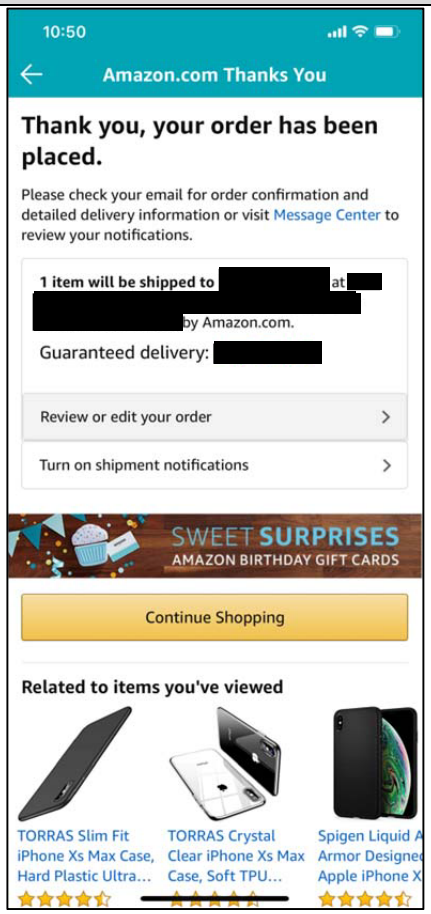
'703 Patent Claim Language	Exemplary Alexa Products
	 Below is another example. "If you want to reorder something you've already purchased from Amazon before, just say, "Alexa, reorder a Swiss Army knife." Alexa will pull up your order history and let you select from the items. You confirm with Alexa which item you want from your history and you're done." *Prime Day*.

EXHIBIT I

US007818176B2

(12) **United States Patent**
Freeman et al.

(10) **Patent No.: US 7,818,176 B2**
(45) **Date of Patent: Oct. 19, 2010**

(54) **SYSTEM AND METHOD FOR SELECTING AND PRESENTING ADVERTISEMENTS BASED ON NATURAL LANGUAGE PROCESSING OF VOICE-BASED INPUT**

(75) Inventors: **Tom Freeman**, Mercer Island, WA (US); **Mike Kennewick**, Bellevue, WA (US)

(73) Assignee: **VoiceBox Technologies, Inc.**, Bellevue, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 740 days.

(21) Appl. No.: **11/671,526**

(22) Filed: **Feb. 6, 2007**

(65) **Prior Publication Data**

US 2008/0189110 A1 Aug. 7, 2008

(51) **Int. Cl.**

G10L 11/00	(2006.01)
G10L 15/18	(2006.01)
G06F 17/27	(2006.01)
G06Q 30/00	(2006.01)

(52) **U.S. Cl.** **704/270**; 704/9; 704/257; 705/14.49

(58) **Field of Classification Search** ..... None
See application file for complete search history.

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5,517,560	A	5/1996	Greenspan	379/114
5,533,108	A	7/1996	Harris et al.	379/201
5,537,436	A	7/1996	Bottoms et al.	375/222
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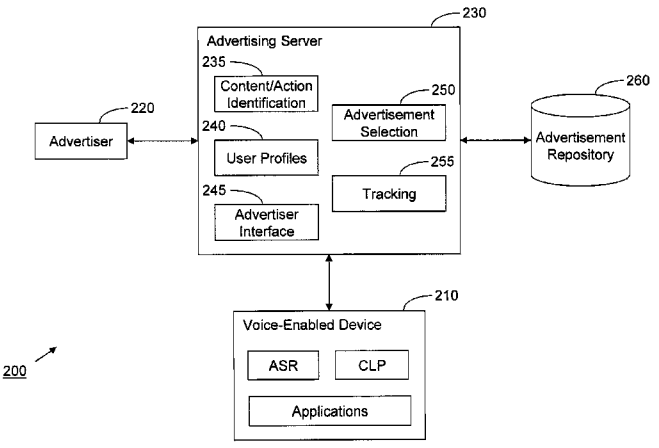
Primary Examiner—Brian L Albertalli
(74) *Attorney, Agent, or Firm*—Pillsbury Winthrop Shaw Pittman LLP

(57) **ABSTRACT**

A system and method for selecting and presenting advertisements based on natural language processing of voice-based inputs is provided. A user utterance may be received at an input device, and a conversational, natural language processor may identify a request from the utterance. At least one advertisement may be selected and presented to the user based on the identified request. The advertisement may be presented as a natural language response, thereby creating a conversational feel to the presentation of advertisements. The request and the user's subsequent interaction with the advertisement may be tracked to build user statistical profiles, thus enhancing subsequent selection and presentation of advertisements.

52 Claims, 3 Drawing Sheets



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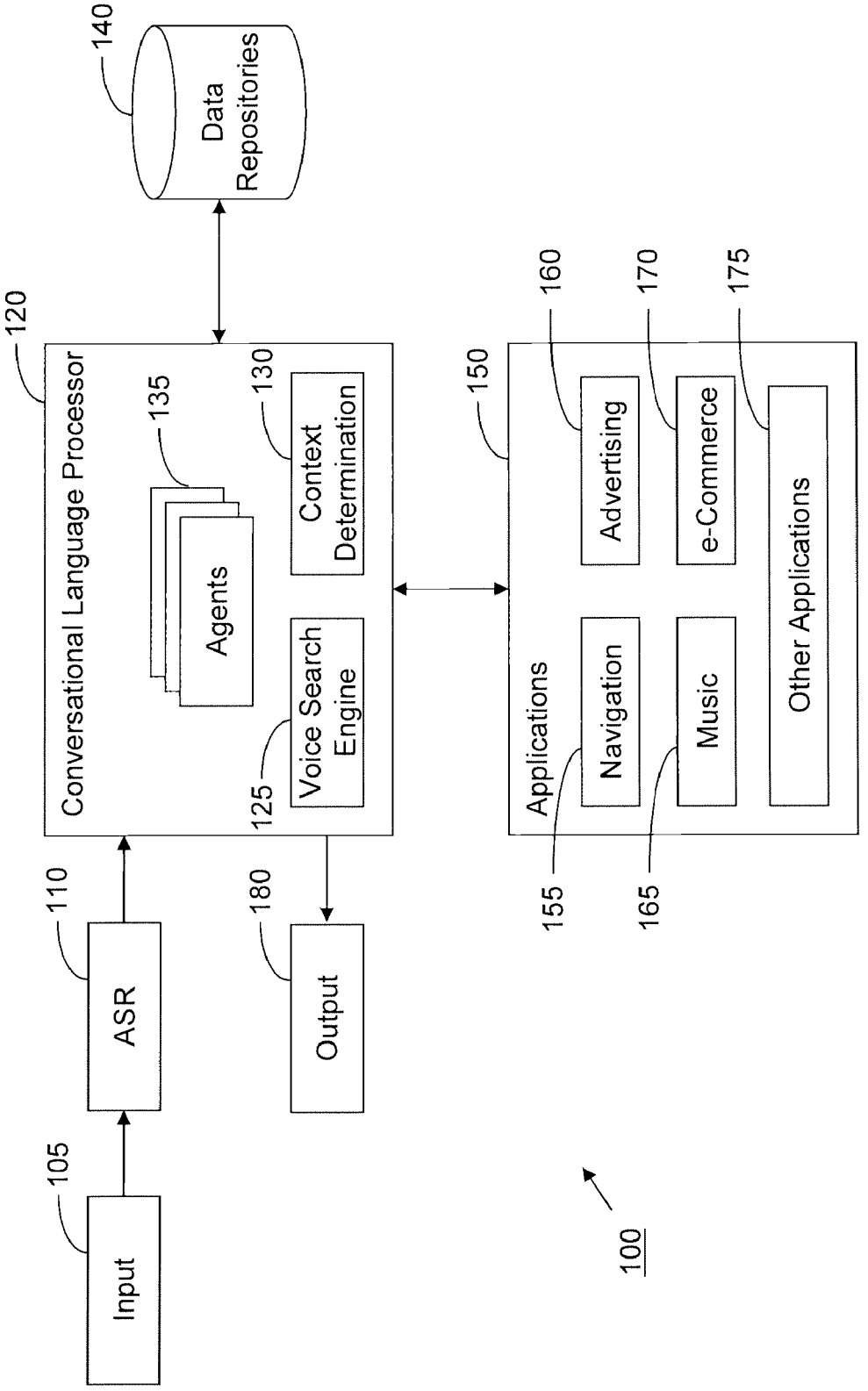
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Conversational Language Processor
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Agents
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Context Determination
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Voice Search Engine
150
Applications
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Advertising
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e-Commerce
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Other Applications
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Navigation
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Music
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ASR
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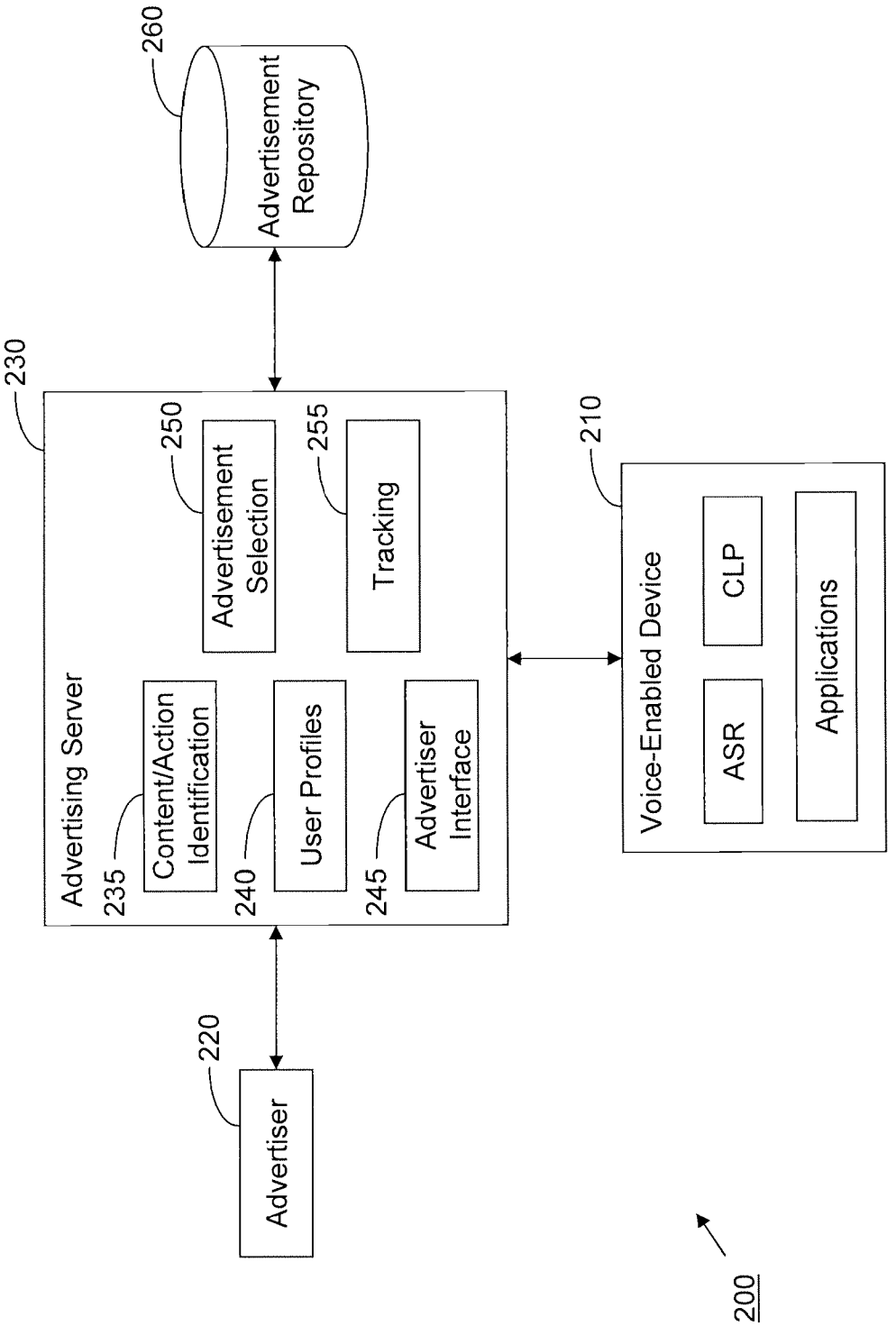
Output
105
Input
100

Fig. 1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Advertisement Repository
230
250
Advertisement Selection
255
Tracking
210
Advertising Server
Content/Action Identification
235
User Profiles
240
Advertiser Interface
245
Voice-Enabled Device
CLP
ASR
Applications
220
Advertiser
200

Fig. 2

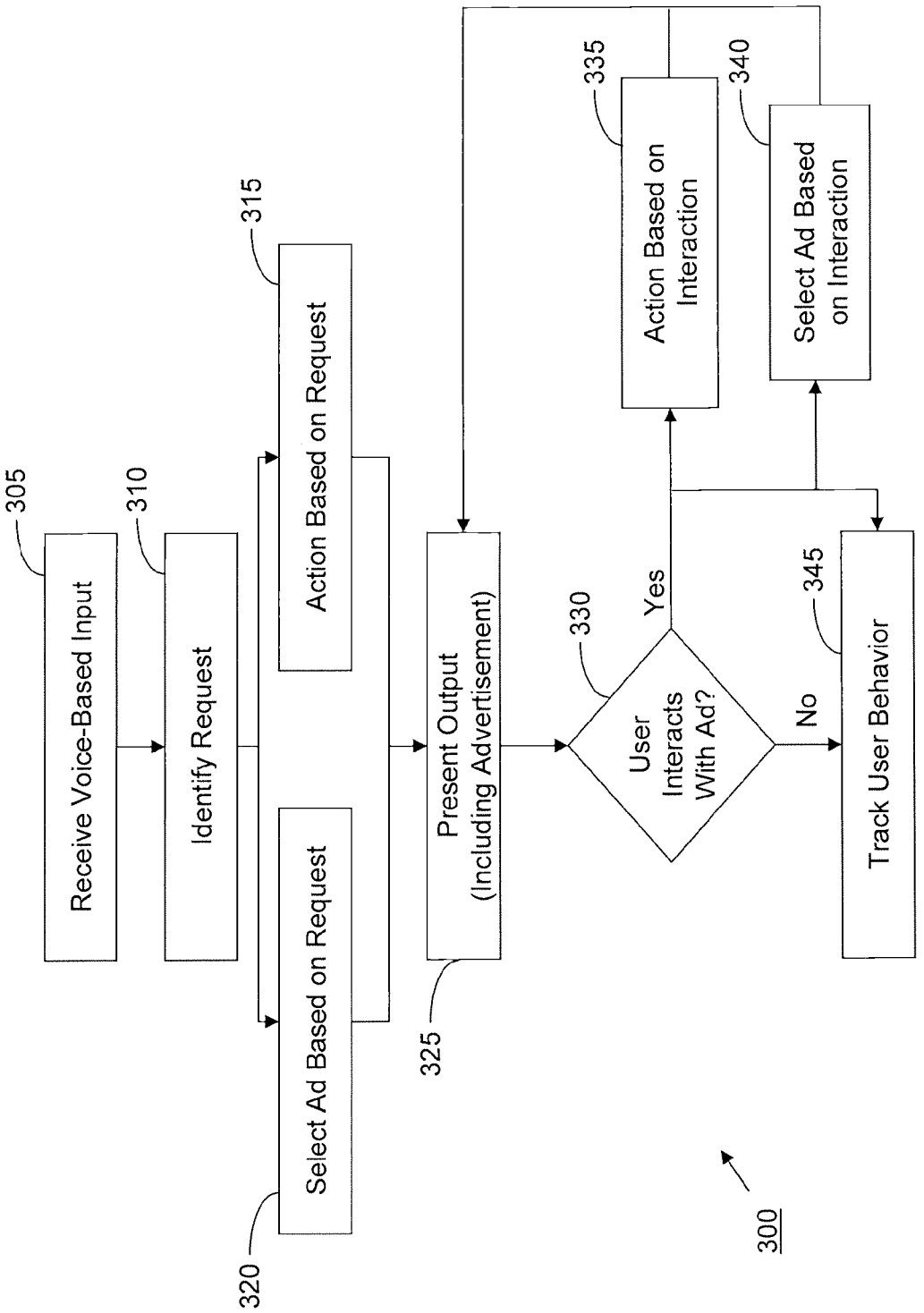

Receive Voice-Based Input
305
Identify Request
310
Action Based on Request
315
Select Ad Based on Request
320
Present Output (Including Advertisement)
325
User Interacts With Ad?
330
Yes
No
Action Based on Interaction
335
Select Ad Based on Interaction
340
Track User Behavior
345
300

Fig. 3

SYSTEM AND METHOD FOR SELECTING AND PRESENTING ADVERTISEMENTS BASED ON NATURAL LANGUAGE PROCESSING OF VOICE-BASED INPUT

FIELD OF THE INVENTION

The present invention relates to selecting and presenting advertisements based on natural language processing of voice-based input.

BACKGROUND OF THE INVENTION

As technology advances, consumer electronics devices tend to play larger roles due to increased functionality and mobility. For example, mobile phones, navigation devices, embedded devices, and other such devices provide a wealth of functionality beyond core applications. However, increased functionality adds difficulty to the learning curve associated with using electronic devices, and increased mobility intensifies the demand for simple mechanisms to interact with devices on the go. For example, existing systems tend to have complex human to machine interfaces, which may inhibit mass-market adoption for various technologies. For example, when a user wishes to perform a relatively simple task on a mobile phone, such as purchasing a ring tone, the user often is forced to navigate through a series of menus and press a series of buttons. In some instances, this may result in the transaction not necessarily occurring, as the user may prefer to avoid the hassles altogether. As such, there is ever-growing demand for ways to exploit technology in intuitive ways.

Voice recognition software may enable a user to exploit applications and features of a device that may otherwise be unfamiliar, unknown, or difficult to use. However, many existing voice user interfaces (when they actually work) still require significant learning on the part of the user. For example, users often cannot directly issue a request for a system to retrieve information or perform an action without having to memorize specific syntaxes, words, phrases, concepts, semantic indicators, or other keywords/qualifiers. Similarly, when users are uncertain of particular needs, many existing systems do not engage the user in a productive, cooperative dialogue to resolve requests and advance a conversation. Instead, many existing speech interfaces force users to use a fixed set commands or keywords to communicate requests in ways that systems can understand. Using existing voice user interfaces, there is virtually no option for dialogue between the user and the system to satisfy mutual goals.

The lack of adequate voice user interfaces results in missed opportunities for providing valuable and relevant information to users. Not only does this potentially leave user requests unresolved, in certain instances, providers of goods and services may lose out on potential business. In an increasingly global marketplace, where marketers are continually looking for new and effective ways to reach consumers, the problems with existing voice user interfaces leaves a large segment of consumer demand unfulfilled. Furthermore, existing techniques for marketing, advertising, or otherwise calling consumers to action fail to effectively utilize voice-based information, which is one of the most natural, intuitive methods of human interaction.

Existing systems suffer from these and other problems.

SUMMARY OF THE INVENTION

According to various aspects of the invention, a system and method for selecting and presenting advertisements based on natural language processing of voice-based inputs is provided. A natural language voice-based input may be received by a voice user interface. The voice-based input may include a user utterance, and a request may be identified from the utterance. Appropriate action may be taken to service the request, while one or more advertisements may be selected and presented to the user. Advertisements may be selected based on various criteria, including content of the input (e.g., concepts, semantic indicators, etc.), an activity related to the input (e.g., a relation to a request, a requested application, etc.), user profiles (e.g., demographics, preferences, location, etc.), or in other ways. A user may subsequently interact with the advertisement (e.g., via a voice-based input), and action may be taken in response to the interaction. Furthermore, the interaction may be tracked to build statistical profiles of user behavior based on affinities or clusters among advertisements, user profiles, contexts, topics, semantic indicators, concepts, or other criteria.

According to various aspects of the invention, advertisers may create advertisements, which may be stored in an advertisement repository. For example, advertisements may include sponsored messages, calls to action, purchase opportunities, trial downloads, or any other marketing communication, as would be apparent to those skilled in the art. Advertisers may specify various parameters to associate with the advertisements, such as various contexts or topic concepts (e.g., semantic indicators for a "music" concept may include words such as "music," "tunes," "songs," etc.), target demographics (e.g., a preferred audience), marketing criteria or prices for insertion (e.g., dynamic or static pricing based on various marketing criteria), or other information, as would be apparent. The advertisement repository may be associated with a server, where in response to a voice-based input from a user (e.g., at a voice-enabled device), a communications link may be established with the server. Information may be extracted from the voice-based input (e.g., words in the input, applications requested by the input, etc.), and the extracted information may be correlated with user profiles, advertisement parameters, or other information to determine which advertisements to select in relation to the voice-based input. The server may subsequently communicate the selected advertisements to the user, and the server may track the user's subsequent interaction with the selected advertisements.

Other objects and advantages of the invention will be apparent based on the following drawings and detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a block diagram of an exemplary system for implementing a voice user interface according to various aspects of the invention.

FIG. **2** illustrates a block diagram of an exemplary advertising system according to various aspects of the invention.

FIG. **3** illustrates a flow diagram of an exemplary method for selecting and presenting advertisements based on voice-based inputs according to various aspects of the invention.

DETAILED DESCRIPTION

Referring to FIG. **1**, an exemplary system **100** for implementing a voice user interface is illustrated according to various aspects of the invention. System **100** may enable users to perform various tasks on a voice-enabled device. For example, users may control navigation devices, media devices, personal computers, personal digital assistants, or any other device supporting voice-based inputs. System **100**

may enable users to request voice-enabled devices to retrieve information or perform various tasks, among other things, using natural language voice-based inputs. For example, system **100** may interpret natural language voice-based inputs and generate responses using, among other things, techniques described in U.S. patent application Ser. No. 10/452,147, entitled "Systems and Methods for Responding to Natural Language Speech Utterance," filed Jun. 3, 2003, which issued as U.S. Pat. No. 7,398,209 on Jul. 8, 2008, and U.S. patent application Ser. No. 10/618,633, entitled "Mobile Systems and Methods for Responding to Natural Language Speech Utterance," filed Jun. 15, 2003, which issued as U.S. Patent No. 7,693,720 on Apr. 6, 2010, both of which are hereby incorporated by reference in their entirety. For example, as described in U.S. patent application Ser. No. 10/452,147, the system **100** may include a speech recognition engine (e.g., an Automatic Speech Recognizer **110**) that may recognize words and phrases in an utterance using entries in one or more dictionary and phrase tables. In addition, as further described therein, 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 (e.g., the probabilities or possibilities may be dynamically updated based on application domains, questions or commands, contexts, user profiles and preferences, user dialog histories, recognizer dictionary and phrase tables, word spellings, and/or other criteria).

According to various aspects of the invention, system **100** may receive a user input, including at least a voice-based user utterance, at an input device **105**. Input device **105** may include any suitable device, or combination of devices, for receiving a voice-based input (e.g., a microphone). In various implementations, input device **105** may include a multi-modal input, such as a touch-screen interface, keypad, or other input. The received utterance may be processed by the Automatic Speech Recognizer **110**. Automatic Speech Recognizer **110** may generate one or more preliminary interpretations of the utterance using various techniques. For example, Automatic Speech Recognizer **110** may interpret the utterance using techniques of phonetic dictation to recognize a stream of phonemes. Further, Automatic Speech Recognizer **110** may perform post-processing to enhance the preliminary interpretations. For example, Automatic Speech Recognizer **110** may vary interpretations of an utterance, or components of an utterance, from one context to another. Other techniques for enhancing an interpretation of a user utterance may be used, such as those described in U.S. patent application Ser. No. 11/513,269, entitled "Dynamic Speech Sharpening," filed Aug. 31, 2006, which issued as U.S. Pat. No. 7,634,409 on Dec. 15, 2009, and which is hereby incorporated by reference in its entirety.

The one or more preliminary interpretations may be provided to a conversational language processor **120**. Conversational language processor **120** may include a voice search engine **125**, a context determination module **130**, and one or more agents **135**, among other things, to enable cooperative, conversational interaction between the user and system **100**. Conversational language processor **120** may be communicatively coupled to one or more data repositories **140** and one or more applications **150**. Conversational language processor **120** may generate a domain-specific conversational response, which may be returned to the user as an output **180**. Output **180** may include a multi-modal output (e.g., by simultaneously returning a voice-based response and displaying information on a display device).

System **100** may further include an interaction with one or more applications **150** to service one or more requests in the utterance. For example, the utterance may include one or more requests for performing an action, retrieving information, or various combinations thereof. Output **180** may include a conversational response to advance a conversation to service requests by invoking one or more applications **150**, as appropriate. For example, applications **150** may include a navigation application **155**, an advertising application **160**, a music application, an electronic commerce application **170**, and/or other applications **175**. Furthermore, Automatic Speech Recognizer **110**, conversational language processor **120**, data repositories **140**, and/or applications **150** may reside locally (e.g., on a user device), remotely (e.g., on a server), and/or hybrid local/remote processing models may be used (e.g., lightweight applications may be processed locally while computationally intensive applications may be processed remotely).

Conversational language processor **120** may build long-term and/or short-term shared knowledge in one or more knowledge source. For example, shared knowledge sources may include information about previous utterances, requests, and other user interactions to inform generating an appropriate response to a current utterance. The shared knowledge may include public/non-private (i.e., environmental) knowledge, as well as personal/private (i.e., historical) knowledge. For example, conversational language processor **120** may use context determination module **130** to establish a context for a current utterance by having domain agents **135** competitively generate a context-based interpretation of the utterance (e.g., by scoring possible interpretations and selecting a highest scoring interpretation). As such, agents **135** may model various domains (e.g., navigation, music, a specific user, global users, advertising, e-commerce, etc.), and conversational language processor **120** may interpret and/or respond to a voice-based input accordingly. For example, context-based interpretations and responses to a voice-based input may be generated using techniques described in U.S. patent application Ser. No. 11/197,504, entitled "Systems and Methods for Responding to Natural Language Speech Utterance," filed Aug. 5, 2005, which issued as U.S. Pat. No. 7,640,160 on Dec. 29, 2009, and U.S. patent application Ser. No. 11/212,693, entitled "Mobile Systems and Methods of Supporting Natural Language Human-Machine Interactions," filed Aug. 29, 2005, both of which are hereby incorporated by reference in their entirety.

Furthermore, conversational language processor **120** may support adaptive misrecognition to reinterpret a current utterance and/or one or more previous utterances. For example, information contained in a current utterance may indicate that interpretations for one or more previous utterances were incorrect, and therefore, the previous utterances may be reinterpreted to improve subsequent interpretations. Accordingly, conversational language processor **120** may use the techniques described herein, along with various other techniques, to interpret and respond to conversational, natural language utterances. Conversational language processor **120** may use various other techniques as will be apparent, such as those described in U.S. patent application Ser. No. 11/200,164, entitled "System and Method of Supporting Adaptive Misrecognition in Conversational Speech," filed Aug. 10, 2005, which issued as U.S. Pat. No. 7,620,549 on Nov. 17, 2009, and U.S. patent application Ser. No. 11/580,926, entitled "System and Method for a Cooperative Conversational Voice User Interface," filed Oct. 16, 2006, both of which are hereby incorporated by reference in their entirety. For example, as described in U.S. patent application Ser. No. 11/200,164, an environmental model may be accessed to determine user location, user activity, track user actions, and/or other envi-

ronmental information to invoke context, domain knowledge, preferences, and/or other cognitive qualities to enhance the interpretation of questions and/or commands. In addition, as further described therein, based on information received from a general cognitive model, the environmental model, and/or a personalized cognitive model, which provide statistical abstracts of user interaction patterns, the system **100** may enhance responses to commands and questions by including a prediction of user behavior.

Referring to FIG. **2**, an exemplary advertising system **200** is illustrated according to various aspects of the invention. System **200** may include a server **230** for receiving one or more advertisements from an advertiser **220**, wherein the advertisements may be stored in a data repository **260** associated with server **230**. For example, advertisements may include sponsored messages or marketing communications, calls to action, purchase opportunities, trial downloads, coupons, or any other suitable marketing, advertising, campaign, or other information, as would be apparent to those skilled in the art. A voice-enabled device **210** may receive a voice-based input and establish communications with advertising server **230**. Subsequently, advertising server **230** may select one or more advertisements from among the advertisements stored in data repository **260**, and the selected advertisements may be provided to the voice-enabled device for presentation to a user.

Advertiser **220** may access advertising server **230** via an advertiser interface **245**. Advertisers **220** may upload targeted advertisements to server **230** via advertiser interface **245**, and server **230** may store the advertisements in data repository **260**. The advertisements may include graphically-based advertisements that include banners, images, audio, video, or any suitable combination thereof. Furthermore, the advertisements may include interactive or embedded information, such as links, metadata, or computer-executable instructions, or any suitable combination thereof. Advertisers may specify criteria for a campaign or targeting information for an advertisement (e.g., a start date, an end date, budget information, geo-targeting information, conceptual or contextual information, or any other suitable criteria), which may be used to facilitate selecting an advertisement in relation to a particular voice-based input.

In addition to providing interface **245** for advertisers, server **230** may include a content/action identification module **235**, a user profile module **240**, an advertisement selection module **250**, and a tracking module **255**. Users may submit voice-based requests to voice-enabled device **210**, and voice-enabled device **210** may communicate information about the voice-based input to server **230**. Server **230** may invoke advertisement selection module **250** to extract relevant information from about the voice-based input, where advertisement selection module **250** may select one or more advertisements relevant to the voice-based input based on information extracted using content/action identification module **235** and/or user profile module **240**.

For example, content/action identification module **235** may identify content of the voice-based input (e.g., words in the input), requested information (e.g., search results, a web page, music, video, graphics, or other information), requested actions (e.g., calculating a navigation route, placing a telephone call, playing a song, etc.), a category or topic related to the input (e.g., music, business, stocks, sports, navigation, movies, etc.), or other criteria to use in selecting an advertisement. Further, user profile module **240** may identify characteristics of a specific user (e.g., demographics, personal preferences, location-based information, etc.), global user profiles (e.g., demographic profiles, click-through rates, etc.), or other criteria to use in selecting an advertisement. Moreover, advertisement selection module **250** may account for where a request originates from. For example, advertisements may be selected based on a default user location (e.g., identified from a user profile), current geolocation information (e.g., identified from a navigation device), whether an affiliate or partner of server **230** initiated the request, or other criteria.

For instance, a user may request airline reservations via voice-enabled device **210**, and content/action identification module **235** may identify specific words used in the request, a category related to the request (e.g., travel, airlines, hotels, etc.), or other information. Furthermore, user profile module **240** may identify relevant characteristics of the user (e.g., user-specific demographics, location information, preferred airlines or hotels, etc.), as well as global user characteristics (e.g., most popular airlines). In various implementations, advertisements may be selected by assigning a score to each advertisement (e.g., based on click-through rates, relevance metrics, target audiences, etc.). As such, advertisement selection module **250** may correlate the information about the request to select advertisements stored in data repository **260**, and server **230** may communicate the selected advertisements to voice-enabled device **210**. Furthermore, selected advertisements may be presented according to a predetermined ordering or ranking (e.g., based on a ranking of relevance to an advertisement).

In various implementations, advertisement selection module **250** may retrieve a predetermined number of advertisements for any given request. Furthermore, the selected advertisements may depend upon a presentation format. For example, advertisements may be selected based on an amount of available space on a display of voice-enabled device **210** and/or a size/shape of the selected advertisements. In another example, voice-based advertisements may be selected and presented to the user audibly (e.g., a "hands-free" advertisement may be preferred when voice-enabled device **210** is a telematics device).

Furthermore, the user's subsequent interaction with an advertisement may be tracked using tracking module **255**. For example, tracking module **255** may determine whether a conversion or click-through occurs for each advertisement presented to users. Further, tracking module **255** may maintain accounting and/or billing information associated with advertisers **220**. For example, advertisers **220** may specify a maximum insertion cost, a cost-per-click-through, an average insertion cost, or other criteria specifying a budget constraint for an advertisement. As such, tracking module **255** may track which advertisements are selected and/or presented, which advertisements result in a conversion or click-through, whether a click-through or conversion results in a transaction or sale, associations between advertisements and users, requests, concepts, semantic indicators, and/or other criteria. For example, tracking user interaction with advertisements may be used to build user-specific and/or global statistical profiles that map or cluster advertisements to topics, semantic indicators, contexts, concepts, etc. based on user behavior, demographics, targeting constraints, content of advertisements, content of requests, actions associated with requests, or other statistically relevant information. Accordingly, the tracking information may be used to bill or invoice advertisers **220**, as well as to improve subsequent performance and relevance of advertisements selected using advertisement selection module **250**. Other techniques and features of selecting and presenting advertisements based on voice-based inputs may suitably be employed, as would be apparent.

Referring to FIG. **3**, an exemplary method for selecting and presenting advertisements based on a voice-based input is

illustrated according to various aspects of the invention. The method may begin in an operation **305**, where a voice-based input, including at least a user utterance, may be received at a voice user interface. The voice user interface may include any suitable mechanism for receiving the utterance (e.g., a microphone), and may interface with any suitable voice-enabled device, as would be apparent, including personal navigation devices, personal digital assistants, media devices, telematics devices, personal computers, mobile phones, or others.

Subsequently, one or more requests included in the voice-based input may be identified in an operation **310**. For example, the requests may include requests to retrieve information, perform tasks, explore or gather information, or otherwise interact with a system or device. For example, a voice-based input to a navigation device may include a request to calculate a route or retrieve location-based information. In another example, a voice-based input to a mobile phone may include a request to place a telephone call, purchase a ringtone, or record a voice-memo. Furthermore, in various implementations, voice-based inputs may include multiple requests, multi-modal requests, cross-device requests, cross-application requests, or other types of requests. For example, an utterance received in operation **305** may be: "Get me a route to Chang's Restaurant, and call them so I can make a reservation." The utterance may thus include multiple requests, including cross-device requests (e.g., calculate a route using a navigation device, and make a telephone call using a mobile phone), as well as cross-application requests (e.g., search for an address and/or phone number using a voice search engine, and calculate a route using a navigation application).

The requests may be part of a conversational interaction between a user and a system or device, whereby an interpretation of requests in a current utterance may be based upon previous utterances in a current conversation, utterances in previous conversations, context-based information, local and/or global user profiles, or other information. For example, a previous request may be reinterpreted based on information included in subsequent requests, a current request may be interpreted based on information included in previous requests, etc. Furthermore, the conversational interaction may take various forms, including query-based conversations, didactic conversations, exploratory conversations, or other types of conversations. For example, the conversational language processor may identify a type of conversation, and information may be extracted from the utterance accordingly to identify the one or more requests in operation **310**. Moreover, the conversational language processor may determine whether any of the requests are incomplete or ambiguous, and .action may be taken accordingly (e.g., a system response may prompt a user to clarify an incomplete and/or ambiguous request). The conversational language processor may therefore use various techniques to identify a conversation type, interpret utterances, identify requests, or perform other tasks, such as those described in the aforementioned U.S. Patent Applications and U.S. Patents, which are hereby incorporated by reference in their entirety.

Upon identifying the one or more requests, action may be taken based on the identified requests in an operation **315**, while one or more advertisements may be selected in an operation **320** (described in greater detail below). For example, one or more context-appropriate applications may be invoked to service the requests in operation **315** (e.g., a voice search engine, a navigation application, an electronic commerce application, or other application may be invoked depending upon the request). Furthermore, in operation **320**, information may be communicated to an advertising server to select one or more advertisements related to the request. Thus, as shown in FIG. **3**, taking action in operation **315** and selecting advertisements in operation **320** may be related operations (e.g., advertisements may be selected to help in interpreting incomplete and/or ambiguous requests).

Upon taking action in operation **315** (e.g., to service the request) and selecting one or more advertisements in operation **320** (e.g., in relation to the request), an output may be presented to the user in operation **325**. The output may indicate a result of the action associated with operation **315**. For example, the output may include requested information, an indication of whether a requested task was successfully completed, whether additional information is needed to service the request (e.g., including a prompt for the information), or other information relating to an action based on the request. Furthermore, the output may include advertisements, as selected in operation **320**. For example, the output may include text-based, graphic-based, video-based, audio-based, or other types of advertisements, as would be apparent to those skilled in the art. Further, the output may include other types of advertisements, including calls to action (e.g., a location-based coupon or purchase opportunity, trial downloads, or other actionable advertising or marketing).

Advertisements may be selected in relation to a request based on various criteria. For example, an advertisement may be selected based on words or other content of the request, relevant words or content related to the words or content of the request, etc. In another example, the advertisement may be selected based on requested tasks/information (e.g., a request for movie showtimes may result in an advertisement being selected for a particular theater). In yet another example, the advertisement may be selected based on a topic or category associated with the requested tasks/information (e.g., a request to purchase airline tickets may result in an advertisement being selected for a hotel in a destination associated with a reserved flight). In still other examples, the advertisement may be selected based on location information, (e.g., advertisements may be selected based on a proximity to a user geolocation identified using a navigation device), user-specific and/or global user profiles (e.g., advertisements may be selected based on user-specific and/or global preferences, advertiser campaign criteria, etc.).

Content of a voice-based input may be determined based on various criteria, including contextual or conceptual information (e.g., semantic indicators, qualifiers, or other information). For example, a given concept may include various semantically equivalent indicators having an identical meaning. Thus, for instance, a voice-based input may be "Play some tunes!" or "Play some music!" or other variants thereof, each of which may be interpreted as relating to a specific idea (or concept) of "Music." Thus, concept or content information in a request may be used to select an advertisement. For example, a user may request to calculate a route in Seattle, Wash. (e.g., "How do I get to the Space Needle?"). Based on a context of the requested task (e.g., "Navigation," "Seattle," etc.), a voice search engine may retrieve an address of the Space Needle and a navigation application may calculate the route. Furthermore, user profile information may indicate that the user is visiting Seattle from out-of-town (e.g., the profile may indicate that the user's home is Sacramento), and therefore, an advertisement for popular points-of-interest in Seattle may be selected. In another example, the user may request information about a sporting event (e.g., "Get me the kickoff time for the Eagles game on Sunday"). Based on a context of the requested information (e.g., "Search," "Sports," "Philadelphia," etc.), the requested information

may be retrieved, while an advertisement for Eagles apparel or memorabilia may be selected.

In various instances, concepts, semantic indicators, qualifiers, or other information included in, or inferred from, a request may indicate an exploratory nature for the request. In other words, the exploratory request may identify a goal for a conversation, instead of a particular task to perform or information to retrieve. As such, in various implementations, an advertisement may be selected in operation **320** in an effort to advance the conversation towards the goal. For example, an exploratory request may include a request for a navigation route (e.g., "I feel like going to a museum, find me something interesting"). Based on a context of the requested task (e.g., "Navigation," "Points of Interest," etc.), the goal of the conversation may be identified, and the request may be serviced in operation **315** (e.g., a voice search engine may locate nearby points of interest based on user preferred topics). Further, the advertising application may select an appropriate advertisement in operation **320**, where the advertisement may be selected in an attempt to advance the conversation towards the goal. For example, statistical profiles (e.g., user profiles, global profiles, topic-based profiles, etc.) may reflect an affinity between an advertisement for a particular museum and other users sharing similar demographics or other characteristics with the requesting user. Thus, in addition to retrieving information about museums in operation **315**, an advertisement for a museum likely to be of interest to the user may be selected in operation **320**.

In various instances, a request may include incomplete, ambiguous, unrecognized, or otherwise insufficient semantic indicators, context, qualifiers, or other information needed to identify the request. In other words, the request may include inadequate information to identify or infer a task to perform, information to retrieve, or a goal for a conversation. Thus, as much information as possible may be extracted and/or inferred from the request based on shared knowledge such as context, user or global profile information, previous utterances, previous conversations, etc. As such, servicing the request may include generating a response and/or communicating with an advertising application to advance a conversation toward a serviceable request. For example, servicing the request in operation **315** and selecting an advertisement in operation **320** may include generating a response and/or selecting an advertisement to frame a subsequent user input, thereby advancing the conversation.

For example, the request may include incomplete, ambiguous, or unrecognized information (e.g., "Do you know [mumbled words] Seattle?"). A context of the requested task may be identified (e.g., "Seattle"), yet the identified context may be insufficient to adequately take action to service the request. Additional information may be inferred based on previous utterances in the conversation, profile information, or other information. However, when the additional information fails to provide adequate information to infer a reasonable hypothesis, servicing the request in operation **315** may include generating a response to frame a subsequent user input and advance the conversation (e.g., information about various topics may be retrieved based on a user's preferred topics). Further, the advertising application may select an advertisement in operation **320** to advance the conversation (e.g., advertisements may be selected based on user and/or global profiles reflecting an affinity between certain advertisements associated with Seattle and user preferences, profiles, etc.). Thus, by selecting an advertisement, indicating dissatisfaction with an advertisement, or otherwise interacting with an advertisement, the interaction may be used to build context and shared knowledge for a subsequent course of the conversation. For example, a user may select an advertisement, and an interpretation of a subsequent voice-based input (e.g., "Call them," "What's the price range?" etc.) may be interpreted with shared knowledge of the advertisement that the voice-based input relates to. Thus, advertisements may be used in a way that enables advertisers to market to consumers, while also improving the consumers' interaction with a device. Other advantages will be apparent to those skilled in the art.

It will be apparent that operation **320** may use various techniques to select advertisements based on voice-based inputs and/or requests included therein. For example, an advertiser may specify a target audience, marketing criteria, campaign strategies, budget constraints, concepts, semantic indicators, related topics, categories, and/or any other suitable information to associate with an advertisement. For instance, advertisers may pay a premium to prioritize an advertisement in relation to similar advertisements (e.g., advertisements associated with competitors). In another example, various statistical profiles may define affinities between advertisements, topics, users, etc. (e.g., based on click-through or conversion rates, or other tracking information, as described in more detail below). Thus, advertisements may be selected in operation **320** using various techniques, including content of the request, an activity/action associated with the request, user profiles, user preferences, statistical metrics, advertiser-specified criteria, to advance a conversation, to resolve ambiguous requests, or in various other ways, as will be apparent.

The output presented to the user in operation **325** may be provided to the user in various ways. For example, in various implementations, the output may include a voice-based or otherwise audible response. In another example, when an associated device includes a display mechanism, the output may be displayed on the display device. It will be apparent that many combinations or variants thereof may be used, such as augmenting a voice-based response with information on a display device. For example, a user may request information about restaurants, and an advertisement may be selected based on a user preference indicating a favorite type of restaurant (e.g., a Chinese restaurant may be selected based on a user profile indicating a preference for Chinese). Therefore, in one example, the output presented in operation **325** may display information about various restaurants matching the requested information, while a voice-based advertisement for the Chinese restaurant may be played to the user (e.g., via a speaker or other suitable mechanism for playing voice back to the user). Many other variations will be apparent (e.g., a graphical advertisement may be displayed on a display device, while a corresponding or different voice-based advertisement may be played audibly).

Subsequent interaction between the user and the presented advertisements may be monitored in a decisional operation **330**. For instance, when the user elects to interact with the advertisement, action may be taken based on the interaction in an operation **335**. The interaction may take various forms, including additional voice-based inputs or other suitable mechanisms for interacting with advertisements (e.g., clicking on an advertisement displayed on a personal digital assistant using an associated stylus). For example, a user may initially request information from a voice-enabled media device (e.g., a satellite radio player) about a song currently playing (e.g., "What is this song?"). In addition to outputting the requested information about the song (e.g., "This song is Double Barrel by Dave and Ansel Collins."), a selected advertisement may enable the user to purchase a ringtone for a mobile phone that corresponds to the song. In this example,

the interaction may include a request to purchase the ringtone (e.g., "Yeah, I'll buy that"), and action taken in operation **335** may include completing a transaction for the ringtone and/or downloading the ringtone to the mobile phone. Furthermore, additional advertisements may be selected in an operation **340** based on the interaction, using similar techniques as described in connection with operation **320** (e.g., advertisements for additional ringtones, similar musicians, etc. may be selected). Processing may subsequently return to operation **325** to present output resulting from the interaction.

User advertisement interaction may be tracked in an operation **345**. For example, operation **345** may track historical data about users, conversations, topics, contexts, or other criteria to associate information with the selected advertisement. The tracking information may therefore be used to build statistical profiles defining affinities, click-through or conversion rates, or other information about various advertisements, topics, or other criteria on a user-specific and/or a global-user level. Thus, clusters or mappings may be created between advertisements, topics, concepts, demographics, or other criteria based on user behavior with the advertisements (e.g., whether a user interacts with the advertisement in operation **330**).

For instance, certain advertisements may experience high click-through rates in relation to a first context and/or topic, but low click-through rates in relation to a second context and/or topic, and therefore, when requests relate to the first context and/or topic, the advertisement may be more likely to be selected in subsequent operations **320**/**340**. In another example, global statistical profiles may indicate that an advertisement experiences more click-throughs by users of a particular demographic, and therefore, the advertisement may be more likely to be selected for users falling within the demographic. Many different techniques for tracking and building statistical profiles will be apparent.

Implementations of the invention may be made in hardware, firmware, software, or any combination thereof. The invention may also be implemented as instructions stored on a machine-readable medium, which may be read and executed by one or more processors. A machine-readable medium may include any mechanism for storing or transmitting information in a form readable by a machine (e.g., a computing device). For example, a machine-readable storage medium may include read only memory, random access memory, magnetic disk storage media, optical storage media, flash memory devices, and others, and a machine-readable transmission media may include forms of propagated signals, such as carrier waves, infrared signals, digital signals, and others. Further, firmware, software, routines, or instructions may be described in the above disclosure in terms of specific exemplary aspects and implementations of the invention, and performing certain actions. However, it will be apparent that such descriptions are merely for convenience and that such actions in fact result from computing devices, processors, controllers, or other devices executing the firmware, software, routines, or instructions.

Aspects and implementations may be described as including a particular feature, structure, or characteristic, but every aspect or implementation may not necessarily include the particular feature, structure, or characteristic. Further, when a particular feature, structure, or characteristic is described in connection with an aspect or implementation, it will be apparent to effect such feature, structure, or characteristic in connection with other aspects or implementations whether or not explicitly described. Thus, various changes and modifications may be made, without departing from the scope and spirit of the invention. The specification and drawings are to be regarded as exemplary only, and the scope of the invention is to be determined solely by the appended claims.

What is claimed is:

1. A method for selecting and presenting advertisements in response to processing natural language utterances, comprising:

receiving a natural language utterance containing at least one request at an input device;

recognizing one or more words or phrases in the natural language utterance at a speech recognition engine coupled to the input device, wherein recognizing the words or phrases in the natural language utterance includes:

mapping a stream of phonemes contained in the natural language utterance to one or more syllables that are phonemically represented in an acoustic grammar; and

generating a preliminary interpretation for the natural language utterance from the one or more syllables, wherein the preliminary interpretation generated from the one or more syllables includes the recognized words or phrases;

interpreting the recognized words or phrases at a conversational language processor coupled to the speech recognition engine, wherein interpreting the recognized words or phrases includes establishing a context for the natural language utterance;

selecting an advertisement in the context established for the natural language utterance; and

presenting the selected advertisement via an output device coupled to the conversational language processor.

2. The method of claim **1**, wherein the conversational language processor selects the advertisement based on information related to one or more of the recognized words or phrases, an action associated with the request, a personalized cognitive model derived from an interaction pattern for a specific user, a generalized cognitive model derived from an interaction pattern for a plurality of users, or an environmental model derived from environmental conditions or surroundings associated with the specific user.

3. The method of claim **2**, further comprising:

tracking an interaction pattern with the advertisement presented via the output device; and

updating one or more of the personalized cognitive model, the generalized cognitive model, or the environmental model based on the interaction pattern tracked for the advertisement.

4. The method of claim **3**, wherein updating one or more of the personalized cognitive model, the generalized cognitive model, or the environmental model builds statistical profiles for selecting subsequent advertisements in response to subsequent natural language utterances.

5. The method of claim **4**, wherein the statistical profiles identify affinities between the advertisement presented via the output device and one or more of the recognized words or phrases, the action associated with the request, the personalized cognitive model, the generalized cognitive model, or the environmental model.

6. The method of claim **3**, further comprising:

building long-term shared knowledge and short-term shared knowledge in response to updating one or more of the personalized cognitive model, the generalized cognitive model, or the environmental model;

receiving a subsequent natural language utterance at the input device; and

interpreting the subsequent natural language utterance at the conversational language processor using the long-term shared knowledge and the short-term shared knowledge.

7. The method of claim **3**, wherein the interaction pattern tracked for the advertisement includes an action performed in response to a subsequent request that identifies the advertisement.

8. The method of claim **7**, wherein the action includes executing a task or retrieving information based on the subsequent request that identifies the advertisement.

9. The method of claim **1**, wherein the conversational language processor selects the advertisement to resolve the request in response to determining that the natural language utterance includes incomplete or ambiguous information.

10. The method of claim **1**, wherein the speech recognition engine recognizes the one or more words or phrases in the natural language utterance using a plurality of entries in one or more dictionary and phrase tables that are dynamically updated based on a history of a current dialog and one or more prior dialogs.

11. The method of claim **10**, wherein the plurality of entries in the one or more dictionary and phrase tables are further dynamically updated based on one or more dynamic fuzzy set possibilities or prior probabilities derived from the history of the current dialog and the prior dialogs.

12. The method of claim **1**, further comprising determining that the conversational language processor incorrectly interpreted the words or phrases in response to an adaptive misrecognition engine detecting a predetermined event, wherein the conversational language processor reinterprets the words or phrases in response to the predetermined event.

13. The method of claim **12**, wherein the predetermined event includes receiving one or more of a subsequent input proximate in time to the natural language utterance, a subsequent input that stops the conversational language processor from processing the request contained in the natural language utterance, a subsequent input that overrides the request in a time shorter than an expected time to process the request, or a subsequent input that repeats the natural language utterance.

14. A method for selecting and presenting advertisements in response to processing natural language utterances, comprising:

receiving a natural language utterance containing at least one request at an input device;

recognizing one or more words or phrases in the natural language utterance at a speech recognition engine coupled to the input device;

interpreting the recognized words or phrases at a conversational language processor coupled to the speech recognition engine, wherein interpreting the recognized words or phrases includes establishing a context for the natural language utterance;

selecting an advertisement in the context established for the natural language utterance;

presenting the selected advertisement via an output device coupled to the conversational language processor; and

determining that the conversational language processor incorrectly interpreted the words or phrases in response to an adaptive misrecognition engine detecting a predetermined event, wherein the conversational language processor reinterprets the words or phrases in response to the predetermined event.

15. The method of claim **14**, wherein the predetermined event includes receiving one or more of a subsequent input proximate in time to the natural language utterance, a subsequent input that stops the conversational language processor from processing the request contained in the natural language utterance, a subsequent input that overrides the request in a time shorter than an expected time to process the request, or a subsequent input that repeats the natural language utterance.

16. The method of claim **14**, wherein recognizing the words or phrases in the natural language utterance includes:

mapping a stream of phonemes contained in the natural language utterance to one or more syllables that are phonemically represented in an acoustic grammar; and

generating a preliminary interpretation for the natural language utterance from the one or more syllables, wherein the preliminary interpretation generated from the one or more syllables includes the recognized words or phrases.

17. The method of claim **14**, wherein the conversational language processor selects the advertisement to resolve the request in response to determining that the natural language utterance includes incomplete or ambiguous information.

18. The method of claim **14**, wherein the conversational language processor selects the advertisement based on information related to one or more of the recognized words or phrases, an action associated with the request, a personalized cognitive model derived from an interaction pattern for a specific user, a generalized cognitive model derived from an interaction pattern for a plurality of users, or an environmental model derived from environmental conditions or surroundings associated with the specific user.

19. The method of claim **18**, further comprising:

tracking an interaction pattern with the advertisement presented via the output device; and

updating one or more of the personalized cognitive model, the generalized cognitive model, or the environmental model based on the interaction pattern tracked for the advertisement.

20. The method of claim **19**, wherein updating one or more of the personalized cognitive model, the generalized cognitive model, or the environmental model builds statistical profiles for selecting subsequent advertisements in response to subsequent natural language utterances.

21. The method of claim **20**, wherein the statistical profiles identify affinities between the advertisement presented via the output device and one or more of the recognized words or phrases, the action associated with the request, the personalized cognitive model, the generalized cognitive model, or the environmental model.

22. The method of claim **19**, further comprising:

building long-term shared knowledge and short-term shared knowledge in response to updating one or more of the personalized cognitive model, the generalized cognitive model, or the environmental model;

receiving a subsequent natural language utterance at the input device; and

interpreting the subsequent natural language utterance at the conversational language processor using the long-term shared knowledge and the short-term shared knowledge.

23. The method of claim **19**, wherein the interaction pattern tracked for the advertisement includes an action performed in response to a subsequent request that identifies the advertisement.

24. The method of claim **23**, wherein the action includes executing a task or retrieving information based on the subsequent request that identifies the advertisement.

25. The method of claim **14**, wherein the speech recognition engine recognizes the one or more words or phrases in the natural language utterance using a plurality of entries in one

or more dictionary and phrase tables that are dynamically updated based on a history of a current dialog and one or more prior dialogs.

26. The method of claim **25**, wherein the plurality of entries in the one or more dictionary and phrase tables are further dynamically updated based on one or more dynamic fuzzy set possibilities or prior probabilities derived from the history of the current dialog and the prior dialogs.

27. A system for selecting and presenting advertisements in response to processing natural language utterances, comprising:

an input device that receives a natural language utterance containing at least one request at an input device;

a speech recognition engine coupled to the input device, wherein the speech recognition engine recognizes one or more words or phrases in the natural language utterance, wherein to recognize the words or phrases in the natural language utterance, the speech recognition engine is configured to:

map a stream of phonemes contained in the natural language utterance to one or more syllables that are phonemically represented in an acoustic grammar; and

generate a preliminary interpretation for the natural language utterance from the one or more syllables, wherein the preliminary interpretation generated from the one or more syllables includes the recognized words or phrases;

a conversational language processor coupled to the speech recognition engine, wherein the conversational language processor is configured to:

interpret the recognized words or phrases, wherein interpreting the recognized words or phrases includes establishing a context for the natural language utterance;

select an advertisement in the context established for the natural language utterance; and

present the selected advertisement via an output device.

28. The system of claim **27**, wherein the conversational language processor selects the advertisement based on information related to one or more of the recognized words or phrases, an action associated with the request, a personalized cognitive model derived from an interaction pattern for a specific user, a generalized cognitive model derived from an interaction pattern for a plurality of users, or an environmental model derived from environmental conditions or surroundings associated with the specific user.

29. The system of claim **28** wherein the conversational language processor is further configured to:

track an interaction pattern with the advertisement presented via the output device; and

update one or more of the personalized cognitive model, the generalized cognitive model, or the environmental model based on the interaction pattern tracked for the advertisement.

30. The system of claim **29**, wherein the conversational language processor updates one or more of the personalized cognitive model, the generalized cognitive model, or the environmental model to build statistical profiles for selecting subsequent advertisements in response to subsequent natural language utterances.

31. The system of claim **30**, wherein the statistical profiles identify affinities between the advertisement presented via the output device and one or more of the recognized words or phrases, the action associated with the request, the personalized cognitive model, the generalized cognitive model, or the environmental model.

32. The system of claim **29**, wherein the conversational language processor is further configured to:

build long-term shared knowledge and short-term shared knowledge in response to updating one or more of the personalized cognitive model, the generalized cognitive model, or the environmental model; and

interpret a subsequent natural language utterance received at the input device language processor using the long-term shared knowledge and the short-term shared knowledge.

33. The system of claim **29**, wherein the interaction pattern tracked for the advertisement includes an action performed in response to a subsequent request that identifies the advertisement.

34. The system of claim **33**, wherein the action includes executing a task or retrieving information based on the subsequent request that identifies the advertisement.

35. The system of claim **27**, wherein the conversational language processor selects the advertisement to resolve the request in response to determining that the natural language utterance includes incomplete or ambiguous information.

36. The system of claim **27** wherein the speech recognition engine recognizes the one or more words or phrases in the natural language utterance using a plurality of entries in one or more dictionary and phrase tables that are dynamically updated based on a history of a current dialog and one or more prior dialogs.

37. The system of claim **36**, wherein the plurality of entries in the one or more dictionary and phrase tables are further dynamically updated based on one or more dynamic fuzzy set possibilities or prior probabilities derived from the history of the current dialog and the prior dialogs.

38. The system of claim **27**, further comprising an adaptive misrecognition engine configured to determine that the conversational language incorrectly interpreted the words or phrases in response to detecting a predetermined event, wherein the conversational language processor reinterprets the words or phrases in response to the predetermined event.

39. The system of claim **38**, wherein the predetermined event includes receiving one or more of a subsequent input proximate in time to the natural language utterance, a subsequent input that stops the conversational language processor from processing the request contained in the, natural language utterance, a subsequent input that overrides the request in a time shorter than an expected time to process the request, or a subsequent input that repeats the natural language utterance.

40. A system for selecting and presenting advertisements in response to processing natural language utterances, comprising:

an input device that receives a natural language utterance containing at least one request at an input device;

a speech recognition engine coupled to the input device, wherein the speech recognition engine recognizes one or more words or phrases in the natural language utterance;

a conversational language processor coupled to the speech recognition engine, wherein the conversational language processor is configured to:

interpret the recognized words or phrases, wherein interpreting the recognized words or phrases includes establishing a context for the natural language utterance;

select an advertisement in the context established for the natural language utterance; and

present the selected advertisement via an output device; and

an adaptive misrecognition engine configured to determine that the conversational language incorrectly interpreted the words or phrases in response to detecting a predetermined event, wherein the conversational language processor reinterprets the words or phrases in response to the predetermined event.

41. The system of claim **40**, wherein the predetermined event includes receiving one or more of a subsequent input proximate in time to the natural language utterance, a subsequent input that stops the conversational language processor from processing the request contained in the natural language utterance, a subsequent input that overrides the request in a time shorter than an expected time to process the request, or a subsequent input that repeats the natural language utterance.

42. The system of claim **40**, wherein to recognize the words or phrases in the natural language utterance, the speech recognition engine is configured to:

map a stream of phonemes contained in the natural language utterance to one or more syllables that are phonemically represented in an acoustic grammar; and

generate a preliminary interpretation for the natural language utterance from the one or more syllables, wherein the preliminary interpretation generated from the one or more syllables includes the recognized words or phrases.

43. The system of claim **40**, wherein the conversational language processor selects the advertisement to resolve the request in response to determining that the natural language utterance includes incomplete or ambiguous information.

44. The system of claim **40**, wherein the conversational language processor selects the advertisement based on information related to one or more of the recognized words or phrases, an action associated with the request, a personalized cognitive model derived from an interaction pattern for a specific user, a generalized cognitive model derived from an interaction pattern for a plurality of users, or an environmental model derived from environmental conditions or surroundings associated with the specific user.

45. The system of claim **44**, wherein the conversational language processor is further configured to:

track an interaction pattern with the advertisement presented via the output device; and

update one or more of the personalized cognitive model, the generalized cognitive model, or the environmental model based on the interaction pattern tracked for the advertisement.

46. The system of claim **45**, wherein the conversational language processor updates one or more of the personalized cognitive model, the generalized cognitive model, or the environmental model to build statistical profiles for selecting subsequent advertisements in response to subsequent natural language utterances.

47. The system of claim **46**, wherein the statistical profiles identify affinities between the advertisement presented via the output device and one or more of the recognized words or phrases, the action associated with the request, the personalized cognitive model, the generalized cognitive model, or the environmental model.

48. The system of claim **45**, wherein the conversational language processor is further configured to:

build long-term shared knowledge and short-term shared knowledge in response to updating one or more of the personalized cognitive model, the generalized cognitive model, or the environmental model; and

interpret a subsequent natural language utterance received at the input device language processor using the long-term shared knowledge and the short-term shared knowledge.

49. The system of claim **45**, wherein the interaction pattern tracked for the advertisement includes an action performed in response to a subsequent request that identifies the advertisement.

50. The system of claim **49**, wherein the action includes executing a task or retrieving information based on the subsequent request that identifies the advertisement.

51. The system of claim **40**, wherein the speech recognition engine recognizes the one or more words or phrases in the natural language utterance using a plurality of entries in one or more dictionary and phrase tables that are dynamically updated based on a history of a current dialog and one or more prior dialogs.

52. The system of claim **51** wherein the plurality of entries in the one or more dictionary and phrase tables are further dynamically updated based on one or more dynamic fuzzy set possibilities or prior probabilities derived from the history of the current dialog and the prior dialogs.

* * * * *

EXHIBIT J

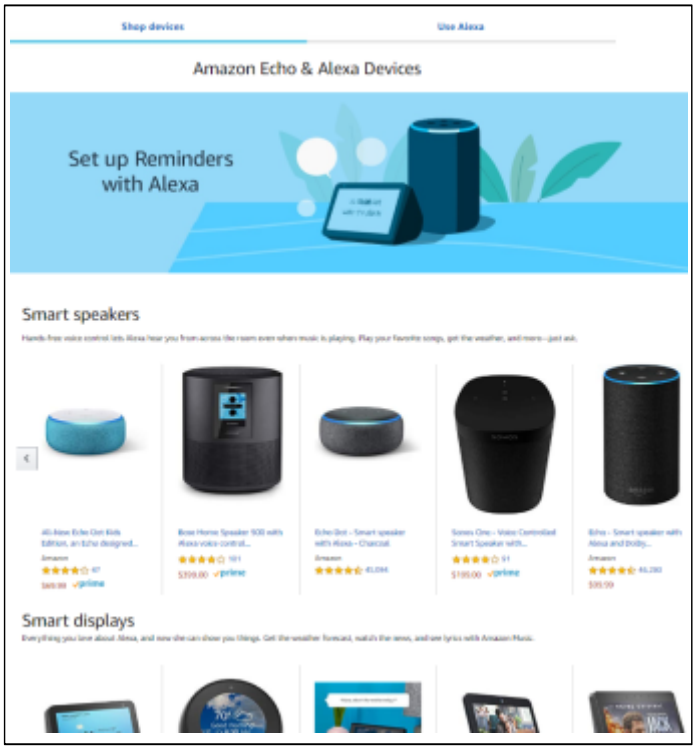
U.S. Pat. No. 7,818,176 ("the '176 patent")
Infringement Chart for Claim 27

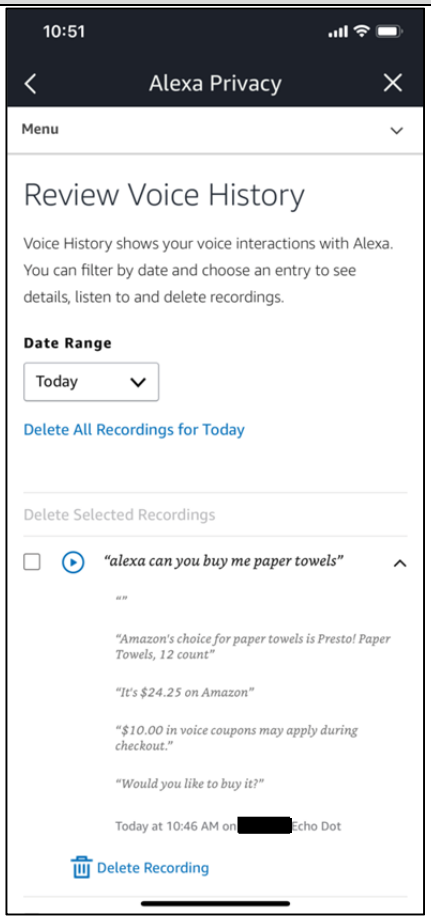
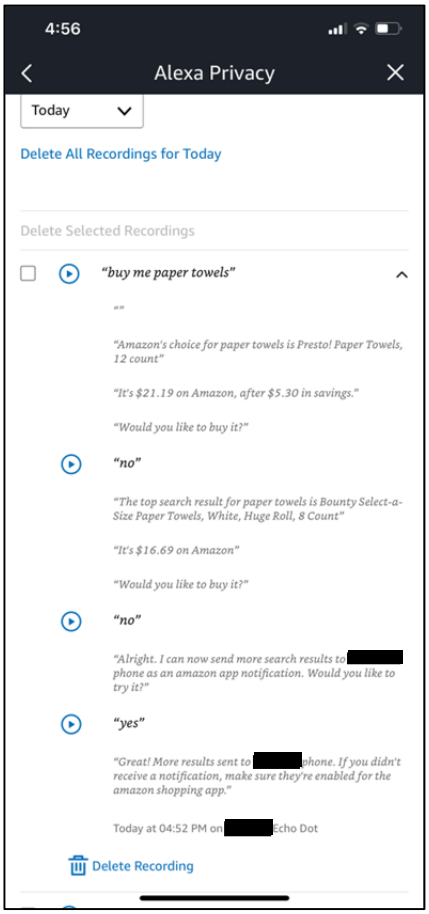
The following chart provides exemplary infringement allegations with respect to an exemplary claim of the '176 patent based on Plaintiff's investigation to date. Plaintiff reserves the right to provide modified and/or more detailed allegations (including with additional claims, products, and evidence) in accordance with its discovery obligations in view of any applicable scheduling order. This chart uses "Alexa Products" to refer to the full scope of instrumentalities identified in the complaint. Any discussion of specific Alexa Products in the following chart is exemplary.

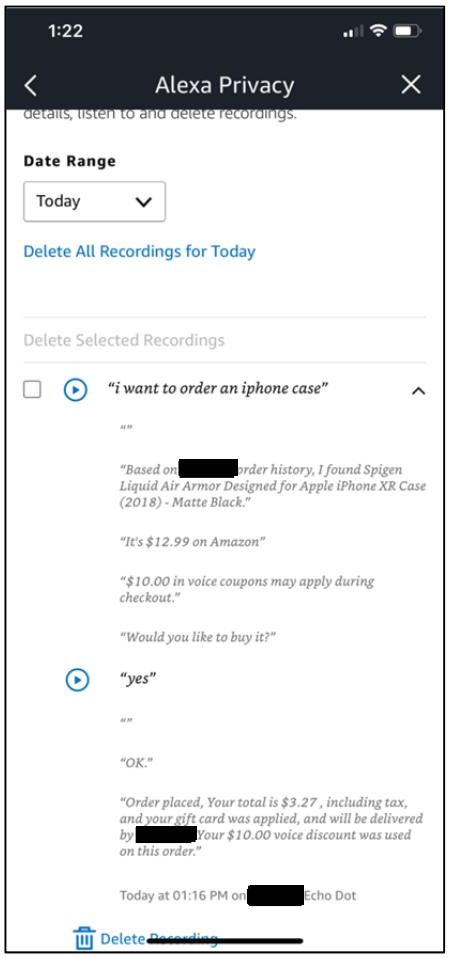
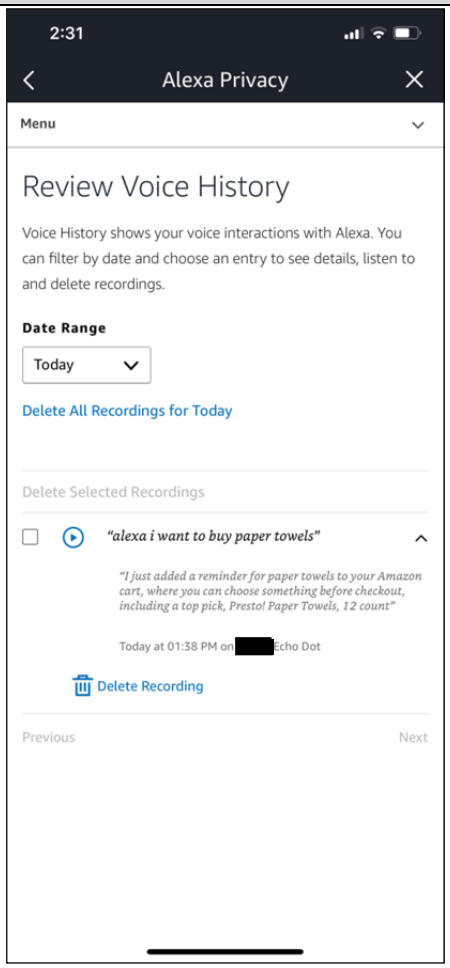
Exemplary information relevant to infringement:

1. *Amazon Echo & Alexa Devices* - Amazon Official Site, https://www.amazon.com/Amazon-Echo-And-Alexa-Devices/b/?ie=UTF8&node=9818047011&ref_=sv_devicesubnav_1 (last visited Jul. 22, 2019)
2. *Speech Recognizer Interface*, Alexa Voice Service, developer.amazon.com, https://developer.amazon.com/docs/alexa-voice-service/speechrecognizer.html (last visited Jul. 22, 2019)
3. Chaim Gartenberg, *How to shop on Amazon using Alexa voice controls*, The Verge, Jul. 10, 2017, https://www.theverge.com/2017/7/10/15947672/amazon-alexa-voice-controls-shopping-prime-echo-how-to ("*How to Shop*")
4. *Place Orders with Alexa*, Amazon Help & Customer Service - Amazon Official Site, https://www.amazon.com/gp/help/customer/display.html?nodeId=201807210 (last visited Jul. 22, 2019)
5. *Alexa and Alexa Device FAQs*, Amazon Help & Customer Service - Amazon Official Site, https://www.amazon.com/gp/help/customer/display.html?nodeId=201602230 (last visited Jul. 22, 2019)
6. *Audio Hardware Configurations*, Alexa Voice Service, developer.amazon.com, https://developer.amazon.com/docs/alexa-voice-service/audio-hardware-configurations.html (last visited Jul. 22, 2019)
7. Taylor Martin, *How to shop with Alexa on Prime Day*, CNET, Jul. 15, 2018, https://www.cnet.com/how-to/how-to-shop-with-alexa-prime-day/ ("*Prime Day*")
8. Richard Baguley & Colin McDonald, *Appliance Science: Alexa, how does Alexa work? The science of the Amazon Echo*, CNET, Aug. 4, 2016, https://www.cnet.com/news/appliance-science-alexa-how-does-alexa-work-the-science-of-amazons-echo/ ("*Appliance Science*")
9. *What is Conversational AI?*, Amazon Alexa - Amazon Developer Services and Technologies - Amazon Official Site, https://developer.amazon.com/alexa-skills-kit/conversational-ai (last visited Jul. 22, 2019)
10. Sarah Perez, *Alexa will soon gain a memory, converse more naturally, and automatically launch skills,* TechCrunch, Apr. 26, 2018, https://techcrunch.com/2018/04/26/alexa-will-soon-gain-a-memory-converse-more-naturally-and-automatically-launch-skills/ ("*Alexa will soon gain a memory*")
11. *Designing for Conversation – Build for dialog*, Amazon Alexa - Amazon Developer Services and Technologies - Amazon Official Site, https://developer.amazon.com/ask-resources/guided/conversational-design-workshop#/lessons/gDcQVF9nOFOtNljrELzARIGN4HuD7LNh?_k=q4qp1a (last visited Jul. 22, 2019)

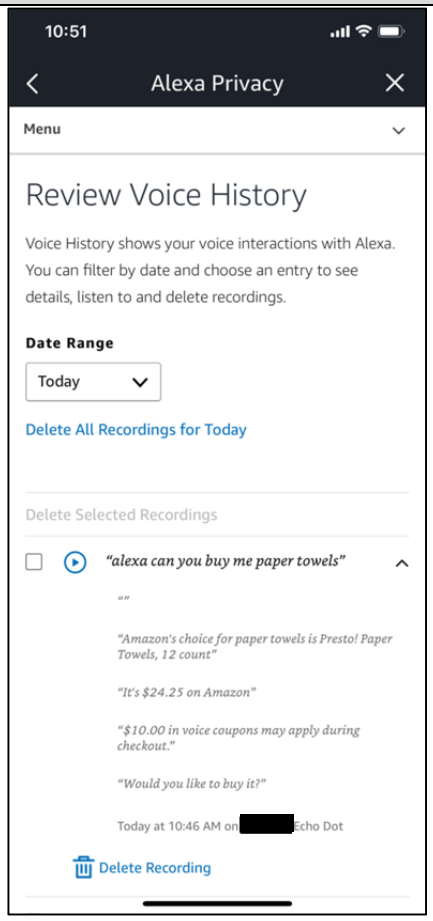
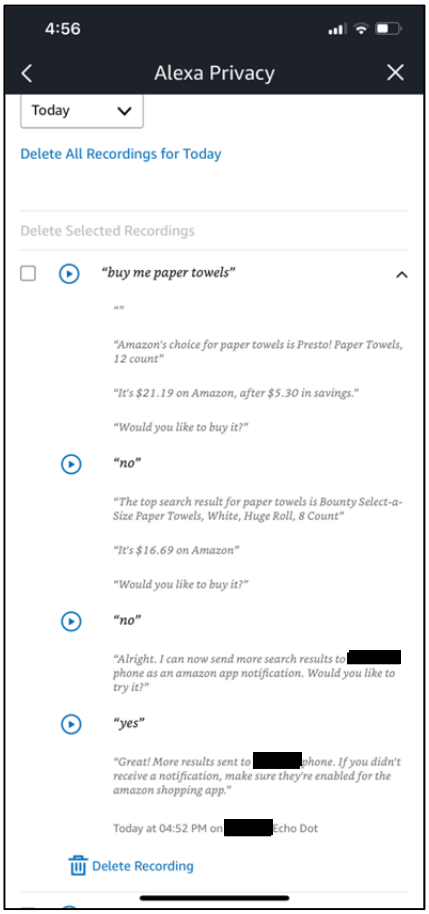
'176 Patent Claim Language	**Exemplary Alexa Products**
27.[pr] A system for selecting and presenting advertisements in response to processing natural	Alexa Products include a system for selecting and presenting advertisements in response to processing natural language utterances. For example, Alexa Products (e.g. Echo, Echo Dot, Alexa apps, and

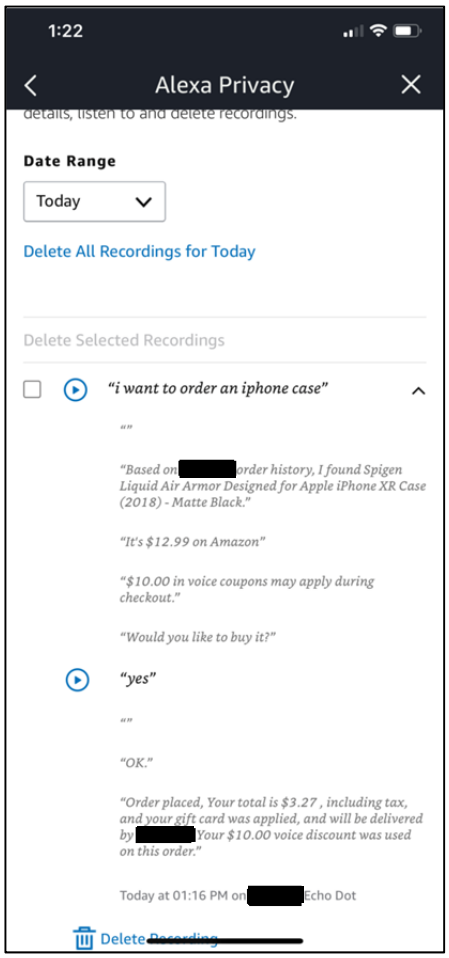
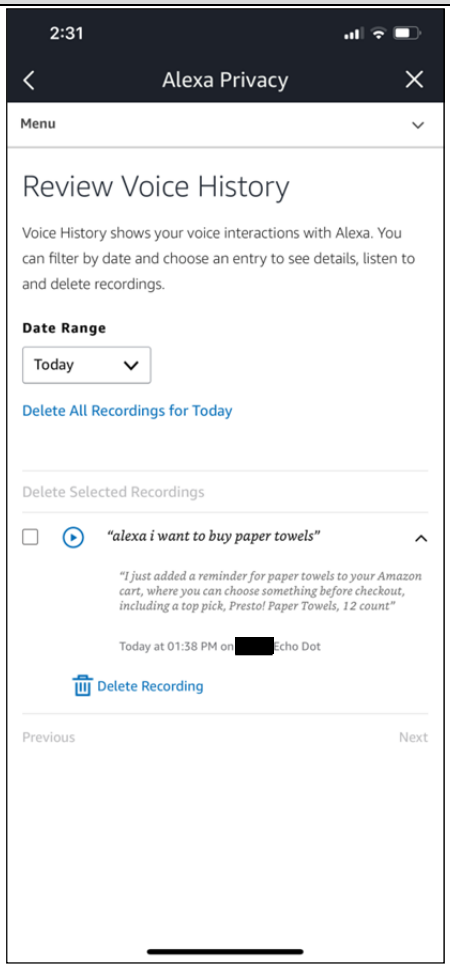
'176 Patent Claim Language	Exemplary Alexa Products
language utterances, comprising:	Alexa cloud) include Alexa.  E.g. *Amazon Echo & Alexa Devices*. "With conversational AI, voice-enabled devices like Amazon Echo . . . ." E.g. *What is Conversational AI?* Alexa Products include Amazon's Alexa cloud. "Alexa allows you to ask questions and make requests using just your voice. For instance, you can ask Alexa a question, such as "What is the weather today in New York?", or tell Alexa to do something, like "Add batteries to my shopping list," or "Play jazz." When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud so we can process and respond to your request." E.g. *Alexa and Alexa Device FAQs* at answer to question 1. When ordering something not in your existing order history, Alexa "will suggest an 'Amazon Choice' product that meets the description." *How to Shop*. "You can ask Alexa to place orders for Prime-eligible physical products. On supported devices, you can also ask Alexa to place orders for music" *Place Orders with Alexa*.
[27.a] an input device that receives a natural language utterance containing at least one request at an input device;	Alexa Products have an input device that receives a natural language utterance containing at least one request at an input device. Examples of receiving an utterance are shown in screenshots of Alexa app's "Review Voice History" page below.

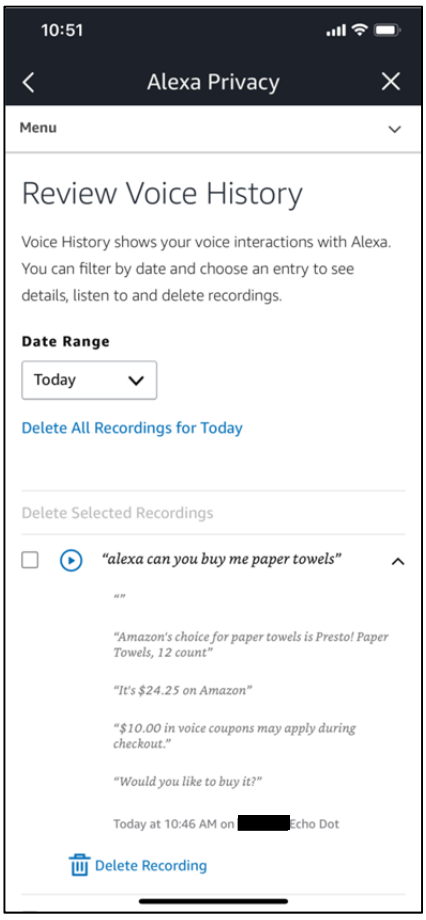
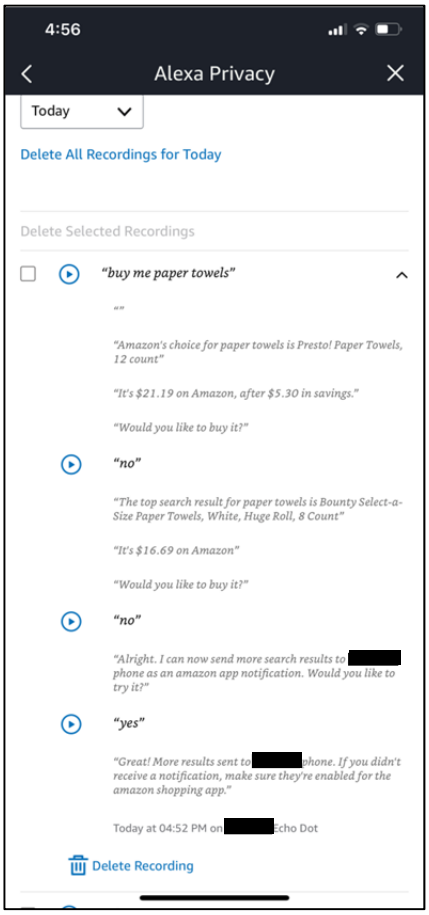
’176 Patent Claim Language	Exemplary Alexa Products
	 

'176 Patent Claim Language	Exemplary Alexa Products
	  Below is another example. "Alexa allows you to ask questions and make requests using just your voice. For instance, you can ask Alexa a question, such as "What is the weather today in New York?", or tell Alexa to do something, like "Add batteries to my shopping list," or "Play jazz." When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud so we can process and respond to your request." E.g. *Alexa and Alexa Device FAQs* at answer to question 1.
[27.b] a speech recognition engine coupled to the input device, wherein the speech recognition engine recognizes one or more words or phrases in the natural language utterance, wherein to recognize the words or phrases in the natural language utterance, the speech recognition engine is configured to:	Alexa Products have a speech recognition engine coupled to the input device, wherein the speech recognition engine recognizes one or more words or phrases in the natural language utterance. For example: "When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud where we process your request and other information to respond to you. For example, when you ask "Alexa, play top hits on Amazon Music" we use the recording of your request and information from Amazon Music to play top hits." *Alexa and Alexa Device FAQs* at answer to question 2. Another example is: "Alexa uses a combination of automatic speech recognition (ASR) and natural language understanding (NLU) to understand user speech and respond with precision. ASR converts user speech into text, NLU converts that text into intents for Alexa to act on. At the end of this process Alexa sends directives to your product

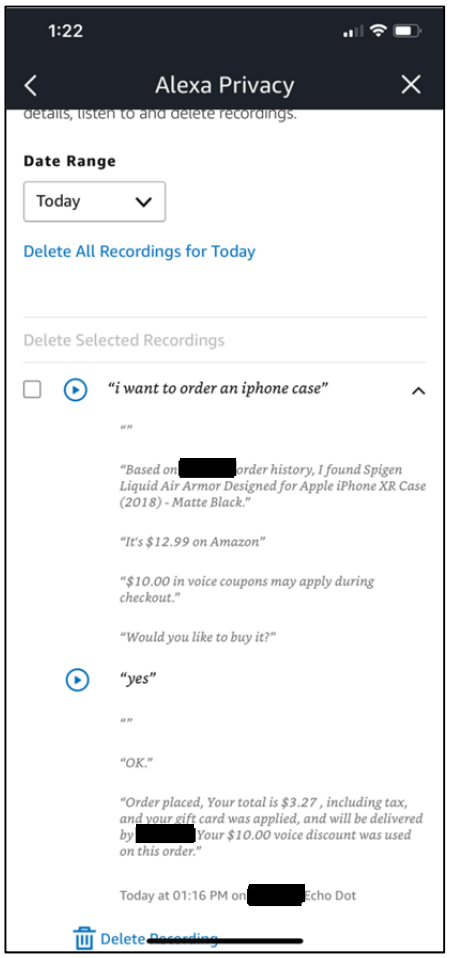
'176 Patent Claim Language	**Exemplary Alexa Products**
	instructing it to perform an action..." *Audio Hardware Configurations* at Automatic Speech Recognition Profiles.
[27.c] map a stream of phonemes contained in the natural language utterance to one or more syllables that are phonemically represented in an acoustic grammar; and	Alexa Products map a stream of phonemes contained in the natural language utterance to one or more syllables that are phonemically represented in an acoustic grammar. For example: "When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud where we process your request and other information to respond to you. For example, when you ask "Alexa, play top hits on Amazon Music" we use the recording of your request and information from Amazon Music to play top hits." *Alexa and Alexa Device FAQs* at answer to question 2. Another example is: "Alexa uses a combination of automatic speech recognition (ASR) and natural language understanding (NLU) to understand user speech and respond with precision. ASR converts user speech into text, NLU converts that text into intents for Alexa to act on. At the end of this process Alexa sends directives to your product instructing it to perform an action..." *Audio Hardware Configurations* at Automatic Speech Recognition Profiles. Another example is: "Every user utterance leverages SpeechRecognizer. It is the core interface of the Alexa Voice Service (AVS). It exposes directives and events for capturing user speech and prompting a client when Alexa needs additional speech input." *Speech Recognizer Interface*
[27.d] generate a preliminary interpretation for the natural language utterance from the one or more syllables, wherein the preliminary interpretation generated from the one or more syllables includes the recognized words or phrases;	Alexa Products generate a preliminary interpretation for the natural language utterance from the one or more syllables, wherein the preliminary interpretation generated from the one or more syllables includes the recognized words or phrases. Examples are generating preliminary interpretations for natural language utterances shown in screenshots of Alexa app's "Review Voice History" page below.

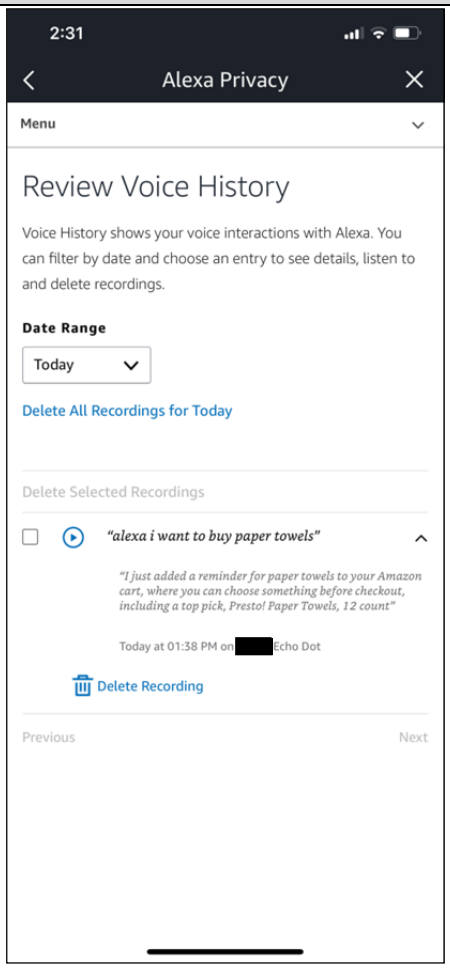
’176 Patent Claim Language	Exemplary Alexa Products
	 

'176 Patent Claim Language	Exemplary Alexa Products
	  Below is another example. "Every user utterance leverages SpeechRecognizer. It is the core interface of the Alexa Voice Service (AVS). It exposes directives and events for capturing user speech and prompting a client when Alexa needs additional speech input." *Speech Recognizer Interface*.
[27.e] a conversational language processor coupled to the speech recognition engine, wherein the conversational language processor is configured to:	Alexa Products have a conversational language processor coupled to the speech recognition engine. For example, Alexa Products include Amazon's Alexa cloud that has one or more processors: "When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud where we process your request and other information to respond to you. For example, when you ask "Alexa, play top hits on Amazon Music" we use the recording of your request and information from Amazon Music to play top hits." *Alexa and Alexa Device FAQs* at answer to question 2. More examples are below. "Alexa uses a combination of automatic speech recognition (ASR) and natural language understanding (NLU) to understand user speech and respond with precision. ASR converts user speech into text, NLU converts that text into intents for Alexa to act on. At the end of this process Alexa sends directives to your product instructing it to perform an action..." *Audio Hardware Configurations* at Automatic Speech

'176 Patent Claim Language	Exemplary Alexa Products
	Recognition Profiles. "The service that processes this recording is called Alexa Voice Services (AVS). Run by Amazon, this converts the recording into commands that it interprets. It's more than a simple voice-to-text service: it is a fully programmable service that can work with other online services to do a surprising range of things." *Appliance Science*.
[27.f] interpret the recognized words or phrases, wherein interpreting the recognized words or phrases includes establishing a context for the natural language utterance;	Alexa Products interpret the recognized words or phrases, wherein interpreting the recognized words or phrases includes establishing a context for the natural language utterance. Examples are interpreting the recognized words or phrases shown in screenshots of Alexa app's "Review Voice History" page below.  

'176 Patent Claim Language	Exemplary Alexa Products





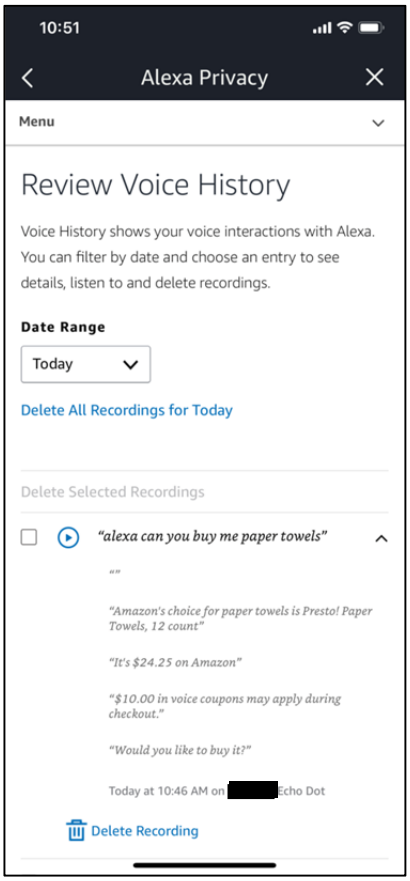
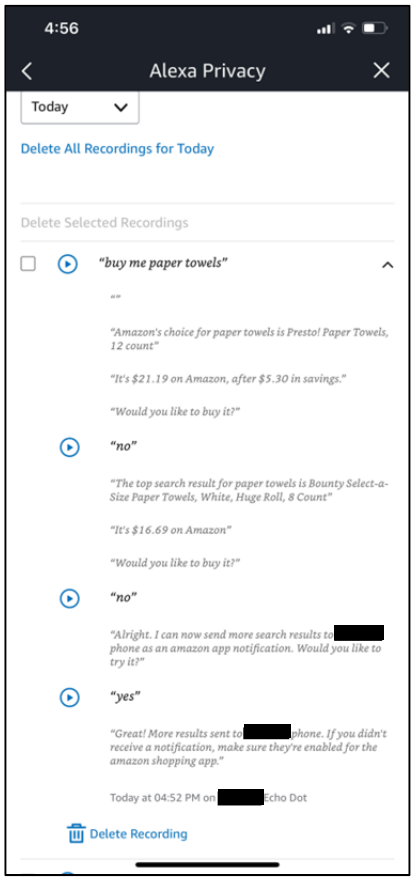
Below are more examples.

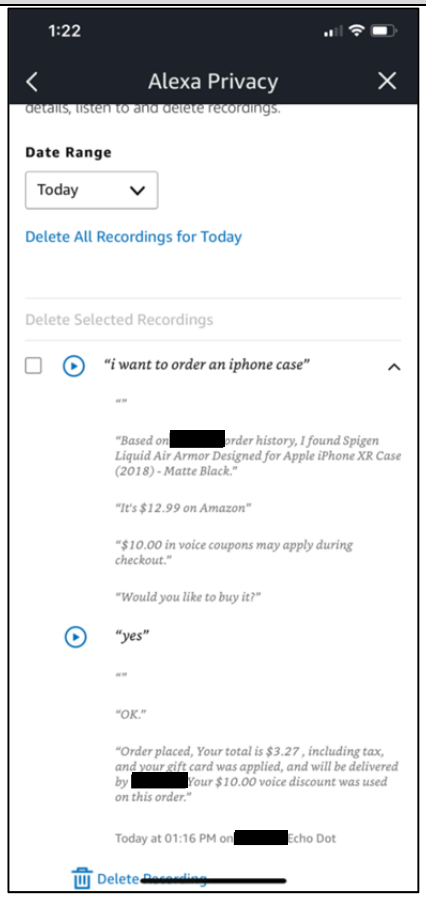
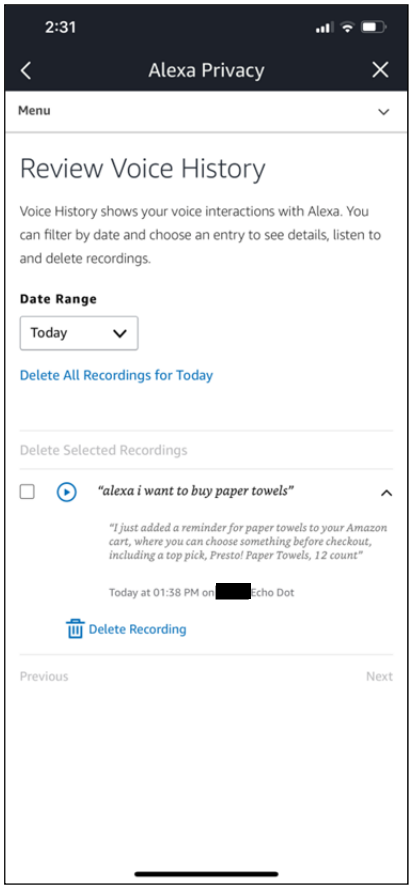
"Alexa uses a combination of automatic speech recognition (ASR) and natural language understanding (NLU) to understand user speech and respond with precision. ASR converts user speech into text, NLU converts that text into intents for Alexa to act on. At the end of this process Alexa sends directives to your product instructing it to perform an action..." *Audio Hardware Configurations* at Automatic Speech Recognition Profiles.

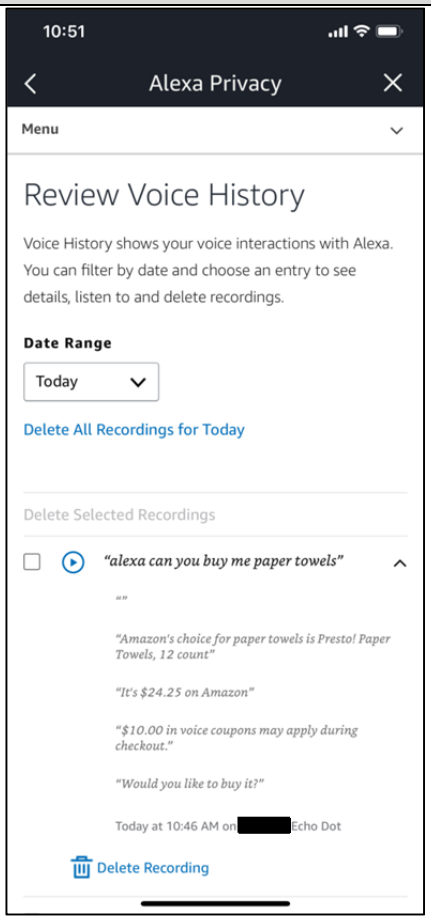
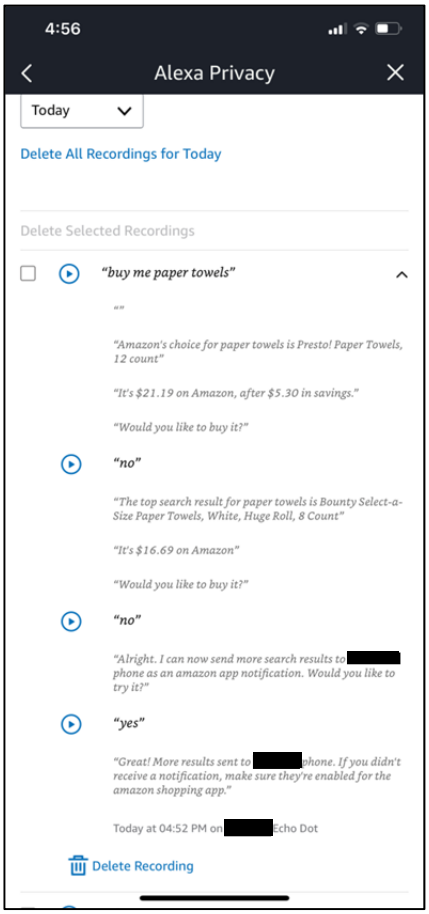
"The service that processes this recording is called Alexa Voice Services (AVS). Run by Amazon, this converts the recording into commands that it interprets. It's more than a simple voice-to-text service: it is a fully programmable service that can work with other online services to do a surprising range of things." *Appliance Science*.

"Everyday conversations take many things into account besides just the words we speak, including why, when, and where we converse. When designing for voice, think about how you can provide context to provide a delightful conversation." *What is Conversational AI?*

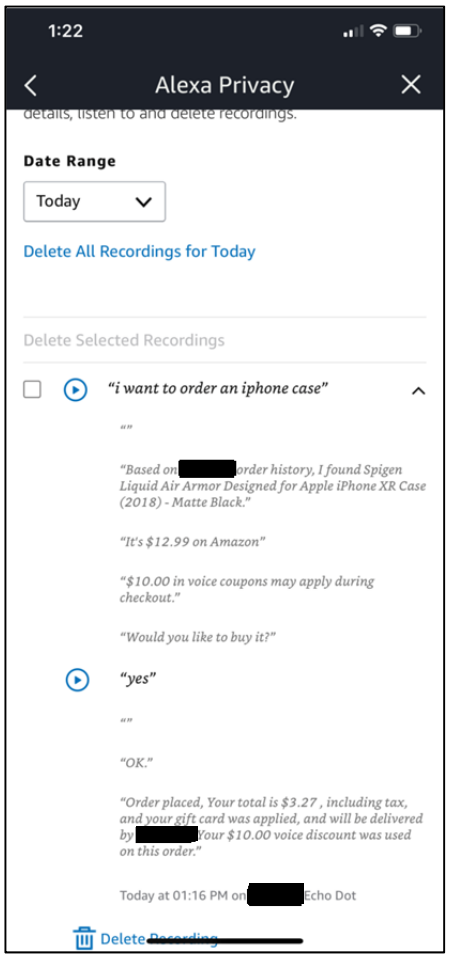
"Alexa will soon be able to have more natural conversations with users, thanks to something called 'context carryover.' This means that Alexa will be able to understand follow-up questions and respond appropriately..." *Alexa will soon gain a memory*.

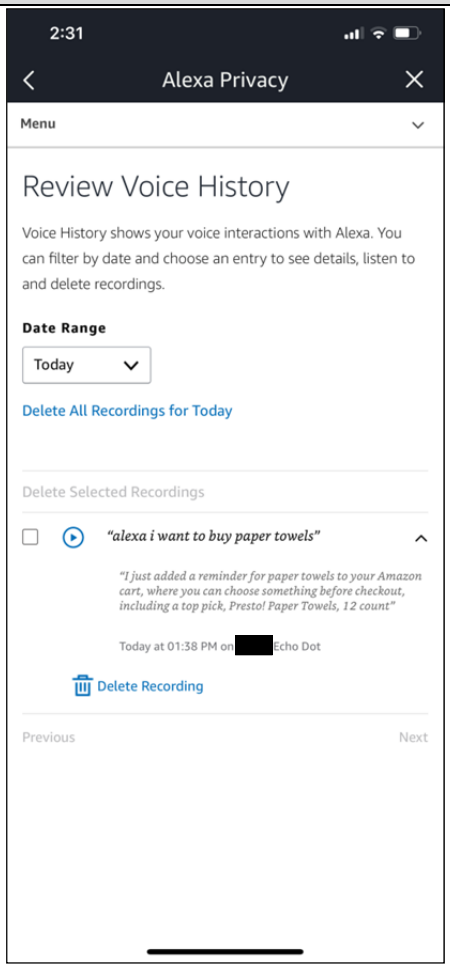
’176 Patent Claim Language	Exemplary Alexa Products
	“The person asking the question initiated the conversation, and you, having tracked the current state, pulled out the appropriate “file” to respond with an answer or appropriate followup question. Dialog Management provides a means for keeping track of context and prompting for required information regardless of the order in which the user provides it.” *Designing for Conversation – Build for dialog.*
[27.g] select an advertisement in the context established for the natural language utterance; and	Alexa Products select an advertisement in the context established for the natural language utterance. Examples are selecting advertisements as shown in screenshots of Alexa app’s “Review Voice History” page below.  

’176 Patent Claim Language	Exemplary Alexa Products
	  Below are more examples. “For starters, if you want to reorder something you've already purchased from Amazon before, just say, "Alexa, reorder a Swiss Army knife." Alexa will pull up your order history and let you select from the items. You confirm with Alexa which item you want from your history and you're done.” *Prime Day*. “To order something you've not ordered through Amazon before, say something like "Alexa, order deodorant," or "Alexa, buy a microSD card." Alexa will then perform a search for that item and offer a few recommendations based on Amazon preferred products or products you've purchased from similar categories in the past. It will talk you through the handful of recommendations. Like with reordering, just tell Alexa the number of the suggestion you want to add it to your cart.” *Prime Day*.
[27.h] present the selected advertisement via an output device.	Alexa Products present the selected advertisement via an output device Examples of presenting advertisements via an output device are shown in screenshots of Alexa app’s “Review Voice History” page below.

’176 Patent Claim Language	Exemplary Alexa Products
	 

’176 Patent Claim Language	Exemplary Alexa Products





Below are more examples.

“For starters, if you want to reorder something you've already purchased from Amazon before, just say, "Alexa, reorder a Swiss Army knife." Alexa will pull up your order history and let you select from the items. You confirm with Alexa which item you want from your history and you're done.” *Prime Day*.

“To order something you've not ordered through Amazon before, say something like "Alexa, order deodorant," or "Alexa, buy a microSD card." Alexa will then perform a search for that item and offer a few recommendations based on Amazon preferred products or products you've purchased from similar categories in the past. It will talk you through the handful of recommendations. Like with reordering, just tell Alexa the number of the suggestion you want to add it to your cart.” *Prime Day*.

EXHIBIT K

US008886536B2

(12) **United States Patent**
Freeman et al.

(10) **Patent No.: US 8,886,536 B2**
(45) **Date of Patent: Nov. 11, 2014**

(54) **SYSTEM AND METHOD FOR DELIVERING TARGETED ADVERTISEMENTS AND TRACKING ADVERTISEMENT INTERACTIONS IN VOICE RECOGNITION CONTEXTS**

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(73) Assignee: **VoiceBox Technologies Corporation**, Bellevue, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/016,757**

(22) Filed: **Sep. 3, 2013**

(65) **Prior Publication Data**

US 2014/0012577 A1 Jan. 9, 2014

Related U.S. Application Data

(63) Continuation of application No. 13/371,870, filed on Feb. 13, 2012, now Pat. No. 8,527,274, which is a continuation of application No. 12/847,564, filed on Jul. 30, 2010, now Pat. No. 8,145,489, which is a continuation of application No. 11/671,526, filed on Feb. 6, 2007, now Pat. No. 7,818,176.

(51) **Int. Cl.**

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G06F 17/27	(2006.01)
G10L 21/00	(2013.01)
G06Q 30/00	(2012.01)
G10L 15/26	(2006.01)
G06Q 30/02	(2012.01)

(52) **U.S. Cl.**

CPC ***G10L 15/18*** (2013.01); ***G10L 15/265*** (2013.01); ***G06Q 30/0251*** (2013.01); ***G06Q 30/0241*** (2013.01); ***G06Q 30/0242*** (2013.01)

USPC **704/257**; 704/9; 704/270.1; 705/14.4

(58) **Field of Classification Search**

None

See application file for complete search history.

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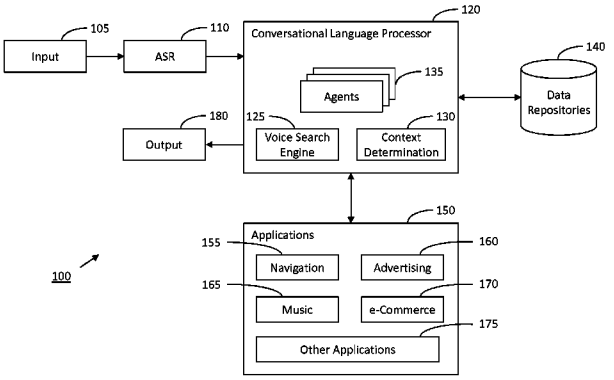
(57) **ABSTRACT**

The system and method described herein may use various natural language models to deliver targeted advertisements and track advertisement interactions in voice recognition contexts. In particular, in response to an input device receiving an utterance, a conversational language processor may select and deliver one or more advertisements targeted to a user that spoke the utterance based on cognitive models associated with the user, various users having similar characteristics to the user, an environment in which the user spoke the utterance, or other criteria. Further, subsequent interaction with the targeted advertisements may be tracked to build and refine the cognitive models and thereby enhance the information used to deliver targeted advertisements in response to subsequent utterances.

55 Claims, 3 Drawing Sheets



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2013/0054228	A1	2/2013	Baldwin et al.	704/9
2013/0211710	A1	8/2013	Kennewick et al.	701/419
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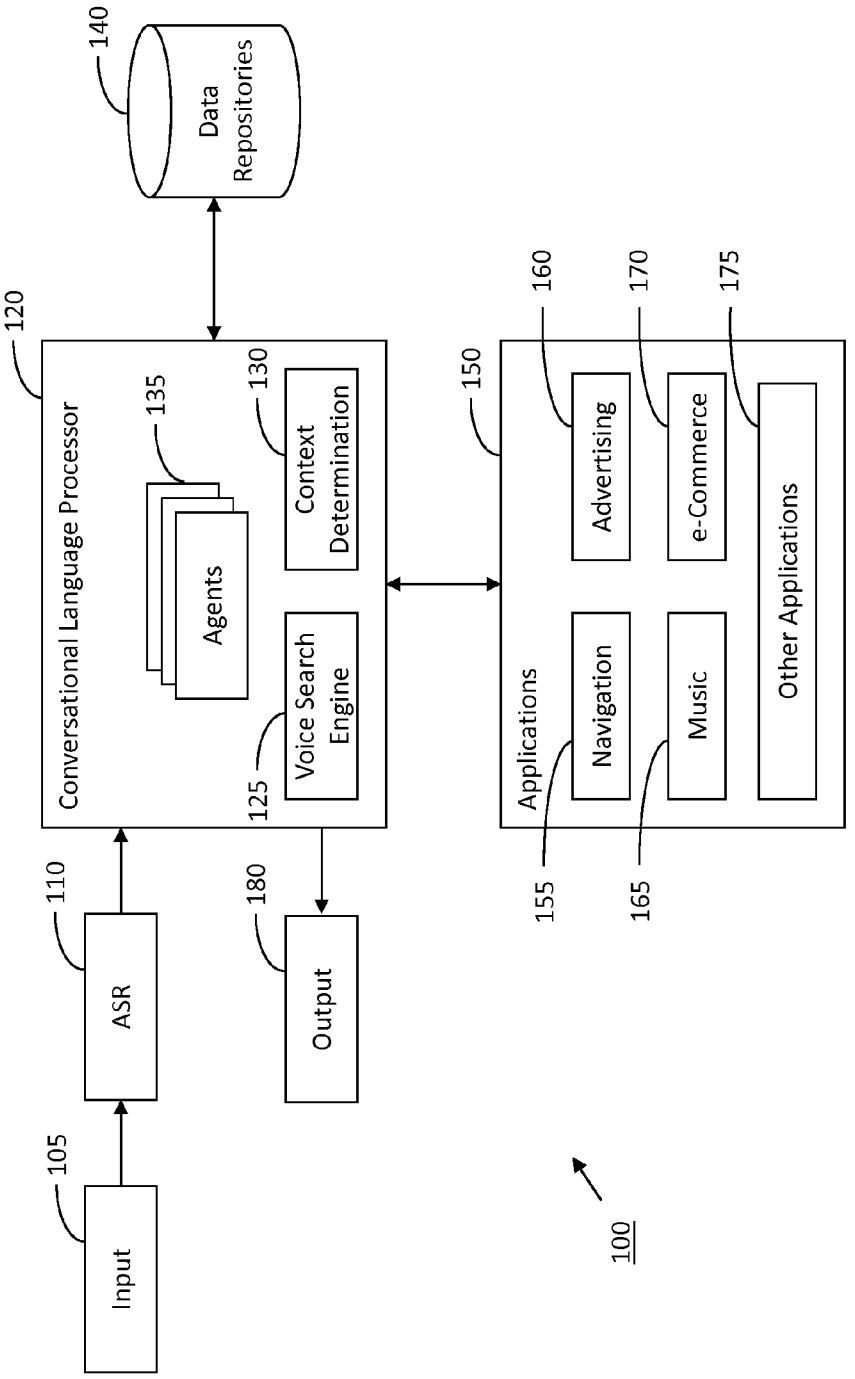

140
Data Repositories
120
Conversational Language Processor
135
Agents
130
Context Determination
125
Voice Search Engine
150
Applications
160
Advertising
170
e-Commerce
175
Other Applications
155
Navigation
165
Music
110
ASR
180
Output
105
Input
100

Figure 1

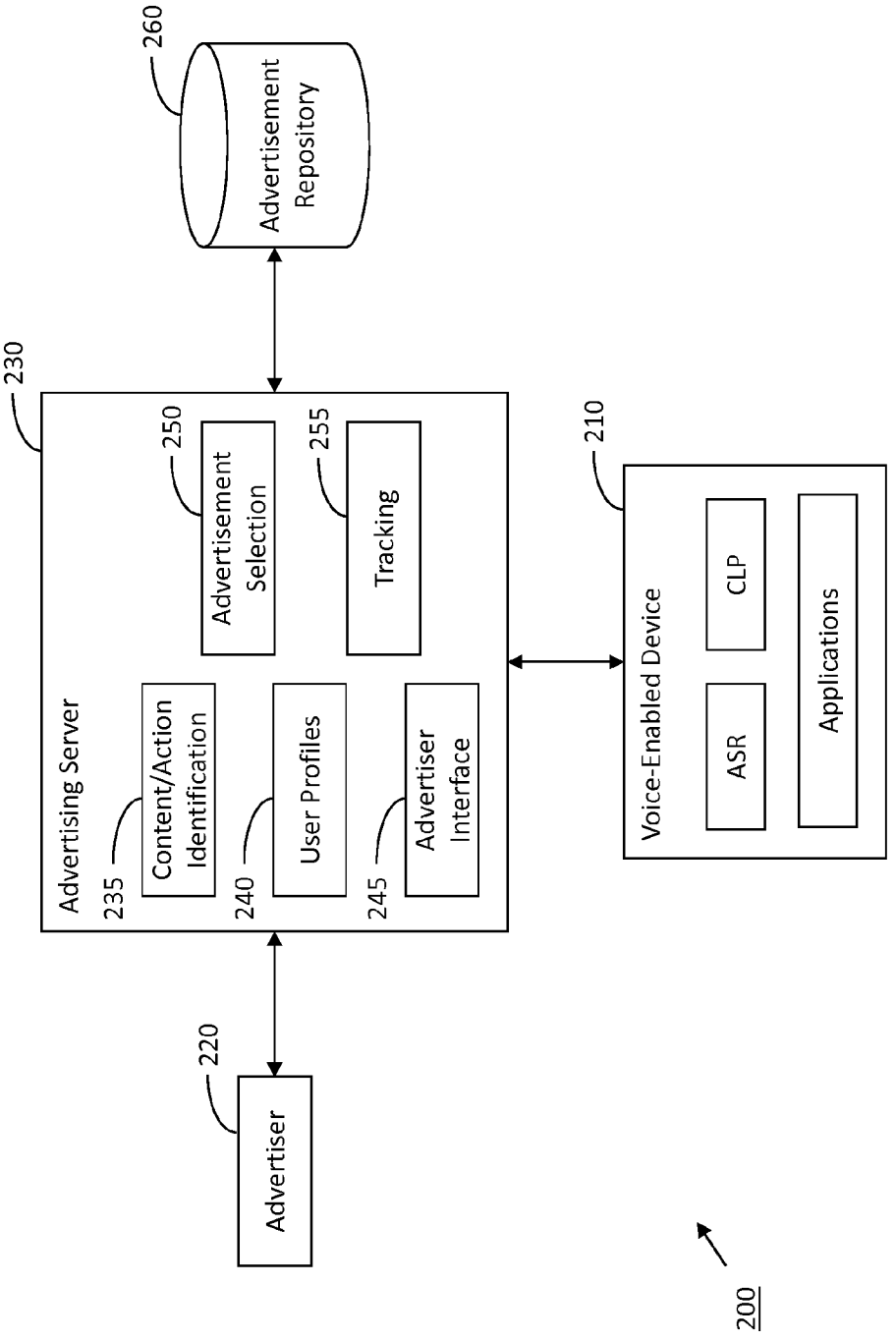

260
Advertisement Repository
230
250
Advertisement Selection
255
Tracking
210
Voice-Enabled Device
CLP
Applications
ASR
Advertising Server
Content/Action Identification
User Profiles
Advertiser Interface
235
240
245
220
Advertiser
200

Figure 2

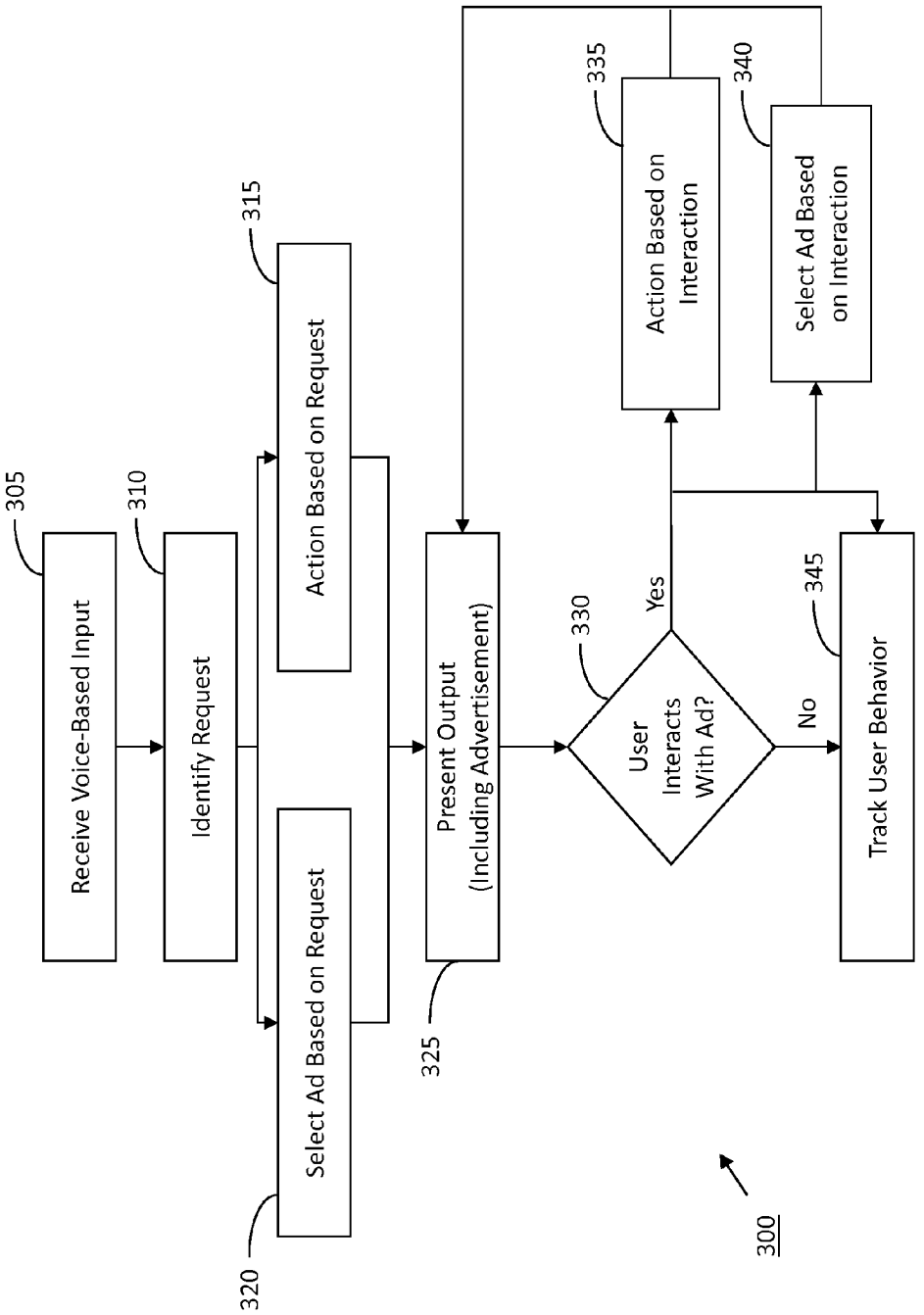

Receive Voice-Based Input
305
Identify Request
310
Action Based on Request
315
Select Ad Based on Request
320
Present Output (Including Advertisement)
325
User Interacts With Ad?
330
Yes
No
Action Based on Interaction
335
Select Ad Based on Interaction
340
Track User Behavior
345
300

Figure 3

SYSTEM AND METHOD FOR DELIVERING TARGETED ADVERTISEMENTS AND TRACKING ADVERTISEMENT INTERACTIONS IN VOICE RECOGNITION CONTEXTS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of Ser. No. 13/371,870, entitled "System and Method for Delivering Target Advertisements and Tracking Advertisement Interactions in Voice Recognition Context," filed Feb. 13, 2012 (which issued as U.S. Pat. No. 8,527,274 on Sep. 3, 2013), which is a continuation of U.S. patent application Ser. No. 12/847,564, entitled "System and Method for Selecting and Presenting Advertisements Based on Natural Language Processing of Voice-Based Input," filed Jul. 30, 2010 (which issued as U.S. Pat. No. 8,145,489 on Mar. 27, 2012), which is a continuation of U.S. patent application Ser. No. 11/671,526, entitled "System and Method for Selecting and Presenting Advertisements Based on Natural Language Processing of Voice-Based Input," filed Feb. 6, 2007 (which issued as U.S. Pat. No. 7,818,176 on Oct. 19, 2010), the contents of which are hereby incorporated by reference in their entirety.

FIELD OF THE INVENTION

The present invention relates to selecting and presenting advertisements based on natural language processing of voice-based input.

BACKGROUND OF THE INVENTION

As technology advances, consumer electronics devices tend to play larger roles due to increased functionality and mobility. For example, mobile phones, navigation devices, embedded devices, and other such devices provide a wealth of functionality beyond core applications. However, increased functionality adds difficulty to the learning curve associated with using electronic devices, and increased mobility intensifies the demand for simple mechanisms to interact with devices on the go. For example, existing systems tend to have complex human to machine interfaces, which may inhibit mass-market adoption for various technologies. For example, when a user wishes to perform a relatively simple task on a mobile phone, such as purchasing a ring tone, the user often is forced to navigate through a series of menus and press a series of buttons. In some instances, this may result in the transaction not necessarily occurring, as the user may prefer to avoid the hassles altogether. As such, there is ever-growing demand for ways to exploit technology in intuitive ways.

Voice recognition software may enable a user to exploit applications and features of a device that may otherwise be unfamiliar, unknown, or difficult to use. However, many existing voice user interfaces (when they actually work) still require significant learning on the part of the user. For example, users often cannot directly issue a request for a system to retrieve information or perform an action without having to memorize specific syntaxes, words, phrases, concepts, semantic indicators, or other keywords/qualifiers. Similarly, when users are uncertain of particular needs, many existing systems do not engage the user in a productive, cooperative dialogue to resolve requests and advance a conversation. Instead, many existing speech interfaces force users to use a fixed set commands or keywords to communicate requests in ways that systems can understand. Using existing voice user interfaces, there is virtually no option for dialogue between the user and the system to satisfy mutual goals.

The lack of adequate voice user interfaces results in missed opportunities for providing valuable and relevant information to users. Not only does this potentially leave user requests unresolved, in certain instances, providers of goods and services may lose out on potential business. In an increasingly global marketplace, where marketers are continually looking for new and effective ways to reach consumers, the problems with existing voice user interfaces leaves a large segment of consumer demand unfulfilled. Furthermore, existing techniques for marketing, advertising, or otherwise calling consumers to action fail to effectively utilize voice-based information, which is one of the most natural, intuitive methods of human interaction.

Existing systems suffer from these and other problems.

SUMMARY OF THE INVENTION

According to various aspects of the invention, a system and method for selecting and presenting advertisements based on natural language processing of voice-based inputs is provided. A natural language voice-based input may be received by a voice user interface. The voice-based input may include a user utterance, and a request may be identified from the utterance. Appropriate action may be taken to service the request, while one or more advertisements may be selected and presented to the user. Advertisements may be selected based on various criteria, including content of the input (e.g., concepts, semantic indicators, etc.), an activity related to the input (e.g., a relation to a request, a requested application, etc.), user profiles (e.g., demographics, preferences, location, etc.), or in other ways. A user may subsequently interact with the advertisement (e.g., via a voice-based input), and action may be taken in response to the interaction. Furthermore, the interaction may be tracked to build statistical profiles of user behavior based on affinities or clusters among advertisements, user profiles, contexts, topics, semantic indicators, concepts, or other criteria.

According to various aspects of the invention, advertisers may create advertisements, which may be stored in an advertisement repository. For example, advertisements may include sponsored messages, calls to action, purchase opportunities, trial downloads, or any other marketing communication, as would be apparent to those skilled in the art. Advertisers may specify various parameters to associate with the advertisements, such as various contexts or topic concepts (e.g., semantic indicators for a "music" concept may include words such as "music," "tunes," "songs," etc.), target demographics (e.g., a preferred audience), marketing criteria or prices for insertion (e.g., dynamic or static pricing based on various marketing criteria), or other information, as would be apparent. The advertisement repository may be associated with a server, where in response to a voice-based input from a user (e.g., at a voice-enabled device), a communications link may be established with the server. Information may be extracted from the voice-based input (e.g., words in the input, applications requested by the input, etc.), and the extracted information may be correlated with user profiles, advertisement parameters, or other information to determine which advertisements to select in relation to the voice-based input. The server may subsequently communicate the selected advertisements to the user, and the server may track the user's subsequent interaction with the selected advertisements.

Other objects and advantages of the invention will be apparent based on the following drawings and detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a block diagram of an exemplary system for implementing a voice user interface according to various aspects of the invention.

FIG. **2** illustrates a block diagram of an exemplary advertising system according to various aspects of the invention.

FIG. **3** illustrates a flow diagram of an exemplary method for selecting and presenting advertisements based on voice-based inputs according to various aspects of the invention.

DETAILED DESCRIPTION

Referring to FIG. **1**, an exemplary system **100** for implementing a voice user interface is illustrated according to various aspects of the invention. System **100** may enable users to perform various tasks on a voice-enabled device. For example, users may control navigation devices, media devices, personal computers, personal digital assistants, or any other device supporting voice-based inputs. System **100** may enable users to request voice-enabled devices to retrieve information or perform various tasks, among other things, using natural language voice-based inputs. For example, system **100** may interpret natural language voice-based inputs and generate responses using, among other things, techniques described in U.S. patent application Ser. No. 10/452,147, entitled "Systems and Methods for Responding to Natural Language Speech Utterance," filed Jun. 3, 2003, which issued as U.S. Pat. No. 7,398,209 on Jul. 8, 2008, and U.S. patent application Ser. No. 10/618,633, entitled "Mobile Systems and Methods for Responding to Natural Language Speech Utterance," filed Jun. 15, 2003, which issued as U.S. Pat. No. 7,693,720 on Apr. 6, 2010, both of which are hereby incorporated by reference in their entirety. For example, as described in U.S. patent application Ser. No. 10/452,147, the system **100** may include a speech recognition engine (e.g., an Automatic Speech Recognizer **110**) that may recognize words and phrases in an utterance using entries in one or more dictionary and phrase tables. In addition, as further described therein, 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 (e.g., the probabilities or possibilities may be dynamically updated based on application domains, questions or commands, contexts, user profiles and preferences, user dialog histories, recognizer dictionary and phrase tables, word spellings, and/or other criteria).

According to various aspects of the invention, system **100** may receive a user input, including at least a voice-based user utterance, at an input device **105**. Input device **105** may include any suitable device, or combination of devices, for receiving a voice-based input (e.g., a microphone). In various implementations, input device **105** may include a multi-modal input, such as a touch-screen interface, keypad, or other input. The received utterance may be processed by the Automatic Speech Recognizer **110**. Automatic Speech Recognizer **110** may generate one or more preliminary interpretations of the utterance using various techniques. For example, Automatic Speech Recognizer **110** may interpret the utterance using techniques of phonetic dictation to recognize a stream of phonemes. Further, Automatic Speech Recognizer **110** may perform post-processing to enhance the preliminary interpretations. For example, Automatic Speech Recognizer **110** may vary interpretations of an utterance, or components of an utterance, from one context to another. Other techniques for enhancing an interpretation of a user utterance may be used, such as those described in U.S. patent application Ser. No. 11/513,269, entitled "Dynamic Speech Sharpening," filed Aug. 31, 2006, which issued as U.S. Pat. No. 7,634,409 on Dec. 15, 2009, and which is hereby incorporated by reference in its entirety.

The one or more preliminary interpretations may be provided to a conversational language processor **120**. Conversational language processor **120** may include a voice search engine **125**, a context determination module **130**, and one or more agents **135**, among other things, to enable cooperative, conversational interaction between the user and system **100**. Conversational language processor **120** may be communicatively coupled to one or more data repositories **140** and one or more applications **150**. Conversational language processor **120** may generate a domain-specific conversational response, which may be returned to the user as an output **180**. Output **180** may include a multi-modal output (e.g., by simultaneously returning a voice-based response and displaying information on a display device).

System **100** may further include an interaction with one or more applications **150** to service one or more requests in the utterance. For example, the utterance may include one or more requests for performing an action, retrieving information, or various combinations thereof. Output **180** may include a conversational response to advance a conversation to service requests by invoking one or more applications **150**, as appropriate. For example, applications **150** may include a navigation application **155**, an advertising application **160**, a music application, an electronic commerce application **170**, and/or other applications **175**. Furthermore, Automatic Speech Recognizer **110**, conversational language processor **120**, data repositories **140**, and/or applications **150** may reside locally (e.g., on a user device), remotely (e.g., on a server), and/or hybrid local/remote processing models may be used (e.g., lightweight applications may be processed locally while computationally intensive applications may be processed remotely).

Conversational language processor **120** may build long-term and/or short-term shared knowledge in one or more knowledge sources. For example, shared knowledge sources may include information about previous utterances, requests, and other user interactions to inform generating an appropriate response to a current utterance. The shared knowledge may include public/non-private (i.e., environmental) knowledge, as well as personal/private (i.e., historical) knowledge. For example, conversational language processor **120** may use context determination module **130** to establish a context for a current utterance by having domain agents **135** competitively generate a context-based interpretation of the utterance (e.g., by scoring possible interpretations and selecting a highest scoring interpretation). As such, agents **135** may model various domains (e.g., navigation, music, a specific user, global users, advertising, e-commerce, etc.), and conversational language processor **120** may interpret and/or respond to a voice-based input accordingly. For example, context-based interpretations and responses to a voice-based input may be generated using techniques described in U.S. patent application Ser. No. 11/197,504, entitled "Systems and Methods for Responding to Natural Language Speech Utterance," filed Aug. 5, 2005, which issued as U.S. Pat. No. 7,640,160 on Dec. 29, 2009, and U.S. patent application Ser. No. 11/212,693, entitled "Mobile Systems and Methods of Supporting Natural Language Human-Machine Interactions," filed Aug.

29, 2005, which issued as U.S. Pat. No. 7,949,529 on May 24, 2011, both of which are hereby incorporated by reference in their entirety.

Furthermore, conversational language processor **120** may support adaptive misrecognition to reinterpret a current utterance and/or one or more previous utterances. For example, information contained in a current utterance may indicate that interpretations for one or more previous utterances were incorrect, and therefore, the previous utterances may be reinterpreted to improve subsequent interpretations. Accordingly, conversational language processor **120** may use the techniques described herein, along with various other techniques, to interpret and respond to conversational, natural language utterances. Conversational language processor **120** may use various other techniques as will be apparent, such as those described in U.S. patent application Ser. No. 11/200,164, entitled "System and Method of Supporting Adaptive Misrecognition in Conversational Speech," filed Aug. 10, 2005, which issued as U.S. Pat. No. 7,620,549 on Nov. 17, 2009, and U.S. patent application Ser. No. 11/580,926, entitled "System and Method for a Cooperative Conversational Voice User Interface," filed Oct. 16, 2006, which issued as U.S. Pat. No. 8,073,681 on Dec. 6, 2011, both of which are hereby incorporated by reference in their entirety. For example, as described in U.S. patent application Ser. No. 11/200,164, an environmental model may be accessed to determine user location, user activity, track user actions, and/or other environmental information to invoke context, domain knowledge, preferences, and/or other cognitive qualities to enhance the interpretation of questions and/or commands. In addition, as further described therein, based on information received from a general cognitive model, the environmental model, and/or a personalized cognitive model, which provide statistical abstracts of user interaction patterns, the system **100** may enhance responses to commands and questions by including a prediction of user behavior.

Referring to FIG. **2**, an exemplary advertising system **200** is illustrated according to various aspects of the invention. System **200** may include a server **230** for receiving one or more advertisements from an advertiser **220**, wherein the advertisements may be stored in a data repository **260** associated with server **230**. For example, advertisements may include sponsored messages or marketing communications, calls to action, purchase opportunities, trial downloads, coupons, or any other suitable marketing, advertising, campaign, or other information, as would be apparent to those skilled in the art. A voice-enabled device **210** may receive a voice-based input and establish communications with advertising server **230**. Subsequently, advertising server **230** may select one or more advertisements from among the advertisements stored in data repository **260**, and the selected advertisements may be provided to the voice-enabled device for presentation to a user.

Advertiser **220** may access advertising server **230** via an advertiser interface **245**. Advertisers **220** may upload targeted advertisements to server **230** via advertiser interface **245**, and server **230** may store the advertisements in data repository **260**. The advertisements may include graphically-based advertisements that include banners, images, audio, video, or any suitable combination thereof. Furthermore, the advertisements may include interactive or embedded information, such as links, metadata, or computer-executable instructions, or any suitable combination thereof. Advertisers may specify criteria for a campaign or targeting information for an advertisement (e.g., a start date, an end date, budget information, geotargeting information, conceptual or contextual information, or any other suitable criteria), which may be used to facilitate selecting an advertisement in relation to a particular voice-based input.

In addition to providing interface **245** for advertisers, server **230** may include a content/action identification module **235**, a user profile module **240**, an advertisement selection module **250**, and a tracking module **255**. Users may submit voice-based requests to voice-enabled device **210**, and voice-enabled device **210** may communicate information about the voice-based input to server **230**. Server **230** may invoke advertisement selection module **250** to extract relevant information from the voice-based input, where advertisement selection module **250** may select one or more advertisements relevant to the voice-based input based on information extracted using content/action identification module **235** and/or user profile module **240**.

For example, content/action identification module **235** may identify content of the voice-based input (e.g., words in the input), requested information (e.g., search results, a web page, music, video, graphics, or other information), requested actions (e.g., calculating a navigation route, placing a telephone call, playing a song, etc.), a category or topic related to the input (e.g., music, business, stocks, sports, navigation, movies, etc.), or other criteria to use in selecting an advertisement. Further, user profile module **240** may identify characteristics of a specific user (e.g., demographics, personal preferences, location-based information, etc.), global user profiles (e.g., demographic profiles, click-through rates, etc.), or other criteria to use in selecting an advertisement. Moreover, advertisement selection module **250** may account for where a request originates from. For example, advertisements may be selected based on a default user location (e.g., identified from a user profile), current geolocation information (e.g., identified from a navigation device), whether an affiliate or partner of server **230** initiated the request, or other criteria.

For instance, a user may request airline reservations via voice-enabled device **210**, and content/action identification module **235** may identify specific words used in the request, a category related to the request (e.g., travel, airlines, hotels, etc.), or other information. Furthermore, user profile module **240** may identify relevant characteristics of the user (e.g., user-specific demographics, location information, preferred airlines or hotels, etc.), as well as global user characteristics (e.g., most popular airlines). In various implementations, advertisements may be selected by assigning a score to each advertisement (e.g., based on click-through rates, relevance metrics, target audiences, etc.). As such, advertisement selection module **250** may correlate the information about the request to select advertisements stored in data repository **260**, and server **230** may communicate the selected advertisements to voice-enabled device **210**. Furthermore, selected advertisements may be presented according to a predetermined ordering or ranking (e.g., based on a ranking of relevance to an advertisement).

In various implementations, advertisement selection module **250** may retrieve a predetermined number of advertisements for any given request. Furthermore, the selected advertisements may depend upon a presentation format. For example, advertisements may be selected based on an amount of available space on a display of voice-enabled device **210** and/or a size/shape of the selected advertisements. In another example, voice-based advertisements may be selected and presented to the user audibly (e.g., a "hands-free" advertisement may be preferred when voice-enabled device **210** is a telematics device).

Furthermore, the user's subsequent interaction with an advertisement may be tracked using tracking module **255**. For

example, tracking module **255** may determine whether a conversion or click-through occurs for each advertisement presented to users. Further, tracking module **255** may maintain accounting and/or billing information associated with advertisers **220**. For example, advertisers **220** may specify a maximum insertion cost, a cost-per-click-through, an average insertion cost, or other criteria specifying a budget constraint for an advertisement. As such, tracking module **255** may track which advertisements are selected and/or presented, which advertisements result in a conversion or click-through, whether a click-through or conversion results in a transaction or sale, associations between advertisements and users, requests, concepts, semantic indicators, and/or other criteria. For example, tracking user interaction with advertisements may be used to build user-specific and/or global statistical profiles that map or cluster advertisements to topics, semantic indicators, contexts, concepts, etc. based on user behavior, demographics, targeting constraints, content of advertisements, content of requests, actions associated with requests, or other statistically relevant information. Accordingly, the tracking information may be used to bill or invoice advertisers **220**, as well as to improve subsequent performance and relevance of advertisements selected using advertisement selection module **250**. Other techniques and features of selecting and presenting advertisements based on voice-based inputs may suitably be employed, as would be apparent.

Referring to FIG. **3**, an exemplary method for selecting and presenting advertisements based on a voice-based input is illustrated according to various aspects of the invention. The method may begin in an operation **305**, where a voice-based input, including at least a user utterance, may be received at a voice user interface. The voice user interface may include any suitable mechanism for receiving the utterance (e.g., a microphone), and may interface with any suitable voice-enabled device, as would be apparent, including personal navigation devices, personal digital assistants, media devices, telematics devices, personal computers, mobile phones, or others.

Subsequently, one or more requests included in the voice-based input may be identified in an operation **310**. For example, the requests may include requests to retrieve information, perform tasks, explore or gather information, or otherwise interact with a system or device. For example, a voice-based input to a navigation device may include a request to calculate a route or retrieve location-based information. In another example, a voice-based input to a mobile phone may include a request to place a telephone call, purchase a ringtone, or record a voice-memo. Furthermore, in various implementations, voice-based inputs may include multiple requests, multi-modal requests, cross-device requests, cross-application requests, or other types of requests. For example, an utterance received in operation **305** may be: "Get me a route to Chang's Restaurant, and call them so I can make a reservation." The utterance may thus include multiple requests, including cross-device requests (e.g., calculate a route using a navigation device, and make a telephone call using a mobile phone), as well as cross-application requests (e.g., search for an address and/or phone number using a voice search engine, and calculate a route using a navigation application).

The requests may be part of a conversational interaction between a user and a system or device, whereby an interpretation of requests in a current utterance may be based upon previous utterances in a current conversation, utterances in previous conversations, context-based information, local and/or global user profiles, or other information. For example, a previous request may be reinterpreted based on information included in subsequent requests, a current request may be interpreted based on information included in previous requests, etc. Furthermore, the conversational interaction may take various forms, including query-based conversations, didactic conversations, exploratory conversations, or other types of conversations. For example, the conversational language processor may identify a type of conversation, and information may be extracted from the utterance accordingly to identify the one or more requests in operation **310**. Moreover, the conversational language processor may determine whether any of the requests are incomplete or ambiguous, and action may be taken accordingly (e.g., a system response may prompt a user to clarify an incomplete and/or ambiguous request). The conversational language processor may therefore use various techniques to identify a conversation type, interpret utterances, identify requests, or perform other tasks, such as those described in the aforementioned U.S. Patent Applications and U.S. Patents, which are hereby incorporated by reference in their entirety.

Upon identifying the one or more requests, action may be taken based on the identified requests in an operation **315**, while one or more advertisements may be selected in an operation **320** (described in greater detail below). For example, one or more context-appropriate applications may be invoked to service the requests in operation **315** (e.g., a voice search engine, a navigation application, an electronic commerce application, or other application may be invoked depending upon the request). Furthermore, in operation **320**, information may be communicated to an advertising server to select one or more advertisements related to the request. Thus, as shown in FIG. **3**, taking action in operation **315** and selecting advertisements in operation **320** may be related operations (e.g., advertisements may be selected to help in interpreting incomplete and/or ambiguous requests).

Upon taking action in operation **315** (e.g., to service the request) and selecting one or more advertisements in operation **320** (e.g., in relation to the request), an output may be presented to the user in operation **325**. The output may indicate a result of the action associated with operation **315**. For example, the output may include requested information, an indication of whether a requested task was successfully completed, whether additional information is needed to service the request (e.g., including a prompt for the information), or other information relating to an action based on the request. Furthermore, the output may include advertisements, as selected in operation **320**. For example, the output may include text-based, graphic-based, video-based, audio-based, or other types of advertisements, as would be apparent to those skilled in the art. Further, the output may include other types of advertisements, including calls to action (e.g., a location-based coupon or purchase opportunity, trial downloads, or other actionable advertising or marketing).

Advertisements may be selected in relation to a request based on various criteria. For example, an advertisement may be selected based on words or other content of the request, relevant words or content related to the words or content of the request, etc. In another example, the advertisement may be selected based on requested tasks/information (e.g., a request for movie showtimes may result in an advertisement being selected for a particular theater). In yet another example, the advertisement may be selected based on a topic or category associated with the requested tasks/information (e.g., a request to purchase airline tickets may result in an advertisement being selected for a hotel in a destination associated with a reserved flight). In still other examples, the advertisement may be selected based on location information, (e.g., advertisements may be selected based on a proximity to a user geolocation identified using a navigation device), user-

specific and/or global user profiles (e.g., advertisements may be selected based on user-specific and/or global preferences, advertiser campaign criteria, etc.).

Content of a voice-based input may be determined based on various criteria, including contextual or conceptual information (e.g., semantic indicators, qualifiers, or other information). For example, a given concept may include various semantically equivalent indicators having an identical meaning. Thus, for instance, a voice-based input may be "Play some tunes!" or "Play some music!" or other variants thereof, each of which may be interpreted as relating to a specific idea (or concept) of "Music." Thus, concept or content information in a request may be used to select an advertisement. For example, a user may request to calculate a route in Seattle, Wash. (e.g., "How do I get to the Space Needle?"). Based on a context of the requested task (e.g., "Navigation," "Seattle," etc.), a voice search engine may retrieve an address of the Space Needle and a navigation application may calculate the route. Furthermore, user profile information may indicate that the user is visiting Seattle from out-of-town (e.g., the profile may indicate that the user's home is Sacramento), and therefore, an advertisement for popular points-of-interest in Seattle may be selected. In another example, the user may request information about a sporting event (e.g., "Get me the kickoff time for the Eagles game on Sunday"). Based on a context of the requested information (e.g., "Search," "Sports," "Philadelphia," etc.), the requested information may be retrieved, while an advertisement for Eagles apparel or memorabilia may be selected.

In various instances, concepts, semantic indicators, qualifiers, or other information included in, or inferred from, a request may indicate an exploratory nature for the request. In other words, the exploratory request may identify a goal for a conversation, instead of a particular task to perform or information to retrieve. As such, in various implementations, an advertisement may be selected in operation **320** in an effort to advance the conversation towards the goal. For example, an exploratory request may include a request for a navigation route (e.g., "I feel like going to a museum, find me something interesting"). Based on a context of the requested task (e.g., "Navigation," "Points of Interest," etc.), the goal of the conversation may be identified, and the request may be serviced in operation **315** (e.g., a voice search engine may locate nearby points of interest based on user preferred topics). Further, the advertising application may select an appropriate advertisement in operation **320**, where the advertisement may be selected in an attempt to advance the conversation towards the goal. For example, statistical profiles (e.g., user profiles, global profiles, topic-based profiles, etc.) may reflect an affinity between an advertisement for a particular museum and other users sharing similar demographics or other characteristics with the requesting user. Thus, in addition to retrieving information about museums in operation **315**, an advertisement for a museum likely to be of interest to the user may be selected in operation **320**.

In various instances, a request may include incomplete, ambiguous, unrecognized, or otherwise insufficient semantic indicators, context, qualifiers, or other information needed to identify the request. In other words, the request may include inadequate information to identify or infer a task to perform, information to retrieve, or a goal for a conversation. Thus, as much information as possible may be extracted and/or inferred from the request based on shared knowledge such as context, user or global profile information, previous utterances, previous conversations, etc. As such, servicing the request may include generating a response and/or communicating with an advertising application to advance a conversation toward a serviceable request. For example, servicing the request in operation **315** and selecting an advertisement in operation **320** may include generating a response and/or selecting an advertisement to frame a subsequent user input, thereby advancing the conversation.

For example, the request may include incomplete, ambiguous, or unrecognized information (e.g., "Do you know [mumbled words] Seattle?"). A context of the requested task may be identified (e.g., "Seattle"), yet the identified context may be insufficient to adequately take action to service the request. Additional information may be inferred based on previous utterances in the conversation, profile information, or other information. However, when the additional information fails to provide adequate information to infer a reasonable hypothesis, servicing the request in operation **315** may include generating a response to frame a subsequent user input and advance the conversation (e.g., information about various topics may be retrieved based on a user's preferred topics). Further, the advertising application may select an advertisement in operation **320** to advance the conversation (e.g., advertisements may be selected based on user and/or global profiles reflecting an affinity between certain advertisements associated with Seattle and user preferences, profiles, etc.). Thus, by selecting an advertisement, indicating dissatisfaction with an advertisement, or otherwise interacting with an advertisement, the interaction may be used to build context and shared knowledge for a subsequent course of the conversation. For example, a user may select an advertisement, and an interpretation of a subsequent voice-based input (e.g., "Call them," "What's the price range?" etc.) may be interpreted with shared knowledge of the advertisement that the voice-based input relates to. Thus, advertisements may be used in a way that enables advertisers to market to consumers, while also improving the consumers' interaction with a device. Other advantages will be apparent to those skilled in the art.

It will be apparent that operation **320** may use various techniques to select advertisements based on voice-based inputs and/or requests included therein. For example, an advertiser may specify a target audience, marketing criteria, campaign strategies, budget constraints, concepts, semantic indicators, related topics, categories, and/or any other suitable information to associate with an advertisement. For instance, advertisers may pay a premium to prioritize an advertisement in relation to similar advertisements (e.g., advertisements associated with competitors). In another example, various statistical profiles may define affinities between advertisements, topics, users, etc. (e.g., based on click-through or conversion rates, or other tracking information, as described in more detail below). Thus, advertisements may be selected in operation **320** using various techniques, including content of the request, an activity/action associated with the request, user profiles, user preferences, statistical metrics, advertiser-specified criteria, to advance a conversation, to resolve ambiguous requests, or in various other ways, as will be apparent.

The output presented to the user in operation **325** may be provided to the user in various ways. For example, in various implementations, the output may include a voice-based or otherwise audible response. In another example, when an associated device includes a display mechanism, the output may be displayed on the display device. It will be apparent that many combinations or variants thereof may be used, such as augmenting a voice-based response with information on a display device. For example, a user may request information about restaurants, and an advertisement may be selected based on a user preference indicating a favorite type of res-

taurant (e.g., a Chinese restaurant may be selected based on a user profile indicating a preference for Chinese). Therefore, in one example, the output presented in operation **325** may display information about various restaurants matching the requested information, while a voice-based advertisement for the Chinese restaurant may be played to the user (e.g., via a speaker or other suitable mechanism for playing voice back to the user). Many other variations will be apparent (e.g., a graphical advertisement may be displayed on a display device, while a corresponding or different voice-based advertisement may be played audibly).

Subsequent interaction between the user and the presented advertisements may be monitored in a decisional operation **330**. For instance, when the user elects to interact with the advertisement, action may be taken based on the interaction in an operation **335**. The interaction may take various forms, including additional voice-based inputs or other suitable mechanisms for interacting with advertisements (e.g., clicking on an advertisement displayed on a personal digital assistant using an associated stylus). For example, a user may initially request information from a voice-enabled media device (e.g., a satellite radio player) about a song currently playing (e.g., "What is this song?"). In addition to outputting the requested information about the song (e.g., "This song is Double Barrel by Dave and Ansel Collins."), a selected advertisement may enable the user to purchase a ringtone for a mobile phone that corresponds to the song. In this example, the interaction may include a request to purchase the ringtone (e.g., "Yeah, I'll buy that"), and action taken in operation **335** may include completing a transaction for the ringtone and/or downloading the ringtone to the mobile phone. Furthermore, additional advertisements may be selected in an operation **340** based on the interaction, using similar techniques as described in connection with operation **320** (e.g., advertisements for additional ringtones, similar musicians, etc. may be selected). Processing may subsequently return to operation **325** to present output resulting from the interaction.

User advertisement interaction may be tracked in an operation **345**. For example, operation **345** may track historical data about users, conversations, topics, contexts, or other criteria to associate information with the selected advertisement. The tracking information may therefore be used to build statistical profiles defining affinities, click-through or conversion rates, or other information about various advertisements, topics, or other criteria on a user-specific and/or a global-user level. Thus, clusters or mappings may be created between advertisements, topics, concepts, demographics, or other criteria based on user behavior with the advertisements (e.g., whether a user interacts with the advertisement in operation **330**).

For instance, certain advertisements may experience high click-through rates in relation to a first context and/or topic, but low click-through rates in relation to a second context and/or topic, and therefore, when requests relate to the first context and/or topic, the advertisement may be more likely to be selected in subsequent operations **320**/**340**. In another example, global statistical profiles may indicate that an advertisement experiences more click-throughs by users of a particular demographic, and therefore, the advertisement may be more likely to be selected for users falling within the demographic. Many different techniques for tracking and building statistical profiles will be apparent.

Implementations of the invention may be made in hardware, firmware, software, or any combination thereof. The invention may also be implemented as instructions stored on a machine-readable medium, which may be read and executed by one or more processors. A machine-readable medium may include any mechanism for storing or transmitting information in a form readable by a machine (e.g., a computing device). For example, a machine-readable storage medium may include read only memory, random access memory, magnetic disk storage media, optical storage media, flash memory devices, and others, and a machine-readable transmission media may include forms of propagated signals, such as carrier waves, infrared signals, digital signals, and others. Further, firmware, software, routines, or instructions may be described in the above disclosure in terms of specific exemplary aspects and implementations of the invention, and performing certain actions. However, it will be apparent that such descriptions are merely for convenience and that such actions in fact result from computing devices, processors, controllers, or other devices executing the firmware, software, routines, or instructions.

Aspects and implementations may be described as including a particular feature, structure, or characteristic, but every aspect or implementation may not necessarily include the particular feature, structure, or characteristic. Further, when a particular feature, structure, or characteristic is described in connection with an aspect or implementation, it will be apparent to effect such feature, structure, or characteristic in connection with other aspects or implementations whether or not explicitly described. Thus, various changes and modifications may be made, without departing from the scope and spirit of the invention. The specification and drawings are to be regarded as exemplary only, and the scope of the invention is to be determined solely by the appended claims.

What is claimed is:

1. A computer-implemented method of providing promotional content related to one or more natural language utterances and/or responses, the method being implemented by a computer system that includes one or more physical processors executing one or more computer program instructions which, when executed, perform the method, the method comprising:

receiving, at the one or more physical processors, a first natural language utterance;

providing, by the one or more physical processors, a response to the first natural language utterance;

receiving, at the one or more physical processors, a second natural language utterance relating to the first natural language utterance;

performing, by the one or more physical processors, speech recognition to recognize one or more words of the second natural language utterance;

determining, by the one or more physical processors, domain information for the one or more recognized words based on the first natural language utterance;

processing, by the one or more physical processors, based on the domain information, the one or more recognized words to determine an interpretation of the second natural language utterance, wherein processing the one or more recognized words comprises:

providing the one or more recognized words to a first domain agent associated with a first domain and a second domain agent associated with a second domain;

obtaining a first interpretation of the second natural language utterance from the first domain agent;

obtaining a second interpretation of the second natural language utterance from the second domain agent; and

determining the interpretation based on one or more of the first interpretation or the second interpretation;

determining, by the one or more physical processors, promotional content based on the interpretation; and

presenting, by the one or more physical processors, the promotional content to a user.

2. The method of claim **1**, wherein the first natural language utterance and the second natural language utterance are received during an interactive session between the user and the computer system, the method further comprising:

determining, by the one or more physical processors, an activity relating to one or more of the first natural language utterance or the second natural language utterance,

wherein determining the promotional content comprises determining the promotional content based on the activity.

3. The method of claim **1**, further comprising:

determining, by the one or more physical processors, context information for the one or more recognized words based on the first natural language utterance,

wherein the interpretation is determined further based on the context information.

4. The method of claim **1**, wherein the first interpretation is determined by the first domain agent based on the first domain, and wherein the second interpretation is determined by the second domain agent based on the second domain.

5. The method of claim **1**, further comprising:

associating, by the one or more physical processors, the first interpretation with a first interpretation score; and

associating, by the one or more physical processors, the second interpretation with a second interpretation score,

wherein determining the interpretation comprises determining the first interpretation as the interpretation based on the first interpretation score and the second interpretation score.

6. The method of claim **5**, wherein the first interpretation is determined as the interpretation based on the first interpretation score being greater than the second interpretation score.

7. The method of claim **1**, further comprising:

receiving, at the one or more physical processors, a third natural language utterance relating to one or more of the first natural language utterance or the second natural language utterance; and

determining, by the one or more physical processors, an interpretation of the third natural language utterance based on the promotional content.

8. The method of claim **7**, wherein the first natural language utterance, the second natural language utterance, and the third natural language utterance are received during an interactive session between the user and the computer system.

9. The method of claim **8**, wherein the third natural language utterance is received after the second natural language utterance.

10. The method of claim **7**, further comprising:

performing, by the one or more physical processors, speech recognition to recognize one or more words of the third natural language utterance, wherein the one or more recognized words of the third natural language utterance include one or more reference words;

determining, by the one or more physical processors, that the one or more reference words refer to an item associated with the promotional content; and

initiating, by the one or more physical processors, a purchase transaction associated with the item based on the determination that the one or more reference words refer to the item.

11. The method of claim **10**, wherein the item includes a purchasable good.

12. The method of claim **7**, further comprising:

initiating, by the one or more physical processors, based on the interpretation of the third natural language utterance, a purchase transaction associated with the promotional content.

13. The method of claim **1**, wherein the first natural language utterance and the second natural language utterance are received during an interactive session between the user and the computer system, the method further comprising:

receiving, at the one or more physical processors, a third natural language utterance during the interactive session; and

processing, by the one or more physical processors, based on the third natural language utterance, the one or more recognized words to determine a reinterpretation of the second natural language utterance.

14. The method of claim **13**, wherein determining the promotional content comprises determining the promotional content based on the reinterpretation.

15. The method of claim **13**, wherein determining the promotional content comprises determining the promotional content based on the interpretation, the method further comprising:

determining, by the one or more physical processors, other promotional content based on the reinterpretation; and

presenting, by the one or more physical processors, the other promotional content to the user.

16. The method of claim **1**, further comprising:

identifying, by the one or more physical processors, one or more requests associated with the second natural language utterance,

wherein determining the promotional content comprises obtaining the promotional content based on a determination that the promotional content relates to the one or more requests.

17. The method of claim **16**, further comprising:

determining, by the one or more physical processors, one or more activities in the one or more requests; and

performing, by the one or more physical processors, the one or more activities,

wherein determining the promotional content comprises determining the promotional content based on the one or more activities.

18. The method of claim **17**, wherein determining the one or more activities comprises determining a call to be initiated for the user in response to the one or more requests, wherein performing the one or more activities comprises initiating the call for the user, and wherein determining the promotional content comprises determining the promotional content based on the call.

19. The method of claim **17**, wherein determining the one or more activities comprises determining a navigation route to be calculated for the user in response to the one or more requests, wherein performing the one or more activities comprises calculating the navigation route for the user, and wherein determining the promotional content comprises determining the promotional content based on the navigation route.

20. The method of claim **17**, wherein determining the one or more activities comprise determining a media item to be presented in response to the one or more requests, wherein performing the one or more activities comprises presenting the media item to the user, and wherein determining the promotional content comprises determining the promotional content based on the media item, the promotional content being different than the media item.

21. The method of claim 17, wherein determining the one or more activities comprises determining a reservation to be made on behalf of the user in response to the one or more requests, and wherein determining the promotional content comprises determining the promotional content based on information relating to the reservation.

22. The method of claim 17, wherein determining the one or more activities comprises determining a first reservation to be made on behalf of the user in response to the one or more requests, and wherein determining the promotional content comprises determining the promotional content based on information relating to a second reservation that is an alternative to the first reservation.

23. The method of claim 17, further comprising:

receiving, at the one or more physical processors, a third natural language utterance relating to one or more of the first natural language utterance or the second natural language utterance;

determining, by the one or more physical processors, an interpretation of the third natural language utterance based on the promotional content; and

initiating, by the one or more physical processors, based on the interpretation of the third natural language utterance, a purchase transaction associated with the promotional content.

24. The method of claim 16, further comprising:

determining, by the one or more physical processors, that at least one request of the one or more requests is incomplete or ambiguous;

monitoring, by the one or more physical processors, interaction of the user with the promotional content; and

interpreting, by the one or more physical processors, the at least one incomplete or ambiguous request based on the interaction.

25. The method of claim 16, wherein the one or more requests include a first request associated with a first application and a second request associated with a second application different than the first application, and wherein the promotional content relates to one or more of the first request or the second request.

26. The method of claim 25, wherein a first application type of the first application includes one or more of a navigation application, a music application, a commerce application, or a calling application, and wherein the second application is of an application type different than the first application type.

27. The method of claim 16, wherein the one or more requests include a first request to be processed by a first device associated with the user and a second request to be processed by a second device associated with the user, and wherein the promotional content relates to one or more of the first request or the second request.

28. The method of claim 27, wherein a first device type of the first device includes one or more of a mobile phone, a navigation device, or a media player device, and wherein the second device is of a device type different than the first device type.

29. The method of claim 27, wherein the first device and the second device are operably independent of one another.

30. The method of claim 1, further comprising:

obtaining, by the one or more physical processors, user profile information associated with the user, wherein the user profile information specifies prior user interactions with items; and

identifying, by the one or more physical processors, categories of items based on the prior user interactions specified by the user profile information,

wherein determining the promotional content comprises determining a promotional item associated with one of the categories.

31. The method of claim 1, further comprising:

obtaining, by the one or more physical processors, user profile information associated with the user, wherein the user profile information specifies prior user interactions with items;

identifying, by the one or more physical processors, one or more requests associated with the first natural language utterance or the second natural language utterance;

determining, by the one or more physical processors, one or more applications for processing the one or more requests; and

identifying, by the one or more physical processors, categories of items based on the prior user interactions specified by the user profile information, wherein the categories relate to the one or more applications,

wherein determining the promotional content comprises determining a promotional item associated with one of the categories.

32. A system for providing promotional content related to one or more natural language utterances and/or responses, the system comprising:

one or more physical processors programmed to execute one or more computer program instructions which, when executed, cause the one or more physical processors to:

receive a first natural language utterance;

provide a response to the first natural language utterance;

receive a second natural language utterance relating to the first natural language utterance;

perform speech recognition to recognize one or more words of the second natural language utterance;

determine domain information for the one or more recognized words based on the first natural language utterance;

process, based on the domain information, the one or more recognized words to determine an interpretation of the second natural language utterance, wherein processing the one or more recognized words comprises:

providing the one or more recognized words to a first domain agent associated with a first domain and a second domain agent associated with a second domain;

obtaining a first interpretation of the second natural language utterance from the first domain agent;

obtaining a second interpretation of the second natural language utterance from the second domain agent; and

determining the interpretation based on one or more of the first interpretation or the second interpretation;

determine promotional content based on the interpretation; and

present the promotional content to a user.

33. A computer-implemented method of providing promotional content related to one or more natural language utterances and/or responses, the method being implemented by a computer system that includes one or more physical processors executing one or more computer program instructions which, when executed, perform the method, the method comprising:

receiving, at the one or more physical processors, a first natural language utterance during an interactive session between a user and the computer system;

providing, by the one or more physical processors, a response to the first natural language utterance;

receiving, at the one or more physical processors, a second natural language utterance relating to the first natural language utterance during the interactive session;

performing, by the one or more physical processors, speech recognition to recognize one or more words of the second natural language utterance;

processing, by the one or more physical processors, based on the first natural language utterance, the one or more recognized words to determine an interpretation of the second natural language utterance;

receiving, at the one or more physical processors, a third natural language utterance during the interactive session;

processing, by the one or more physical processors, based on the third natural language utterance, the one or more recognized words to determine a reinterpretation of the second natural language utterance;

determining, by the one or more physical processors, promotional content based on one or more of the interpretation or the reinterpretation; and

presenting, by the one or more physical processors, the promotional content to the user.

34. The method of claim **33**, wherein determining the promotional content comprises determining the promotional content based on the reinterpretation.

35. The method of claim **33**, wherein determining the promotional content comprises determining the promotional content based on the interpretation, the method further comprising:

determining, by the one or more physical processors, other promotional content based on the reinterpretation; and

presenting, by the one or more physical processors, the other promotional content to the user.

36. A system for providing promotional content related to one or more natural language utterances and/or responses, the system comprising:

one or more physical processors programmed to execute one or more computer program instructions which, when executed, cause the one or more physical processors to:

receive a first natural language utterance during an interactive session between a user and the system;

provide a response to the first natural language utterance;

receive a second natural language utterance relating to the first natural language utterance during the interactive session;

perform speech recognition to recognize one or more words of the second natural language utterance;

process, based on the first natural language utterance, the one or more recognized words to determine an interpretation of the second natural language utterance;

receive a third natural language utterance during the interactive session;

process, based on the third natural language utterance, the one or more recognized words to determine a reinterpretation of the second natural language utterance;

determine promotional content based on one or more of the interpretation or the reinterpretation; and

present the promotional content to the user.

37. A computer-implemented method of providing promotional content related to one or more natural language utterances and/or responses, the method being implemented by a computer system that includes one or more physical processors executing one or more computer program instructions which, when executed, perform the method, the method comprising:

receiving, at the one or more physical processors, a first natural language utterance;

providing, by the one or more physical processors, a response to the first natural language utterance;

receiving, at the one or more physical processors, a second natural language utterance relating to the first natural language utterance;

identifying, by the one or more physical processors, one or more requests associated with the second natural language utterance;

determining, by the one or more physical processors, that at least one request of the one or more requests is incomplete or ambiguous;

determining, by the one or more physical processors, promotional content that relates to the one or more requests;

presenting, by the one or more physical processors, the promotional content to a user;

monitoring, by the one or more physical processors, interaction of the user with the promotional content; and

interpreting, by the one or more physical processors, the at least one incomplete or ambiguous request based on the interaction.

38. A system for providing promotional content related to one or more natural language utterances and/or responses, the system comprising:

one or more physical processors programmed to execute one or more computer program instructions which, when executed, cause the one or more physical processors to:

receive a first natural language utterance;

provide a response to the first natural language utterance;

receive a second natural language utterance relating to the first natural language utterance;

identify one or more requests associated with the second natural language utterance;

determine that at least one request of the one or more requests is incomplete or ambiguous;

determine promotional content that relates to the one or more requests;

present the promotional content to a user;

monitor interaction of the user with the promotional content; and

interpret the at least one incomplete or ambiguous request based on the interaction.

39. A computer-implemented method of providing promotional content related to one or more natural language utterances and/or responses, the method being implemented by a computer system that includes one or more physical processors executing one or more computer program instructions which, when executed, perform the method, the method comprising:

receiving, at the one or more physical processors, a first natural language utterance;

providing, by the one or more physical processors, a response to the first natural language utterance;

receiving, at the one or more physical processors, a second natural language utterance relating to the first natural language utterance;

identifying, by the one or more physical processors, requests associated with the second natural language utterance, wherein the requests include a first request associated with a first application and a second request associated with a second application different than the first application;

determining, by the one or more physical processors, promotional content that relates to one or more of the first request or the second request; and

presenting, by the one or more physical processors, the promotional content to a user.

40. The method of **39**, wherein a first application type of the first application includes one or more of a navigation application, a music application, a commerce application, or a calling application, and wherein the second application is of an application type different than the first application type.

41. The method of claim **39**, further comprising:

receiving, at the one or more physical processors, a third natural language utterance relating to one or more of the first natural language utterance or the second natural language utterance; and

determining, by the one or more physical processors, an interpretation of the third natural language utterance based on the promotional content.

42. The method of claim **41**, further comprising:

initiating, by the one or more physical processors, based on the interpretation of the third natural language utterance, a purchase transaction associated with the promotional content.

43. A system for providing promotional content related to one or more natural language utterances and/or responses, the system comprising:

one or more physical processors programmed to execute one or more computer program instructions which, when executed, cause the one or more physical processors to:

receive a first natural language utterance;

provide a response to the first natural language utterance;

receive a second natural language utterance relating to the first natural language utterance;

identify requests associated with the second natural language utterance, wherein the requests include a first request associated with a first application and a second request associated with a second application different than the first application;

determine promotional content that relates to one or more of the first request or the second request; and

present the promotional content to a user.

44. A computer-implemented method of providing promotional content related to one or more natural language utterances and/or responses, the method being implemented by a computer system that includes one or more physical processors executing one or more computer program instructions which, when executed, perform the method, the method comprising:

receiving, at the one or more physical processors, a first natural language utterance;

providing, by the one or more physical processors, a response to the first natural language utterance;

receiving, at the one or more physical processors, a second natural language utterance relating to the first natural language utterance;

identifying, by the one or more physical processors, requests associated with the second natural language utterance, wherein the requests include a first request to be processed by a first device associated with a user and a second request to be processed by a second device associated with the user;

determining, by the one or more physical processors, promotional content that relates to one or more of the first request or the second request; and

presenting, by the one or more physical processors, the promotional content to the user.

45. The method of claim **44**, wherein a first device type of the first device includes one or more of a mobile phone, a navigation device, or a media player device, and wherein the second device is of a device type different than the first device type.

46. The method of claim **44**, wherein the first device and the second device are operably independent of one another.

47. The method of claim **44**, further comprising:

receiving, at the one or more physical processors, a third natural language utterance relating to one or more of the first natural language utterance or the second natural language utterance; and

determining, by the one or more physical processors, an interpretation of the third natural language utterance based on the promotional content.

48. The method of claim **47**, further comprising:

initiating, by the one or more physical processors, based on the interpretation of the third natural language utterance, a purchase transaction associated with the promotional content.

49. A system for providing promotional content related to one or more natural language utterances and/or responses, the system comprising:

one or more physical processors programmed to execute one or more computer program instructions which, when executed, cause the one or more physical processors to:

receive a first natural language utterance;

provide a response to the first natural language utterance;

receive a second natural language utterance relating to the first natural language utterance;

identify requests associated with the second natural language utterance, wherein the requests include a first request to be processed by a first device associated with a user and a second request to be processed by a second device associated with the user;

determine promotional content that relates to one or more of the first request or the second request; and

present the promotional content to the user.

50. A computer-implemented method of providing promotional content related to one or more natural language utterances and/or responses, the method being implemented by a computer system that includes one or more physical processors executing one or more computer program instructions which, when executed, perform the method, the method comprising:

receiving, at the one or more physical processors, a first natural language utterance;

providing, by the one or more physical processors, a response to the first natural language utterance;

receiving, at the one or more physical processors, a second natural language utterance relating to the first natural language utterance;

obtaining, by the one or more physical processors, user profile information associated with a user, wherein the user profile information specifies prior user interactions with items;

identifying, by the one or more physical processors, categories of items based on the prior user interactions specified by the user profile information;

determining, by the one or more physical processors, based on the first natural language utterance and the second natural language utterance, promotional content associated with one of the categories; and

presenting, by the one or more physical processors, the promotional content to the user.

51. The method of claim **50**, further comprising:

receiving, at the one or more physical processors, a third natural language utterance relating to one or more of the first natural language utterance or the second natural language utterance; and

determining, by the one or more physical processors, an interpretation of the third natural language utterance based on the promotional content.

52. The method of claim **51**, further comprising:

initiating, by the one or more physical processors, based on the interpretation of the third natural language utterance, a purchase transaction associated with the promotional content.

53. A system for providing promotional content related to one or more natural language utterances and/or responses, the system comprising:

one or more physical processors programmed to execute one or more computer program instructions which, when executed, cause the one or more physical processors to:

receive a first natural language utterance;

provide a response to the first natural language utterance;

receive a second natural language utterance relating to the first natural language utterance;

obtain user profile information associated with a user, wherein the user profile information specifies prior user interactions with items;

identify categories of items based on the prior user interactions specified by the user profile information;

determine, based on the first natural language utterance and the second natural language utterance, promotional content associated with one of the categories; and

present the promotional content to the user.

54. A computer-implemented method of providing promotional content related to one or more natural language utterances and/or responses, the method being implemented by a computer system that includes one or more physical processors executing one or more computer program instructions which, when executed, perform the method, the method comprising:

receiving, at the one or more physical processors, a first natural language utterance;

providing, by the one or more physical processors, a response to the first natural language utterance;

receiving, at the one or more physical processors, a second natural language utterance relating to the first natural language utterance;

obtaining, by the one or more physical processors, user profile information associated with a user, wherein the user profile information specifies prior user interactions with items;

identifying, by the one or more physical processors, one or more requests associated with one or more of the first natural language utterance or the second natural language utterance;

determining, by the one or more physical processors, one or more applications for processing the one or more requests; and

identifying, by the one or more physical processors, categories of items based on the prior user interactions specified by the user profile information, wherein the categories relate to the one or more applications;

determining, by the one or more physical processors, based on the first natural language utterance and the second natural language utterance, promotional content associated with one of the categories; and

presenting, by the one or more physical processors, the promotional content to the user.

55. A system for providing promotional content related to one or more natural language utterances and/or responses, the system comprising:

one or more physical processors programmed to execute one or more computer program instructions which, when executed, cause the one or more physical processors to:

receive a first natural language utterance;

provide a response to the first natural language utterance;

receive a second natural language utterance relating to the first natural language utterance;

obtain user profile information associated with a user, wherein the user profile information specifies prior user interactions with items;

identify one or more requests associated with one or more of the first natural language utterance or the second natural language utterance;

determine one or more applications for processing the one or more requests; and

identify categories of items based on the prior user interactions specified by the user profile information, wherein the categories relate to the one or more applications;

determine, based on the first natural language utterance and the second natural language utterance, promotional content associated with one of the categories; and

present the promotional content to the user.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 8,886,536 B2
APPLICATION NO. : 14/016757
DATED : November 11, 2014
INVENTOR(S) : Tom Freeman et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the title page, in Item (72) Inventors,

change "Mike Kennwick" to --Mike Kennewick--.

Signed and Sealed this
Twenty-eighth Day of April, 2015

Michelle K. Lee

Michelle K. Lee
Director of the United States Patent and Trademark Office

EXHIBIT L

U.S. Pat. No. 8,886,536 ("the '536 patent")
Infringement Chart for Claim 44

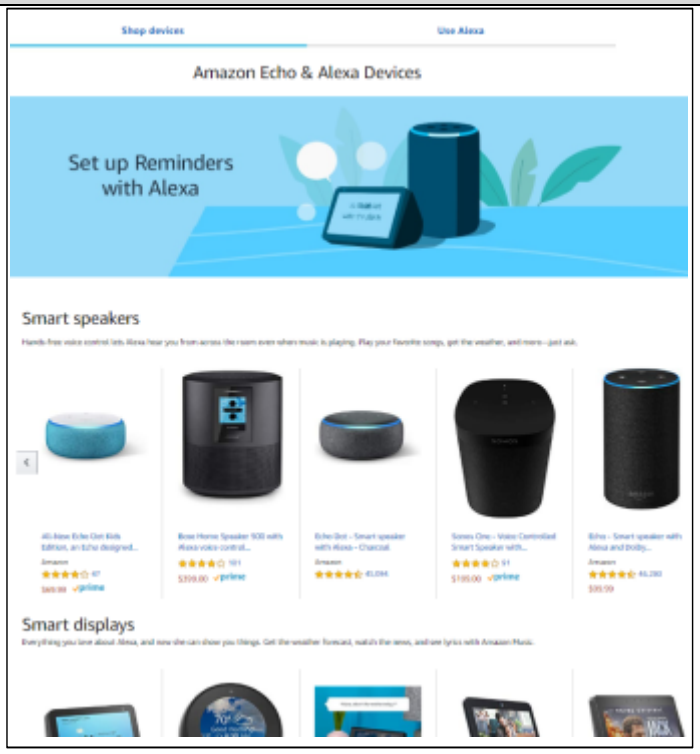
The following chart provides exemplary infringement allegations with respect to an exemplary claim of the '536 patent based on Plaintiff's investigation to date. Plaintiff reserves the right to provide modified and/or more detailed allegations (including with additional claims, products, and evidence) in accordance with its discovery obligations in view of any applicable scheduling order. This chart uses "Alexa Products" to refer to the full scope of instrumentalities identified in the complaint. Any discussion of specific Alexa Products in the following chart is exemplary.

Exemplary information relevant to infringement:

1. *Amazon Echo & Alexa Devices* - Amazon Official Site, https://www.amazon.com/Amazon-Echo-And-Alexa-Devices/b/?ie=UTF8&node=9818047011&ref_=sv_devicesubnav_1 (last visited Jul. 22, 2019)
2. *Alexa and Alexa Device FAQs*, Amazon Help & Customer Service - Amazon Official Site, https://www.amazon.com/gp/help/customer/display.html?nodeId=201602230 (last visited Jul. 22, 2019)
3. *Place Orders with Alexa*, Amazon Help & Customer Service - Amazon Official Site, https://www.amazon.com/gp/help/customer/display.html?nodeId=201807210 (last visited Jul. 22, 2019)
4. Chaim Gartenberg, *How to shop on Amazon using Alexa voice controls*, The Verge, Jul. 10, 2017, https://www.theverge.com/2017/7/10/15947672/amazon-alexa-voice-controls-shopping-prime-echo-how-to ("*How to Shop*")
5. Taylor Martin, *How to shop with Alexa on Prime Day*, CNET, Jul. 15, 2018, https://www.cnet.com/how-to/how-to-shop-with-alexa-prime-day/ ("*Prime Day*")
6. *Designing for Conversation – Build for dialog*, Amazon Alexa - Amazon Developer Services and Technologies - Amazon Official Site, https://developer.amazon.com/ask-resources/guided/conversational-design-workshop#/lessons/gDcQVF9nOFOtNljrELzARIGN4HuD7LNh?_k=q4qp1a (last visited Jul. 22, 2019)
7. *Amazon Echo Teardown*, IFIXIT, Dec. 16, 2014, https://www.ifixit.com/Teardown/Amazon+Echo+Teardown/33953
8. *What is Conversational AI?*, Amazon Alexa - Amazon Developer Services and Technologies - Amazon Official Site, https://developer.amazon.com/alexa-skills-kit/conversational-ai (last visited Jul. 22, 2019)
9. *Speech Recognizer Interface*, Alexa Voice Service, developer.amazon.com, https://developer.amazon.com/docs/alexa-voice-service/speechrecognizer.html (last visited Jul. 22, 2019)

'536 Patent Claim Language	**Exemplary Alexa Products**
44.[pr] A computer-implemented method of providing promotional content related to one or more natural language utterances and/or responses, the method being implemented by a computer system that includes one or more physical processors executing one or more computer program instructions which, when executed, perform the method, the method comprising:	Alexa Products are programmed to perform and have performed methods of providing promotional content related to one or more natural language utterances and/or responses, the method being implemented by a computer system that includes one or more physical processors executing one or more computer program instructions which, when executed, perform the recited method. For example, Alexa Products (e.g. Echo, Echo Dot, Alexa apps, Shopping apps, and Alexa cloud) include Alexa.

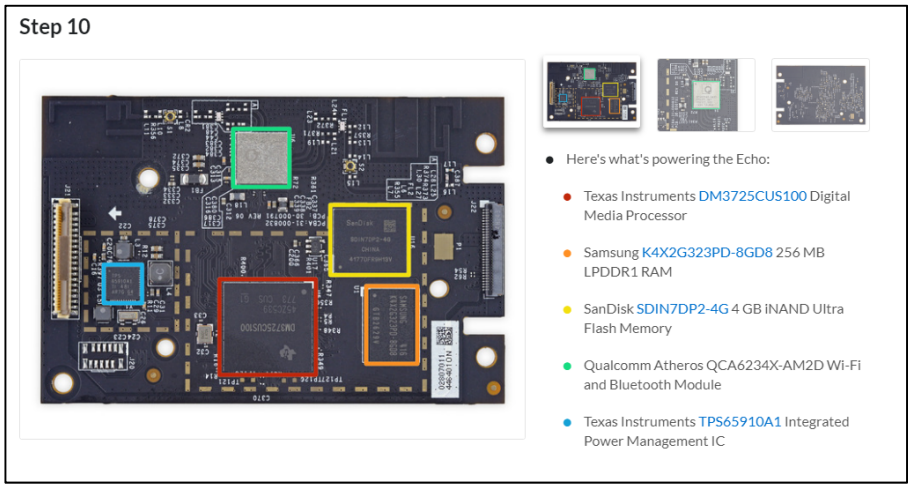
'536 Patent Claim Language	Exemplary Alexa Products



E.g. *Amazon Echo & Alexa Devices*.

"With conversational AI, voice-enabled devices like Amazon Echo . . . ." E.g. *What is Conversational AI?*

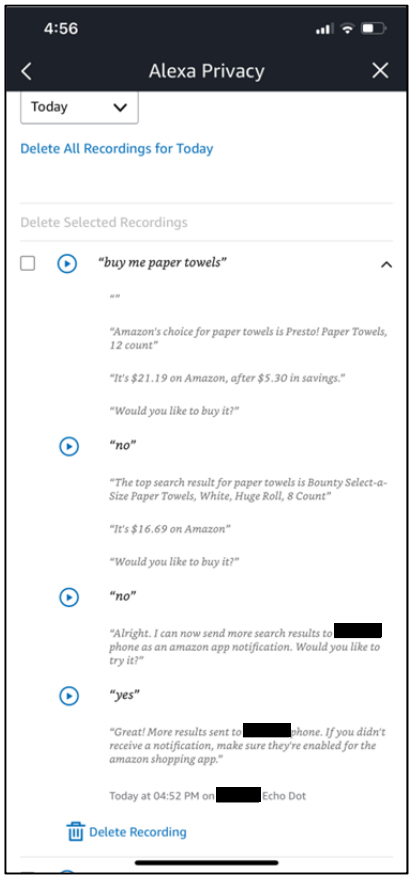
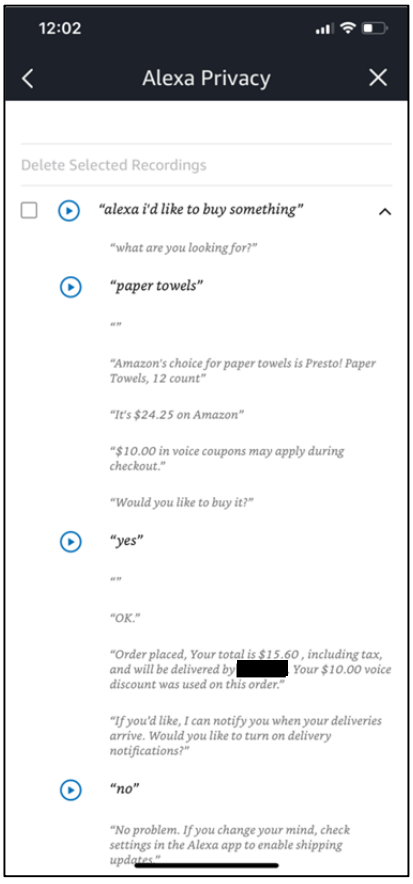
For example, the Echo has the physical processors shown below:

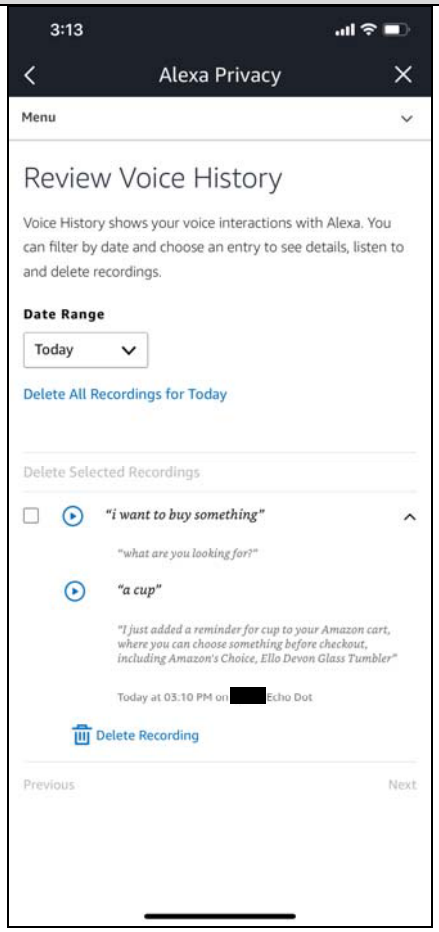


E.g. *Amazon Echo Teardown* at Step 10.

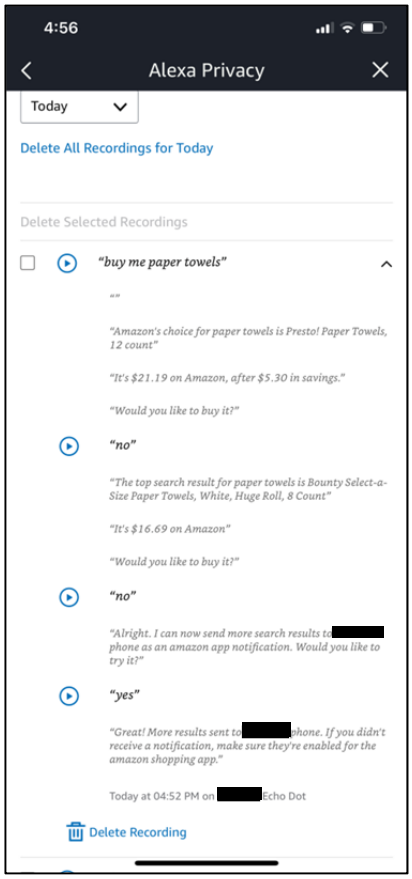
Below are more examples.

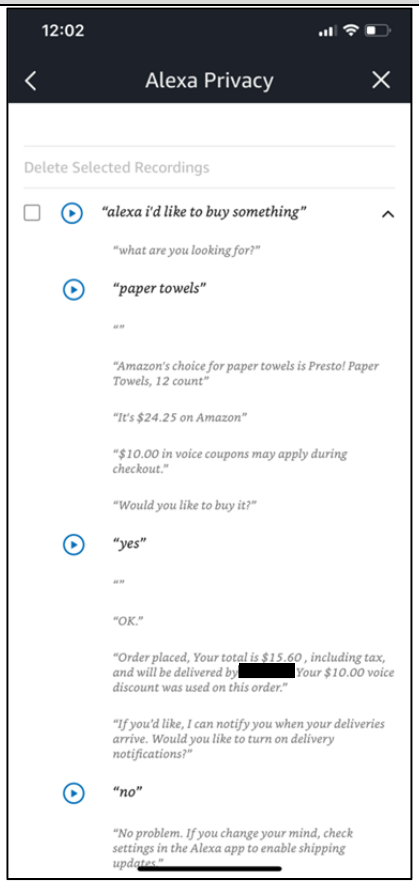
Alexa Products include Amazon's Alexa cloud. "Alexa allows you to ask questions and make requests using just your voice. For instance, you can ask Alexa a question, such as "What is the weather today in New York?", or tell Alexa to do something, like "Add batteries to my shopping list," or "Play jazz." When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud so we can process and respond to your request." E.g. *Alexa and Alexa Device FAQs* at answer

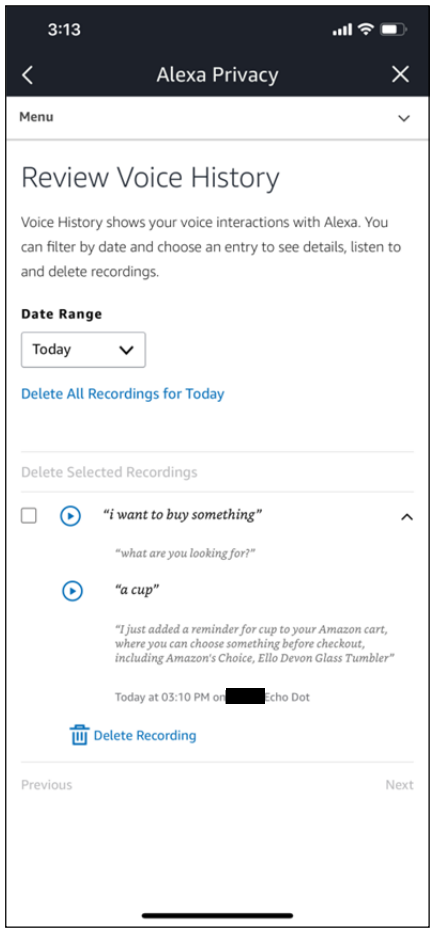
'536 Patent Claim Language	Exemplary Alexa Products
	to question 1. When ordering something not in your existing order history, Alexa "will suggest an 'Amazon Choice' product that meets the description." *How to Shop*. "You can ask Alexa to place orders for Prime-eligible physical products. On supported devices, you can also ask Alexa to place orders for music." *Place Orders with Alexa*.
[44.a] receiving, at the one or more physical processors, a first natural language utterance;	Alexa Products receive, at the one or more physical processors, a first natural language utterance. Examples of receiving a first utterance are shown in screenshots of Alexa app's "Review Voice History" page below.  

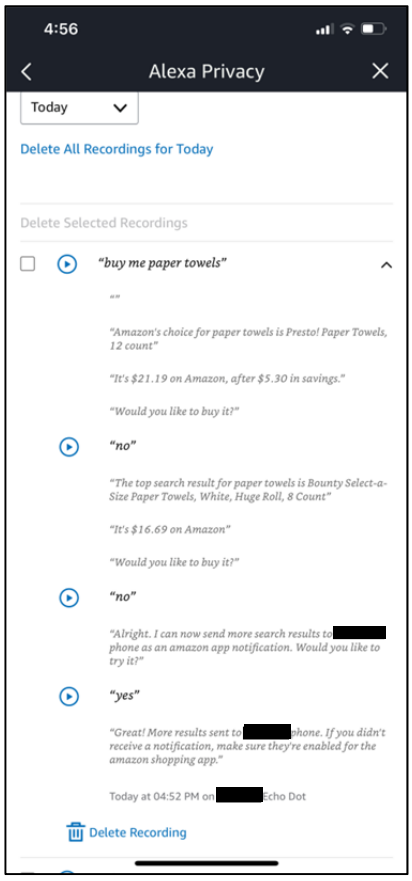
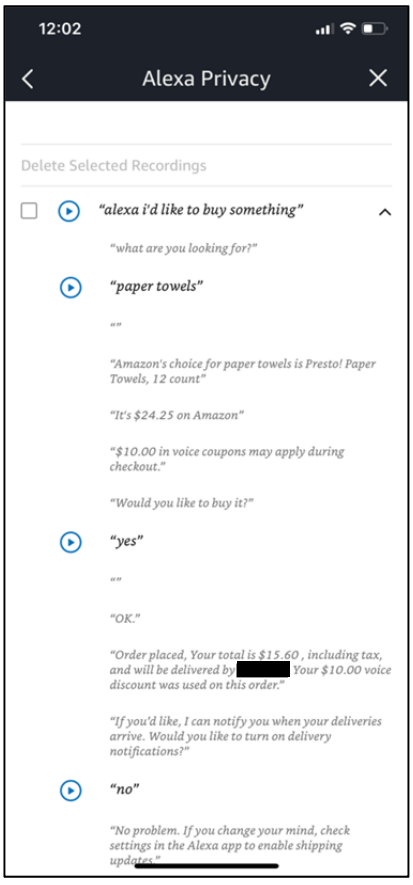
'536 Patent Claim Language	Exemplary Alexa Products
	 Below are more examples. "Alexa allows you to ask questions and make requests using just your voice. For instance, you can ask Alexa a question, such as "What is the weather today in New York?", or tell Alexa to do something, like "Add batteries to my shopping list," or "Play jazz." When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud so we can process and respond to your request." E.g. *Alexa and Alexa Device FAQs* at answer to question 1. "Each line of the script spoken by the user is known as an utterance. The utterances are then mapped to an intent. When the user speaks one of them the associated intent will be invoked." *Designing for Conversation – Build for dialog* at Step 2. "Every user utterance leverages SpeechRecognizer. It is the core interface of the Alexa Voice Service (AVS). It exposes directives and events for capturing user speech and prompting a client when Alexa needs additional speech input." *Speech Recognizer Interface*.
[44.b] providing, by the one or more physical processors, a response to the first natural language utterance;	Alexa Products provide, by the one or more physical processors, a response to the first natural language utterance. Examples of providing a response are shown in screenshots of Alexa app's "Review Voice History" page below.

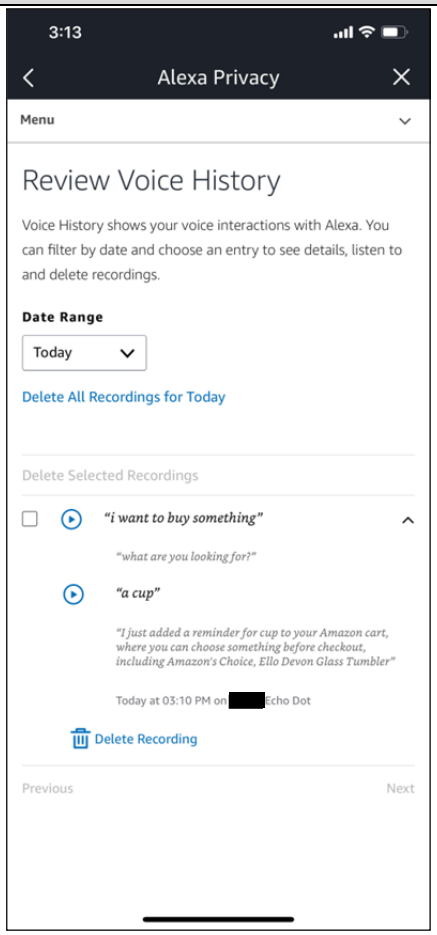
’536 Patent Claim Language	Exemplary Alexa Products

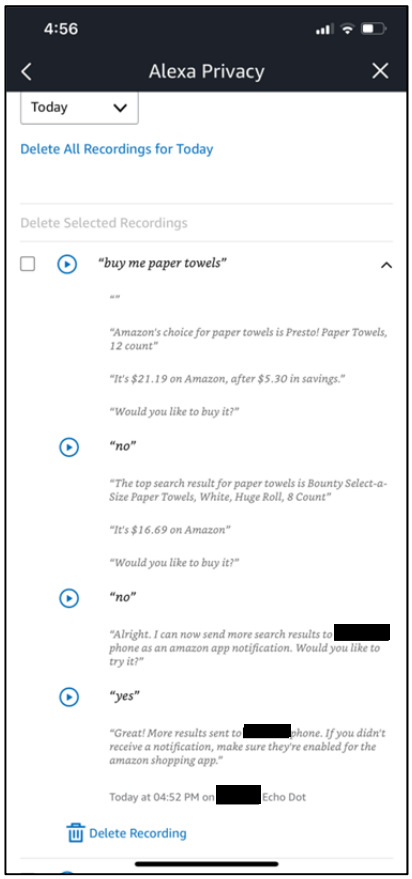
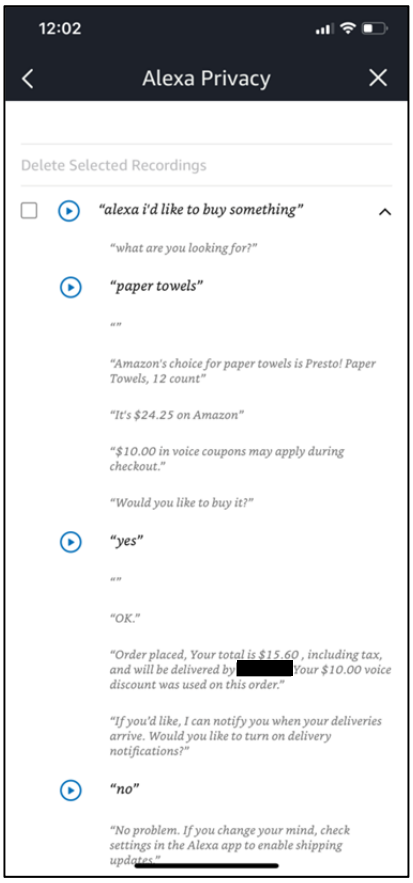




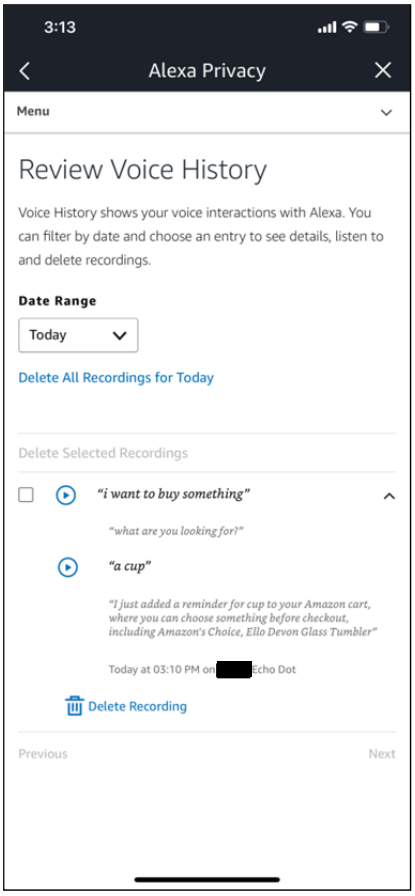


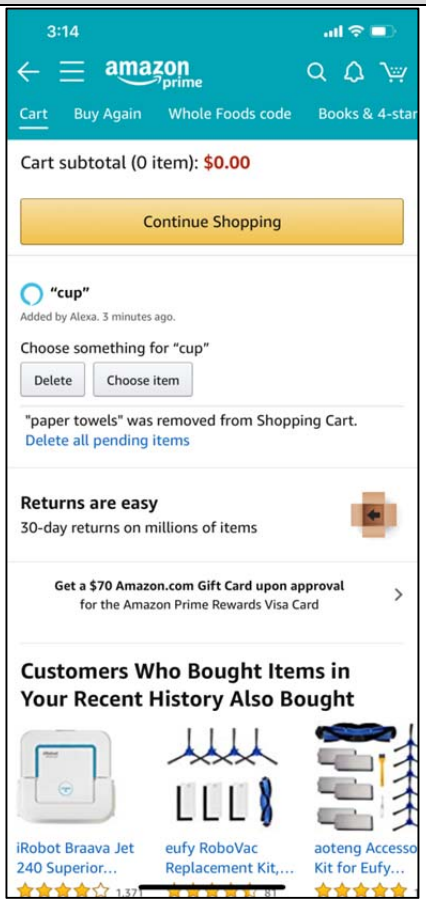
’536 Patent Claim Language	Exemplary Alexa Products
	Below are more examples. “It will talk you through the handful of recommendations. Like with reordering, just tell Alexa the number of the suggestion you want to add in your cart.” *Prime Day*. “Conversations are not isolated occurrences. They build on previous questions and answers, whether from five minutes or five days ago. When appropriate, voice-first experiences should account for prior context to make the conversation more engaging or relevant to the user.” *What is Conversational AI?* “Every user utterance leverages SpeechRecognizer. It is the core interface of the Alexa Voice Service (AVS). It exposes directives and events for capturing user speech and prompting a client when Alexa needs additional speech input.” *Speech Recognizer Interface*.
[44.c] receiving, at the one or more physical processors, a second natural language utterance relating to the first natural language utterance;	Alexa Products, receive, at the one or more physical processors, a second natural language utterance relating to the first natural language utterance. Examples of receiving a second utterance are shown in screenshots of Alexa app’s “Review Voice History” page below.  

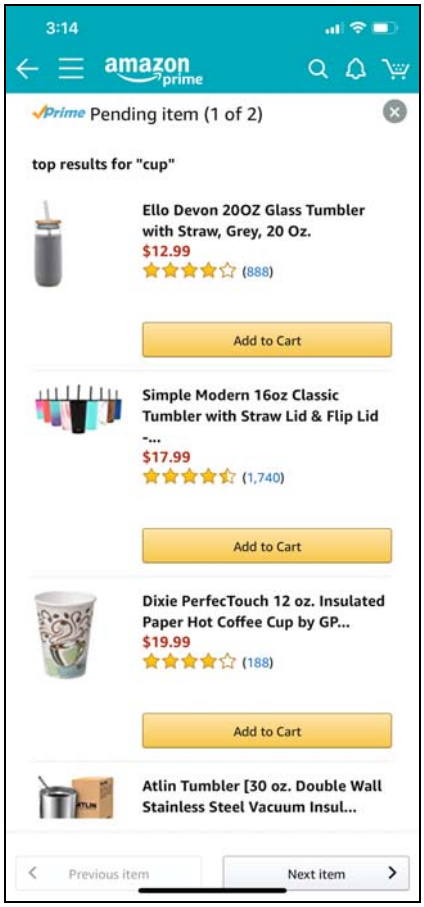
'536 Patent Claim Language	Exemplary Alexa Products
	 Below are more examples. "It will talk you through the handful of recommendations. Like with reordering, just tell Alexa the number of the suggestion you want to add in your cart." *Prime Day*. "Alexa allows you to ask questions and make requests using just your voice. For instance, you can ask Alexa a question, such as "What is the weather today in New York?", or tell Alexa to do something, like "Add batteries to my shopping list," or "Play jazz." When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud so we can process and respond to your request." E.g. *Alexa and Alexa Device FAQs* at answer to question 1. "Each line of the script spoken by the user is known as an utterance. The utterances are then mapped to an intent. When the user speaks one of them the associated intent will be invoked." *Designing for Conversation – Build for dialog* at Step 2. "Every user utterance leverages SpeechRecognizer. It is the core interface of the Alexa Voice Service (AVS). It exposes directives and events for capturing user speech and prompting a client when Alexa needs additional speech input." *Speech Recognizer Interface*.
[44.d] identifying, by the one or more physical processors, requests associated with the second natural	Alexa Products identify, by the one or more physical processors, requests associated with the second natural language utterance, wherein the requests include a first request to be processed by a first device

'536 Patent Claim Language	Exemplary Alexa Products
language utterance, wherein the requests include a first request to be processed by a first device associated with a user and a second request to be processed by a second device associated with the user;	associated with a user and a second request to be processed by a second device associated with the user. Examples are identifying requests associated with the second natural language utterance, as shown below in screenshots of Alexa app's "Review Voice History" and Amazon app's "cart" and "results" pages below.  

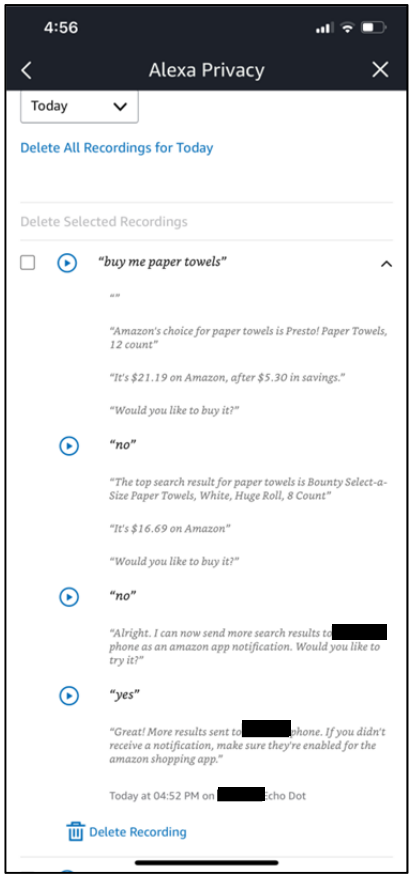
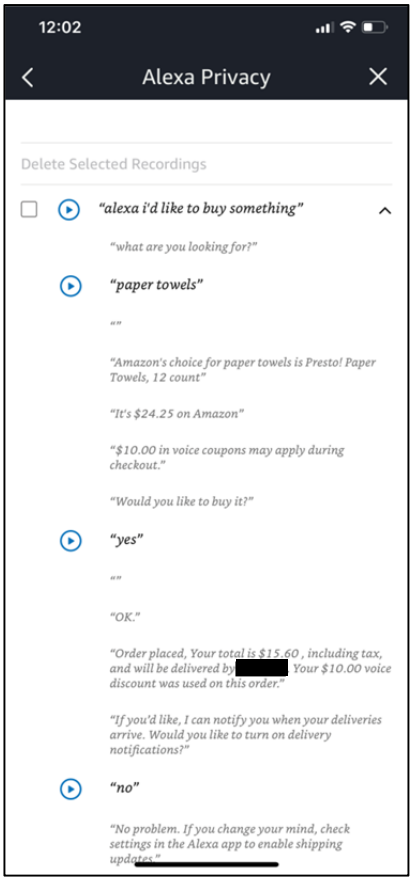
'536 Patent Claim Language	Exemplary Alexa Products



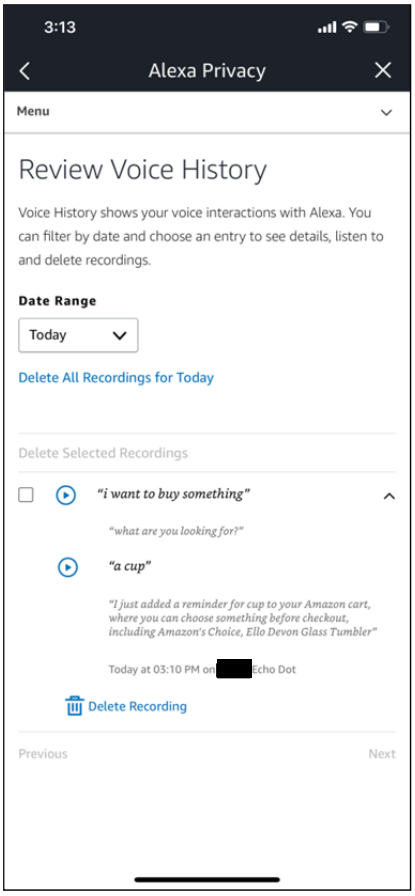


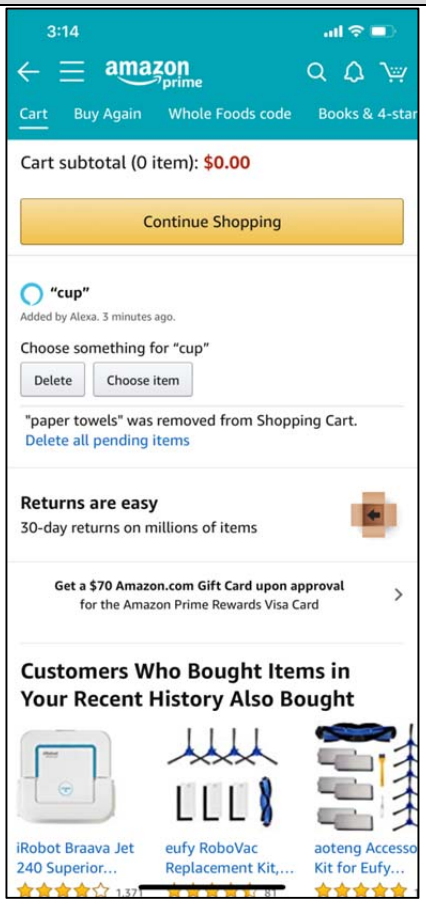


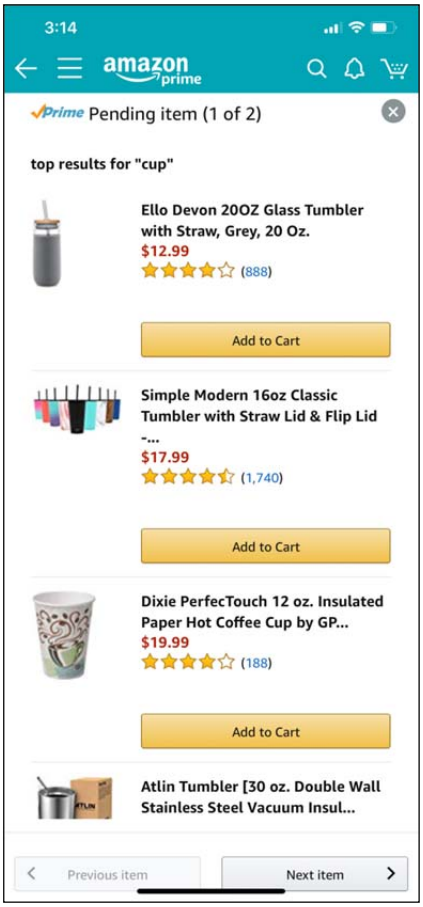
Another example is: "When you speak to Alexa, a recording of what

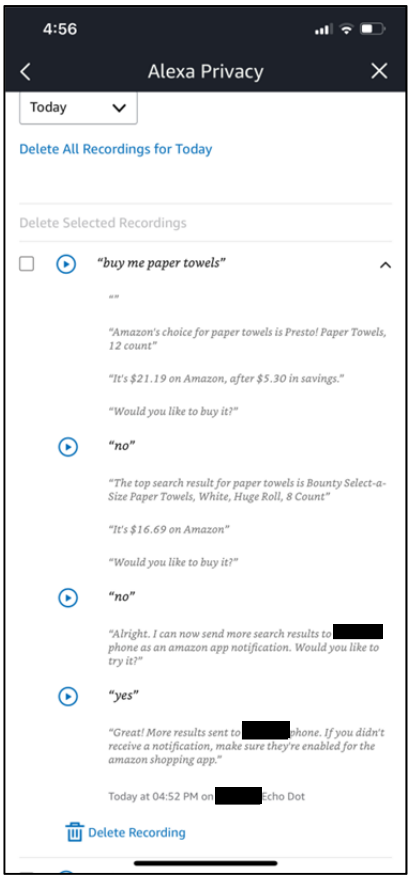
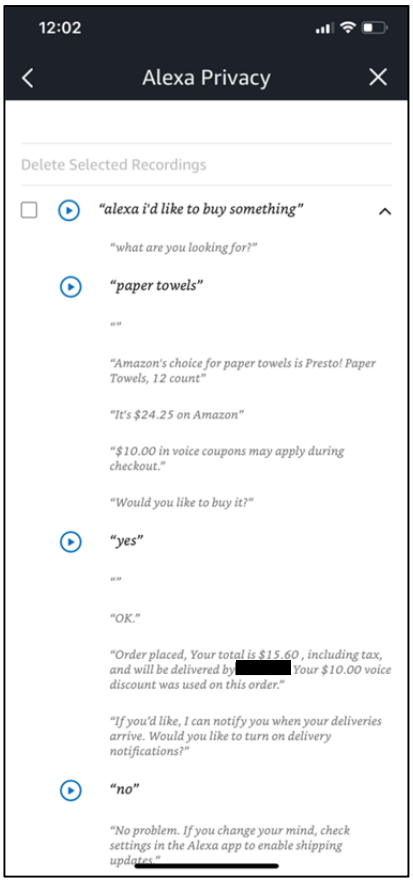
'536 Patent Claim Language	Exemplary Alexa Products
	you asked Alexa is sent to Amazon's cloud where we process your request and other information to respond to you." *Alexa and Alexa Device FAQs* at answer to question 2.
[44.e] determining, by the one or more physical processors, promotional content that relates to one or more of the first request or the second request; and	Alexa Products determine, by the one or more physical processors, promotional content that relates to one or more of the first request or the second request. Examples are determining promotional content, as shown below in screenshots of Alexa app's "Review Voice History" and Amazon app's "cart" and "results" pages below.  

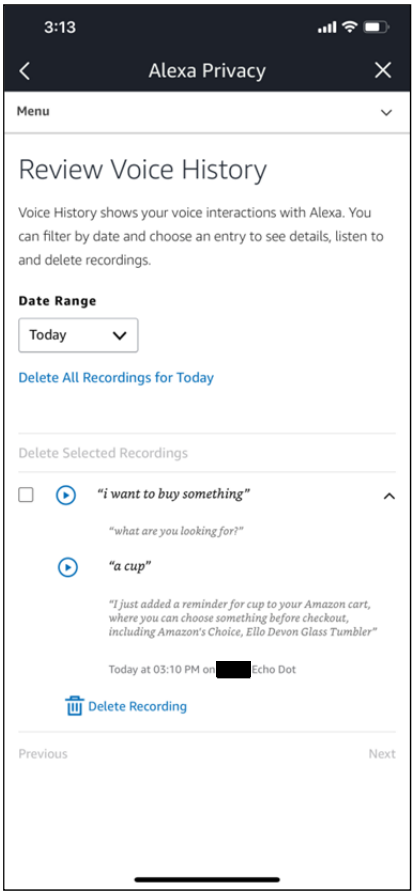
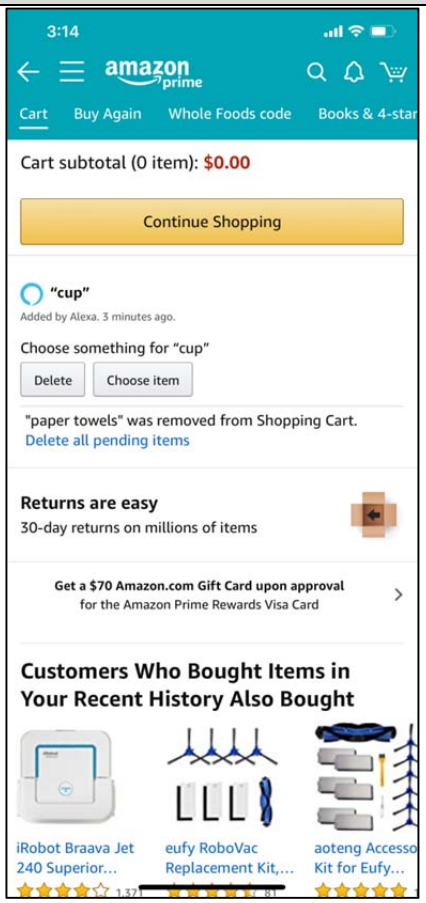
’536 Patent Claim Language	Exemplary Alexa Products







'536 Patent Claim Language	Exemplary Alexa Products
	More examples are below. When ordering something not in your existing order history, Alexa "will suggest an 'Amazon Choice' product that meets the description." *How to Shop*. "Conversations are not isolated occurrences. They build on previous questions and answers, whether from five minutes or five days ago. When appropriate, voice-first experiences should account for prior context to make the conversation more engaging or relevant to the user." *What is Conversational AI?*
[44.f] presenting, by the one or more physical processors, the promotional content to the user.	Alexa Products present, by the one or more physical processors, the promotional content to the user. Examples of presenting the promotional content are shown below in screenshots of Alexa app's "Review Voice History" and Amazon app's "cart" and "results" pages below.  

’536 Patent Claim Language	Exemplary Alexa Products
	 

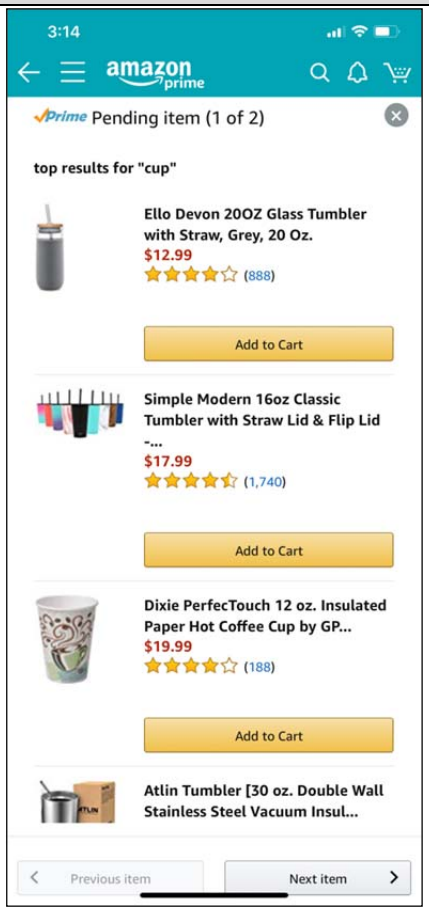
'536 Patent Claim Language	Exemplary Alexa Products
	 Below are more examples. "It will talk you through the handful of recommendations. Like with reordering, just tell Alexa the number of the suggestion you want to add in your cart." *Prime Day*. When ordering something not in your existing order history, Alexa "will suggest an 'Amazon Choice' product that meets the description." *How to Shop*.

EXHIBIT M

US009269097B2

(12) **United States Patent**
Freeman et al.

(10) **Patent No.: US 9,269,097 B2**
(45) **Date of Patent: Feb. 23, 2016**

(54) **SYSTEM AND METHOD FOR DELIVERING TARGETED ADVERTISEMENTS AND/OR PROVIDING NATURAL LANGUAGE PROCESSING BASED ON ADVERTISEMENTS**

(71) Applicant: **VOICEBOX TECHNOLOGIES CORPORATION**, Bellevue, WA (US)

(72) Inventors: **Tom Freeman**, Mercer Island, WA (US); **Mike Kennewick**, Bellevue, WA (US)

(73) Assignee: **VoiceBox Technologies Corporation**, Bellevue, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/537,598**

(22) Filed: **Nov. 10, 2014**

(65) **Prior Publication Data**

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Related U.S. Application Data

(63) Continuation of application No. 14/016,757, filed on Sep. 3, 2013, now Pat. No. 8,886,536, which is a continuation of application No. 13/371,870, filed on Feb. 13, 2012, now Pat. No. 8,527,274, which is a

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(51) **Int. Cl.**
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G06Q 30/02 (2012.01)
(Continued)

(52) **U.S. Cl.**
CPC ***G06Q 30/0251*** (2013.01); ***G06F 17/275*** (2013.01); ***G06Q 30/0241*** (2013.01); ***G06Q 30/0242*** (2013.01); ***G10L 15/18*** (2013.01); ***G10L 15/26*** (2013.01); ***G10L 15/265*** (2013.01)

(58) **Field of Classification Search**
CPC G10L 15/18
See application file for complete search history.

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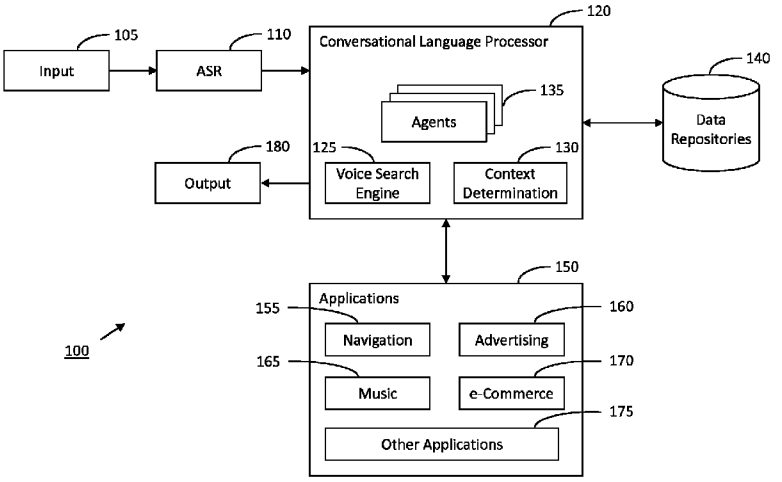
Primary Examiner — Brian Albertalli
(74) *Attorney, Agent, or Firm* — Sheppard Mullin Richter & Hampton LLP

(57) **ABSTRACT**

The system and method described herein may use various natural language models to deliver targeted advertisements and/or provide natural language processing based on advertisements. In one implementation, an advertisement associated with a product or service may be provided for presentation to a user. A natural language utterance of the user may be received. The natural language utterance may be interpreted based on the advertisement and, responsive to the existence of a pronoun in the natural language utterance, a determination of whether the pronoun refers to one or more of the product or service or a provider of the product or service may be effectuated.

23 Claims, 3 Drawing Sheets



Related U.S. Application Data

continuation of application No. 12/847,564, filed on Jul. 30, 2010, now Pat. No. 8,145,489, which is a continuation of application No. 11/671,526, filed on Feb. 6, 2007, now Pat. No. 7,818,176.

(51) **Int. Cl.**

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G06F 17/27	(2006.01)

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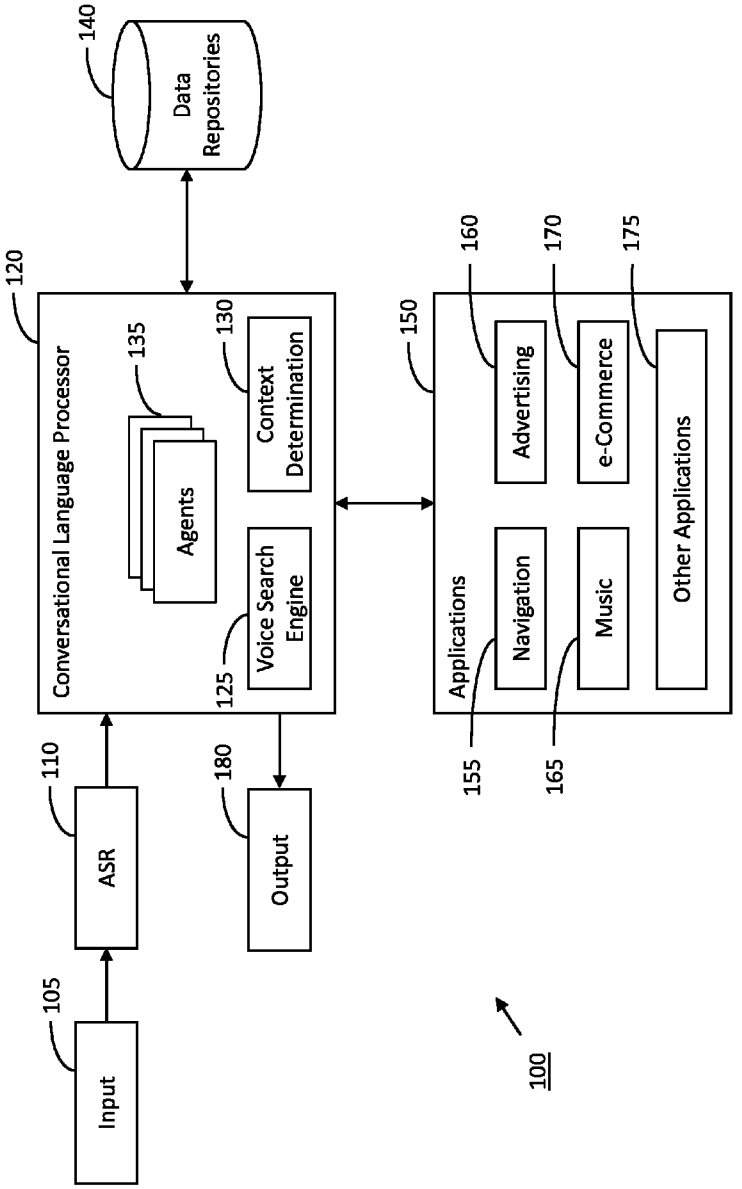

140
Data Repositories
120
Conversational Language Processor
135
Agents
130
Context Determination
125
Voice Search Engine
150
160
Advertising
170
e-Commerce
175
Other Applications
Applications
155
Navigation
165
Music
110
ASR
180
Output
105
Input
100

Figure 1

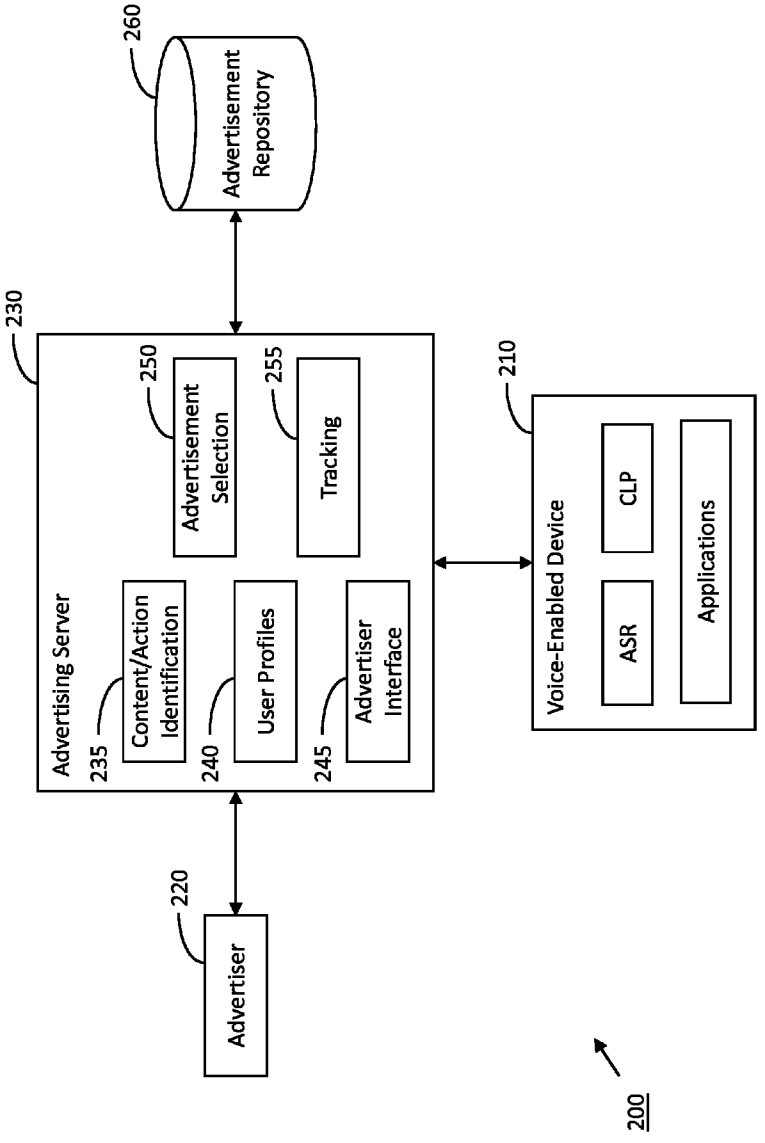

260
Advertisement Repository
230
Advertising Server
250
Advertisement Selection
255
Tracking
235
Content/Action Identification
240
User Profiles
245
Advertiser Interface
210
Voice-Enabled Device
CLP
ASR
Applications
220
Advertiser
200

Figure 2

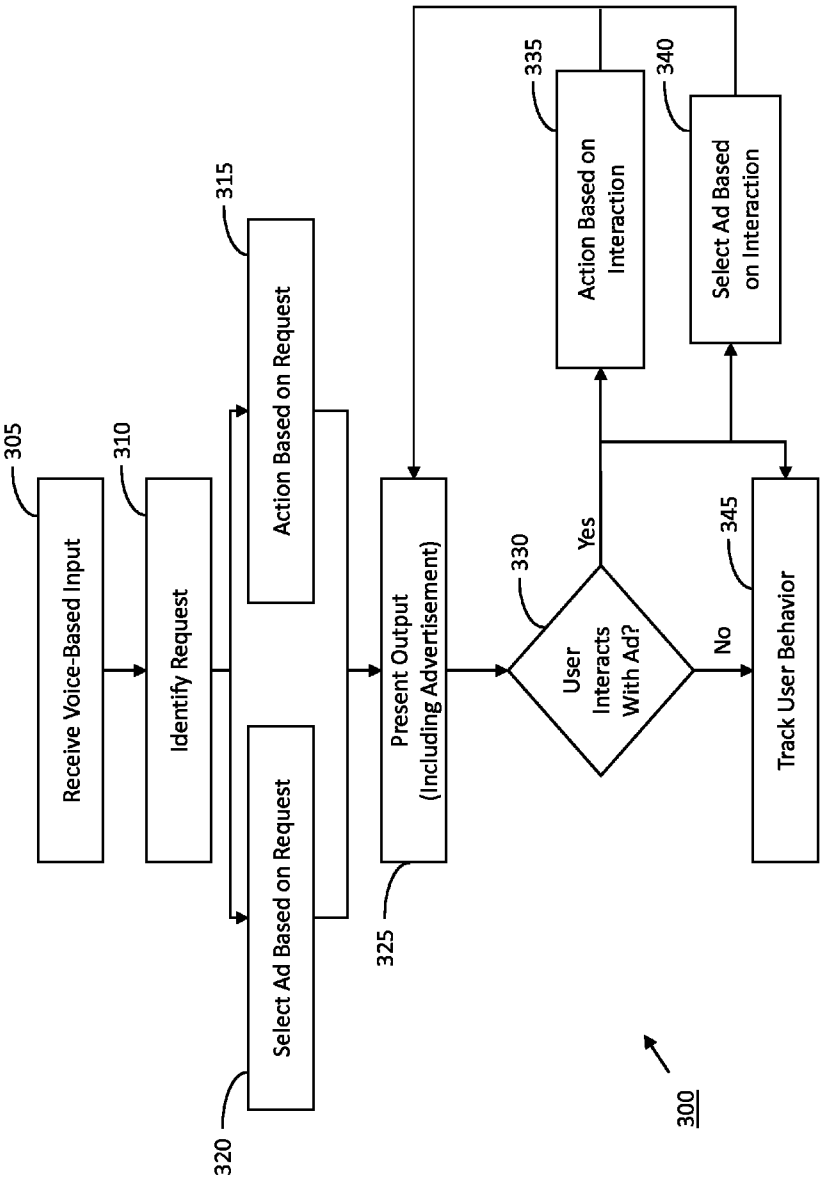

Receive Voice-Based Input
305
Identify Request
310
Action Based on Request
315
Select Ad Based on Request
320
Present Output (Including Advertisement)
325
User Interacts With Ad?
330
Yes
No
Action Based on Interaction
335
Select Ad Based on Interaction
340
Track User Behavior
345
300

Figure 3

SYSTEM AND METHOD FOR DELIVERING TARGETED ADVERTISEMENTS AND/OR PROVIDING NATURAL LANGUAGE PROCESSING BASED ON ADVERTISEMENTS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 14/016,757, entitled "System and Method for Delivering Targeted Advertisements and Tracking Advertisement Interactions in Voice Recognition Context," filed Sep. 3, 2013, which is a continuation of U.S. patent application Ser. No. 13/371,870, entitled "System and Method for Delivering Target Advertisements and Tracking Advertisement Interactions in Voice Recognition Context," filed Feb. 13, 2012 (which issued as U.S. Pat. No. 8,527,274 on Sep. 3, 2013), which is a continuation of U.S. patent application Ser. No. 12/847,564, entitled "System and Method for Selecting and Presenting Advertisements Based on Natural Language Processing of Voice-Based Input," filed Jul. 30, 2010 (which issued as U.S. Pat. No. 8,145,489 on Mar. 27, 2012), which is a continuation of U.S. patent application Ser. No. 11/671,526, entitled "System and Method for Selecting and Presenting Advertisements Based on Natural Language Processing of Voice-Based Input," filed Feb. 6, 2007 (which issued as U.S. Pat. No. 7,818,176 on Oct. 19, 2010), the contents of which are hereby incorporated by reference in their entirety.

FIELD OF THE INVENTION

The present invention relates to delivering targeted advertisements and/or processing natural language processing based on advertisements.

BACKGROUND OF THE INVENTION

As technology advances, consumer electronics devices tend to play larger roles due to increased functionality and mobility. For example, mobile phones, navigation devices, embedded devices, and other such devices provide a wealth of functionality beyond core applications. However, increased functionality adds difficulty to the learning curve associated with using electronic devices, and increased mobility intensifies the demand for simple mechanisms to interact with devices on the go. For example, existing systems tend to have complex human to machine interfaces, which may inhibit mass-market adoption for various technologies. For example, when a user wishes to perform a relatively simple task on a mobile phone, such as purchasing a ring tone, the user often is forced to navigate through a series of menus and press a series of buttons. In some instances, this may result in the transaction not necessarily occurring, as the user may prefer to avoid the hassles altogether. As such, there is ever-growing demand for ways to exploit technology in intuitive ways.

Voice recognition software may enable a user to exploit applications and features of a device that may otherwise be unfamiliar, unknown, or difficult to use. However, many existing voice user interfaces (when they actually work) still require significant learning on the part of the user. For example, users often cannot directly issue a request for a system to retrieve information or perform an action without having to memorize specific syntaxes, words, phrases, concepts, semantic indicators, or other keywords/qualifiers. Similarly, when users are uncertain of particular needs, many existing systems do not engage the user in a productive, cooperative dialogue to resolve requests and advance a conversation. Instead, many existing speech interfaces force users to use a fixed set commands or keywords to communicate requests in ways that systems can understand. Using existing voice user interfaces, there is virtually no option for dialogue between the user and the system to satisfy mutual goals.

The lack of adequate voice user interfaces results in missed opportunities for providing valuable and relevant information to users. Not only does this potentially leave user requests unresolved, in certain instances, providers of goods and services may lose out on potential business. In an increasingly global marketplace, where marketers are continually looking for new and effective ways to reach consumers, the problems with existing voice user interfaces leaves a large segment of consumer demand unfulfilled. Furthermore, existing techniques for marketing, advertising, or otherwise calling consumers to action fail to effectively utilize voice-based information, which is one of the most natural, intuitive methods of human interaction.

Existing systems suffer from these and other problems.

SUMMARY OF THE INVENTION

According to various aspects of the invention, a system and method for selecting and presenting advertisements based on natural language processing of voice-based inputs is provided. A natural language voice-based input may be received by a voice user interface. The voice-based input may include a user utterance, and a request may be identified from the utterance. Appropriate action may be taken to service the request, while one or more advertisements may be selected and presented to the user. Advertisements may be selected based on various criteria, including content of the input (e.g., concepts, semantic indicators, etc.), an activity related to the input (e.g., a relation to a request, a requested application, etc.), user profiles (e.g., demographics, preferences, location, etc.), or in other ways. A user may subsequently interact with the advertisement (e.g., via a voice-based input), and action may be taken in response to the interaction. Furthermore, the interaction may be tracked to build statistical profiles of user behavior based on affinities or clusters among advertisements, user profiles, contexts, topics, semantic indicators, concepts, or other criteria.

According to various aspects of the invention, advertisers may create advertisements, which may be stored in an advertisement repository. For example, advertisements may include sponsored messages, calls to action, purchase opportunities, trial downloads, or any other marketing communication, as would be apparent to those skilled in the art. Advertisers may specify various parameters to associate with the advertisements, such as various contexts or topic concepts (e.g., semantic indicators for a "music" concept may include words such as "music," "tunes," "songs," etc.), target demographics (e.g., a preferred audience), marketing criteria or prices for insertion (e.g., dynamic or static pricing based on various marketing criteria), or other information, as would be apparent. The advertisement repository may be associated with a server, where in response to a voice-based input from a user (e.g., at a voice-enabled device), a communications link may be established with the server. Information may be extracted from the voice-based input (e.g., words in the input, applications requested by the input, etc.), and the extracted information may be correlated with user profiles, advertisement parameters, or other information to determine which advertisements to select in relation to the voice-based input. The server may subsequently communicate the selected

advertisements to the user, and the server may track the user's subsequent interaction with the selected advertisements.

Other objects and advantages of the invention will be apparent based on the following drawings and detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a block diagram of an exemplary system for implementing a voice user interface according to various aspects of the invention.

FIG. **2** illustrates a block diagram of an exemplary advertising system according to various aspects of the invention.

FIG. **3** illustrates a flow diagram of an exemplary method for selecting and presenting advertisements based on voice-based inputs according to various aspects of the invention.

DETAILED DESCRIPTION

Referring to FIG. **1**, an exemplary system **100** for implementing a voice user interface is illustrated according to various aspects of the invention. System **100** may enable users to perform various tasks on a voice-enabled device. For example, users may control navigation devices, media devices, personal computers, personal digital assistants, or any other device supporting voice-based inputs. System **100** may enable users to request voice-enabled devices to retrieve information or perform various tasks, among other things, using natural language voice-based inputs. For example, system **100** may interpret natural language voice-based inputs and generate responses using, among other things, techniques described in U.S. patent application Ser. No. 10/452,147, entitled "Systems and Methods for Responding to Natural Language Speech Utterance," filed Jun. 3, 2003, which issued as U.S. Pat. No. 7,398,209 on Jul. 8, 2008, and U.S. patent application Ser. No. 10/618,633, entitled "Mobile Systems and Methods for Responding to Natural Language Speech Utterance," filed Jun. 15, 2003, which issued as U.S. Pat. No. 7,693,720 on Apr. 6, 2010, both of which are hereby incorporated by reference in their entirety. For example, as described in U.S. patent application Ser. No. 10/452,147, the system **100** may include a speech recognition engine (e.g., an Automatic Speech Recognizer **110**) that may recognize words and phrases in an utterance using entries in one or more dictionary and phrase tables. In addition, as further described therein, 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 (e.g., the probabilities or possibilities may be dynamically updated based on application domains, questions or commands, contexts, user profiles and preferences, user dialog histories, recognizer dictionary and phrase tables, word spellings, and/or other criteria).

According to various aspects of the invention, system **100** may receive a user input, including at least a voice-based user utterance, at an input device **105**. Input device **105** may include any suitable device, or combination of devices, for receiving a voice-based input (e.g., a microphone). In various implementations, input device **105** may include a multi-modal input, such as a touch-screen interface, keypad, or other input. The received utterance may be processed by the Automatic Speech Recognizer **110**. Automatic Speech Recognizer **110** may generate one or more preliminary interpretations of the utterance using various techniques. For example, Automatic Speech Recognizer **110** may interpret the utterance using techniques of phonetic dictation to recognize a stream of phonemes. Further, Automatic Speech Recognizer **110** may perform post-processing to enhance the preliminary interpretations. For example, Automatic Speech Recognizer **110** may vary interpretations of an utterance, or components of an utterance, from one context to another. Other techniques for enhancing an interpretation of a user utterance may be used, such as those described in U.S. patent application Ser. No. 11/513,269, entitled "Dynamic Speech Sharpening," filed Aug. 31, 2006, which issued as U.S. Pat. No. 7,634,409 on Dec. 15, 2009, and which is hereby incorporated by reference in its entirety.

The one or more preliminary interpretations may be provided to a conversational language processor **120**. Conversational language processor **120** may include a voice search engine **125**, a context determination module **130**, and one or more agents **135**, among other things, to enable cooperative, conversational interaction between the user and system **100**. Conversational language processor **120** may be communicatively coupled to one or more data repositories **140** and one or more applications **150**. Conversational language processor **120** may generate a domain-specific conversational response, which may be returned to the user as an output **180**. Output **180** may include a multi-modal output (e.g., by simultaneously returning a voice-based response and displaying information on a display device).

System **100** may further include an interaction with one or more applications **150** to service one or more requests in the utterance. For example, the utterance may include one or more requests for performing an action, retrieving information, or various combinations thereof. Output **180** may include a conversational response to advance a conversation to service requests by invoking one or more applications **150**, as appropriate. For example, applications **150** may include a navigation application **155**, an advertising application **160**, a music application, an electronic commerce application **170**, and/or other applications **175**. Furthermore, Automatic Speech Recognizer **110**, conversational language processor **120**, data repositories **140**, and/or applications **150** may reside locally (e.g., on a user device), remotely (e.g., on a server), and/or hybrid local/remote processing models may be used (e.g., lightweight applications may be processed locally while computationally intensive applications may be processed remotely).

Conversational language processor **120** may build long-term and/or short-term shared knowledge in one or more knowledge sources. For example, shared knowledge sources may include information about previous utterances, requests, and other user interactions to inform generating an appropriate response to a current utterance. The shared knowledge may include public/non-private (i.e., environmental) knowledge, as well as personal/private (i.e., historical) knowledge. For example, conversational language processor **120** may use context determination module **130** to establish a context for a current utterance by having domain agents **135** competitively generate a context-based interpretation of the utterance (e.g., by scoring possible interpretations and selecting a highest scoring interpretation). As such, agents **135** may model various domains (e.g., navigation, music, a specific user, global users, advertising, e-commerce, etc.), and conversational language processor **120** may interpret and/or respond to a voice-based input accordingly. For example, context-based interpretations and responses to a voice-based input may be generated using techniques described in U.S. patent application Ser. No. 11/197,504, entitled "Systems and Methods for Responding to Natural Language Speech Utterance," filed Aug. 5, 2005, which issued as U.S. Pat. No. 7,640,160 on Dec. 29, 2009, and U.S. patent application Ser. No. 11/212,693, entitled "Mobile Systems and Methods of Supporting

Natural Language Human-Machine Interactions," filed Aug. 29, 2005, which issued as U.S. Pat. No. 7,949,529 on May 24, 2011, both of which are hereby incorporated by reference in their entirety.

Furthermore, conversational language processor **120** may support adaptive misrecognition to reinterpret a current utterance and/or one or more previous utterances. For example, information contained in a current utterance may indicate that interpretations for one or more previous utterances were incorrect, and therefore, the previous utterances may be reinterpreted to improve subsequent interpretations. Accordingly, conversational language processor **120** may use the techniques described herein, along with various other techniques, to interpret and respond to conversational, natural language utterances. Conversational language processor **120** may use various other techniques as will be apparent, such as those described in U.S. patent application Ser. No. 11/200,164, entitled "System and Method of Supporting Adaptive Misrecognition in Conversational Speech," filed Aug. 10, 2005, which issued as U.S. Pat. No. 7,620,549 on Nov. 17, 2009, and U.S. patent application Ser. No. 11/580,926, entitled "System and Method for a Cooperative Conversational Voice User Interface," filed Oct. 16, 2006, which issued as U.S. Pat. No. 8,073,681 on Dec. 6, 2011, both of which are hereby incorporated by reference in their entirety. For example, as described in U.S. patent application Ser. No. 11/200,164, an environmental model may be accessed to determine user location, user activity, track user actions, and/or other environmental information to invoke context, domain knowledge, preferences, and/or other cognitive qualities to enhance the interpretation of questions and/or commands. In addition, as further described therein, based on information received from a general cognitive model, the environmental model, and/or a personalized cognitive model, which provide statistical abstracts of user interaction patterns, the system **100** may enhance responses to commands and questions by including a prediction of user behavior.

Referring to FIG. **2**, an exemplary advertising system **200** is illustrated according to various aspects of the invention. System **200** may include a server **230** for receiving one or more advertisements from an advertiser **220**, wherein the advertisements may be stored in a data repository **260** associated with server **230**. For example, advertisements may include sponsored messages or marketing communications, calls to action, purchase opportunities, trial downloads, coupons, or any other suitable marketing, advertising, campaign, or other information, as would be apparent to those skilled in the art. A voice-enabled device **210** may receive a voice-based input and establish communications with advertising server **230**. Subsequently, advertising server **230** may select one or more advertisements from among the advertisements stored in data repository **260**, and the selected advertisements may be provided to the voice-enabled device for presentation to a user.

Advertiser **220** may access advertising server **230** via an advertiser interface **245**. Advertisers **220** may upload targeted advertisements to server **230** via advertiser interface **245**, and server **230** may store the advertisements in data repository **260**. The advertisements may include graphically-based advertisements that include banners, images, audio, video, or any suitable combination thereof. Furthermore, the advertisements may include interactive or embedded information, such as links, metadata, or computer-executable instructions, or any suitable combination thereof. Advertisers may specify criteria for a campaign or targeting information for an advertisement (e.g., a start date, an end date, budget information, geo-targeting information, conceptual or contextual information, or any other suitable criteria), which may be used to facilitate selecting an advertisement in relation to a particular voice-based input.

In addition to providing interface **245** for advertisers, server **230** may include a content/action identification module **235**, a user profile module **240**, an advertisement selection module **250**, and a tracking module **255**. Users may submit voice-based requests to voice-enabled device **210**, and voice-enabled device **210** may communicate information about the voice-based input to server **230**. Server **230** may invoke advertisement selection module **250** to extract relevant information from the voice-based input, where advertisement selection module **250** may select one or more advertisements relevant to the voice-based input based on information extracted using content/action identification module **235** and/or user profile module **240**.

For example, content/action identification module **235** may identify content of the voice-based input (e.g., words in the input), requested information (e.g., search results, a web page, music, video, graphics, or other information), requested actions (e.g., calculating a navigation route, placing a telephone call, playing a song, etc.), a category or topic related to the input (e.g., music, business, stocks, sports, navigation, movies, etc.), or other criteria to use in selecting an advertisement. Further, user profile module **240** may identify characteristics of a specific user (e.g., demographics, personal preferences, location-based information, etc.), global user profiles (e.g., demographic profiles, click-through rates, etc.), or other criteria to use in selecting an advertisement. Moreover, advertisement selection module **250** may account for where a request originates from. For example, advertisements may be selected based on a default user location (e.g., identified from a user profile), current geolocation information (e.g., identified from a navigation device), whether an affiliate or partner of server **230** initiated the request, or other criteria.

For instance, a user may request airline reservations via voice-enabled device **210**, and content/action identification module **235** may identify specific words used in the request, a category related to the request (e.g., travel, airlines, hotels, etc.), or other information. Furthermore, user profile module **240** may identify relevant characteristics of the user (e.g., user-specific demographics, location information, preferred airlines or hotels, etc.), as well as global user characteristics (e.g., most popular airlines). In various implementations, advertisements may be selected by assigning a score to each advertisement (e.g., based on click-through rates, relevance metrics, target audiences, etc.). As such, advertisement selection module **250** may correlate the information about the request to select advertisements stored in data repository **260**, and server **230** may communicate the selected advertisements to voice-enabled device **210**. Furthermore, selected advertisements may be presented according to a predetermined ordering or ranking (e.g., based on a ranking of relevance to an advertisement).

In various implementations, advertisement selection module **250** may retrieve a predetermined number of advertisements for any given request. Furthermore, the selected advertisements may depend upon a presentation format. For example, advertisements may be selected based on an amount of available space on a display of voice-enabled device **210** and/or a size/shape of the selected advertisements. In another example, voice-based advertisements may be selected and presented to the user audibly (e.g., a "hands-free" advertisement may be preferred when voice-enabled device **210** is a telematics device).

Furthermore, the user's subsequent interaction with an advertisement may be tracked using tracking module **255**. For

example, tracking module **255** may determine whether a conversion or click-through occurs for each advertisement presented to users. Further, tracking module **255** may maintain accounting and/or billing information associated with advertisers **220**. For example, advertisers **220** may specify a maximum insertion cost, a cost-per-click-through, an average insertion cost, or other criteria specifying a budget constraint for an advertisement. As such, tracking module **255** may track which advertisements are selected and/or presented, which advertisements result in a conversion or click-through, whether a click-through or conversion results in a transaction or sale, associations between advertisements and users, requests, concepts, semantic indicators, and/or other criteria. For example, tracking user interaction with advertisements may be used to build user-specific and/or global statistical profiles that map or cluster advertisements to topics, semantic indicators, contexts, concepts, etc. based on user behavior, demographics, targeting constraints, content of advertisements, content of requests, actions associated with requests, or other statistically relevant information. Accordingly, the tracking information may be used to bill or invoice advertisers **220**, as well as to improve subsequent performance and relevance of advertisements selected using advertisement selection module **250**. Other techniques and features of selecting and presenting advertisements based on voice-based inputs may suitably be employed, as would be apparent.

Referring to FIG. **3**, an exemplary method for selecting and presenting advertisements based on a voice-based input is illustrated according to various aspects of the invention. The method may begin in an operation **305**, where a voice-based input, including at least a user utterance, may be received at a voice user interface. The voice user interface may include any suitable mechanism for receiving the utterance (e.g., a microphone), and may interface with any suitable voice-enabled device, as would be apparent, including personal navigation devices, personal digital assistants, media devices, telematics devices, personal computers, mobile phones, or others.

Subsequently, one or more requests included in the voice-based input may be identified in an operation **310**. For example, the requests may include requests to retrieve information, perform tasks, explore or gather information, or otherwise interact with a system or device. For example, a voice-based input to a navigation device may include a request to calculate a route or retrieve location-based information. In another example, a voice-based input to a mobile phone may include a request to place a telephone call, purchase a ringtone, or record a voice-memo. Furthermore, in various implementations, voice-based inputs may include multiple requests, multi-modal requests, cross-device requests, cross-application requests, or other types of requests. For example, an utterance received in operation **305** may be: "Get me a route to Chang's Restaurant, and call them so I can make a reservation." The utterance may thus include multiple requests, including cross-device requests (e.g., calculate a route using a navigation device, and make a telephone call using a mobile phone), as well as cross-application requests (e.g., search for an address and/or phone number using a voice search engine, and calculate a route using a navigation application).

The requests may be part of a conversational interaction between a user and a system or device, whereby an interpretation of requests in a current utterance may be based upon previous utterances in a current conversation, utterances in previous conversations, context-based information, local and/or global user profiles, or other information. For example, a previous request may be reinterpreted based on information included in subsequent requests, a current request may be interpreted based on information included in previous requests, etc. Furthermore, the conversational interaction may take various forms, including query-based conversations, didactic conversations, exploratory conversations, or other types of conversations. For example, the conversational language processor may identify a type of conversation, and information may be extracted from the utterance accordingly to identify the one or more requests in operation **310**. Moreover, the conversational language processor may determine whether any of the requests are incomplete or ambiguous, and action may be taken accordingly (e.g., a system response may prompt a user to clarify an incomplete and/or ambiguous request). The conversational language processor may therefore use various techniques to identify a conversation type, interpret utterances, identify requests, or perform other tasks, such as those described in the aforementioned U.S. patent applications and U.S. patents, which are hereby incorporated by reference in their entirety.

Upon identifying the one or more requests, action may be taken based on the identified requests in an operation **315**, while one or more advertisements may be selected in an operation **320** (described in greater detail below). For example, one or more context-appropriate applications may be invoked to service the requests in operation **315** (e.g., a voice search engine, a navigation application, an electronic commerce application, or other application may be invoked depending upon the request). Furthermore, in operation **320**, information may be communicated to an advertising server to select one or more advertisements related to the request. Thus, as shown in FIG. **3**, taking action in operation **315** and selecting advertisements in operation **320** may be related operations (e.g., advertisements may be selected to help in interpreting incomplete and/or ambiguous requests).

Upon taking action in operation **315** (e.g., to service the request) and selecting one or more advertisements in operation **320** (e.g., in relation to the request), an output may be presented to the user in operation **325**. The output may indicate a result of the action associated with operation **315**. For example, the output may include requested information, an indication of whether a requested task was successfully completed, whether additional information is needed to service the request (e.g., including a prompt for the information), or other information relating to an action based on the request. Furthermore, the output may include advertisements, as selected in operation **320**. For example, the output may include text-based, graphic-based, video-based, audio-based, or other types of advertisements, as would be apparent to those skilled in the art. Further, the output may include other types of advertisements, including calls to action (e.g., a location-based coupon or purchase opportunity, trial downloads, or other actionable advertising or marketing).

Advertisements may be selected in relation to a request based on various criteria. For example, an advertisement may be selected based on words or other content of the request, relevant words or content related to the words or content of the request, etc. In another example, the advertisement may be selected based on requested tasks/information (e.g., a request for movie showtimes may result in an advertisement being selected for a particular theater). In yet another example, the advertisement may be selected based on a topic or category associated with the requested tasks/information (e.g., a request to purchase airline tickets may result in an advertisement being selected for a hotel in a destination associated with a reserved flight). In still other examples, the advertisement may be selected based on location information, (e.g., advertisements may be selected based on a proximity to a user geolocation identified using a navigation device), user-

specific and/or global user profiles (e.g., advertisements may be selected based on user-specific and/or global preferences, advertiser campaign criteria, etc.).

Content of a voice-based input may be determined based on various criteria, including contextual or conceptual information (e.g., semantic indicators, qualifiers, or other information). For example, a given concept may include various semantically equivalent indicators having an identical meaning. Thus, for instance, a voice-based input may be "Play some tunes!" or "Play some music!" or other variants thereof, each of which may be interpreted as relating to a specific idea (or concept) of "Music." Thus, concept or content information in a request may be used to select an advertisement. For example, a user may request to calculate a route in Seattle, Wash. (e.g., "How do I get to the Space Needle?"). Based on a context of the requested task (e.g., "Navigation," "Seattle," etc.), a voice search engine may retrieve an address of the Space Needle and a navigation application may calculate the route. Furthermore, user profile information may indicate that the user is visiting Seattle from out-of-town (e.g., the profile may indicate that the user's home is Sacramento), and therefore, an advertisement for popular points-of-interest in Seattle may be selected. In another example, the user may request information about a sporting event (e.g., "Get me the kickoff time for the Eagles game on Sunday"). Based on a context of the requested information (e.g., "Search," "Sports," "Philadelphia," etc.), the requested information may be retrieved, while an advertisement for Eagles apparel or memorabilia may be selected.

In various instances, concepts, semantic indicators, qualifiers, or other information included in, or inferred from, a request may indicate an exploratory nature for the request. In other words, the exploratory request may identify a goal for a conversation, instead of a particular task to perform or information to retrieve. As such, in various implementations, an advertisement may be selected in operation **320** in an effort to advance the conversation towards the goal. For example, an exploratory request may include a request for a navigation route (e.g., "I feel like going to a museum, find me something interesting"). Based on a context of the requested task (e.g., "Navigation," "Points of Interest," etc.), the goal of the conversation may be identified, and the request may be serviced in operation **315** (e.g., a voice search engine may locate nearby points of interest based on user preferred topics). Further, the advertising application may select an appropriate advertisement in operation **320**, where the advertisement may be selected in an attempt to advance the conversation towards the goal. For example, statistical profiles (e.g., user profiles, global profiles, topic-based profiles, etc.) may reflect an affinity between an advertisement for a particular museum and other users sharing similar demographics or other characteristics with the requesting user. Thus, in addition to retrieving information about museums in operation **315**, an advertisement for a museum likely to be of interest to the user may be selected in operation **320**.

In various instances, a request may include incomplete, ambiguous, unrecognized, or otherwise insufficient semantic indicators, context, qualifiers, or other information needed to identify the request. In other words, the request may include inadequate information to identify or infer a task to perform, information to retrieve, or a goal for a conversation. Thus, as much information as possible may be extracted and/or inferred from the request based on shared knowledge such as context, user or global profile information, previous utterances, previous conversations, etc. As such, servicing the request may include generating a response and/or communicating with an advertising application to advance a conversation toward a serviceable request. For example, servicing the request in operation **315** and selecting an advertisement in operation **320** may include generating a response and/or selecting an advertisement to frame a subsequent user input, thereby advancing the conversation.

For example, the request may include incomplete, ambiguous, or unrecognized information (e.g., "Do you know [mumbled words] Seattle?"). A context of the requested task may be identified (e.g., "Seattle"), yet the identified context may be insufficient to adequately take action to service the request. Additional information may be inferred based on previous utterances in the conversation, profile information, or other information. However, when the additional information fails to provide adequate information to infer a reasonable hypothesis, servicing the request in operation **315** may include generating a response to frame a subsequent user input and advance the conversation (e.g., information about various topics may be retrieved based on a user's preferred topics). Further, the advertising application may select an advertisement in operation **320** to advance the conversation (e.g., advertisements may be selected based on user and/or global profiles reflecting an affinity between certain advertisements associated with Seattle and user preferences, profiles, etc.). Thus, by selecting an advertisement, indicating dissatisfaction with an advertisement, or otherwise interacting with an advertisement, the interaction may be used to build context and shared knowledge for a subsequent course of the conversation. For example, a user may select an advertisement, and an interpretation of a subsequent voice-based input (e.g., "Call them," "What's the price range?" etc.) may be interpreted with shared knowledge of the advertisement that the voice-based input relates to. Thus, advertisements may be used in a way that enables advertisers to market to consumers, while also improving the consumers' interaction with a device. Other advantages will be apparent to those skilled in the art.

It will be apparent that operation **320** may use various techniques to select advertisements based on voice-based inputs and/or requests included therein. For example, an advertiser may specify a target audience, marketing criteria, campaign strategies, budget constraints, concepts, semantic indicators, related topics, categories, and/or any other suitable information to associate with an advertisement. For instance, advertisers may pay a premium to prioritize an advertisement in relation to similar advertisements (e.g., advertisements associated with competitors). In another example, various statistical profiles may define affinities between advertisements, topics, users, etc. (e.g., based on click-through or conversion rates, or other tracking information, as described in more detail below). Thus, advertisements may be selected in operation **320** using various techniques, including content of the request, an activity/action associated with the request, user profiles, user preferences, statistical metrics, advertiser-specified criteria, to advance a conversation, to resolve ambiguous requests, or in various other ways, as will be apparent.

The output presented to the user in operation **325** may be provided to the user in various ways. For example, in various implementations, the output may include a voice-based or otherwise audible response. In another example, when an associated device includes a display mechanism, the output may be displayed on the display device. It will be apparent that many combinations or variants thereof may be used, such as augmenting a voice-based response with information on a display device. For example, a user may request information about restaurants, and an advertisement may be selected based on a user preference indicating a favorite type of res-

taurant (e.g., a Chinese restaurant may be selected based on a user profile indicating a preference for Chinese). Therefore, in one example, the output presented in operation **325** may display information about various restaurants matching the requested information, while a voice-based advertisement for the Chinese restaurant may be played to the user (e.g., via a speaker or other suitable mechanism for playing voice back to the user). Many other variations will be apparent (e.g., a graphical advertisement may be displayed on a display device, while a corresponding or different voice-based advertisement may be played audibly).

Subsequent interaction between the user and the presented advertisements may be monitored in a decisional operation **330**. For instance, when the user elects to interact with the advertisement, action may be taken based on the interaction in an operation **335**. The interaction may take various forms, including additional voice-based inputs or other suitable mechanisms for interacting with advertisements (e.g., clicking on an advertisement displayed on a personal digital assistant using an associated stylus). For example, a user may initially request information from a voice-enabled media device (e.g., a satellite radio player) about a song currently playing (e.g., "What is this song?"). In addition to outputting the requested information about the song (e.g., "This song is Double Barrel by Dave and Ansel Collins."), a selected advertisement may enable the user to purchase a ringtone for a mobile phone that corresponds to the song. In this example, the interaction may include a request to purchase the ringtone (e.g., "Yeah, I'll buy that"), and action taken in operation **335** may include completing a transaction for the ringtone and/or downloading the ringtone to the mobile phone. Furthermore, additional advertisements may be selected in an operation **340** based on the interaction, using similar techniques as described in connection with operation **320** (e.g., advertisements for additional ringtones, similar musicians, etc. may be selected). Processing may subsequently return to operation **325** to present output resulting from the interaction.

User advertisement interaction may be tracked in an operation **345**. For example, operation **345** may track historical data about users, conversations, topics, contexts, or other criteria to associate information with the selected advertisement. The tracking information may therefore be used to build statistical profiles defining affinities, click-through or conversion rates, or other information about various advertisements, topics, or other criteria on a user-specific and/or a global-user level. Thus, clusters or mappings may be created between advertisements, topics, concepts, demographics, or other criteria based on user behavior with the advertisements (e.g., whether a user interacts with the advertisement in operation **330**).

For instance, certain advertisements may experience high click-through rates in relation to a first context and/or topic, but low click-through rates in relation to a second context and/or topic, and therefore, when requests relate to the first context and/or topic, the advertisement may be more likely to be selected in subsequent operations **320**/**340**. In another example, global statistical profiles may indicate that an advertisement experiences more click-throughs by users of a particular demographic, and therefore, the advertisement may be more likely to be selected for users falling within the demographic. Many different techniques for tracking and building statistical profiles will be apparent.

Implementations of the invention may be made in hardware, firmware, software, or any combination thereof. The invention may also be implemented as instructions stored on a machine-readable medium, which may be read and executed by one or more processors. A machine-readable medium may include any mechanism for storing or transmitting information in a form readable by a machine (e.g., a computing device). For example, a machine-readable storage medium may include read only memory, random access memory, magnetic disk storage media, optical storage media, flash memory devices, and others, and a machine-readable transmission media may include forms of propagated signals, such as carrier waves, infrared signals, digital signals, and others. Further, firmware, software, routines, or instructions may be described in the above disclosure in terms of specific exemplary aspects and implementations of the invention, and performing certain actions. However, it will be apparent that such descriptions are merely for convenience and that such actions in fact result from computing devices, processors, controllers, or other devices executing the firmware, software, routines, or instructions.

Aspects and implementations may be described as including a particular feature, structure, or characteristic, but every aspect or implementation may not necessarily include the particular feature, structure, or characteristic. Further, when a particular feature, structure, or characteristic is described in connection with an aspect or implementation, it will be apparent to effect such feature, structure, or characteristic in connection with other aspects or implementations whether or not explicitly described. Thus, various changes and modifications may be made, without departing from the scope and spirit of the invention. The specification and drawings are to be regarded as exemplary only, and the scope of the invention is to be determined solely by the appended claims.

What is claimed is:

1. A method for providing natural language processing based on advertisements, the method being implemented on a computer system having one or more physical processors executing computer program instructions which, when executed, perform the method, the method comprising:

providing, by the computer system, an advertisement associated with a product or service for presentation to a user;

receiving, at the computer system, a natural language utterance of the user; and

interpreting, by the computer system, the natural language utterance based on the advertisement and, responsive to the existence of a pronoun in the natural language utterance, determining whether the pronoun refers to one or more of the product or service or a provider of the product or service.

2. The method of claim **1**, further comprising:

generating, by the computer system, a request related to the product or service responsive to determining that the pronoun refers to the product or service.

3. The method of claim **1**, further comprising:

generating, by the computer system, a request related to the provider of the product or service responsive to determining that the pronoun refers to the provider.

4. The method of claim **1**, wherein the natural language utterance includes a specified action and the pronoun, the method further comprising:

generating, by the computer system, a request to take the specified action with respect to the product or service responsive to determining that the pronoun refers to the product or service.

5. The method of claim **1**, wherein the natural language utterance includes a specified action and the pronoun, the method further comprising:

generating, by the computer system, a request to take the specified action with respect to the provider of the product or service responsive to determining that the pronoun refers to the provider.

6. The method of claim **1**, wherein the advertisement includes one or more of a call to action, a purchase opportunity, or a trial opportunity.

7. The method of claim **1**, further comprising:

receiving, at the computer system, another natural language utterance of the user prior to the advertisement being provided for presentation to the user; and

performing, by the computer system, speech recognition to recognize one or more words of the other natural language utterance,

wherein providing the advertisement includes providing the advertisement based on the one or more recognized words.

8. The method of claim **1**, further comprising:

receiving, at the computer system, another natural language utterance of the user prior to the advertisement being provided for presentation to the user;

interpreting, by the computer system, the other natural language utterance; and

reinterpreting and/or confirming the interpretation of the other natural language utterance based on an interaction of the user with the advertisement.

9. The method of claim **1**, further comprising:

receiving, at the computer system, another natural language utterance prior to the advertisement being provided for presentation to the user; and

determining, by the computer system, one or more requests associated with the other natural language utterance, and

wherein providing the advertisement includes providing the advertisement based on the one or more requests.

10. The method of claim **9**, wherein the one or more requests include a first request to be processed by a first device associated with the user and a second request to be processed by a second device associated with the user, and

wherein providing the advertisement includes providing the advertisement based on one or more of the first request or the second request.

11. The method of claim **10**, wherein a first device type of the first device includes one or more of a mobile phone, a navigation device, or a medial player device, and wherein the second device is of a second device type different than the first device type.

12. The method of claim **9**, wherein the one or more requests include a first request associated with a first application and a second request associated with a second application different than the first application, and

wherein providing the advertisement includes providing the advertisement based on one or more of the first request or the second request.

13. The method of **12**, wherein a first application type of the first application includes one or more of a navigation application, a music application, a commerce application, or a calling application, and wherein the second application is of an application type different than the first application type.

14. The method of claim **9**, further comprising:

obtaining, by the computer system, user profile information associated with the user, wherein the user profile information specifies prior user interactions with items;

determining by the computer system, one or more applications for processing the one or more requests, and

determining, by the computer system, categories of items based on the prior user interactions specified by the user profile information, wherein the categories relate to the one or more applications, and

wherein providing the advertisement includes providing the advertisement based on one or more of more of the categories.

15. The method of claim **1**, further comprising:

obtaining, by the computer system, user profile information associated with the user, wherein the user profile information specifies prior user interactions with items; and

identifying, by the computer system, categories of items based on the prior user interactions specified by the user profile information, and

wherein providing the advertisement includes providing the advertisement based on one or more of the categories.

16. The method of claim **1**, further comprising:

receiving, at the computer system, a first natural language utterance during an interactive session between the user and the computer system;

interpreting, by the computer system, the first natural language utterance;

receiving, at the computer system, a second natural language utterance during the interactive session; and

reinterpreting, by the computer system, the first natural language utterance based on the second natural language utterance,

wherein providing the advertisement includes providing the advertisement based on one or more of the interpretation or the reinterpretation of the first natural language utterance.

17. The method of claim **16**, wherein providing the advertisement comprises providing the advertisement based on the reinterpretation of the first natural language utterance.

18. The method of claim **16**, further comprising:

performing, by the computer system, speech recognition to recognize one or more words of the first natural language user utterance,

wherein interpreting the first natural language utterance includes processing, based on the first natural language utterance, the one or more recognized words to determine the interpretation of the first natural language utterance, and

wherein reinterpreting the first natural language utterance comprises processing, based on the second natural language utterance, the one or more recognized words to determine the reinterpretation of the first natural language utterance.

19. The method of claim **1**, further comprising:

facilitating, by the computer system, delivery of the product or service responsive to determining that the pronoun refers to one or more of the product or service or the provider of the product or service.

20. The method of claim **19**, wherein facilitating delivery of the product or service includes performing a purchase transaction for the product or service.

21. The method of claim **19**, wherein the product or service comprises a particular product, and wherein facilitating delivery of the product or service includes providing the particular product to a user device of the user.

22. The method of claim **1**, wherein the product or service includes one or more of an application, a ringtone, a song, a video, a coupon, or a product related to a scheduled event.

23. A system providing natural language processing based on advertisements, the system comprising:

one or more physical processors programmed with computer program instructions which, when executed, cause the one or more physical processors to:

provide an advertisement associated with a product or service for presentation to a user;

receive a natural language utterance of the user; and

interpret the natural language utterance based on the advertisement and, responsive to the existence of a pronoun in the natural language utterance, determine whether the pronoun refers to one or more of the product or service or a provider of the product or service.

* * * * *

EXHIBIT N

USPN 9,269,097 ("the '097 patent")
Infringement Chart for Claim 1

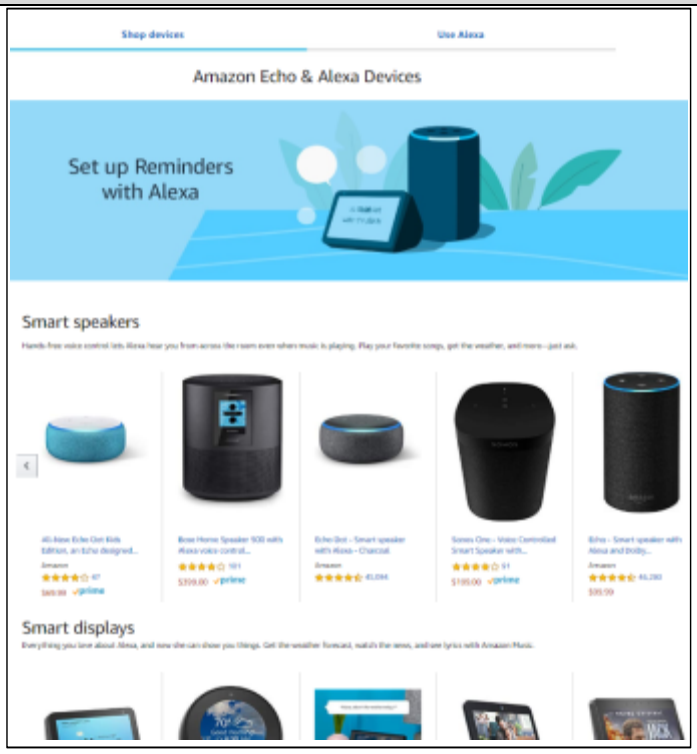
The following chart provides exemplary infringement allegations with respect to an exemplary claim of the '097 patent based on Plaintiff's investigation to date. Plaintiff reserves the right to provide modified and/or more detailed allegations (including with additional claims, products, and evidence) in accordance with its discovery obligations in view of any applicable scheduling order. This chart uses "Alexa Products" to refer to the full scope of instrumentalities identified in the complaint. Any discussion of specific Alexa Products in the following chart is exemplary.

Exemplary information relevant to infringement:

1. *Amazon Echo & Alexa Devices* - Amazon Official Site, https://www.amazon.com/Amazon-Echo-And-Alexa-Devices/b/?ie=UTF8&node=9818047011&ref_=sv_devicesubnav_1 (last visited Jul. 22, 2019)
2. *Alexa and Alexa Device FAQs*, Amazon Help & Customer Service - Amazon Official Site, https://www.amazon.com/gp/help/customer/display.html?nodeId=201602230 (last visited Jul. 22, 2019)
3. Chaim Gartenberg, *How to shop on Amazon using Alexa voice controls*, The Verge, Jul. 10, 2017, https://www.theverge.com/2017/7/10/15947672/amazon-alexa-voice-controls-shopping-prime-echo-how-to ("*How to Shop*")
4. *Audio Hardware Configurations*, Alexa Voice Service, developer.amazon.com, https://developer.amazon.com/docs/alexa-voice-service/audio-hardware-configurations.html (last visited Jul. 22, 2019)
5. *Designing for Conversation – Build for dialog*, Amazon Alexa - Amazon Developer Services and Technologies - Amazon Official Site, https://developer.amazon.com/ask-resources/guided/conversational-design-workshop#/lessons/gDcQVF9nOFOtNljrELzARIGN4HuD7LNh?_k=q4qp1a (last visited Jul. 22, 2019)
6. *Amazon Echo Teardown*, IFIXIT, Dec. 16, 2014, https://www.ifixit.com/Teardown/Amazon+Echo+Teardown/33953
7. Richard Baguley & Colin McDonald, *Appliance Science: Alexa, how does Alexa work? The science of the Amazon Echo*, CNET, Aug. 4, 2016, https://www.cnet.com/news/appliance-science-alexa-how-does-alexa-work-the-science-of-amazons-echo/ ("*Appliance Science*")
8. Taylor Martin, *How to shop with Alexa on Prime Day*, CNET, Jul. 15, 2018, https://www.cnet.com/how-to/how-to-shop-with-alexa-prime-day/ ("*Prime Day*")
9. *What is Conversational AI?*, Amazon Alexa - Amazon Developer Services and Technologies - Amazon Official Site, https://developer.amazon.com/alexa-skills-kit/conversational-ai (last visited Jul. 22, 2019)

'097 Patent Claim Language	**Exemplary Alexa Products**
1.[pr] A method for providing natural language processing based on advertisements, the method being implemented on a computer system having one or more physical processors executing computer program instructions which, when executed, perform the method, the method comprising:	Alexa Products are programmed to perform and have performed methods for providing natural language processing based on advertisements, the method being implemented on a computer system having one or more physical processors executing computer program instructions which, when executed, perform the recited method. For example, Alexa Products (e.g. Echo, Echo Dot, Alexa apps, and Alexa cloud) include Alexa.

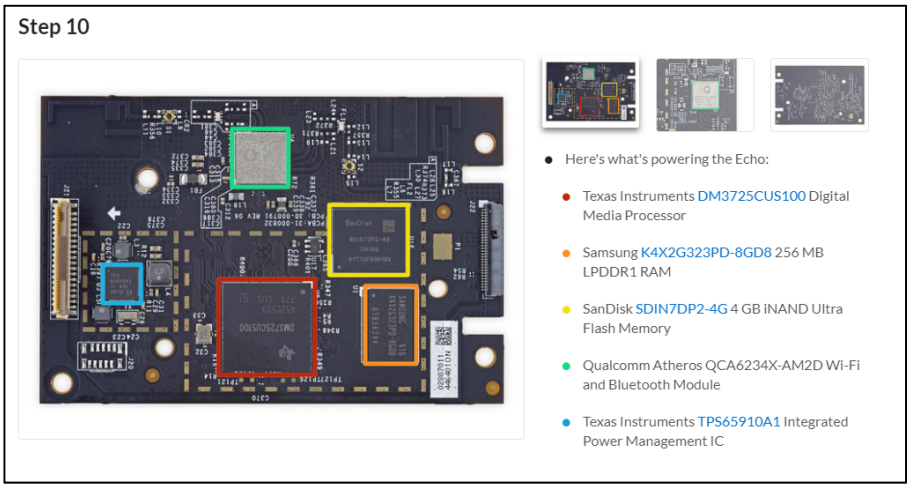
'097 Patent Claim Language	Exemplary Alexa Products



E.g. *Amazon Echo & Alexa Devices*.

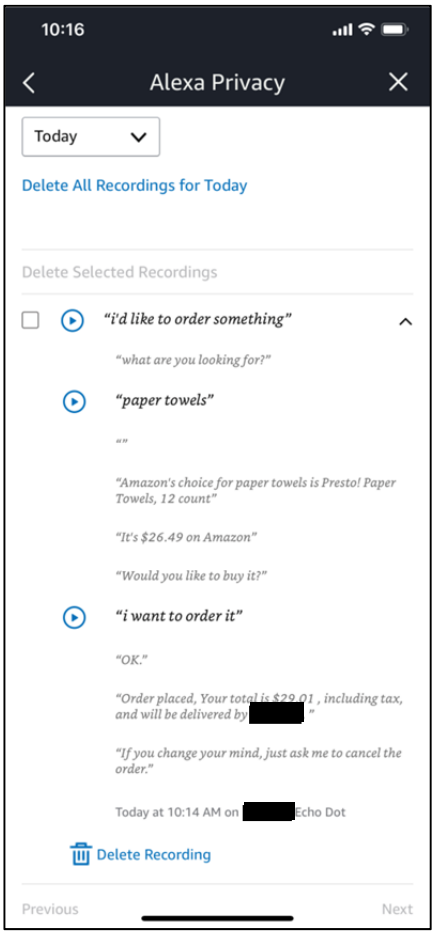
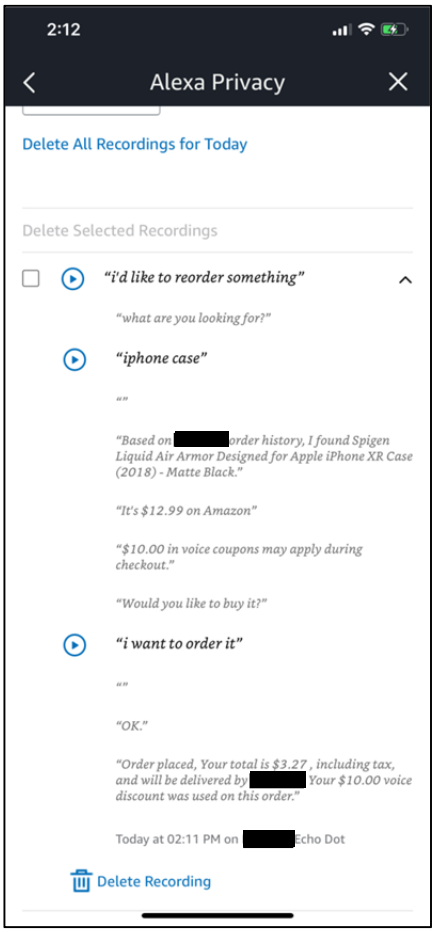
"With conversational AI, voice-enabled devices like Amazon Echo . . . ." E.g. *What is Conversational AI?*

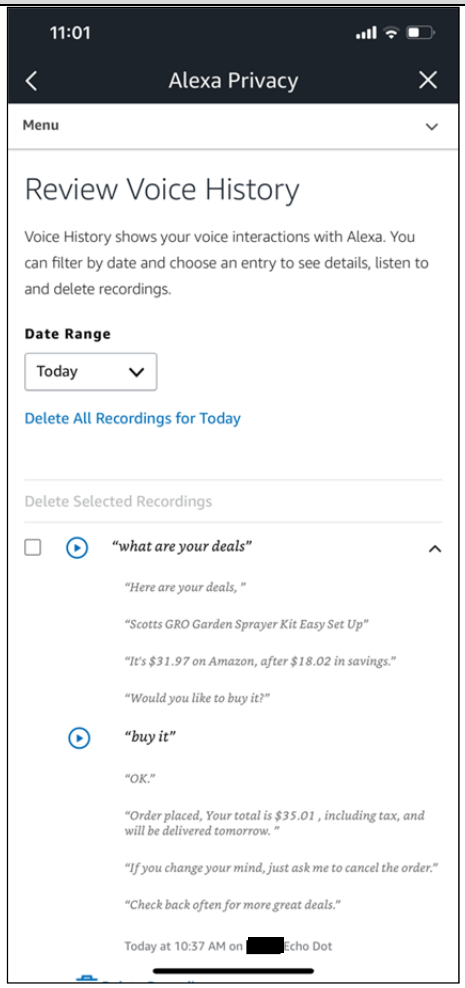
For example, the Echo has the physical processors shown below:

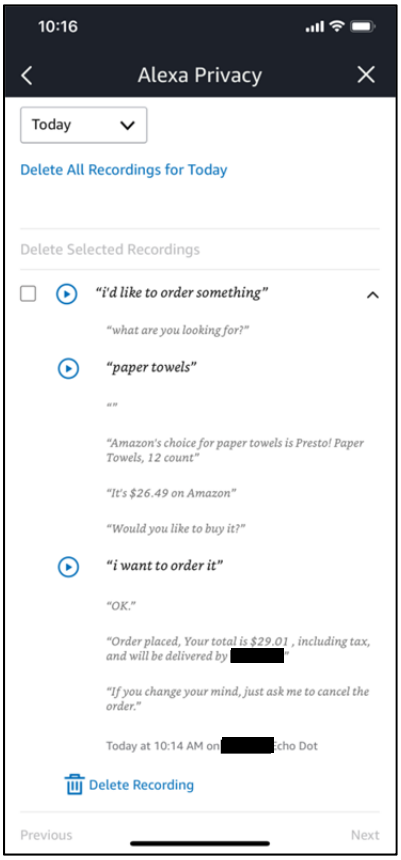
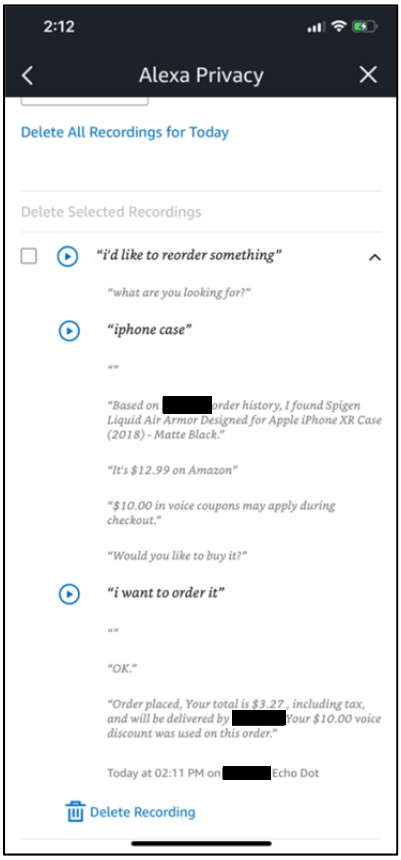


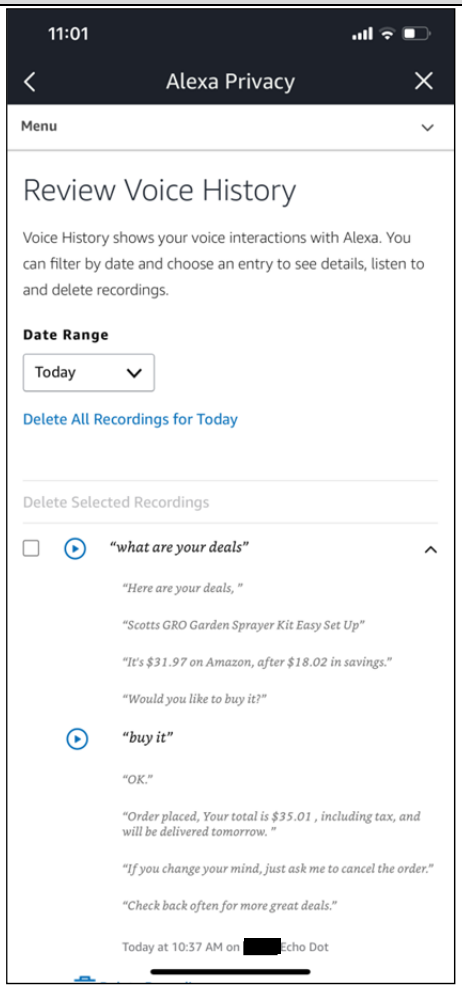
E.g. *Amazon Echo Teardown* at Step 10.

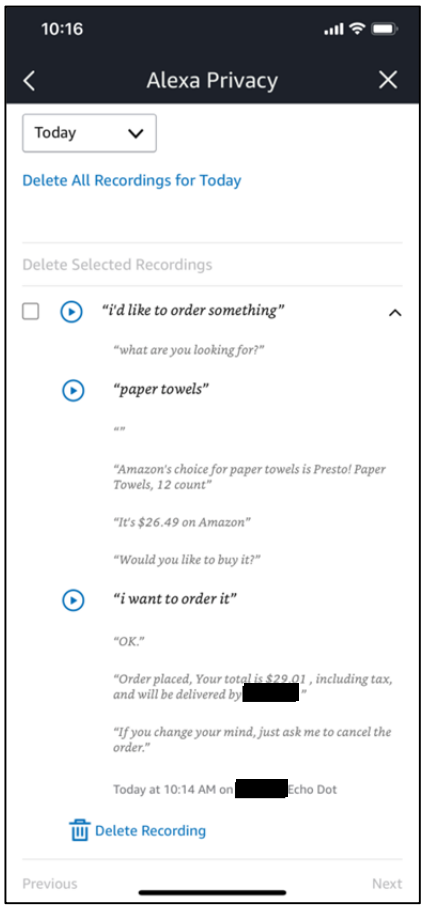
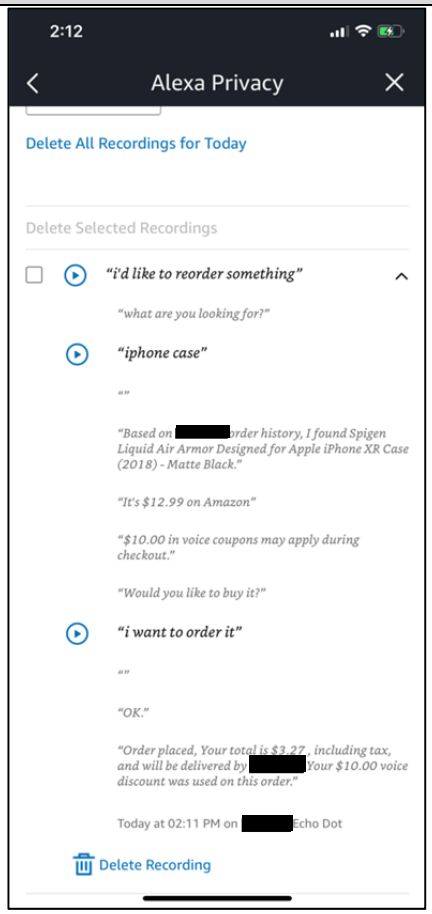
As another example, Alexa Products include Amazon's Alexa cloud that has one or more physical processors: "Alexa allows you to ask questions and make requests using just your voice. For instance, you can ask Alexa a question, such as "What is the weather today in New York?", or tell Alexa to do something, like "Add batteries to my shopping list," or "Play jazz." When you speak to Alexa, a recording of what you asked Alexa is sent to Amazon's cloud so we can process and respond to your request." E.g. *Alexa and Alexa Device FAQs* at answer to question 1.

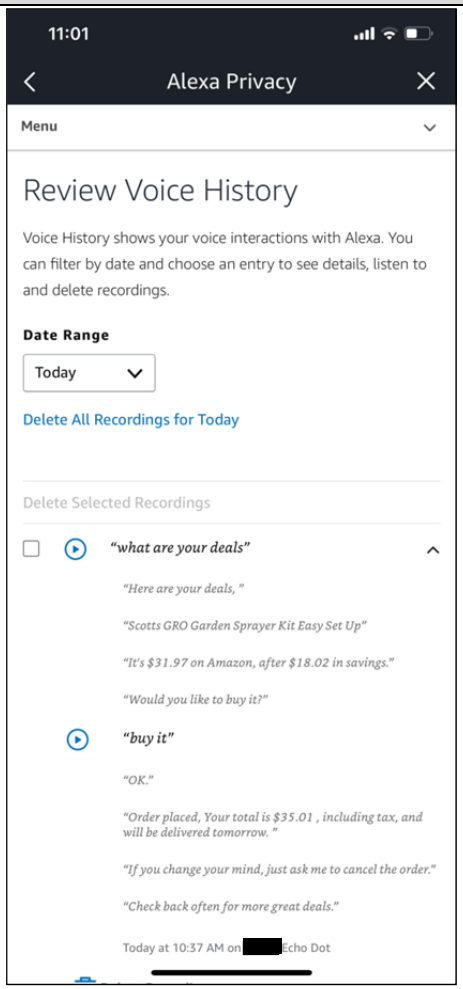
'097 Patent Claim Language	Exemplary Alexa Products
	When ordering something not in your existing order history, Alexa "will suggest an 'Amazon Choice' product that meets the description." *How to Shop*. "Alexa uses a combination of automatic speech recognition (ASR) and natural language understanding (NLU) to understand user speech and respond with precision. ASR converts user speech into text, NLU converts that text into intents for Alexa to act on. At the end of this process Alexa sends directives to your product instructing it to perform an action..." *Audio Hardware Configurations* at Automatic Speech Recognition Profiles.
[1.a] providing, by the computer system, an advertisement associated with a product or service for presentation to a user;	Alexa Products provide, by the computer system, an advertisement associated with a product or service for presentation to a user. Examples of providing an advertisement associated with a product or service are shown in screenshots of Alexa app's "Review Voice History" page below.  

'097 Patent Claim Language	Exemplary Alexa Products
	 Other examples are below. When ordering something not in your existing order history, Alexa "will suggest an 'Amazon Choice' product that meets the description." *How to Shop*. "For starters, if you want to reorder something you've already purchased from Amazon before, just say, "Alexa, reorder a Swiss Army knife." Alexa will pull up your order history and let you select from the items. You confirm with Alexa which item you want from your history and you're done." *Prime Day*. "To order something you've not ordered through Amazon before, say something like "Alexa, order deodorant," or "Alexa, buy a microSD card." Alexa will then perform a search for that item and offer a few recommendations based on Amazon preferred products or products you've purchased from similar categories in the past. It will talk you through the handful of recommendations. Like with reordering, just tell Alexa the number of the suggestion you want to add it to your cart." *Prime Day*.
[1.b] receiving, at the computer system, a natural language utterance of the user; and	Alexa Products receive, at the computer system, a natural language utterance of the user. Examples of receiving utterances are shown below in screenshots of

'097 Patent Claim Language	Exemplary Alexa Products
	Alexa app's "Review Voice History" page below.  

'097 Patent Claim Language	Exemplary Alexa Products
	 Another example is: "Each line of the script spoken by the user is known as an utterance. The utterances are then mapped to an intent. When the user speaks one of them the associated intent will be invoked." *Designing for Conversation – Build for dialog* at Step 2.
[1.c] interpreting, by the computer system, the natural language utterance based on the advertisement and, responsive to the existence of a pronoun in the natural language utterance, determining whether the pronoun refers to one or more of the product or service or a provider of the product or service.	Alexa Products interpret, by the computer system, the natural language utterance based on the advertisement and, responsive to the existence of a pronoun in the natural language utterance, determining whether the pronoun refers to one or more of the product or service or a provider of the product or service. Examples are interpreting the natural language utterances, as shown in screenshots of Alexa app's "Review Voice History" page below.

’097 Patent Claim Language	Exemplary Alexa Products
	 

'097 Patent Claim Language	Exemplary Alexa Products
	 Another example is: "The service that processes this recording is called Alexa Voice Services (AVS). Run by Amazon, this converts the recording into commands that it interprets. It's more than a simple voice-to-text service: it is a fully programmable service that can work with other online services to do a surprising range of things." *Appliance Science*.